Social Mobility in Modernizing Switzerland

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1 Introduction

In times of rising economic inequality, the questions of fairness and equal opportunities are of utmost importance. Indeed, the attention paid to Piketty's (2013) *Capital in the Twenty-First Century* is certainly not only due to the fact that he and his colleagues (Piketty and Saez 2003; Atkinson et al. 2011; Piketty and Saez 2014) demonstrate that inequality is on the rise again after decades of being exceptionally low. Rather, the controversial debate (e.g., Boushey et al. 2017) has been sparked by the mechanisms Piketty (2013) claims not only stand behind rising inequality of outcomes (such as income), but also behind inequality of opportunities.

While inequality of outcomes and inequality of opportunities are distinct phenomena, it is easy to see that the first can entail the latter. Consider a society in which everyone initially enjoys the same opportunities – a level playground, so to speak. In a first round, all members of that society receive a set of resources. While the distribution of these resources is unequal, they are allotted in a way considered fair by all members. In other words, while outcomes are unequally distributed, the opportunities are perfectly equal, which leads all members to judge the created inequality as fair (compare with Breen 2010b). However, as additional resources create additional opportunities, those who have received more resources now also have more options and if the returns on the resources are high, inequality will be accentuated over the life-course, as those who have will receive more (Dannefer 1987). Under certain conditions,[1] it may even become impossible for those with few resources to catch up, as, even with the greatest efforts, their earnings will be insufficient to match the returns on the resources of the wealthy. The longer the distance in time since the initial distribution of the resources, the more difficult it becomes to justify this accentuating inequality by referring to the initially equal opportunity. This is certainly true when the accumulated resources are passed to the next generation, generating inequalities that are only traceable to the family in which a person is born.

These unequal "birth lottery" opportunities are judged by many influential theories to violate fundamental principles of justice (Rawls 1971; Cohen 1997; Roemer and Trannoy 2015). While people sometimes prefer unequal over perfectly equal societies (Norton 2014; Starmans et al. 2017), they only do so as long as they perceive the mechanism creating inequality to be fair, which includes the idea that the family or social

1 For example, the famous "$r > g$" (the rate of return on capital r is greater than the rate of economic growth g) in the work of Piketty (2013), but see also Homburg (2015) for a polemic qualification of this claim.

origin of a person does not matter greatly for the distribution of resources and social positions (Tyler 2011).[2]

If Piketty is right, continuing on the western development path that paralleled the decrease in inequality in the mid-20th century (and which has often simply been labeled "modernization" (Mergel 2012)) will lead to increasing inequality and decreasing social mobility. Piketty was not first economist who received attention for issuing such a warning. Krueger (2012) coined the term "Great Gatsby Curve" (Jerrim and Macmillan 2015) for the observed negative correlation between economic inequality and intergenerational social mobility and warned that rising inequality would lead to less mobility. These warnings question one of the most important promises of the modernization thesis. As I will discuss in more detail later (sub-section 3.3.1), authors such as Kerr et al. (1960) assume that modern and industrial societies will increasingly value merit and productivity and dismiss ascribed personal characteristics such as gender, race, or social origin when allocating social positions. According to this thinking, the combination of various modernization processes (such as industrialization, urbanization, and educational expansion) are expected to lead to higher rates of social mobility (Treiman 1970) – and eventually to societies that are open in respect to social origin in the sense that the chances of attaining any social position are not affected by a person's family of origin.

In sum, there are two rival predictions regarding how the relevance of social origin for an individual's social standing will change in future. The first expects economic inequality to continue rising in western societies, which can be assumed to strengthen the effects of social origin (Piketty 2013; Krueger 2012). The second assumes that, if modernization processes continue to operate, social mobility will increase, and ascribed characteristics will (further) lose their relevance. It is the nature of predictions that they are difficult and not testable. However, we can test whether the modernization thesis holds for the past, as its predictions are concerned with the whole transition from pre-modern to ideal "modern" societies.

Testing the modernization thesis with respect to social mobility is not a new endeavor, as such tests have been carried out with various data and a multitude of conceptual and methodological approaches since its first formulation – with inconclusive results (for overviews, see Form 1979; Ganzeboom et al. 1991; Breen and Jonsson 2005; Hout and DiPrete 2006; Torche 2015). For early modernization, there is

2 But note that the connection between beliefs about inequality and mobility may be more complex (Davidai 2018).

evidence of increasing mobility, at least at times of rapid industrialization (Maas and van Leeuwen 2016; Lippényi et al. 2015; Knigge et al. 2014b; Knigge et al. 2014a). For later modernization (that is, for 20th century western societies), the evidence is mixed. Some authors have reported decreasing effects of social origin (Ganzeboom et al. 1989), others trendless fluctuations (Erikson and Goldthorpe 1992), and still others the increasing relevance of social origin (Long and Ferrie 2013a), to name but a few examples.

Focusing on the example of Switzerland, the present dissertation aims to contribute to this existing research in three ways. From a conceptual and methodological point of view, I will first ask how we can conceptualize, measure, and ultimately compare the degree of a society's "openness" with respect to social origin. This seems to be an important first step, as the history of mobility research has been notoriously technical, which may blind researchers to what they really want to measure. I will argue that while there is nothing wrong in the traditional odds-ratio and log-linear model-based approach when describing patterns of class mobility, these approaches may be less well suited for measuring and comparing the general degree of relevance of social origin in a given society. Rather than focusing on associations measured by odds-ratios, we may want to measure the degree to which an individuals' social position is determined by the (measurable) characteristics of her or his parents. For such purposes, Theil (1970) has proposed to use the measure of Mutual Information borrowed from information theory, and I will show how this can be implemented and used for measuring and comparing the relevance of social origin to the social standing of individuals.

In a second step, I will briefly examine social mobility in 20th-century Switzerland. I will do so in pursuit of two goals. The first is to apply the proposed index of Mutual Information as a measure of the relevance of social origin and to compare it to the results from the more traditional unidiff model. This will make it possible to assess the validity and usefulness of the proposed measure when studying questions of social mobility. The second goal is to point out how this measure could be used to help close existing research gaps in the mobility literature – both in general and in the Swiss case – and to produce some first, exploratory insights in these respects.

The most substantive contribution of this thesis, however, is found in chapter 3, which focuses on the relevance of social origin during Switzerland's industrialization in the 19th century. Analyzing the effects of social origin during this phase of modernization is of special value when testing the modernization thesis, as most contribution to it were formulated by contrasting pre-industrial and industrial societies (Kerr et al. 1960; Treiman 1970; Landes 2003). In other words, analyzing social mobility in a context of early industrialization makes it possible to test this thesis on its home ground. If it does not hold here, where else should it hold?

Switzerland in the 19th century represents a well suited test-case for such an attempt, as it included regions of rapid industrialization, while other areas remained predominantly agrarian (see section 3.1). For my dissertation project, I had the opportunity to collect new data from two cantons that make it possible to exploit this feature. Lucerne, on the one hand, was a mainly rural canton in which the primary sector preserved its dominant role, while some areas nevertheless saw clear industrialization processes. The other case is the canton of Glarus, where proto-industrialization had already pushed back agriculture at the time the mechanized textile industry took over. The resulting new dataset makes it possible to analyze social mobility across two very differently industrialized contexts and within each of them by studying time-trends and the effects of various modernization processes. As a last step, I will complement the picture on the relevance of social origin in times of early modernization by studying homogamy by social origin in the canton of Lucerne. Marrying someone of similar social origin reflects the relevance of social origin as an important aspect of women's and men's life in a societal context of early modernization. Among other conclusions, combining the insights generated by this thesis on the relevance of social origin in times of early industrialization with the insights drawn from the existing literature (section 4.3) strengthens the argument that the link between equality of outcomes and equality of opportunities is crucial for understanding the changing relevance of social origin.

2 The Relevance of Social Origin: Concepts and Measures

The aim of this thesis is to trace changes in the overall relevance of social origin for an individual's social standing, which can be seen as an indicator for a society's openness with respect to her or his family of origin. Approaching this aim requires measuring and comparing the degree to which the class an individual belongs to is determined by the social position of her or his parents over time and various levels of modernization. This is not straightforward, which is reflected by the fact that methodological advancements have played an important role in the literature on social mobility (Hout 1983: 7; Erikson and Goldthorpe 1992: 54). While methodological advancements have been driven by the wish to approach concepts of social mobility derived from theory, the impression remains that, in practice, researchers have also gone the other way by fitting concepts into measures. For example, widely used summary measures of odds ratios, such as the so-called unidiff parameters (Breen and Jonsson 2005: 234–5), have been used in partly problematic ways. As I will discuss in the next section, odds ratios in the context of social mobility research can be seen as measurements of class barriers. Consequently, (unweighted) summaries of odds ratios say something about the "average" rigidity of the class barriers in a given society. As I will argue, however, this does not necessarily equal the "average" effects of social origin, which, according to my understanding, have to be approximated to measure the overall relevance of social origin for individual status attainment in a given society. Whether a given measure is appropriate depends on the research question at hand, as the concepts behind the former should be paralleled by the concept behind the latter. Consequently, the aim of this section is to clarify these concepts – in both substantial and technical terms – and to justify the choice of the Mutual Information Index as the primary measure for the relevance of social origin used in this thesis. I will approach this aim through three steps. Section 2.1 will start by exploring how we can conceptually think about this general relevance of social origin for an individual's social standing and how far this concept is mirrored by traditional measures of social mobility, before introducing the basic ideas behind the Mutual Information Index. Section 2.2 will give the technical details of one of the traditional measures and of the Mutual Information Index. Section 2.3 will then compare the two measures and give some exploratory insights into the changing relevance of social origin for an individual's social standing.

2.1 Concepts of Open Societies Respecting Social Origin

2.1.1 Traditional Concepts and Measures

Societies in which social origin has little influence on an individual's social position are said to be "socially fluid" (Breen and Jonsson 2005). To approach a more concrete definition of social fluidity, a first noteworthy observation is that social fluidity usually comes with comparably high rates of observed intergenerational social mobility. In the literature, observed intergenerational social mobility describes the fact that the observed social position of a person differs from the social position of her or his family of origin (Ganzeboom et al. 1991). In other words, observed mobility is mobility in its manifest sense, and is the only definition of social mobility that can be applied to individuals. Early research on social mobility (Sorokin 1927/1959) and early tests of the modernization thesis (Lipset and Zetterberg 1959) have investigated this immediate form of social mobility.

While social fluidity usually comes with comparably high rates of observed mobility, it is not necessarily the case that socially fluid societies have high mobility rates; nor is it the case that high mobility rates mean high levels of social fluidity. A socially fluid society can have low rates of observed mobility if a large part of the population is concentrated within one (or very few) social positions. Consider a society with the three social classes A, B, and C, with B being by far the largest class (consisting of 90% of the population). In such a society, observed mobility is necessarily low, as individuals originating from class B will likely also belong to class B – not necessarily because their origin influences their destination, but certainly because there is not much choice other than belonging to class B. To assess the influence of social origin, we therefore need to compare the observed immobility with the marginal distribution of the classes. Low mobility rates point to a high influence of social origin if and only if an individual's likelihood of entering the class of their parents surpasses the likelihood that can be expected from chance alone, given the marginal distribution of the classes. Therefore, we could adjust the observed mobility rate by subtracting the number of individuals than can be expected to be immobile by chance alone from the total number of immobile individuals.

However, focusing only on mobility rates can be misleading, even when applying such corrections, as social origin can be of relevance for an individual's social class even if they are socially mobile and do not belong to the same social class as their parents. This is of special importance if the class structure changes from one generation to the next. For example, during rapid industrialization, the working class will grow from one generation to the next, while other classes, such as the class of farmers, will shrink. In such a situation, many descendants of a non-industrial class will be "forced" to be socially mobile, because there are not enough non-industrial positions within the class structure of their own generation. In the literature, this forced mobility is often labeled "structural mobility" (Boudon 1973: 17). If such structural changes from one generation to the next enforce mobility, but an individual's position in the new social stratification depends heavily on their parents' position in the old stratification, mobility rates are high despite the strong effects of social origin. Most people would agree that such a society cannot be called open respecting social origin, because the chances of individuals attaining a certain social position depend on their social origin and are not equal.

One way to deal with this problem is to measure social positions on a continuous scale and to use the correlation between the parents' and the individual's positions as an indicator for the importance of social origin. Blau and Duncan (1967) went one step further in this direction and analyzed the status attainment process using a path model reflecting the idea that the parents' social status and education affects an individual's social status partly indirectly via the individual's education (see **Figure 2-1** for an example).

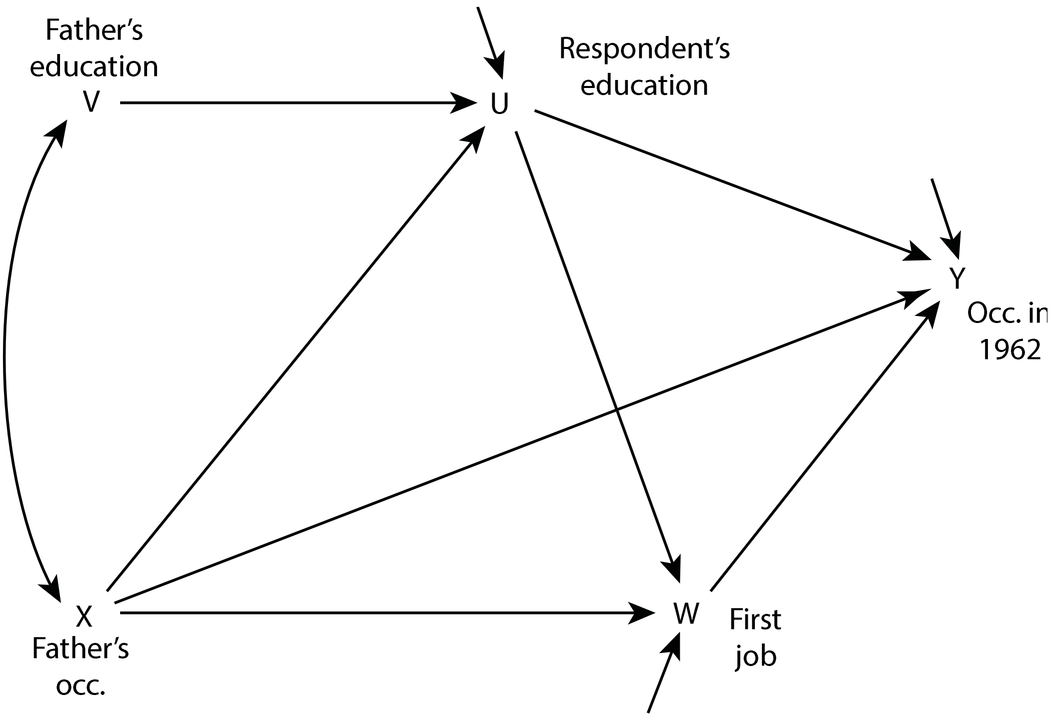

Figure 2-1. Blau and Duncan's model of status attainment
Source: redrawn after Blau and Duncan (1967: 170), omitting the path coefficients.

The advantage of such an approach is obvious, as it reveals mechanisms of the status attainment process, which remains a black box for approaches focusing exclusively on the total association between the social positions of the parents and their child. A special strength of this model is that it is able to assess the role of an individual's own education within the process of status attainment. Because of this feature, such models allow us to assess the degree of a society's openness by the ratio of paths related to social origin (ascriptive paths) and those that point to achievement. Regarding **Figure 2-1**, the ratio of the effect of a son's education on his current occupational status (U→Y) and the direct effect of the father's occupational status on his son's current occupational status (X→Y) is such a measure (Ganzeboom et al. 1991: 283–4). Conceptually, such a ratio captures a key prediction of the modernization thesis, which is one reason why Treiman (1970) suggested using this model as a blueprint for international comparisons that would allow testing of this thesis.

While several studies have been published in this vein (Treiman and Ganzeboom 1990), the model has been rarely used for truly comparative studies, mostly because the comparable individual-level data necessary for these models were not available, but also because the socioeconomic index used by Blau and Duncan (1967) was not internationally comparable (Ganzeboom et al. 1991). Before such a measure was proposed by Ganzeboom and Treiman (1996), the attention of researchers turned away from continuous scales of social status to nominal classes of occupations. Three reasons for this can be identified. First, analyzing continuous scales of social status by means of path models such as the model of status attainment in **Figure 2-1** may be helpful for revealing causal mechanisms within the process of status attainment, but fails to deliver detailed descriptions of mobility patterns (Hauser 1978). For example, continuous scales make it difficult to see who goes where or stays within their class of origin and to reveal boundaries and affinities between classes. Second, researchers such as Erikson et al. (1979) insist that important barriers between social positions cannot be captured by a purely hierarchical ordering (see also Erikson and Goldthorpe 2009; Chan and Goldthorpe 2007). Third, log-linear models, made popular among researchers of social mobility by Hauser (1978), allowed for the modeling of specific patterns of mobility while applying a confirmatory approach to the mobility table and perfectly separating the effects of social origin from the effects of the marginal class distributions. The latter means that these models provide measures of social origin unaffected by changes in the marginal distribution ("margin-free"), a property researchers have been demanding for a long time (e.g., Boudon 1973).

The concept behind these models is called "relative mobility", which sometimes is simply understood as a synonym for "social fluidity" (e.g., Breen and Jonsson 2005). The idea behind this concept is that inequality of opportunities is something "inherently comparative" (Marshall and Swift 1996: 376). In other words, it involves comparing the opportunities of a person with those of another person. According to this definition, relative social mobility is high if the odds of attaining a certain position are similar for all social origins. Consequently, high relative mobility implies that the odds ratio of a person from origin *i* compared to a person from origin *j* of attaining position *k* instead of *l* is close to one for all possible combinations of social positions *i*, *j*, *k*, and *l*:

$$OR_{ijk}^{high\ relative\ mobility} = \frac{\frac{p(y=k|x=i)}{p(y=l|x=i)}}{\frac{p(y=k|x=j)}{p(y=l|x=j)}} \cong 1, \qquad \forall\, i,j,k,l \in K \qquad \text{2-1}$$

This definition of social mobility relies on distinct groups of social position and is, therefore, usually used to analyze social mobility between social classes. In this view, uneven odds for reaching certain classes of destination by class of origin (odds ratios deviating substantively from unity) indicate class barriers that are difficult to cross from one generation to the next. Thus, a closed (open) society is a society with rigid (fluid) class barriers. Of course, a primary interest in these class barriers is a strong argument for using a class based approach and not one based on a continuous status scale – for example, because class and not status is perceived as the most pertinent dimension for a specific research question (Chan and Goldthorpe 2007).

Log-linear models, such as the ones proposed by Hauser (1978), model and describe a set of mobility tables – cross-tabulations of the current class of the child (often called "destination") and the class of one or both parents (often called "origin"). They do so by means of a set of parameters representing the marginal distributions and all possible (or a selection of) odds ratios. Hauser (1978) promoted these kinds of models as a tool for describing patterns of social origin, with variations of these patterns between tables representing different periods or geographical areas. Revealing patterns and important class barriers (or, conversely, affinities between certain classes) is really the domain where these models excel. Most prominently, Erikson and Goldthorpe (1992) have arrived at a so-called "core model", a description of a mobility regime shared by many countries, which also allows researchers to detect deviations from this pattern.

As class barriers distinguish socially open from socially closed societies, revealing such barriers is important to understand in what sense a society can be said to be "open" or "closed". When comparing different societies, however, it is not straightforward to determine from such class barriers which society is more fluid or more open, simply because there is no obvious rule regarding how to aggregate these class barriers to the unidimensional measure necessary to rank such "openness". Models such as the "core model" collapse certain barriers to a few meaningful dimensions, such as inheritance effects, hierarchical effects, sector effects, and affinity effects. Nonetheless, multiple dimensions remain, and the multidimensionality of this class barrier-based concept of openness makes it difficult to answer research questions that rely on ranking – for example, whether a given society has become more open over the course of modernization.

In 1992, two independent publications proposed a rather technical solution to this problem. The so-called "unidiff model" (Erikson and Goldthorpe 1992) or the "log multiplicative layer effects model" (Xie 1992) distinguishes between the association pattern (which indicates the barriers between the classes) and the "strength" of these associations. While the pattern is common to all mobility tables analyzed, it is allowed to vary uniformly in strength between them. The so-called unidiff parameters of these models are factors that indicate how many times more strongly this pattern works in a given table compared to in a reference table. As long as the uniformity assumption holds, these models can be used to compare (for example) the strength of the class barriers in one birth cohort to the class barriers of another birth cohort. Technically, the unidiff model offers an elegant and parsimonious way to model a set of mobility tables that differ in magnitude but not (much) in the pattern of the odds ratios describing the origin–destination association. In many empirical applications, the unidiff model fits the data almost as well as a saturated model, which allows the association parameters to vary freely between the tables, but using much less degrees of freedom (examples are: Erikson and Goldthorpe 1992; Breen 2004a; Jacot 2013; Hertel 2017).

However, when used for studying trends or differences in the amount of relative social mobility, the unidiff model yields results that are difficult to interpret. There is both a technical and a conceptual explanation for this. On the technical side, the limiting factor relates to the fact that the unidiff parameters have no "natural" scale, but can be interpreted only in relation to the reference group. Because of this, it is only of limited use when comparing different sub-populations, such as genders. If we are not at least willing to assume a common mobility pattern for all of such a sub-population,[3] these models do not allow for a comparison of the overall level of social origin effects between two groups. Furthermore, when comparing time trends between such sub-populations, the only comparable result is whether there is a decrease, an increase, or stability – but

[3] For Switzerland, the differences in the mobility patterns between the genders are quite large (Falcon 2013: 220).

this does not allow us to assess for which group a change was the most important.[4] While this limitation applies to some specific research questions, the conceptual difficulties are more general. I will discuss them in the next sub-section, as they are important for considering an alternative and, as I will argue, a conceptually more coherent measure for the general relevance of social origin for an individual's status attainment in a given society.

2.1.2 Measures of Social Mobility: Should They Be 'Margins-Free'?

As sketched out in the last sub-section, log-linear models have been applied to reveal class barriers or the underlying pattern of mobility. This underlying pattern has also been labeled the "genotypical pattern" (Featherman et al. 1975: 340) (a product of the fundamental organization of a society), which is then exogenously (through factors determining the marginal distributions of a mobility table, such as supply and demand for specific kinds of labor) transformed into the "phenotypical pattern", which can be revealed by studying observed mobility. Revealing the underlying pattern is indeed an important analytical goal and helps us understand the forces underlying the reproduction of a stratified system. Because class barriers in the sense of unequal opportunities are unaffected by the marginal distribution, we need measurements or models that filter out the effects of the marginal distribution to detect them. In other words, we need so-called "margin-free" measures, such as odds ratios, which can be obtained by means of log-linear models. While individual class barriers can only be revealed by such "margin-free" measures, I will argue in this section that such measures may not be best suited for measuring and comparing the general importance of social origin for an individual's status attainment, or for measuring the general openness of a society respecting the family of origin. Exactly for this, however, many authors have used these models. For example, the work of Featherman et al. (1975) has been interpreted in a way that these authors "insist [that the] mobility of the 'genotype level' must be investigated" in order "to judge openness in a true sense" (Imada 2000: 37).[5] Erikson and Goldthorpe (1992) draw a direct line of argument between the "'genotypical' level of the pattern of relative mobility chances" (p. 24) and the "openness" of a society. An unidiff model can then be used to determine "levels of the patterns" in each mobility table, that is, how pronounced each pattern is. A society with a mobility table showing a pronounced pattern indicated by a high unidiff parameter is then be said to be socially more fluid than one with a lower parameter (Breen 2004b).

[4] On the interpretation of these parameters, see also Erikson and Goldthorpe (1992: note 25).
[5] Note that this is a rather free interpretation of the statement of Featherman et al. (1975).

What is potentially problematic about this approach is that unidiff models model cells of mobility tables, and not the societies described by these mobility tables. In a mobility table, each origin–destination combination always concerns exactly one cell; when comparing the chances of entering a given destination class between two classes of origin, this always concerns two rows in such a table. Depending on the research question, this can be perfectly fine. Odds ratios based on mobility tables can answer the question posed by a working class girl about how much better her chances would be of reaching the upper service class if she had been born the child of a manager. These are the sorts of questions Marshall and Swift (1996: 376) refer to when they characterize equality of opportunity as something that is "inherently comparative", and in this case, it is indeed a one-by-one comparison.

However, this is not the main research question here, as I am primarily interested in comparing the general level of origin effects over time, and only secondarily within particular class barriers. For answering such questions related to the general degree of a society's openness, we need to generalize from particular class barriers to the society as a whole. Studies applying unidiff models do so by applying the aggregation-rule technically built into the model – less open societies have less pronounced patterns of class barriers, while each barrier has the same weight irrespective of the proportion of the society for which a particular class barrier is of relevance. This conforms with the paradigm according to which a good measure of social mobility should not be affected by changes in marginal class distribution, but there is ground for the argument that not considering changes in the class distribution at all can be misleading.

When studying industrialization or modernization processes, the diminishing weight of the farming classes is of special importance, as it is a defining (or at least a characteristic) feature of these processes (Treiman 1970; Kuznets 1955). Such a marginalization of agriculture could mean that the size of the farming class approaches zero, for example because of the complete urbanization of the area; Singapore (Fields 1994) could serve as an almost perfect real world example. This extreme case is helpful for illustrating why ignoring changes in class distribution can produce misleading results when analyzing the changing effects of social origin. For illustrative purpose, we assume the farming class to be the only source of social origin effects. More specifically, the odds ratios between two non-farming classes are thought to equal one. By contrast, the odds ratios between descendants of farmers and individuals with a non-farming background are very uneven in this example. Additionally, we assume that none of these class barriers changes over time. In other words, we assume that nothing changes except the shrinking proportion of the farming class and the proportional growth of the other classes. In this example, it is obvious that a purely margin-free, odds ratio-based concept of an open society leads to a paradoxical result: while this society would be called completely open without the farming class, it retains the exact same level of openness, while the proportion of the farming class approaches zero. Thus, if we apply the aggregation rule built into the unidiff model for making substantive generalizations from individual class barriers to the overall openness of a society, we accept that a large farming class makes the same contribution to a society's social rigidity as an almost disappeared farming class – while a farming class that has completely disappeared contributes nothing.[6]

It is surprising to find that this paradox has not influenced the research on social mobility. In their critical assessment of Long and Ferrie's (2013a) long-term study of social mobility in Great Britain and the United States, however, Xie and Killewald (2013) stress the general problem. They point to the fact that the constantly high level of self-recruitment of farmers in the US against the background of a strong decline in the agricultural sector can lead to decreasing fluidity in terms of odds ratios, while one would otherwise judge the same society to have become more mobile. Xie and Killewald (2013) note that this problem has not been as apparent in previous research because of the common practice of excluding direct class inheritance (the diagonals in mobility tables) from the analyses – a practice that "has effectively glossed over important aspects of the role of farmers", as Long and Ferrie (2013b: 2045) put it. One conclusion to be drawn from this debate is that parts of the previous research on social mobility deserves careful revision (Xie and Killewald 2013: 2018; Long and Ferrie 2013b: 2045). I will come back to this point at the end of the next sub-section when presenting an alternative measure for the general relevance of social origin for the status attainment of an individual. For now, it is sufficient to conclude that giving each origin–destination-combination the exact same weight may not be appropriate, and may lead to paradoxical results.[7]

[6] The fact that the growth of classes with low origin effects leads to a lower overall relevance could be called a "direct compositional effect", whereas the effect resulting from differential association and educational expansion (Breen and Jonsson 2007; Breen 2010a, 2010b) can be seen as an indirect compositional effect. The latter is the mechanical result of educational expansion if the origin–destination-association is less pronounced among the more highly educated.

[7] In the context of ethnic segregation, Mora and Ruiz-Castillo (2009a) present further arguments for the claim that a completely "margin-free" measure may not be appropriate for an overall assessment of the importance of one characteristic (e.g., social origin or ethnic group) over another characteristic (e.g., social destination or school choice) of a given person.

Besides the ignorance of "margin-free" measures regarding the population weight of each class barrier, one can also argue that the influence of social origin should be compared to the influence of the marginal distribution of both parents' and child's social positions to assess the relevance of social origin for an individual's status attainment. To clarify this point, consider the mobility tables of two example societies in **Table 2-1**. The two tables are the same, with the exception of the column of those with a high-class destination. This column has been multiplied by 30 in Society B. Multiplying the marginal distribution by an arbitrary factor does not alter the internal structure of a matrix. By consequence, the odds ratio is the same in both societies ($OR_A = \frac{20 \cdot 20}{10 \cdot 10} = OR_B = \frac{600 \cdot 20}{300 \cdot 10} = 4$). However, if we compare the conditional probabilities of attaining a high status belonging to those of high origin with those of individuals of low origin, it is obvious that origin has a different relevance in the two societies. In Society A, being of "high" origin increases the probability of entering the higher class drastically (by about 33 percentage points). In Society B, by contrast, where the probability is very high for descendants of both origins, the difference is only about five percentage points. In this society, the marginal distribution steers individuals towards a high destination regardless of their origin, and this means the influence of origin is less consequential. This is, of course, not surprising, as it simply reflects the different meanings of odds and (conditional) probabilities. However, these examples highlight that odds ratios may not be the best measure for analyzing and comparing the relevance of social origin.

Table 2-1. Examples of the steering power of the marginal distribution

	Society A			Society B		
	High Destination	Low Destination		High Destination	Low Destination	
High Origin	**20** 66.7%	**10** 33.3%	*30* *100%*	**600** 98.4%	**10** 1.6%	*610* *100%*
Low Origin	**10** 33.3%	**20** 66.7%	*30* *100%*	**300** 93.8%	**20** 6.3%	*320* *100%*
	30 *50%*	*30* *50%*	*60* *100%*	*900* *96.8%*	*30* *3.2%*	*930* *100%*

Source: author.

To repeat: the research question at hand determines whether this argumentation against relying solely on odds ratios when studying effects of social origin applies. For example, the first argument assumes implicitly that the relevant social positions are somehow comparable. In this case, weighting the class barriers based on the margins makes sense. However, there are imaginable cases where this demographic aspect is completely irrelevant. To illustrate this, consider a society where all political power is concentrated within one distinct "ruling class". In this case, the size of this class does not matter for the openness of this society respecting political power. The only thing that is relevant is whether this class exists or not.[8] By consequence, the contrast between "the class size approaches zero" and the "the class does not exist at all", as sketched out above, would not be a problematic feature of a "margin-free" measure in such a case. However, the present thesis investigates the general importance of a subject's social origin and how this importance has changed over time. For this question, the above arguments speak, in sum, against the use of a purely "margin-free" measure.

If we accept this conclusion, the question remains of what properties an appropriate measure of the importance of social origin should have. With an odds ratio-based approach, such a measure should clearly share the ability to detect complete independence of origin and destination. Moreover, and in contrast to observed mobility, an existing association between origin and destination should not be masked by structural mobility. In other words, if a part of the population is forced to leave the class of their parents because of structural changes, this should only affect our measure if the structural changes go hand in hand with changes in the relevance of social origin for the status attainment of individuals. Contrary to purely "margin-free" measures, however, this should take into account changes in the marginal distribution that affect the relevance of existing dependencies between origin and destination – either because these changes affect the influence of the margins, or because these changes increase (or decrease) the proportion of the society affected by strong origin–destination associations. For analytical purposes, it would nevertheless be valuable if changes in such a measure were to produce decomposable measurements in part stemming from changes in the marginal distribution and in part originating from changes in the dependence structure between origin and destination.[9] A different form of decomposability is also important: to assess the importance of certain class barriers, it

8 There is some link between this argument and Breen's (2010b) argument that equality of opportunities respecting social origin is always a combination of the effects of social origin, and how in a given context differential outcomes translate to differential opportunities.

9 Such decompositions are not only interesting for analytical reasons; they can also be an important tool to assess the amount of bias introduced by messy data. In an appendix to their concluding remarks, Breen and Luijkx (2004) assess the possible effects of falling survey response rates on the analyses of temporal variations in social mobility in Europe. They show that, in some of the analyzed countries, response rates fell considerably over the observed period. They argue "that non-respondents are drawn from among those with low income and low levels of education",[9] but that this would not affect the association between father's and son's social class (Breen and Luijkx 2004: 405). In such a case, a "margin-free" measure is desirable as it will not be biased by the survey non-response, while a "margin-sensitive" measure will.

should be possible to decompose the measurement into the parts different destinations (or origins) contribute to the overall measurement. Such a decomposition would make it possible to identify those classes for which social origin is of particular importance, and also to reveal class barriers.

Finally, such a measure should allow researchers to respect the multi-faceted nature of social origin. The terms “social origin” or “family background” do not refer to a single aspect of the social reality in which a person was born and raised. Instead, it refers to the whole package of origin family resources that potentially affect her or his future social standing. The question of “the composition of family background” (Buis 2013) had already been discussed when Blau and Duncan (1967: 175) proposed their seminal “model of status attainment”. Only relatively recently, however, has it reappeared prominently in the literature on social stratification and the effects of social origin (Bukodi and Goldthorpe 2013; Buis 2013; Hällsten and Pfeffer 2017; Mood 2017). It is difficult to capture the joint influence of several of these dimensions within the framework of odds ratios. Capturing the joint influence of several dimensions of origin would be a valuable feature of an alternative measure of the relevance of social origin. In other words, such a measure should make it possible to estimate the overall importance of social origin, even if we assume multiple dimensions of social origin to be relevant, such as the highest level of education of each of the parents plus both parents’ occupational status.

2.1.3 The Index of Mutual Information as a Measure for the Relevance of Origin

To approach a measure that matches the wish list sketched out above, we might need to reconsider the kinds of questions we want to answer with a given measure. As has been pointed out, odds ratios can answer the question of a working class girl who wants to know how her chances of reaching the upper service class compare to those of a manager’s child. While this question is perfectly relevant, I have argued that it is not straightforward to extend it to society as a whole. Instead of comparing two odds of reaching a certain class, we might instead ask how much we learn about her destination class by becoming aware of her working class origin. This question too directly relates to the relevance of a working class background. In addition, it is easily generalizable to the whole society by asking how much we can learn on average about a person’s social standing by knowing his or her social origin. Because origin can only carry significant amounts of information on destination if origin is relevant for destination, the answer to this question is also an answer to the question on the importance of social origin for an individual’s own social position.

When introducing logistic regression to sociologists, Theil (1970) concluded with a section on the measurement of "the degree to which the determining factors of our relations account for the phenomenon which they serve to explain" (p. 125). This is exactly what we are concerned with when analyzing the relevance of social origin for an individual's class affiliation: we estimate associations, but in the end we are interested in whether the degree social origin (measured by one or multiple variables) determines the class an individual belongs to. Theil's (1970) approach for measuring this degree of determination operates along the lines sketched out above, by asking how much information one can gain on the phenomenon at stake by learning these determining factors.

Information theory, which goes back to Shannon (1948) and has been introduced to economics and the social sciences by Theil (1967, 1972), deals with these kinds of questions by turning them around: the more information I have about something, the less information I will gain by actually observing it. The question "How much can I learn about Y by learning X?" can thus be answered by the difference between the *a priori* and the *a posteriori* information gain. Here, the *a priori* information gain measures how much one can learn by observing X if one only knows the unconditional distribution of X. Similarly, the *a posteriori* information gain measures how much one can learn by observing X if one knows the distribution of X conditional on Y. As an analogy to the discussion above, the former takes into account the "steering power" of the marginal distribution, while the latter additionally includes the influence of origin. If the difference between the two is large, we can conclude that social origin is important for an individual's own social position as it carries an important amount of information on this person's class over and above the information included in the distribution of social positions. Because of this, information theory can serve as a conceptual framework for analyzing linkages between two entities: between district and race, in the case of residential segregation by race (Mora and Ruiz-Castillo 2011); between fields of study and occupational positions, in the case of school-to-work linkages (DiPrete et al. 2017); or between the social class of parents and their children, in the case of social mobility (Silber and Spadaro 2011)[10].

In this thesis, I will use the Mutual Information Index (M-index) as a measurement for the linkage between origin and destination, which is based on entropy, the measure

[10] To the best of my knowledge, this is the only publication that makes use of the M-index for analyzing social mobility.

of information available before and after learning the class of origin. As we will see in more detail in sub-section 2.2.2, the M-index is given by

$$M = \sum_{j=1}^{J} \sum_{k=1}^{K} p(x_j, y_k) \ln\left(\frac{p(y_k|x_j)}{p(y_k)}\right). \qquad 2\text{-}2$$

The M-index is not the only possible measure based on information theory that could be used to measure linkages between origin and destination. Mora and Ruiz-Castillo (2011) discuss several entropy-based measures for measuring segregation – all of those measures could also be used for studying social mobility. The measure they denote H,[11] for example, has been used for analyzing social mobility in Switzerland (Jann and Combet 2012; Jann and Seiler 2014) and can be calculated by normalizing the M-index by the *a priori* information available on the destination class. The main advantage of this latter measure lies in its somewhat more intuitive "Proportional Reduction of Error (PRE)"-interpretation – a proportion might be easier to grasp than the difference of two abstract entropies. However, the normalization destroys some of the desired properties of the measure. If the destination class is already strongly determined by the marginal distribution, we want to take this into account when measuring the relevance of social origin for an individual's class affiliation. Mora and Ruiz-Castillo (2009a: 188–90) show that the way this is done when calculating the M-index leads to more consistent results than the H-index. These authors also point out that only the M-index has strong decomposability properties respecting the contributions of several subgroups to the overall linkage (Mora and Ruiz-Castillo 2011: 173–84). For example, the M-index can be decomposed into local M-indices for each class of origin without introducing any ambiguities. More specifically, the local M-index for those with farming parents will tell us how strongly predetermined the class of daughters and sons of farmers is because of the fact that their parents were farmers. An additional, more mundane reason for choosing the M- instead of the H-index relates to the fact that the normalization necessary to calculate the H-index can be difficult to implement in the case of more complex applications. Choosing a simpler measure thus prepares the ground for an easy implementation of future features, allowing new insights into the mobility process. Finally, the M-index has been chosen by other researchers for studying conceptually similar social phenomena (Mora and Ruiz-Castillo 2011; DiPrete et al. 2017; Forster and Bol 2018), mostly because it can be perfectly decomposed into local

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11 Note that the choice of this notation is unfortunate, as H is often used to describe entropy, while I is used for the index of mutual information (Theil 1967; Stone 2016). I have decided to follow (Mora and Ruiz-Castillo 2011) to be consistent with the literature that makes use of the M-index cited in this section.

M-indices. Therefore, choosing the M-index instead of another measure grounded into information theory provides a better integration into the existing literature.[12]

Before formalizing the M-index in the next section, I would like to illustrate the basic idea using two somewhat exaggerated examples. First, imagine you were visiting a large building and you were guessing the sex of the next person to come around the corner. Your surprise to meet a man will be limited, as the odds are about even. Nevertheless, you would be even less surprised if you knew you were in a monastery. The second example is closer to the framework of social mobility. Imagine you were meeting an unknown woman and guessing her social status. You are very surprised to learn you are talking to a princess, as the odds of doing so are very small. However, you would not be surprised at all if you knew her mother is a queen.

In both cases, the difference between the *a priori* and the *a posteriori* information gain is large because the additional information largely determines the outcome at hand. Monasteries and convents are segregated by sex and a mother being a queen usually makes the daughter a princess. The mutual information between the outcome (male or princess, respectively) and the context information (monastery or mother being a queen, respectively) thus reflects the strong link between them. Given the different marginal distributions, however, the mutual information will be much lower in the case of the monk than in case of the princess. This reflects the fact that for a randomly chosen woman being a princess, it is much more relevant to have a queen as a mother than it is to live in a monastery for a randomly chosen person to be male.

In the first case, mutual information can be seen as a measure for residential segregation by gender, in the second for the effects of social origin on social position. In both cases, however, the examples tell little about segregation or the importance of social origin in general, because in most societies both monks and queens make up only a very small fraction of the population. The M-index considers this by weighting the local mutual information measure by its respective demographic proportion. The fact that M-index can be additively combined from weighted local measures means, in reverse, that M-index is directly decomposable into sub-group specific local linkages. The advantage of this decomposability is two-fold. First, a decomposition into origin specific linkages allows measuring the influence of a specific origin. Analogously, the decomposition into

12 A counterexample is the very recent study by Ferguson and Koning (2018) on segregation within firms using H. It is unfortunate that they do not justify their choice of measure within the family of entropy-based measures, as some of the arguments against the use of H discussed by Mora and Ruiz-Castillo (2011) seem to apply here.

destination specific linkages allows answering the question how relevant social origin is for entering a certain destination class. Second, the overall M-index can be split into linkages by macro-units – for example by birth cohort or country. Macro-unit specific linkages can then be explained by macro-level characteristics.

The main strength of such a measure of the relevance of social origin stems from the flexibility in the specification of what one initially knows about an individual's social position and of what makes up the additional information on social origin. In other words, what is known *a priori* about X is not necessarily limited to the unconditional distribution of X, but could include information on some control variables V. For example, the data used in section 2.3 stem from different sources. In such a case, V could include a variable indicating the data sources, which controls for differences in the marginal distribution of X between surveys. V could also contain mediators between Y and X. For example, if V includes an individual's own education, M is a measure of the direct effect of social origin, net of education. Obviously, V also needs to be part of the *a posteriori* information to make the two comparable. Finally, researchers applying this approach are also free to specify the additional information that makes up (together with the *a priori* information) the *a posteriori* information. More specifically, the added information is not limited to one measure of social origin (such as the father's class), but could include both parents' own occupational status plus the highest educational level attained by each of them. In this case, the M-index represents what one learns about an individual's own status by becoming aware of all these characteristics of her or his social origin.

What remains on the list of desirable features of a measure for the general relevance of social origin discussed above is the ability to separate changes in the influence of social origin from the influence of the marginal distribution. As we will see in the next sub-section, two different decomposition methods have been proposed to approach this goal. As discussed above, the M-index considers the marginal distribution in two respects: first, for comparing the influence of social origin to the one of the margins; and, second, when weighting the information gain for each origin–destination-combination with its population share. In other words, the M-index can be thought to consist of these three elements: it increases with the influence of social origin, it decreases with the influence of the margins, and it increases with share of the population for which origin is of high relevance. Mora and Ruiz-Castillo (2009a, 2011) proposed a method that makes it possible to decompose differences in the M-index between two groups (e.g., between two birth cohorts) at least partially into these elements. It separates the part originating from differences of the influence of one of the margins, the part originating from differences in the weights according to the other marginal distribution, and residual differences net of the other two differences. As the residual part still contains an unknown part stemming from other differences in the marginal distribution, this is not a perfect decomposition for obtaining a margin-free measure; it nevertheless provides valuable insights into the differences in the stratification system of the two groups compared. However, Deutsch et al. (2006) proposed a method that directly aims at separating the differences stemming from the marginal distribution from the differences stemming from the "internal structure" (i.e., the pattern of associations between the classes of the two generations). Their thinking is that when comparing two mobility tables, one might change the one into the other by taking two steps: first by changing the margins, and second by changing the internal structure (or the other way around). The proposed method allows retracing these steps; this makes it possible to obtain the portions changed in each step, and thus to determine the contribution of differences in the associations to the overall difference in the M-index separately from the contribution of the differences in the margins. In other words, this complete decomposition of any change or difference in the M-index yields both the counterfactual change in the M-index if only the margins changed, and the part if only the associations had changed, but not the marginal distribution – together, they add up to the factual difference in the M-index. Unfortunately, this decomposition is not yet available for more advanced uses of the M-index and can only be applied when analyzing and comparing the overall association between two categorical variables without any further variables involved. Because of this, this decomposition is not available if we want to control for confounding factors or if we want to analyze the joint effect of social origin measured by multiple variables.

While this is certainly a limitation, a brief reanalysis of the data analyzed by Long and Ferrie (2013a) highlights the usefulness of the M-index as a measure of the overall level of social fluidity in general and the decomposition proposed by Deutsch et al. (2006) in particular. As briefly sketch-out in the previous sub-section, Long and Ferrie (2013a) analyzed social mobility in Great Britain and the United States after 1850. Their most controversial conclusion was that the US was more open in the 19th than in the 20th century. Both their own measure and the unidiff parameters they estimated suggested so. When reanalyzing their data using a unidiff model for 1880, 1900 (the reference table), and 1973 (Long and Ferrie 2013a: Tables 1 & 3), I can confirm their conclusion:

class barriers became more rigid from 1880 to 1900 and again from 1900 to 1973.[13] In the counterfactual case (that the margins in 1880 and 1973 had been the same as in 1900; applying the decomposition proposed by Deutsch et al. (2006)), the *M*-index leads to the same conclusion. Compared to 1900, the *M*-index would be lower in 1880 (-0.036, p=0.001) and higher in 1973 (0.036, p=0.009; both p-values based on bootstrapped standard errors with 1,000 replications).

These results, indicating a consistent increase from 1880 to 1900 and from 1900 to 1973, are surprising and were disputed when they were first published by Long and Ferrie (2013a). Both Hout and Guest (2013) and Xie and Killewald (2013) criticized the results as driven only by the (increasingly) strong rate of farmers recruited among sons of farmers, while at the same time the proportion of farmers among the US's population had decreased dramatically – something that had already been highlighted by Long and Ferrie (2013a). Using the *M*-index, we can take this shrinking proportion of farmers into account by weighting each origin–destination combination by its relative population weight, which yields the factual (not decomposed) *M*-index. This tells a different story from the margin-free measures. If we are analyzing the general relevance of social origin for an individual's class affiliation, we see that origin has indeed became more important between 1880 and 1900 (the *M*-index rose from 0.073 to 0.107, p=0.002), but between 1900 and 1973 the relevance of social origin returned to about the level of 1880 (the *M*-index decreased from 0.107 to 0.070, p=0.002). Finally, using the *M*-index, it is also straightforward to reassess the role of farmers in this process, which had led to such divergent results (Xie and Killewald 2013; Hout and Guest 2013). If we calculate the *M*-index locally for each destination class, we see a stable trend for the white-collar class from 1880 to 1900 and a clear decrease between 1900 and 1973, while for both the skilled/semiskilled and for the unskilled working classes the relevance of social origin did not vary significantly. In contrast to the classes where the relevance remained stable or decreased, the class of origin increased dramatically in relevance for becoming a farmer: the local *M*-index rose from 0.081 in 1880 to 0.173 in 1900, then rose dramatically to 1.069 in 1973.[14] However, as the proportion of farming sons decreased equally strongly (1880: 43.9%, 1900: 31.5%, and 1973: 2.5%), this increased relevance

[13] Compared to 1990 the unidiff parameter is estimated to be lower for 1880 (-0.219, p<0.001) and for 1973 (0.199, p=0.036); I follow Long and Ferrie (2013a) in estimating separate models for each pairwise contrast.

[14] Because Long and Ferrie (2013a) use a four-fold classification scheme, this is a very high value, as the theoretical maximum is at $\log(4) = 1.386$ (see sub-section 2.2.2).

of social origin for becoming a farmer is of little importance for the overall *M*-index for 1973.

Following this approach, the *M*-index confirms the hypothesis that the increasing importance of social origin between 1900 and 1973 found by Long and Ferrie (2013a) was only driven by farmers. However, instead of "glossing over" the problem of dominant origin–destination combination by simply ignoring the main-diagonal of the mobility table (i.e., by ignoring class immobility; Long and Ferrie 2013b; Xie and Killewald 2013), the *M*-index weights each of these combinations according to their population weight. Because of this weighting, the *M*-index properly counterbalances the increasing relevance of social origin for becoming a farmer by the shrinking importance of this class for an assessment of the level of origin effects in the whole population.

2.2 Methodological and Technical Aspects: Unidiff Models and the *M*-Index

In this thesis, I will make use of three measures for measuring and comparing the effects of social origin on an individual's social standing. First, when analyzing the relevance of social origin in the cantons of Lucerne and Glarus in the 19th century in chapter 3, I will start the analyses of each aspect by looking at observed mobility as the most direct form of social mobility. As this can be done by means of standard logistic regression models, there is no need to go into the technical details here.[15] Second, all these analyses will be complemented by analyzing and comparing the intergenerational class linkage measured by the M-index. Third and finally, the unidiff model and its parameters will serve as a reference when assessing the validity and usefulness of the M-index in section 2.3.

The aim of this section is to provide some technical supplements to the more intuitive conceptual introduction to those measures given in section 2.1. To avoid an overly abstract description, I will present these methods with the example of temporal changes in intergenerational class linkage in mind. In other words, I will primarily describe how these methods can be used for comparing the strength of the associations between the social class of parents and their children across birth cohorts or over time.

2.2.1 The Individual-Level Unidiff Estimator

As sketched out in sub-section 2.1.1, log-linear models have been used for describing sets of mobility tables since they were proposed for mobility research by Hauser (1978; for a general overview, see Hout 1983). Mobility tables are simple contingency tables that tabulate the class of the respondents against the class of their parents. For analyzing temporal changes in mobility, mobility tables for each birth cohort can be constructed and the frequency in each cell of the resulting three-way table (destination × origin × cohort) can be described by a set of multiplicative parameters with increasing specificity. Let us denote the J classes of origin by X, the K classes of destination by Y, and the L birth cohorts by Z. The saturated model can then accurately model each cell frequency μ_{jkl} by:

$$\mu_{jkl} = \mu \alpha_j \beta_k \gamma_l \delta_{jk}^{XY} \delta_{jl}^{XZ} \delta_{kl}^{YZ} \delta_{jkl}^{XYZ}, \qquad \text{2-3}$$

where μ stands for the mean of the cell frequencies; α_j, β_k, and γ_l adjust for the marginal distribution of origin, destination, and birth cohorts respectively; and the δs for the two-

15 A introduction into logistic regression models can, for example, be found in the not so new but refreshingly clear-cut article of Theil (1970), which also serves as a starting point for the use of the M-index for measuring the linkage between social origin and an individual's social class.

and three-way interactions between the three dimensions. Using the log-link, 2-3 can be transformed into a log-linear model, which consists of linear terms (Agresti 2002):

$$\log \mu_{jkl} = \lambda + \lambda_j^X + \lambda_k^Y + \lambda_l^Z + \lambda_{jk}^{XY} + \lambda_{jl}^{XZ} + \lambda_{kl}^{YZ} + \lambda_{jkl}^{XYZ}. \qquad \text{2-4}$$

While the saturated model does fit perfectly, it is often inappropriate. In many cases, it is not necessary to model each association for each mobility table separately to achieve a satisfactory fit of the data. A more parsimonious model may result in a good fit more efficiently. More importantly, a saturated model is often not helpful because it may yield more parameters than can be interpreted. Therefore, an oft-used starting point when analyzing temporal changes in social mobility is the constant mobility model that allows origin and destination to be associated, but assumes the association to be constant across the birth cohorts. In other words, it omits the three way association λ_{jkl}^{XYZ}, so the model becomes:

$$\log \mu_{jkl} = \lambda + \lambda_j^X + \lambda_k^Y + \lambda_l^Z + \lambda_{jk}^{XY} + \lambda_{jl}^{XZ} + \lambda_{kl}^{YZ}. \qquad \text{2-5}$$

A next possible step would then consist of comparing the fit of this constant model to the saturated model. If the latter fits the data significantly better than the constrained model, we could conclude that the associations do differ between birth cohorts. If there was indeed a difference, this information alone is often not sufficient. Rather, we would like to know more about these differences. A first possibility is to allow certain associations to change between birth cohorts, while we hold others constant. It is also possible to combine several associations to meaningful groups so changes in such groups can be analyzed. The so-called "topological" or "levels" models proposed by Hauser (1978, 1980; Hout 1983: 37–51) belong to this class of models. The second possibility is closer to the approach of this thesis and is concerned with the direction and strength of the change in social mobility at a general level. As already discussed, the unidiff model (Xie 1992; Erikson and Goldthorpe 1992) is the most widely used approach to obtain answers to these kinds of questions. As in the case of the constant mobility model, a set of associations common to all birth cohorts is added to the independence model (in the case of unidiff models, the corresponding parameters are usually labeled ψ_{ij}^{XY}). In contrast to the constant mobility model, the strength of these association is allowed to vary by a common factor ϕ_l between the L levels of birth cohorts:

$$\log \mu_{jkl} = \lambda + \lambda_j^X + \lambda_k^Y + \lambda_l^Z + \lambda_{jl}^{XZ} + \lambda_{kl}^{YZ} + \phi_l \psi_{jk}^{XY} \qquad \text{2-6}$$

The parameters ϕ_l are often simply called the unidiff parameters. As discussed at the end of sub-section 2.1.1, these parameters make it possible to compare social fluidity between birth cohorts, as high unidiff parameters point to more rigid class barriers.

As log-linear models describe contingency tables – such as (sets of) mobility tables – they are not models of individual characteristics, but rather of cells of tables aggregating individuals with certain characteristics. This comes with some limitations. For example, it is not possible to account for covariates at the individual level, which could be interesting for either controlling for confounding variables or for explaining mobility by the characteristics of the individuals (Logan 1983). In addition, we can only compare mobility between distinct birth cohorts. In other words, when analyzing temporal changes, the individuals need to be grouped together into birth cohorts that span a certain period. However, it would often be desirable to study time trends (for example using a linear or a quadratic parametrization) on the basis of the exact date, or year, of birth. Finally, it is not easily possible to respect more complex survey designs (weights, clustering, or stratification, to name but a few) when analyzing already-aggregated data.

Because of these limitations, researchers have identified individual-level equivalents to log-linear models used for analyzing social mobility (Logan 1983; Breen 1994). Instead of modeling expected cell-frequencies (μ_{jkl} in the equations above), we can model the expected probability of an individual i belonging to a given class Y. Multinomial logistic regression models can be used for this purpose. For example, the equivalent of the constant mobility model given in equation 2-5 is to model the expected probability (given origin and cohort) that the destined class is $x = j$. Such a model is given by

$$\Pr(Y_i = k|\boldsymbol{X}, \boldsymbol{Z}) = \frac{\exp(\alpha_k + \boldsymbol{\beta}'_k\boldsymbol{X}_i + \boldsymbol{\gamma}'_k\boldsymbol{Z}_i)}{1 + \sum_{h=1}^{J-1}\exp(\alpha_h + \boldsymbol{\beta}'_h\boldsymbol{X}_i + \boldsymbol{\gamma}'_h\boldsymbol{Z}_i)}. \qquad \text{2-7}$$

Because we change our focus from cohort–origin–destination-combinations (the cells in the mobility tables) to the destination class $\boldsymbol{y}$ – the response variable – all parameters in 2-5 unrelated to $\boldsymbol{y}$ are redundant (Breen 1994) and do not appear in 2-7. When comparing 2-7 to 2-5, α_k is the equivalent to λ_k^Y, $\boldsymbol{\beta}$ is the equivalent to λ_{jk}^{XY}, and $\boldsymbol{\gamma}$ the equivalent to λ_{kl}^{YZ}. Similarly, by adding the interaction between $\boldsymbol{x}$ and $\boldsymbol{z}$, we obtain the equivalent to the saturated model (2-4):

$$\Pr(Y_i = k|\boldsymbol{X}, \boldsymbol{Z}, \boldsymbol{XZ}) = \frac{\exp(\alpha_k + \boldsymbol{\beta}'_k\boldsymbol{X}_i + \boldsymbol{\gamma}'_k\boldsymbol{Z}_i + \boldsymbol{\delta}'_k\boldsymbol{X}_i\boldsymbol{Z}_i)}{1 + \sum_{h=1}^{J-1}\exp(\alpha_h + \boldsymbol{\beta}'_h\boldsymbol{X}_i + \boldsymbol{\gamma}'_h\boldsymbol{Z}_i + \boldsymbol{\delta}'_h\boldsymbol{X}_i\boldsymbol{Z}_i)}. \qquad \text{2-8}$$

To the best of my knowledge, an individual-level unidiff model has not yet been published. However, by comparing the two examples given here (2-7 and 2-8) to their log-linear counterparts (2-5 and 2-4), we can see that such a model can be specified by replacing $\boldsymbol{\beta}'_k\boldsymbol{X}_i + \boldsymbol{\delta}'_k\boldsymbol{X}_i\boldsymbol{Z}_i$ in 2-8 by the unidiff element $\boldsymbol{\phi}'\boldsymbol{Z}_i \cdot \boldsymbol{\psi}'_k\boldsymbol{X}_i$:

$$\Pr\left(Y_i = k|\boldsymbol{Z},\text{unidiff}(\boldsymbol{X},\boldsymbol{Z})\right) = \frac{\exp(\alpha_k + \boldsymbol{\gamma}'_k\boldsymbol{Z}_i + \boldsymbol{\phi}'\boldsymbol{Z}_i \cdot \boldsymbol{\psi}'_k\boldsymbol{X}_i)}{1 + \sum_{h=1}^{J-1}\exp(\alpha_h + \boldsymbol{\gamma}'_h\boldsymbol{Z}_i + \boldsymbol{\phi}'\boldsymbol{Z}_i \cdot \boldsymbol{\psi}'_h\boldsymbol{X}_i)} \qquad \text{2-9}$$

Note that the vector of the ϕ-parameters has no index, because it is common to all $J-1$ response-specific equations. As in the case of the log-linear equivalent (Xie 1992), we need to apply constraints to ensure that all parameters can be identified. In the choice of these constraints, I follow Bouchet-Valat et al. (2017), the authors of the "logmult" package, which can be used to estimate a wide range of log-linear models using R. More specifically, I first replace $\boldsymbol{\phi}$ by $\exp(\boldsymbol{\phi}^*)$, which ensures the uniqueness of the model by constraining this part of the unidiff element to $(0, +\infty)$:

$$\Pr\left(Y_i = k|\boldsymbol{Z},\text{unidiff}(\boldsymbol{X},\boldsymbol{Z})\right) = \frac{\exp\left(\alpha_k + \boldsymbol{\gamma}'_k\boldsymbol{Z}_i + \exp\left(\boldsymbol{\phi}^{*'}\right)\boldsymbol{Z}_i \cdot \boldsymbol{\psi}'_k\boldsymbol{X}_i\right)}{1 + \sum_{h=1}^{J-1}\exp\left(\alpha_h + \boldsymbol{\gamma}'_h\boldsymbol{Z}_i + \exp\left(\boldsymbol{\phi}^{*'}\right)\boldsymbol{Z}_i \cdot \boldsymbol{\psi}'_h\boldsymbol{X}_i\right)}. \qquad \text{2-10}$$

In addition, all categorical variables are dummy-coded. In other words, the corresponding parameters express the deviation from the reference category.[16] With these constraints, 2-10 can be estimated using a maximum-likelihood estimator programmed using standard statistical software (for this thesis, I have written the corresponding program for Stata (StataCorp 2017)).

2.2.2 The *M*-Index and its Counterfactual Decompositions

Basic Definition

As illustrated in detail in sub-section 2.1.3, the linkages between the class of parents and their children can be approached by measuring the amount of information on a child's class y that can be gained by learning the class of her or his parents x. In this paragraph, I give a more technical overview. While the basic concepts are presented based on the literature (Theil 1970; Theil and Finizza 1971; Mora and Ruiz-Castillo 2009a; Frankel and Volij 2011; DiPrete et al. 2017), I also provide some original contributions when it comes to extensions specifically designed for studying questions of social mobility.

The M-index is an entropy-based measure, as entropy measures the amount of information available about y. The index measures the mutual information shared by the class of parents and their children, and can be obtained by comparing the *a posteriori* entropy (after learning the parents' class) to the *a priori* entropy, which measures the information available on y before learning the parents' class and is a function of the marginal distribution of the classes of destination. The *a priori* entropy is given by

[16] Note that, when using a continuous variable z for estimating ϕ, it is important to mimic the reference-coding by avoiding a circumstance in which zero lies outside the sample, as the unidiff term always expresses the strength of the association pattern in reference to $z = 0$.

$$T(P_Y) = -\sum_{k=1}^{K} p(y_k)\ln\big(p(y_k)\big). \qquad \text{2-11}$$

If everyone belongs to the same class and all other classes are empty, we know everything on y_i just by being aware of the distribution of *Y*. In this case, the entropy is zero,[17] because we learn nothing by actually observing y_k. By contrast, if all classes are equally distributed, it is much harder to guess y_k, and the information gained by actually observing it is much greater. In this case, $T(P_Y)$ reaches its theoretical maximum, which is $\log(K)$ (Theil 1970).

The analog logic applies for calculating the *a posteriori* entropy, which measures the information on *y* after learning *x,* the class of the parents. Once we know the parents' class, the relevant distribution is no longer the marginal distribution of *Y* but the distribution of $Y|x_j$, that is the distribution of classes among the descendants of the class x_j (the class of the parents). For this class, the entropy is

$$T\big(P_Y|x_j\big) = -\sum_{k=1}^{K} p\big(y_k|x_j\big)\ln\Big(p\big(y_k|x_j\big)\Big) \qquad \text{2-12}$$

and the weighted average over all classes of origin yields the overall *a posteriori* entropy:

$$T\big(P_{Y|X}\big) = -\sum_{j=i}^{J} p\big(x_j\big)\sum_{k=1}^{K} p\big(y_k|x_j\big)\ln\Big(p\big(y_k|x_j\big)\Big). \qquad \text{2-13}$$

The *M*-index measuring the intergenerational class linkage is then given by the difference between 2-13 and 2-11, which can be simplified to 2-2 given in sub-section 2.1.3:

$$\begin{aligned}
M &= T(P_Y) - T\big(P_{Y|X}\big) \\
&= \left[-\sum_{k=1}^{K} p(y_k)\ln\big(p(y_k)\big)\right] - \left[-\sum_{j=i}^{J} p\big(x_j\big)\sum_{k=1}^{K} p\big(y_k|x_j\big)\ln\Big(p\big(y_k|x_j\big)\Big)\right] \\
&= \sum_{j=1}^{J} p\big(x_j\big)\sum_{k=1}^{K} p\big(y_k|x_j\big)\ln\Big(p\big(y_k|x_j\big)\Big) - p(y_k)\ln\big(p(y_k)\big) \\
&= \sum_{j=1}^{J} p\big(x_j\big)\sum_{k=1}^{K} p\big(y_k|x_j\big)\ln\left(\frac{p\big(y_k|x_j\big)}{p(y_k)}\right) \\
&= \sum_{j=1}^{J}\sum_{k=1}^{K} p\big(x_j, y_k\big)\ln\left(\frac{p\big(y_k|x_j\big)}{p(y_k)}\right).
\end{aligned} \qquad \text{2-14}$$

17 $0\ln(0)$ is treated as 0 here (Theil 1972: 5).

From the second-last line of 2-14, it is straightforward to calculate "local" M-indices, separately for each class of origin: they can simply be achieved by omitting the weighted averaging over the classes of origin (DiPrete et al. 2017; Mora and Ruiz-Castillo 2009a, 2011). Therefore,

$$M_j = \sum_{k=1}^{K} p\left(y_k | x_j\right) \ln\left(\frac{p\left(y_k | x_j\right)}{p\left(y_k\right)}\right), \quad \text{2-15}$$

which can also be calculated for each destination class:

$$M_k = \sum_{j=1}^{J} p\left(y_k | x_j\right) \ln\left(\frac{p\left(y_k | x_j\right)}{p\left(y_k\right)}\right). \quad \text{2-16}$$

So far, the M-index has been presented in its basic form. To exploit the full flexibility of the M-index described in sub-section 2.1.3, the definition needs to be generalized. However, continuing in an analog way as in 2-14 would require a completely different notation (see Mora and Ruiz-Castillo 2009b; Stone 2016), which would add little to the understanding of the M-index in the way it is applied in this thesis. Rather, we can re-write the M-index as it was given in equations 2-2 and 2-14, with elements calculated at the individual level. We do so by simply defining an individual-level m_i in a way that the expected value of m_i, i.e. $E(m_i)$, equals the macro-level M. This condition is satisfied if

$$m_i = \ln\left(\frac{\Pr(Y_i = k | X_i)}{\Pr(Y_i = k)}\right), \quad \text{2-17}$$

where $\Pr(Y_i = k)$ is the probability that the destination class is the one observed in case i, while $\Pr(Y_i = k | X_i)$ is the probability that the destination class is the one observed in case i conditional on the observed class of origin. $E(m_i)$ equals M because

$$\begin{aligned} E(m_i) &= \frac{1}{N}\sum_{i=1}^{N} \ln\left(\frac{\Pr(Y_i = k | X_i)}{\Pr(Y_i = k)}\right) \\ &= \sum_{j=1}^{J}\sum_{k=1}^{K}\sum_{i=1}^{N} \frac{1}{N}[X_i = j, Y_i = K] \ln\left(\frac{\Pr(Y_i = k | X_i)}{\Pr(Y_i = k)}\right) \quad \text{2-18} \\ &= \sum_{j=1}^{J}\sum_{k=1}^{K} p\left(x_j, y_k\right) \ln\left(\frac{p\left(y_k | x_j\right)}{p\left(y_k\right)}\right) = M. \end{aligned}$$

The second step in 2-18 may not be necessary, but it illustrates the fact that we can replace the cell-based weighting of the term $\ln\left(\frac{p(y_k|x_j)}{p(y_k)}\right)$ by averaging over the sample: running through all cases in the sample, counting those satisfying the condition $\left[X = x_j, Y = y_k\right]$, and dividing the result by N yields $p\left(x_j, y_j\right)$.

With an M-index definition based on individual-level elements to hand, the generalization of the index is straightforward. As already noted by Theil (1970), the M-index cannot only be used to measure the information gain (or the reduction of entropy in Y) between the state zero, when only the marginal distribution of Y is known, and the state one, when the distribution of $Y|X$ is known (i.e., $T(P_Y) - T(P_{Y|X})$). Rather, it can also be used for measuring the (partial) entropy reduction due to learning any set of variables $\boldsymbol{X}$, be they categorical or continuous, over and above the entropy reduction due to the set of variables $\boldsymbol{V}$, where $\boldsymbol{V}$ can (but does not necessarily need to) be empty. For example, $\boldsymbol{X}$ could include both the mother's and the father's occupational class plus the highest educational attainment of each, while $\boldsymbol{V}$ could include a set of dummies that adjust for differences in the marginal distribution of Y stemming from different data sources. Alternatively, $\boldsymbol{V}$ could include a measurement of an individual's own educational attainment, in which case the M-index measures the direct effect of the social origin net of the portion mediated by educational attainment.

In this more general form, the M-index is defined by

$$M^* = T(P_{Y|\boldsymbol{V}}) - T(P_{Y|(\boldsymbol{X},\boldsymbol{V})}), \tag{2-19}$$

where $\boldsymbol{X}$ is a vector of variables measuring social origin and $\boldsymbol{V}$ is an optional set of (control) variables. Note that M, as defined in equation 2-2, is a special case of M^*, where $\boldsymbol{V}$ is empty and $\boldsymbol{X}$ includes only a single (categorical) variable. M^* can be obtained by combining 2-19 and 2-18:

$$\begin{aligned} M^* &= T(P_{Y|\boldsymbol{V}}) - T(P_{Y|(\boldsymbol{X},\boldsymbol{V})}) \\ &= \frac{1}{N}\sum_{i=1}^{N} \ln\left(\frac{\Pr(Y_i = k|X_i, V_i)}{\Pr(Y_i = k|V_i)}\right) = E(m_i^*). \end{aligned} \tag{2-20}$$

Implementation and Statistical Inference

In this thesis, I will follow two distinct technical approaches for obtaining the M-index. The first is to calculate it directly on the basis of contingency tables; the second is a model-based approach using multinomial logistic regression as a basis for predicting the (conditional) probabilities.

The first approach is straightforward and very fast in terms of computation time. However, I will follow this approach only for calculating basic M-indices as defined in equation 2-2, because its implementation quickly becomes unfeasible when more than three variables (one each for origin, destination, and birth cohort) are involved. The necessary contingency tables can be tabulated separately for each birth cohort, from which the cell proportions can be calculated that can be plugged into equation 2-2.

Bootstrap procedures (Davison and Hinkley 1997) can then be used for producing the standard errors necessary for statistical inferences, such as tests between birth cohorts.

For exploiting the full flexibility offered by measuring the linkage between origin and destination be the M-index, I use multinomial logistic regression models[18] for predicting the probabilities to be plugged into equation 2-20. As for the first approach, this could be done separately for distinct birth cohorts by estimating the models used to predict both $\widehat{\Pr}(Y_i = k|V_i)$ and $\widehat{\Pr}(Y_i = k|X_i, V_i)$ separately for each cohort. Alternatively, one can fully interact the variables $\boldsymbol{X}$ and $\boldsymbol{V}$ with $\boldsymbol{Z}$, where the last variable can be (for example) a set of dummy variables measuring birth cohorts or a linear or quadratic parametrization of time using the respondent's year of birth.

From a practical point of view, the M-index for any level of $\boldsymbol{Z}$ can be obtained by implementing four steps:

1. Estimate the restricted model, which does not include the variables $\boldsymbol{X}$:

$$\widehat{Pr}(Y_i = k|\boldsymbol{V}, \boldsymbol{Z}, \boldsymbol{VZ}) = \frac{\exp(\alpha_k + \boldsymbol{\varphi}'_k \boldsymbol{V}_i + \boldsymbol{\gamma}'_k \boldsymbol{Z}_i + \boldsymbol{\delta}'_k \boldsymbol{V}_i \boldsymbol{Z}_i)}{1 + \sum_{h=1}^{J-1} \exp(\alpha_h + \boldsymbol{\varphi}'_h \boldsymbol{X}_i + \boldsymbol{\gamma}'_h \boldsymbol{Z}_i + \boldsymbol{\delta}'_k \boldsymbol{V}_i \boldsymbol{Z}_i)} \qquad \text{2-21}$$

2. Estimate the unrestricted model, which does include the variables $\boldsymbol{X}$:

$$\widehat{\Pr}(Y_i = k|\boldsymbol{V}, \boldsymbol{X}, \boldsymbol{Z}, \boldsymbol{VX}, \boldsymbol{VZ}) = \frac{\exp\left(\alpha_k + \boldsymbol{\beta}'_k \boldsymbol{X}_i + \boldsymbol{\varphi}'_k \boldsymbol{V}_i + \boldsymbol{\gamma}'_k \boldsymbol{Z}_i + \boldsymbol{\delta}^{X\prime}_k \boldsymbol{X}_i \boldsymbol{Z}_i + \boldsymbol{\delta}^{V\prime}_k \boldsymbol{V}_i \boldsymbol{Z}_i\right)}{1 + \sum_{h=1}^{J-1} \exp(\alpha_h + \boldsymbol{\beta}'_h \boldsymbol{X}_i + \boldsymbol{\varphi}'_h \boldsymbol{V}_i + \boldsymbol{\gamma}'_h \boldsymbol{Z}_i + \boldsymbol{\delta}^{X\prime}_h \boldsymbol{X}_i \boldsymbol{Z}_i + \boldsymbol{\delta}^{V\prime}_h \boldsymbol{V}_i \boldsymbol{Z}_i)} \qquad \text{2-22}$$

3. Calculate m_i based on the predictions under the models estimated in step 1 and 2:

$$m_i = \log\left(\frac{\widehat{\Pr}(Y_i = k|\boldsymbol{V}, \boldsymbol{X}, \boldsymbol{Z}, \boldsymbol{VX}, \boldsymbol{VZ})}{\widehat{\Pr}(Y_i = k|\boldsymbol{V}, \boldsymbol{Z}, \boldsymbol{VZ})}\right) \qquad \text{2-23}$$

4. Estimate the expected value of m_i to obtain the M-index separately for various values of $\boldsymbol{Z}^*$ (and optional controls for $\boldsymbol{V}^*$) by using an ordinary least square regression model, where $\boldsymbol{Z}^*$ and $\boldsymbol{V}^*$ are subsets of the sets of variables $\boldsymbol{Z}$ and $\boldsymbol{V}$, respectively:[19]

$$M(\boldsymbol{V}, \boldsymbol{Z}) = E(m_i|\boldsymbol{V}, \boldsymbol{Z}) = \widehat{m}_i = \alpha + \boldsymbol{\beta}' \boldsymbol{V}^*_i + \boldsymbol{\gamma}' \boldsymbol{Z}^*_i, \qquad \boldsymbol{V}^*_i \subseteq \boldsymbol{V}_i, \boldsymbol{Z}^*_i \subseteq \boldsymbol{Z}_i \qquad \text{2-24}$$

[18] Any other appropriate statistical model that allows predicting the required probabilities can be used here. When comparing the M-index to the unidiff parameters in sub-section 2.3.2, I also make use of the unidiff model presented in 2-10 for this aim.

[19] There are scenarios in which $\boldsymbol{Z}^*$ is not in the strictest sense a subset of $\boldsymbol{Z}$. For example, if $\boldsymbol{Z}$ contains dummy variables for distinct groups such as cohorts or countries, $\boldsymbol{Z}^*$ could include macro-variables measuring characteristics of $\boldsymbol{Z}$ that explain differences between these groups.

For this thesis, I have written an estimator based on the Generalized Method of Moments (GMM),[20] which allows to complete the above four steps simultaneously while taking into account that the probabilities used for calculating m_i are estimated and not observed (Greene 2012; Drukker 2014). Not taking this into account will result in biased standard errors produced by the regression model in 2-24.

Counterfactual Decomposition

As pointed out in sub-section 2.1.3, two counterfactual decomposition methods are available that make it possible to assess the contributions of changes in the marginal distribution to changes in the M-index. Both provide pairwise decompositions that allow for the decomposition of the difference in the M-index between two birth cohorts into counterfactual portions. In other words, they answer questions like "What would this difference look like if only A, but not B and C, had changed between the two birth cohorts?"

A first decomposition, proposed by Mora and Ruiz-Castillo (2009a; DiPrete et al. 2017), allows us to decompose the difference between cohort k and k' into ΔO, the difference in the entropy of parents' class distribution, ΔD, the difference in the distributions of the classes of destination, and ΔN, the residual change, net of these differences. I will not present the technical details of this decomposition method here, because in this thesis I will only use it for some minor complementary analyses. They have also been well treated by Mora and Ruiz-Castillo (2009a) and DiPrete et al. (2017).[21]

The second decomposition of pairwise differences in the M-index is of greater importance for this thesis, both when comparing the M-index to the unidiff parameters in section 2.3 and for various substantial analyses in chapter 3. This method was proposed for the study of social mobility by Silber and Spadaro (2011), based on work by Deutsch et al. (2006; partly inspired by Karmel and Maclachlan 1988), and makes it possible to perfectly separate the change in the M-index due to changes in the association patterns from the own caused by changes in the marginal distribution.

The decomposition consists of a conceptual and a technical part. The conceptual part starts with the idea that the difference in the M-index between two cohorts k and k' is the result of two contributions: C_{marg}, stemming from differences in the marginal

[20] I use the bootstrap procedure for obtaining the standard errors for the M-index produced from unidiff models (compare with note 18).

[21] Note that there is a typo on line 3 of equation A7 in DiPrete et al. (2017: 1922) It should read $\Delta O_g = T_{occ}(k) - T_{occ}(k')$ and not $\Delta O_g = T_{occ}(k') - T_{occ}(k)$.

distributions; and C_{int}, stemming from differences in the internal structures of the two mobility tables. Therefore,

$$M_k - M_{k'} = \Delta M(\Delta marg, \Delta int) = C_{marg} + C_{int}. \qquad \text{2-25}$$

There are two equivalent ways to identify the contribution that comes only from differences in the internal structures of the mobility tables. First, we can either calculate directly $\Delta M(\Delta int)$ from the two tables $\boldsymbol{K}$, which is the factual mobility tables for cohort k, and $\boldsymbol{K}'_{cf}$, which is the counterfactual table for cohort k', with a factual internal structure but counterfactual marginal distributions. Equivalently, we calculate the factual difference $\Delta M(\Delta marg, \Delta int)$, then subtracting $\Delta M(\Delta marg)$, based on $\boldsymbol{K}$ and $\boldsymbol{K}_{cf}$. Because both ways are equivalent, we need to weight them equally for obtaining C_{int}:

$$C_{int} = \tfrac{1}{2}\big(\Delta M(\Delta marg, \Delta int) - \Delta M(\Delta marg)\big) + \tfrac{1}{2}\big(\Delta M(\Delta int)\big) \qquad \text{2-26}$$

The same Shapley decomposition procedure (Chantreuil and Trannoy 1999, 2013) can then be analogously applied for obtaining C_{marg}.

The technical part of this decomposition method consists in the use of the raking procedure first proposed by Deming and Stephan (1940). Let π_{kij} be the cell proportions, $\pi_{k\cdot j}$ the marginal distribution of the classes of origin, and $\pi_{ki\cdot}$ marginal distribution of the destination classes for the cohort k, while $\pi_{k'ij}$, $\pi_{k'\cdot j}$, and $\pi_{k'i\cdot}$ are the equivalents for cohort k'. $\boldsymbol{K}_{cf}$, which has the internal structure of $\boldsymbol{K}$ but the margins of $\boldsymbol{K}'$, can then be obtained by iteratively re-weighting π_{kij} with $w_{row} = \frac{\pi_{k'\cdot j}}{\pi_{k\cdot j}}$ and $w_{col} = \frac{\pi_{k'i\cdot}}{\pi_{ki\cdot}}$. After a few iterations, the resulting table converges to $\boldsymbol{K}_{cf}$. The resulting tables can then be used for calculating the elements of equations 2-26:

$$\begin{aligned} \Delta M(\Delta marg, \Delta int) &= M(\boldsymbol{K}) - M(\boldsymbol{K}') \\ \Delta M(\Delta int) &= M(\boldsymbol{K}) - M(\boldsymbol{K}'_{cf}) \\ \Delta M(\Delta marg) &= M(\boldsymbol{K}) - M(\boldsymbol{K}_{cf}) \end{aligned} \qquad \text{2-27}$$

***

This section has provided the necessary background for analyzing, comparing, and (to some extent) explaining the relevance of social origin for an individual's own social standing by applying the flexible and powerful tool of the M-index. I have purposely kept my remarks specific to the needs of this thesis, which may obscure some of the general applications for the M-index but avoids an overly abstract treatment of the matter. To repeat: the M-index can be applied in every situation where the degree to which a categorical measured phenomenon is determined by a given set of factors is of interest (Theil 1970: 125). The above remarks highlight that we can compare this degree both across distinct groups or between various levels of a continuous variable, which is exactly in line with the research question of this thesis.

2.3 An Application to 20th Century Switzerland

This section has both a methodological and a substantive aim. The primary aim is to assess the validity and usefulness of the M-index by comparing it to the corresponding unidiff parameters and to explore its potential through some exemplary applications. The secondary aim is to identify open questions in the literature on social mobility in 20th century Switzerland. It is out of the scope of this thesis to deliver comprehensive answers to these questions, but I will outline how they can be approached by using the M-index as a flexible measure of intergenerational status linkage. Its exemplary applications give some first insights into how this might be done.

Starting with the pioneering work of Girod (1957), which includes some results on the city of Geneva, the Swiss literature on the relevance of social origin for individuals social standing has come in two waves. The first started with the prerunner study on educational inequalities (Buchmann et al. 1993) and mostly took place around the turn of the millennium (Levy et al. 1997; Bergman et al. 2002; Joye et al. 2003; for a comprehensive overview, see Jann and Combet 2012; Falcon 2013). About 10 years later, again led by studies on the effects of social origin on educational attainment (Pfeffer 2008; Meyer 2009; Hupka-Brunner et al. 2010), a new wave updated the knowledge (Falcon 2012; Jann and Combet 2012; Falcon 2013; Jacot 2013; Jann and Seiler 2014; Falcon and Joye 2015).

Overall, these studies found clear effects of social origin – in fact the only internationally comparative study (Pfeffer 2008) found that Switzerland belonged to the category of countries with more rigid class barriers – and this probably did not change over time. The "probably" refers to the lack of consensus within the literature respecting time trends, which stems from two sources. First, Joye et al. (2003) reported mixed results when analyzing sub-groups respecting age and sources of data, which leaves open the possibility that their results had been confounded by survey and/or age effects. In her thesis, Falcon (2013: 251–66) carefully assessed these potential confounders and found no indications for such biases. Nonetheless, the analysis of Joye et al. (2003) highlights the need to adequately consider the respective sources of biases, questioning results obtained without such controls. Second, several studies found no clear time trends for men, but identified a more or less robust increase in the effects of origin on women's educational attainment over the whole (Buchmann et al. 1993; Falcon 2013), or at least towards the end (Jann and Combet 2012), of the period they analyzed. While most of the mentioned publications include results on women and men, there exists no systematic analysis of the differences in the origin effects between the two genders. This partly results from the limitations in log-linear models when it comes to study time trends for separate sub-groups (see the discussion at the end of sub-section 2.1.1). Analyses based on the M-index could contribute to close this gap, as the M-index makes it possible to compare the relevance of social origin directly between sub-groups without relying on far-reaching assumptions like a common pattern of origin–destination-associations for the two genders.

While the need for systematic analysis of gender differences becomes evident when looking at the existing results, some research areas are only marginally covered at best. The most obvious research gap is the lack of internationally comparative studies that include Switzerland. Another gap relates to a more general shortcoming in mobility research and concerns the composition of social origin. As discussed at the end of sub-section 2.1.2, this question has been neglected as status attainment models have gone out of fashion and have only recently regained attention (Buis 2013; Bukodi and Goldthorpe 2013) – a question that also includes the challenge of how properly to include mothers when measuring “social origin” (Korupp et al. 2002; Beller 2009). As is the case in the international literature, only a few Swiss studies included either more than one dimension of social origin or status measures for both parents. Bergman et al. (2002) and Stamm and Lamprecht (2005) included both the mother’s and the father’s educational attainment, while Buchmann et al. (1993) considered both the father’s educational attainment and his occupational prestige. These studies follow the tradition of status attainment research and report partial correlation of each dimension, which makes it difficult to assess the changing relevance of social origin, understood as a package of resources that can be measured through the parents’ educational attainments and social positions.[22] Finally, studies on social mobility in Ireland demonstrate that important insights can be gained by analyzing time trends separately for different parts of society (Whelan and Layte 2006).[23] Although Falcon (2013) studied the association pattern in detail, no analyses of changes in this pattern are available.

The remainder of this section will first present a descriptive overview of the social stratification of Switzerland and its changes over time. I will then analyze changes in the linkage between social origin and destination, in terms of educational and occupational class mobility – based both on the M-index and on parameters of the unidiff model. This makes it possible to evaluate the performance of the M-index presented in this chapter

22 Note however that Buchmann et al. (1993) report and mention (but do not discuss) a cohort specific R^2, which is conceptually closely related to the M-index.

23 See sub-section 4.3.1 of the concluding chapter for a brief discussion of this case.

according to the more traditional unidiff parameters – a comparison I will deepen by analyzing the small differences between the two methods in more detail. As a next step, I will use the M-index to generate new insights into the changing relevance of social origin for the social standing of respondents from Switzerland over the course of the second half of the 20th century and beyond. I start doing so by checking the validity of the results based on gross M-indices by controlling for potentially confounding age and survey effects. From a substantive point of view more interestingly, I will then analyze time trends separately by origin and destination before expanding the measurement of social origin by first including mothers and then by including the educational attainment of both parents and occupational class simultaneously. This will give some additional insights into hitherto neglected areas of research on social mobility in Switzerland. In the concluding section of this chapter, I will come back to the two additional research gaps mentioned above (gender differences and international comparison) and briefly outline how the analysis of the M-index could contribute to closing them.

2.3.1 Data and Descriptive Overview

For the following analyses of social mobility in 20th century Switzerland, I use a harmonized dataset that has, in part, operated as the basis of studies undertaken by Jann and Combet (2012) and Jann and Seiler (2014).[24] It includes 10 surveys with a total of about 24,000 observations in 20 waves that all include information on the educational attainment and social position of parents and respondents. **Table 2-2** refers to the two analytical datasets used in this study. The first includes all cases for which data on the social class and education of the respondent is available, as well as for at least one parent. Where information on both parents is available, the highest class[25] or educational attainment of the two is used. Using the parent with the highest status corresponds to the so-called "dominance approach" proposed by Erikson (1984) as one possibility for considering mothers in determining the status of the family of origin. The conventional view has been that a family can only belong to one class (traditionally that of the father; for a discussion, see Sorensen 1994). This position was reinforced in research practice by the fact that it is difficult to incorporate multiple measurements of social origin into the traditional ways of analyzing social mobility based on mobility

[24] Note that there is also a clear overlap with the data used by Falcon (2012, 2013). This is the result of the fact that both Falcon (2012) and Jann and Combet (2012) integrate all publicly available datasets that include the information necessary to study social mobility for respondents residing in Switzerland.

[25] Because the EGP classes (see **Table 2-3**) used here are not strictly hierarchical, I make use of ISEI status scale (Ganzeboom et al. 1992) for determining which of the two parents has the highest occupational status. Parental class is then constructed based on this parent's data.

tables, such as the use of unidiff models. Therefore, when comparing the M-index to the unidiff parameters, I follow the dominance approach for measuring social origin. Because several of the surveys used for compiling the dataset only include information on one parent, this is the larger of the two datasets, which is beneficial, as some of the comparison rely on the data-demanding cohort-based operationalization of time trends. The second dataset includes all cases for which information on educational attainment and social class is available for the respondents and both parents. This dataset will be used when measuring social origin by considering both mothers and fathers, which leads to a more comprehensive picture of intergenerational status linkages (Korupp et al. 2002; Beller 2009).

Table 2-2. Data used for analyzing effects of social origin in 20th century Switzerland

Survey description	Wave: year and label	*N* per survey Dominance approach	Both parents
Attitudes politiques 1975			
	1975 AP75	178	
ISSP "Social inequality"			
	1999 ISSP99	736	
Les Suisses et leur société			
	1991 CH91	886	
Swiss Environmental Survey			
	1994 UWS94	1,609	1,201
Swiss Labor Market Survey 1998			
	1998 SAMS98	1,349	1,170
Swiss Household Panel			
	1999 SHP99	2,696	2,327
	2004 SHP04	1,410	1,170
European Social Survey			
	2002 ESS02	1,039	879
	2004 ESS04	1,147	1,005
	2006 ESS06	1,039	943
	2008 ESS08	932	849
	2010 ESS10	798	702
	2012 ESS12	791	714
MOSAiCH (ISSP)			
	2005 MOS05	584	
	2007 MOS07	529	
	2009 MOS09	693	
	2011 MOS11	705	633
	2013 MOS13	700	641
European Values Study 2008			
	2008 EVS08	672	
Statistics on Income and Living Conditions			
	2011 SILC11	5,516	4,681
Total		24,009	16,915

To avoid strong age effects, only respondents aged between 35 and 69 have been included in these two datasets. While **Table 2-2** gives the total number of observations by survey and dataset, the histogram in **Figure 2-2** shows the distribution of the birth years of the respondents. It also indicates the cut-off points of the five birth cohorts constructed for those analyses that require a cohort-based operationalization of temporal changes. More specifically, the datasets cover the range of birth years from 1925 to 1978. This range has been cut into five birth cohorts that each include a similar number of observations, which results in cohorts that cover the following periods: 1925–46, 1947–54, 1955–1960, 1961–66, and 1967–78.

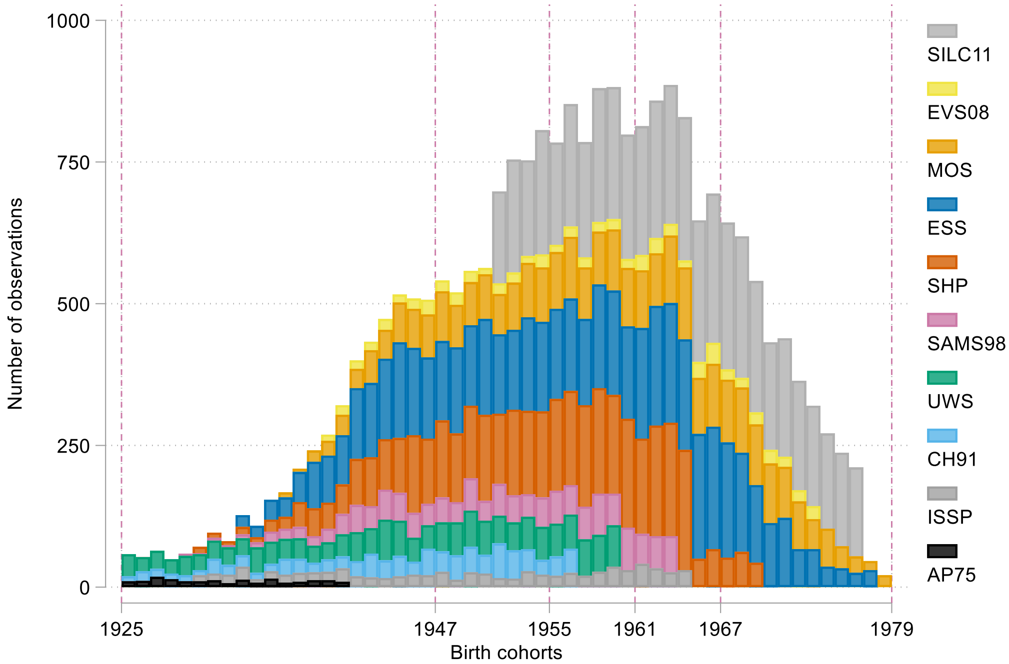


Figure 2-2. Histogram with numbers of observation by birth year, with cohort cut-off points

Source: author. The dataset "dominance approach" has been used here; see **Table 2-2**.

The two main dimensions used in the analyses are class and education. For class, the original EGP scheme (Erikson et al. 1983: 307) has been collapsed into the seven classes presented in **Table 2-3**. To utilize the full richness of the data, *homemaker* is included as an eighth class for the class scheme of the mothers. As none of the models used here assumes square or even symmetric mobility tables, this extension is not problematic. For education, I use a classification collapsing the highest level of education achieved into the three categories presented in **Table 2-4**. This three-fold classification does not reflect the dualistic educational system in Switzerland very well, but it is the only way to incorporate the heterogeneous and at times crude classifications used by some of the surveys.[26]

[26] This is especially true for SILC.

Table 2-3. Social Class (EGP): Scheme used for this study

EGP Class		Description
I	Upper service	Higher-grade professionals, administrators and officials; managers in large industrial establishments; large proprietors
II	Lower service	Lower-grade professionals, administrators, and officials; higher-grade technicians; managers in small business and industrial establishments; supervisors of non-manual employees
III	Non-manual employees	Routine non-manual employees in administration and commerce; sales personnel; other rank-and-file service workers
IVa,b	Self-employed	Small proprietors, artisans, etc., with employees (IVa); without employees (IVb)
IVc, VIIb	Farmers	Farmers and smallholders, self-employed fishermen (IVc); agricultural workers (VIIb)
V, VI	Technicians and skilled workers	Lower-grade technicians; supervisors of manual workers; skilled manual workers
VIIa,b	Semi-/unskilled workers	Semi- and unskilled manual workers

Source: based on Erikson et al. (1979).

Table 2-4. Education: Scheme used for this study

Educational level	Included educational degrees
Compulsory or less	No formal education; compulsory education; one year of vocational training
Secondary (general and vocational)	Vocational training and education; general education without baccalaureate; general education with baccalaureate; vocational baccalaureate; college of education (without university of education)
Tertiary (general and vocational)	Professional education and training; advanced federal professional and training diploma; professional education college; university of applied sciences; university of education; university; Federal Institute of Technology

Changing structures of social stratification provide the context of changes in social mobility. **Figure 2-3** and **Figure 2-4** display how educational and class structures have changed across the five birth cohorts for female and male respondents, as well as for their parents. All, including the parent cohorts, are based on the birth year of the respondents, which allows for a comparison of their class and educational structures with those of their parents.

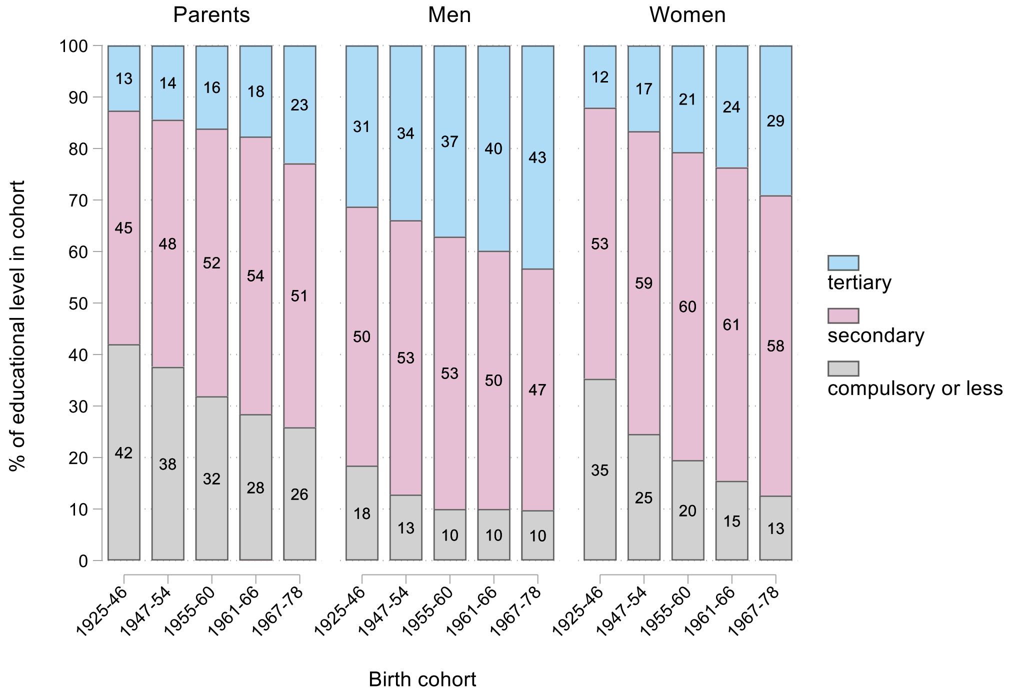


Figure 2-3. Distribution of highest attained level of education by child's birth cohort

Note: Weighted proportions. Source: author. The dataset "dominance approach" has been used here; see **Table 2-2.**

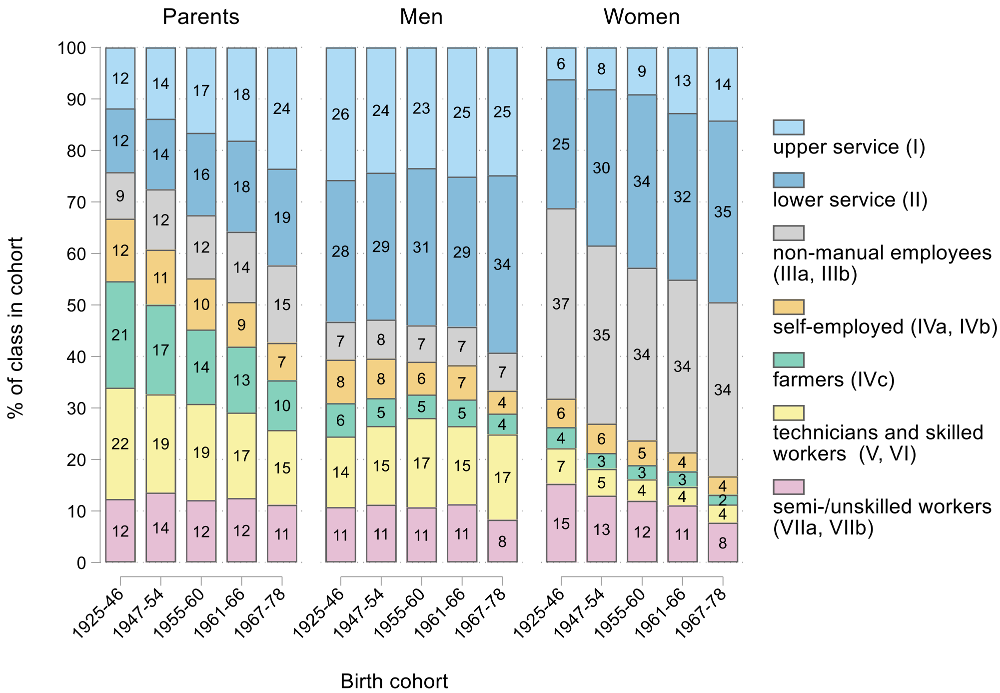


Figure 2-4. Distribution of social classes by child's birth cohort

Note: Weighted proportions. Source: author. The dataset "dominance approach" has been used here; see **Table 2-2.**

Educational expansion clearly shows up in **Figure 2-3**, which also indicates that the changes have been much more pronounced for women then for men. With respect to class, **Figure 2-4** allows three observations. First, it clearly shows that class structure has changed profoundly for parents as well as for female respondents, but not for male respondents. Second, there was plenty of room for upward mobility for men in early birth cohorts, as for these cohorts the two service classes were visibly larger for the respondents than for their parents. This gap has been closed by the end of the observed period. Third, no such "headroom" can be found for women. However, for female respondents, an important change can be observed for the middle class of the non-manual employees: compared to the parental class structure, this class was four times as large for the first cohort, but only a bit more than twice as large for the last cohort.

2.3.2 Comparing the *M*-Index to Unidiff Parameters

An Overview

When analyzing temporal changes, the adequate implementation of time trends is of utmost importance. Besides non-parametrical approaches (for example the smoothed values in Jann and Seiler 2014), several parametrizations are possible. Traditionally, distinct cohorts are used, as this is a precondition for constructing individual mobility tables for each cohort that can then be analyzed by means of log-linear models. However, as discussed in sub-section 2.2.1, log-linear models, including unidiff models, can be re-specified at the individual level, which makes continuous parameterizations of time possible, such as linear or quadratic trends. Such continuous parametrizations can produce a smoother fit of the model to the data than cohorts can, as they produce no "steps" between cohorts. Furthermore, continuous parametrization tends to be more parsimonious than cohorts, which makes it more likely that existing time trends will be detected. Thus, if there exists a parametrization that satisfactorily approximates the underlying time trend, a continuous parametrization, not based on cohorts, will often be preferable.

Table 2-5 shows the fit statistics of the basic models used for comparing the *M*-index to the unidiff model for both educational and class mobility,[27] using two different parametrizations: cohorts and a quadratic time trend (all models are independently estimated for women and men). The unidiff models are used for producing the unidiff parameters discussed below based on the implementation discussed in sub-section

27 Class mobility analyzes the linkage between the social class of parents and respondents, while educational mobility is concerned with the linkage between the highest educational attainment of parents and respondents.

2.2.1, while the saturated models yield the conditional probabilities of belonging to the observed class necessary for calculating the *M*-index (equation 2-22, p. 39).

Table 2-5. Fit statistics for basic models

	N	Log-likelihood	*df*	*BIC*
Education, women				
Unidiff, quadratic	12316	-10360.03	12	20833.08
Unidiff, cohorts	12316	-10399.74	18	20969.01
Saturated, quadratic	12316	-10356.75	18	20883.05
Saturated, cohorts	12316	-10391.5	30	21065.56
Education, men				
Unidiff, quadratic	11593	-9886.613	12	19885.52
Unidiff, cohorts	11593	-9916.916	18	20002.28
Saturated, quadratic	11593	-9881.862	18	19932.17
Saturated, cohorts	11593	-9908.206	30	20097.16
Class, women				
Unidiff, quadratic	12346	-18945.11	56	38417.79
Unidiff, cohorts	12346	-18950.36	70	38560.19
Saturated, quadratic	12346	-18901.32	126	38989.7
Saturated, cohorts	12346	-18853.6	210	39685.63
Class, men				
Unidiff, quadratic	11663	-19238.33	56	39001.04
Unidiff, cohorts	11663	-19230.12	70	39115.74
Saturated, quadratic	11663	-19191.24	126	39562.37
Saturated, cohorts	11663	-19136.47	210	40239.42

Source: author. The dataset "dominance approach" has been used here; see **Table 2-2**.

The fits of the models for analyzing social mobility are usually judged by the Bayesian Information Criterion (BIC; Raftery 1986; Raftery and Hout 1993), which takes the degrees of freedom and the number of observation used in a model into account. Judging by this criterion, the quadratic models are always to be preferred over their cohort-based counterpart. In the case of educational mobility, the quadratic model also fits the data better in absolute terms, judging by the log-likelihood value. By contrast, the cohort-based models fit the data slightly better when analyzing class mobility. This small improvement comes, however, at the cost of many more degrees of freedom. Because of this, we can conclude that quadratic time trends are better than comparing individual birth cohorts when analyzing temporal changes in social mobility. However, as the decomposition method necessary for some comparisons between the *M*-index and the unidiff parameters are only available for differences between distinct cohorts, I will report cohort-based results throughout this sub-section, but add quadratic time trends whenever possible. When comparing the unidiff to the saturated multinomial logistic regression model, **Table 2-5** indicates that the saturated models fit the data only slightly better than the much more parsimonious unidiff models. Therefore, the unidiff model is preferable over the saturated model when focusing on the fit statistics. Note, however, that these measurements refer to the overall fit of the models. While generally appropriate, it is possible that misfits for specific cohorts or birth years would produce biased time trends. Thus, comparing the results from the unidiff models to the *M*-index based on saturated models makes it possible to detect such potential local misfits.

Figure 2-5 shows how the linkage between the origin and destination has changed over the range of birth years covered by the dataset (1925–78). Two transformations were necessary to make it possible to compare the *M*-index directly to the unidiff results. As a first step, we need to define the scales' zero in comparable way. The unidiff parameters have no absolute zero; they always measure the deviation in the strength of the overall pattern in origin–destination association from a reference cohort or point. For the cohort-based analyses, this is the cohort 1955–60, while for the continuous measurement of time, the years of birth have been centered around 1958, which then serves as the reference point. To make the *M*-index comparable to this characteristic of the unidiff results, the results in this sub-section only report the deviation from the same reference cohort and point used for the unidiff model. As a second step, the measured intervals can be made comparable by bringing the two measurements onto the same scale. As the unidiff parameters have no natural scale but depend on the underlying pattern of association (see the discussion at the end of sub-section 2.1.1), I bring them onto the scale of the *M*-index by applying a variance-based rescale factor (for details, see the notes on the individual figures).

Two especially noteworthy conclusions can be drawn from these basic analyses. First, from a methodological point of view, the two measures generally agree well. With one exception, both measures lead to the same conclusion for each of the analyses. In the case of men's educational mobility this is not strictly true, as in this case, the unidiff parameters do not significantly differ from the reference cohort/point, while the differences are statistically significant in the case of the *M*-index. Second, and substantively, all results but the one for men's class mobility suggest a U-shaped pattern of the strength of the intergenerational linkage. In other words, it seems that the linkage initially decreased but eventually started to increase again. I will analyze these time trends in more detail in sub-section 2.3.3, after a closer look at the difference between the results based on the unidiff models and the *M*-index.

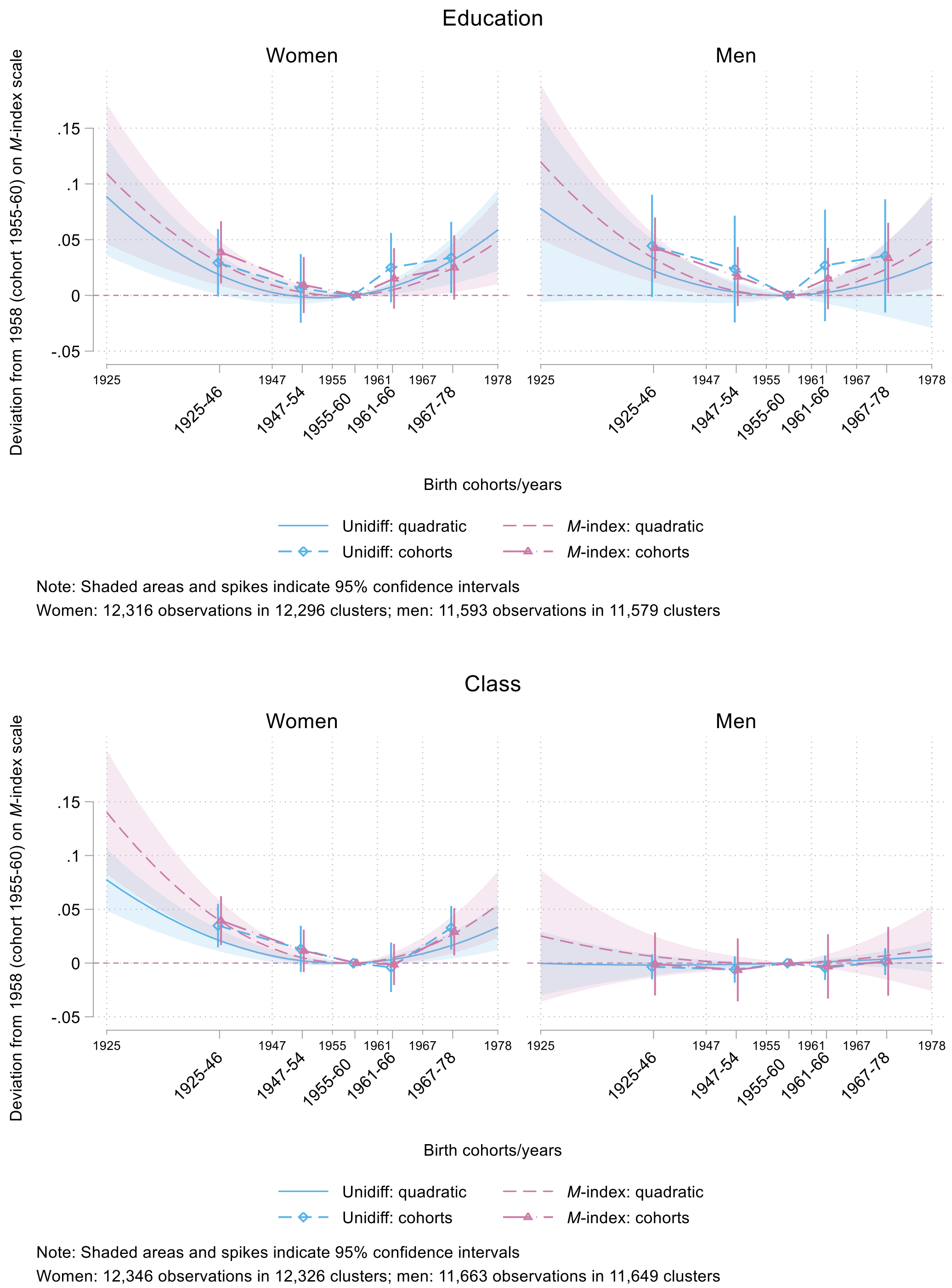


Figure 2-5. Intergenerational linkage of class and educational attainment by birth year or cohort

Note: The unidiff results have been rescaled to the M-index scale with a rescale factor given by $R = Var(\boldsymbol{\phi})/Var(\boldsymbol{M})$**,** where $\boldsymbol{\phi}$ and $\boldsymbol{M}$ are the vectors of the (logged) unidiff and M-index-parameters for birth cohorts; R has been calculated separately for the two genders and outcomes, but the same factor is used for continuous (birth years) and categorical (cohorts) time. Source: author. The dataset "dominance approach" has been used here; see **Table 2-2**.

Exploring the Differences

While the results from the two approaches are similar, they are not perfectly congruent. Based on the discussion of the concepts behind the two measures in section 2.1, there are two potential sources for the remaining small differences. First, the M-index is not a margin-free measure. Differences in the M-index between a given cohort and the reference cohort could, therefore, stem partly from differences in the marginal distributions that lead to differences in the entropy or the weighting based on the marginal distributions. Second, the basic assumption of the unidiff model is that the underlying pattern of origin–destination associations is uniform across all birth cohorts. If this assumption is violated, the unidiff parameters will be biased, which translates into differences between these parameters and the M-index, which is based on saturated models not affected by such biases. We can now trace each potential source of difference by sequentially eliminating the corresponding differences.

By applying the decomposition method proposed by Deutsch et al. (2006) to the pairwise differences between each cohort and the reference cohort, we can eliminate the contribution of differences in the marginal distribution to differences in the M-index. From **Figure 2-6**, we can see that when considering only the portion stemming from differences in the internal structures of each of the mobility tables, the congruence between the results based on the M-index and the unidiff parameters is close to perfect. In other words, the main source of the differences between the two results arise from variations in the marginal structure that are taken into account by the M-index, but not by the unidiff model. These variations are of special relevance in the case of educational mobility, where the factual M-index shows more pronounced U-shaped trends than the unidiff parameters or the counterfactual M-index differences. From this observation, we can conclude that the changes in the marginal distribution of the educational categories that result from educational expansion reinforce the trend in the intergenerational linkage that results from the changing association between the educational attainments of parents and their children. To some degree, the opposite can be observed in the case of the intergenerational class linkage of men. Here, the factual M-index displays no changes at all, while both its counterfactual decomposition and the unidiff parameters exhibit some (statistically insignificant) fluctuations. In this case, the small changes in the linkage due to changes in the associations are canceled out by changes in the marginal distributions.

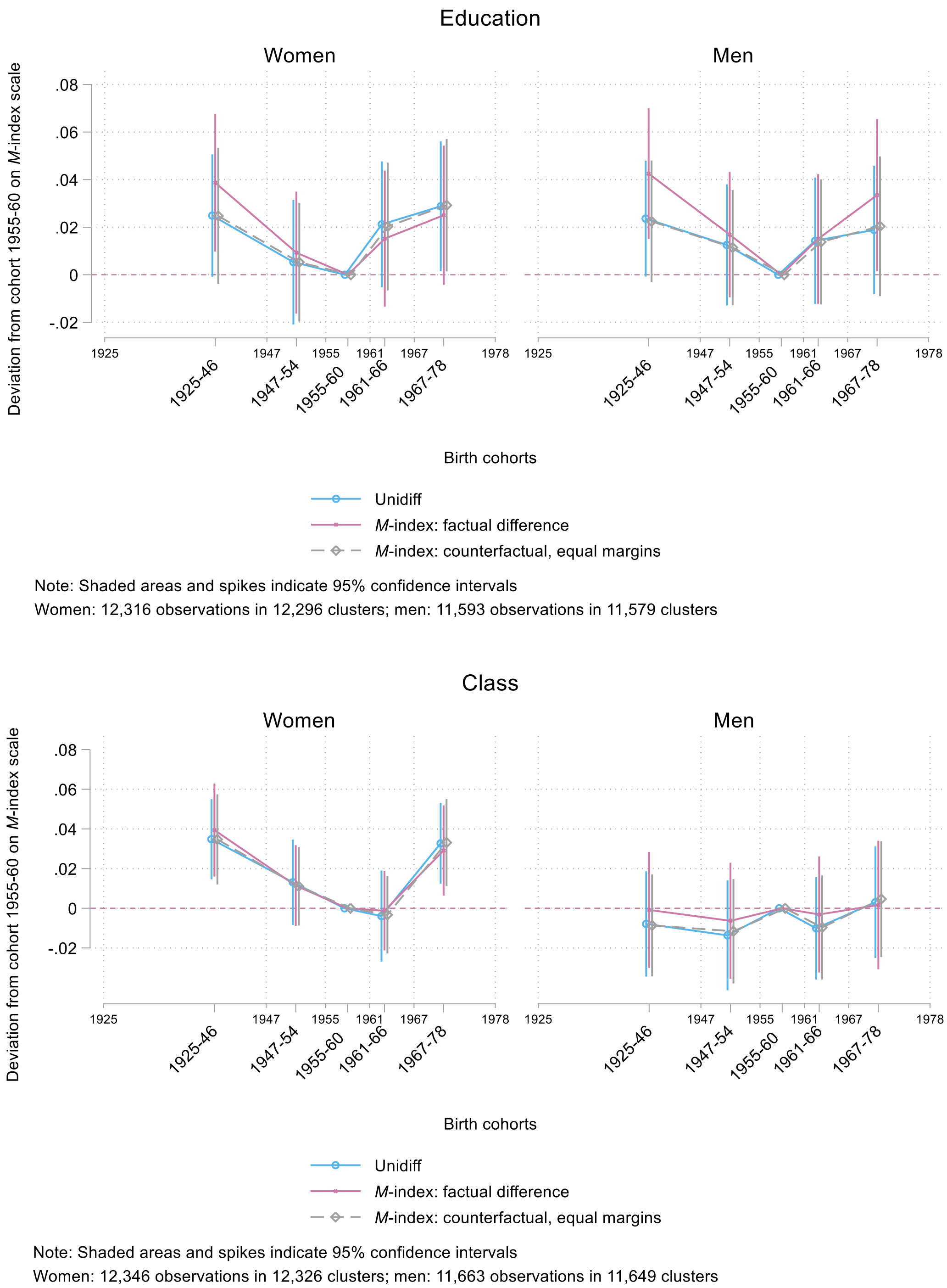
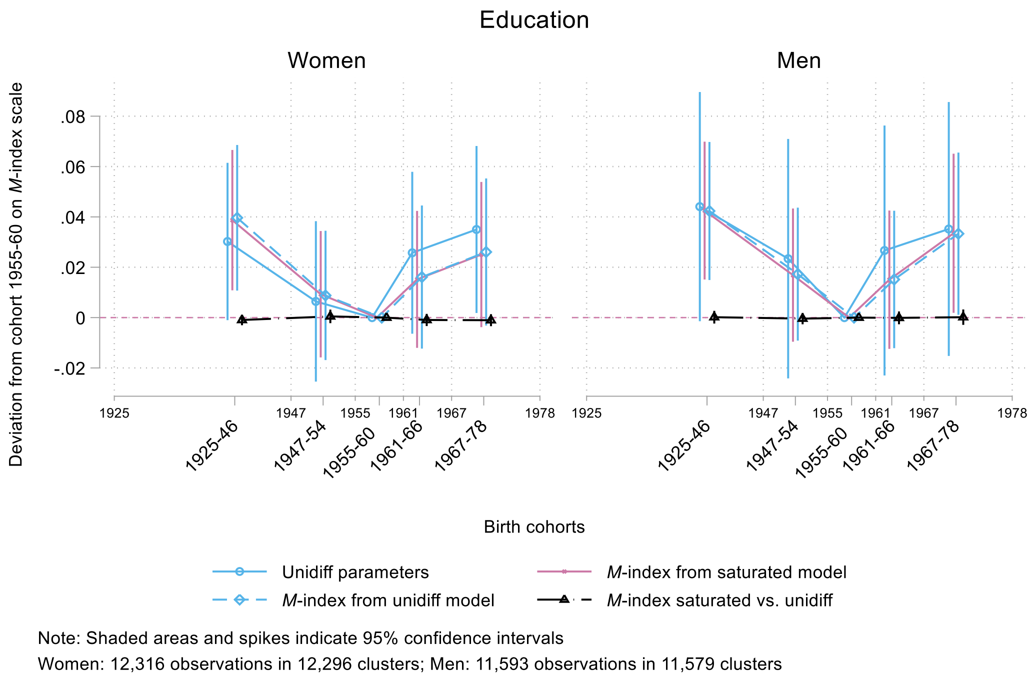


Figure 2-6. Comparing the *M*-index to unidiff parameters: what if the marginal distribution remained unchanged?

Note: Counterfactual *M*-index based on the decomposition of the pairwise difference (reference: cohort 1955-60) proposed by Deutsch et al. (2006); as in **Figure 2-5**, the unidiff parameters have been rescaled to the scale of the *M*-index (for calculating the rescale factor, the variance of the counterfactual *M*-index has been used); confidence intervals are based on bootstrapped standard errors. Source: author. The dataset “dominance approach” has been used here; see **Table 2-2**.



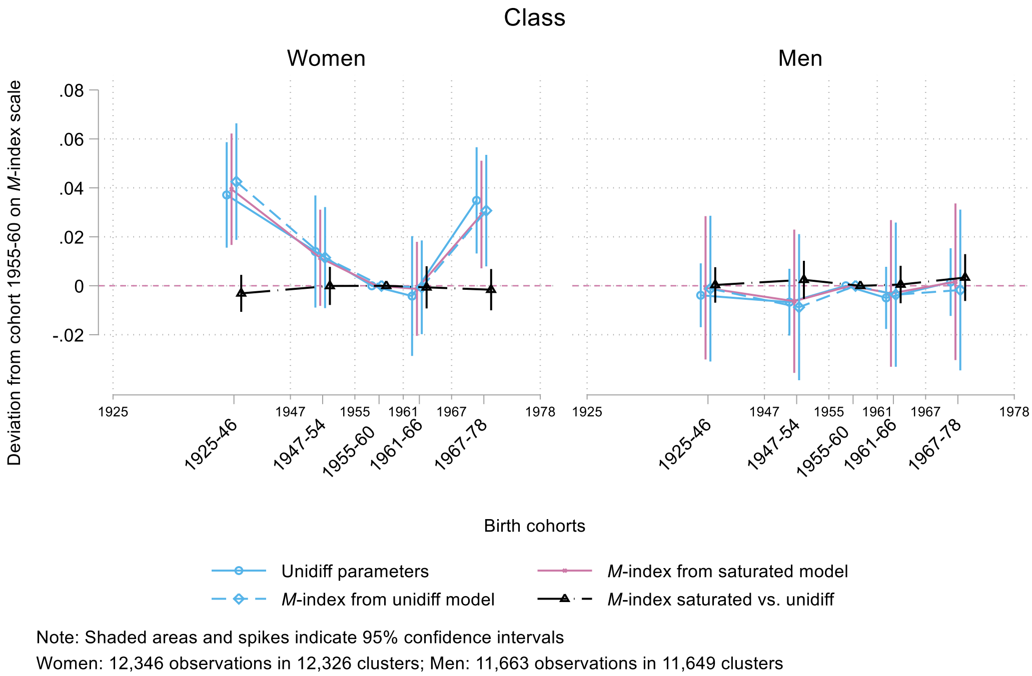


Figure 2-7. Comparing the *M*-index to unidiff parameters: are the differences due to model misfit?

Note: As in **Figure 2-5**, the unidiff parameters have been rescaled to the scale of the *M*-index (for calculating the rescale factor, the variance of the *M*-index from the unidiff model has been used) and confidence intervals are based on bootstrapped standard errors. Source: author. The dataset "dominance approach" has been used here; see **Table 2-2**.

Because there is virtually no difference left when taking into account the changes in the M-index due to changes in the marginal distribution, we can assume that the difference between the two measures is only marginally caused by a suboptimal fit of the unidiff models. This assumption is confirmed by the results presented in **Figure 2-7**. Here, I eliminate the portion of differences between the two measures due to misfits of the unidiff model by additionally calculating the M-index based on the unidiff model. In other words, instead of estimating the probabilities of belonging to the observed class or educational group (conditional on origin) based on a saturated model, they are estimated under the unidiff model (compare with footnote 18, p. 9). If the misfits introduced by the unidiff modeling approach were indeed an important driver behind the differences between the two measures, the M-index based on the unidiff model would be closer to the unidiff parameters than the M-index based on the saturated model. **Figure 2-7** shows that this is not the case and that eventual existing misfits due to the unidiff assumptions did not bias the time trends in the unidiff parameters.

2.3.3 The Changing Relevance of Social Origin in Detail

The analyses used for comparing the M-index to the unidiff parameters presented above suggest a U-shaped, curvilinear trend of the linkage strength between origin and destination. For women, this pattern has been found for both educational mobility and class mobility, while for men, there was some evidence of such a trend for educational mobility but not for class mobility. The aim of this sub-section is to assess the robustness of the trends found above; to explore them in more detail; and to extend the scope of social origin, not only by considering both parents explicitly, but also by considering both parents' educational attainment and their social class as two measurements of an individual's multifaceted social origin.

Confounded Trends?

As a first step, we may want to make sure that the found time trends are not confounded by survey and/or age effects. While the former could be the result of the fact that respondents with different birth years are not evenly distributed over the different surveys, the latter could be caused by the fact that, at the time of the interview, earlier cohorts tended to be older than later cohorts were. As briefly discussed by Jann and Combet (2012: 192–3), this could potentially bias the resulting time trends via two paths. First, the marginal distributions could differ between different age groups or surveys. For example, the topmost class could be less prevalent among younger respondents, or some classes might be underrepresented in some of the surveys. Second, it might be that the associations between origin and destination are stronger in

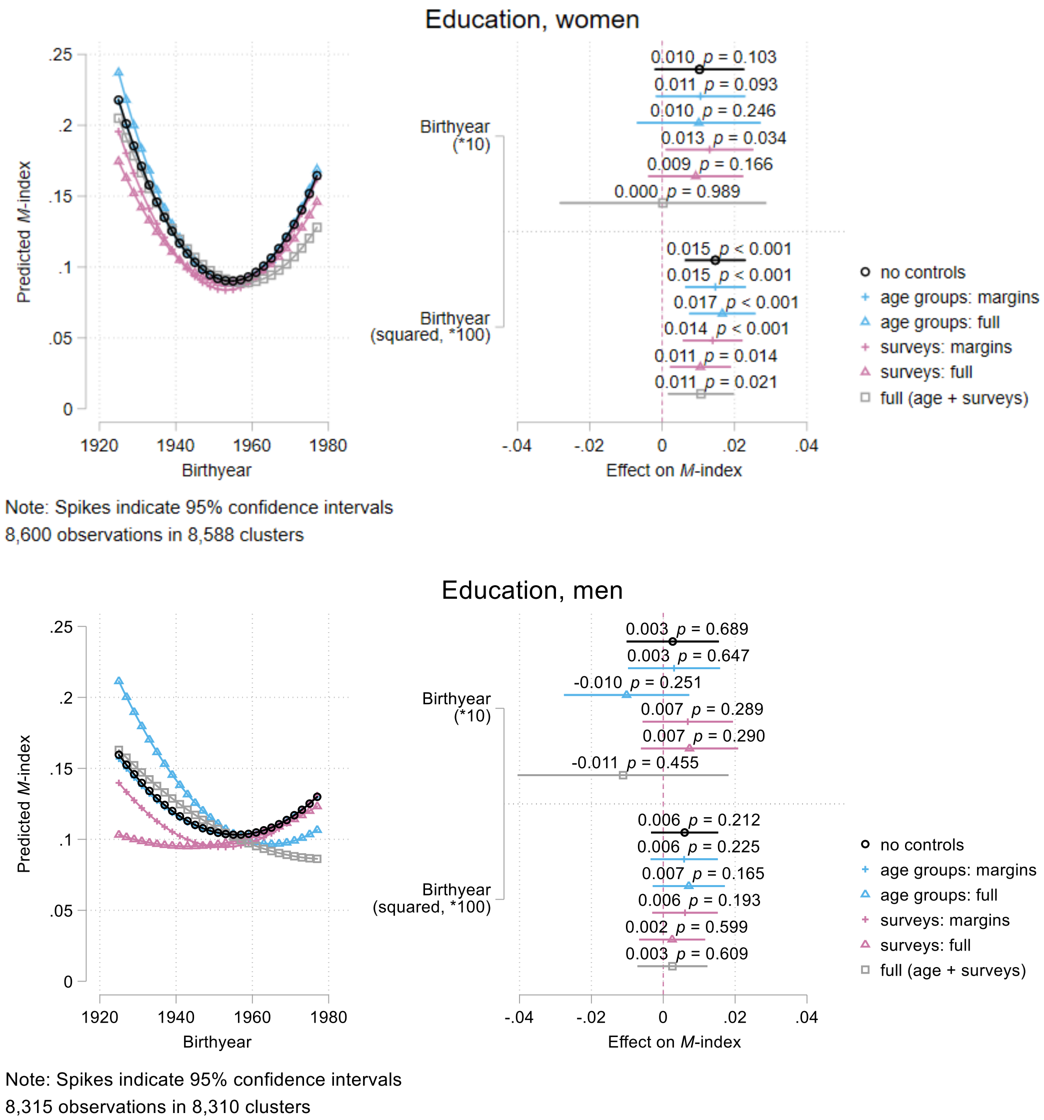


Figure 2-8. Intergenerational linkage of educational attainment by birth year: controlling for age and survey effects

Notes: Compare **Figure A-1** (p. 261) for predicted time trends with confidence intervals; predictions and coefficients from a GMM estimator. Source: author. The dataset “both parents” has been used here; see **Table 2-2.**

some groups than in others. While there might be a real age effect in this respect, it is unlikely that the association would truly differ between surveys. However, differential measurement quality might have the effect that the associations will be estimated to be stronger in surveys with better measurements than in surveys with poorer measurements.

The first source of error can be taken into account by including control variables for age groups and surveys into the set of variables $\boldsymbol{V}$, used into both the restricted and unrestricted model (p. 39, equations 2-22 and 2-23, respectively) used for predicting the probabilities required to calculate the individual-level m_i. The second source of error can then be taken into account by also including these control variables into $\boldsymbol{V}^{*}$,

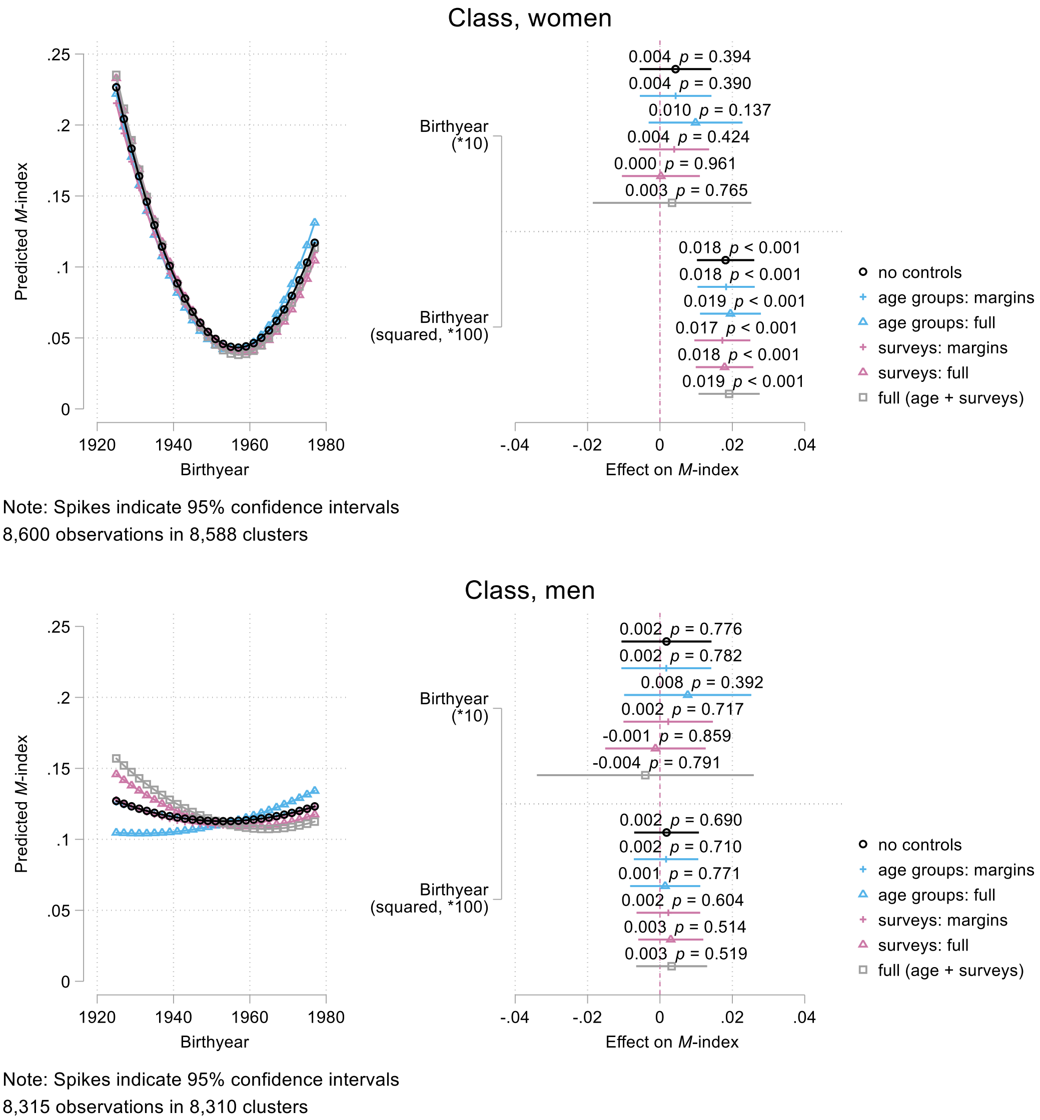


Figure 2-9. Intergenerational class linkage by birth year: controlling for age and survey effects

Note: Compare **Figure A-2** (p. 262) for predicted time trends with confidence intervals; for further notes and source see **Figure 2-8.**

the set of control variables used when estimating the aggregated M-index from m_i, according to the model described in equation 2-24 (p. 39). In **Figure 2-8** and **Figure 2-9**, I subsequently take both sources of bias into account by controlling both separately and simultaneously for age and survey effects. While I use dummy variables for each of the surveys listed in **Table 2-2**, I use the following age groups for controlling for age effects: 35–40, 41–55, and 56–69.

Figure 2-8 shows how the predicted quadratic time trends[28] in the intergenerational linkage of educational attainment and the underlying model-coefficients change when

[28] To avoid unreadable graphs due to overlapping confidence intervals, the predicted time trends are displayed without such confidence intervals. Interested readers may follow the

introducing these control variables. As we have seen in the last sub-section, the time trends of women's educational mobility follow a clear U-shaped trend. Without controls, the coefficient of the linear term of the birth years (centered around 1958) is slightly positive, but just misses conventional levels of statistical significance. According to this model, the predicted linkage strength decreased significantly in 1925 (slope: -0.009, p<0.001), reached a minimum at 1954.5 (95% CI [1950.7, 1958.3]), and increased significantly in 1978 (slope: +0.007, p<0.001). Controlling for age effects does not change this picture, while controlling for survey effects slightly reduces the curving. With controls for both potentially confounding effects, the initial decrease remains largely the same (slope: -0.007, p=0.019), but the timing of the minimum becomes much less clear (1957.9; 95% CI [1944.6, 1971.2]), and the increase for later cohorts becomes less pronounced and does not reach conventional levels of statistical significance (slope: +0.004, p=0.104). In other words, the models with controls confirm that, for women, the strength of the linkage between parents and respondents decreased for the early cohorts, and that this relationship was curvilinear. However, the situation is less clear for later cohorts: while there is some evidence of a strengthening linkage, the possibility cannot be ruled out that this result is confounded by survey and age effects.

In the case of the educational mobility of men, the model without controls provides some weak evidence for a curvilinear pattern similar to that of women. However, the degree of certainty is already very low in this model, and the results presented in **Figure 2-8** show that the linear term of the quadratic function in particular is very sensitive to the introduction of full controls for age effects. Overall, there is no robust evidence for any trend in the linkage between the educational attainment of parents and men.

The situation respecting class mobility is similar. Here, the results in **Figure 2-9** present no evidence for time trends for men, but indicate a clear U-shaped pattern for women. In the case of women's intergenerational class linkage, these results suggest that the found time trend is not confounded by survey or age effects, as the results remain remarkably stable when we include controls for these effects. Under the model including the full set of controls, the predicted M-values decrease dramatically from 0.235 in 1925 (slope: -0.012, p<0.001) to a minimum of 0.038, which is reached in 1957.1 (95% CI [1951.4, 1962.8]), and increases again to 0.121 in 1978 (slope: +0.008, p<0.001).

references in the notes on the figures for consulting plotted time trends that include confidence intervals.

In sum, according to these basic models, no time trends have been found for men, while for women, a curvilinear time trend shows up for the linkage between origin and destination. In other words, origin was of high but decreasing relevance for the women of early cohorts, and this downward trend eventually reached a minimum for cohorts born in the late 1950s. In the case of women's class mobility, the linkage strength between the generations increased again for later cohorts, while for educational mobility, it remains unclear whether there was also such a re-increase or whether the effects of social origin remain at this lower level.

Local Linkages

Departing from this basic analysis, one way to deepen our investigations is to disaggregate the above time trends by origin and destination. The brief re-analysis of the data analyzed by Long and Ferrie (2013a) in sub-section 2.1.3 illustrated that disaggregating the overall M-index by calculating the local M-index for each origin or destination can be a powerful tool for analyzing social mobility. To repeat: the local linkage by origin reflects the degree of predetermination of an individual's class affiliation because her or his parents belonged to class X. By contrast, the local linkage by destination reflects the relevance of social origin for belonging to class X. In the case of the re-analysis of temporal trends in the US, the local M-index of those who have become farmers helped clarify a targeted research question, namely the role of farmers in the debated comparison between the 19th and the 20th century. For our purposes, as a tool for explorative analyses of time trends, such a disaggregation is a mixed blessing. On the one hand, it can produce valuable insights – for example into the differences in the time trends between women and men – that can inspire future research. On the other hand, such a disaggregation yields a large number of results; more specifically, it produces time trends for each class and educational level for both the parents and the child. Without targeted research questions (such as the role of farmers in the example of the re-analysis of Long and Ferrie's data), it would be unwieldy to give all these results in detail here, and would certainly go beyond the scope of this section. Rather, I will simply exemplify the potential of analyzing such local linkages by pointing out some selected insights gained from such a disaggregation.

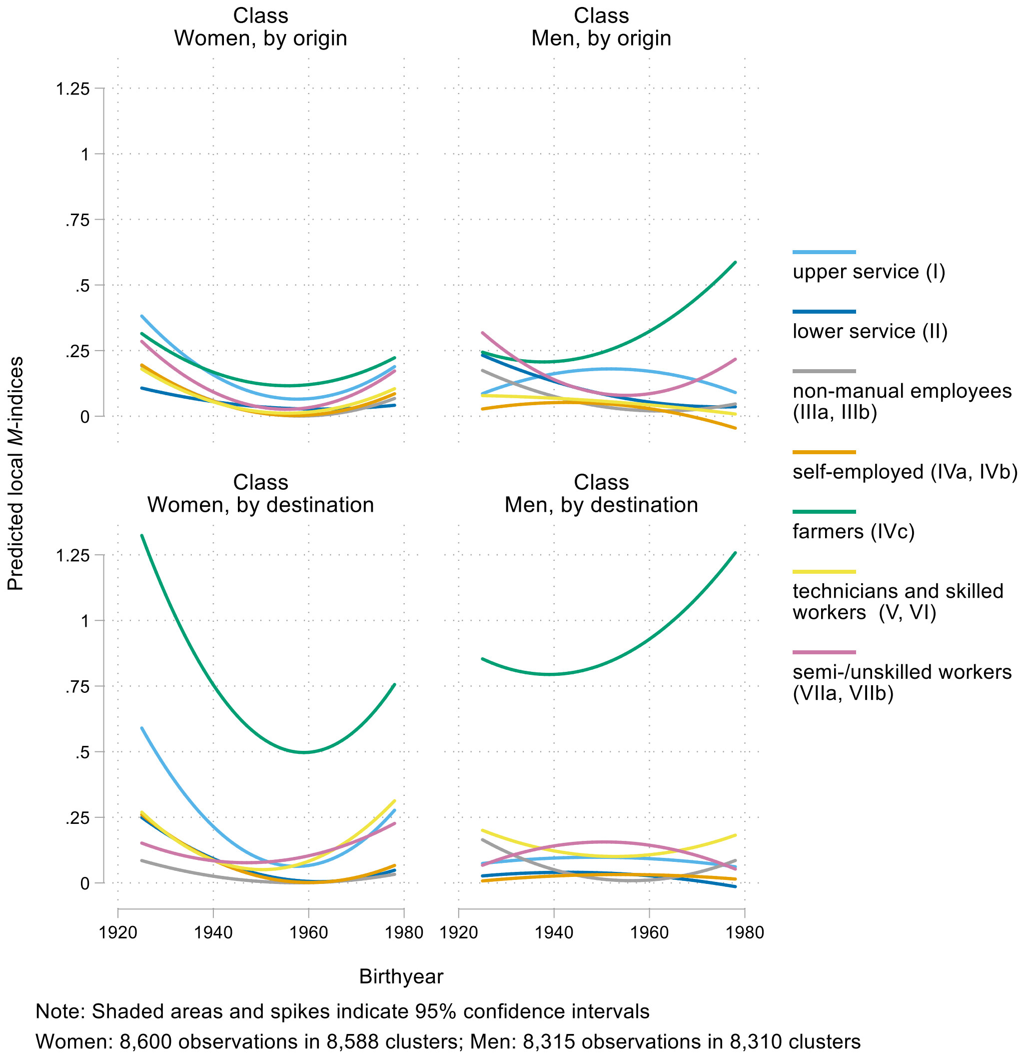


Figure 2-10. Local class linkages: *M*-index disaggregated by origin and destination

Note: Compare **Figure A-3** (p. 263) for predicted time trends with confidence intervals; includes controls for survey and age effects; for further notes and source see **Figure 2-8.**

A first insight can be gained by comparing the disaggregation of both educational (**Figure 2-11**) and class mobility (**Figure 2-10**) between the two genders. In both cases, we can see that the "no trend" found above for men does not mean that nothing changed at all, but that there were heterogeneous sub-trends. While women's local *M*-indices all follow a consistent U-shaped pattern, the trends for men are mixed: here we find increasing and decreasing U-shaped patterns, as well as inverted U-shaped patterns. When aggregating these local linkages to the overall *M*-index, these diverging trends cancel each other out.

When focusing on educational mobility, a striking shift can also be noticed in **Figure 2-11**. While tertiary education lost its outstanding role in the intergenerational transmission of educational attainment, the lowest level (compulsory or less) took over.

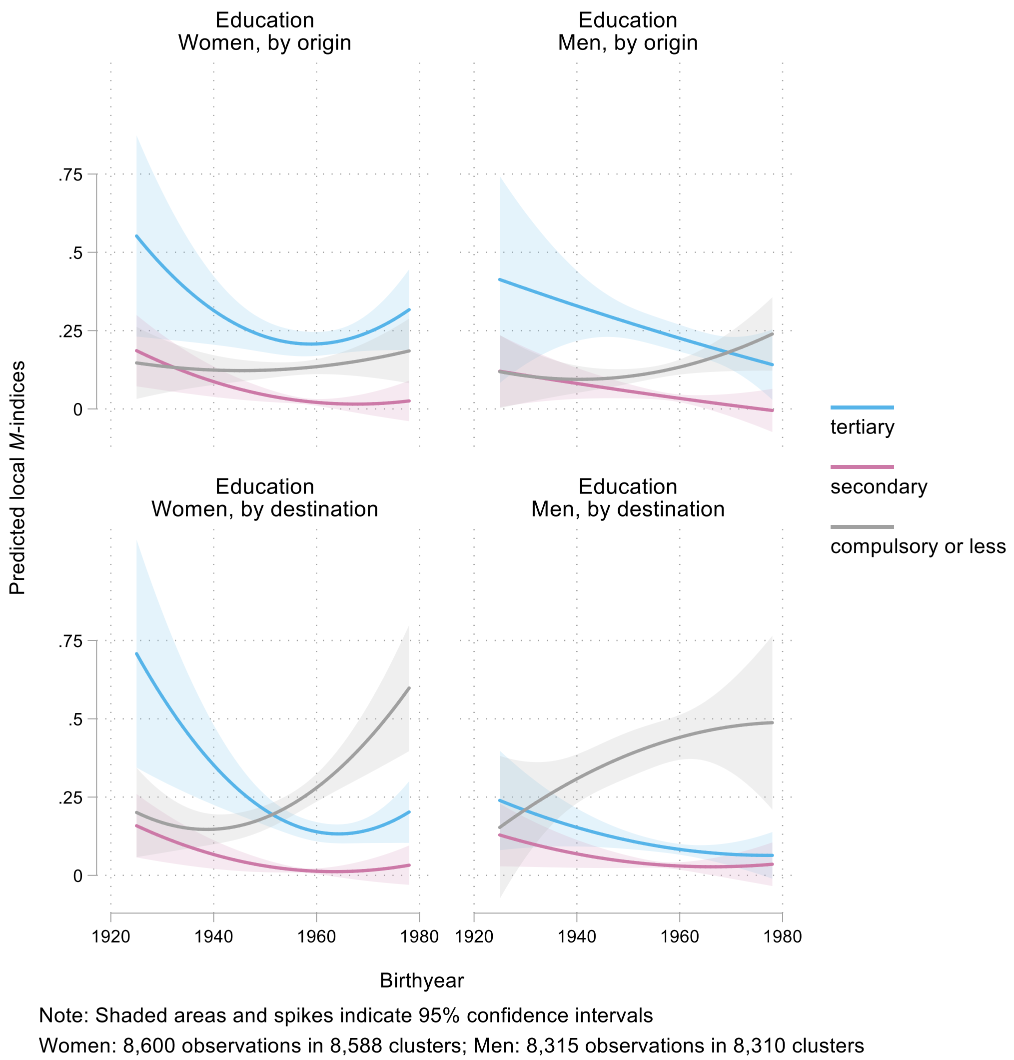


Figure 2-11. Local linkages of educational attainment: *M*-index disaggregated by origin and destination

Notes: includes controls for survey and age effects; for further notes and source see **Figure 2-8**.

This is obviously a result of educational expansion: for the earlier cohort, it was something extraordinary to graduate at the tertiary level or – even more so – to have parents with a tertiary degree. For later cohorts, the opposite is true, as (especially among respondents) those who attained compulsory education or less belonged to a clear minority (compare **Figure 2-3**, p. 49), and this lowest educational level became strongly determined by the education of their parents.

Turning to class mobility (**Figure 2-10**), it is again the farmer class that stands out. For both women and men, social origin is of utmost importance for becoming a farmer. However, while for women the relevance followed the now well-known U-shaped pattern, the relevance of social origin for becoming a farmer continuously increased for men. In addition, originating from a farming family became increasingly important for men, while no pronounced trend in the importance of that origin can be found for women.

Expanding "Social Origin"

So far, I have investigated linkages between the educational attainments of parents and children, as well as between the social class of parents and children. Following the dominance approach (Erikson 1984), I have also only considered the parent with the highest education or the highest status, which conforms with the conventional view on social origin, according to which it is the household as an entity that is relevant. Only relatively recently did this view lose its dominance (Beller 2009), although arguments and evidence against it have been around for a while (Sorensen 1994; Korupp et al. 2002). The remainder of this sub-section will thus expand on what is subsumed under the term "social origin" in two steps.

For both steps, I will start with a traditional approach by analyzing the linkage between the respondent's own class (education) and her or his father's class (or education, respectively). For the first step, I will then add the mother's class (or education), which makes it possible to measure the total of each parent's individual influence on the respondent's social position. By doing so, we can investigate how far mothers have mattered for an individual's educational attainment and class affiliation in 20th century Switzerland (**Figure 2-12** and **Figure 2-13**). As a second step, I will also include the other measurement of social origin for each parent. In other words, when analyzing the relevance of social origin for a respondent's educational attainment, I will include not only the parents' educational attainments, but also the class of each, which makes it possible to expand "social origin" across multiple dimensions (Buis 2013; Bukodi and Goldthorpe 2013).

Respecting women's educational attainment, **Figure 2-12** suggests that mothers have mattered relatively constantly over the observed period. The *M*-index for both parents is consistently higher than that for the father only. The former measures the gained information on women's educational attainment by learning the education of both the mother and the father, while in the latter case, only information on the father's education is learned. With the exception of the earliest and latest cohorts, where the level of uncertainty is high (**Figure A-4**, p. 264), the difference is statistically significant but does not change importantly over the observed period. Because the two evolve in parallel, considering mother independently from the father does not change the general trend – if anything, the curving becomes slightly more pronounced. As a result, the conclusion to be drawn on women's educational mobility from the results based on the

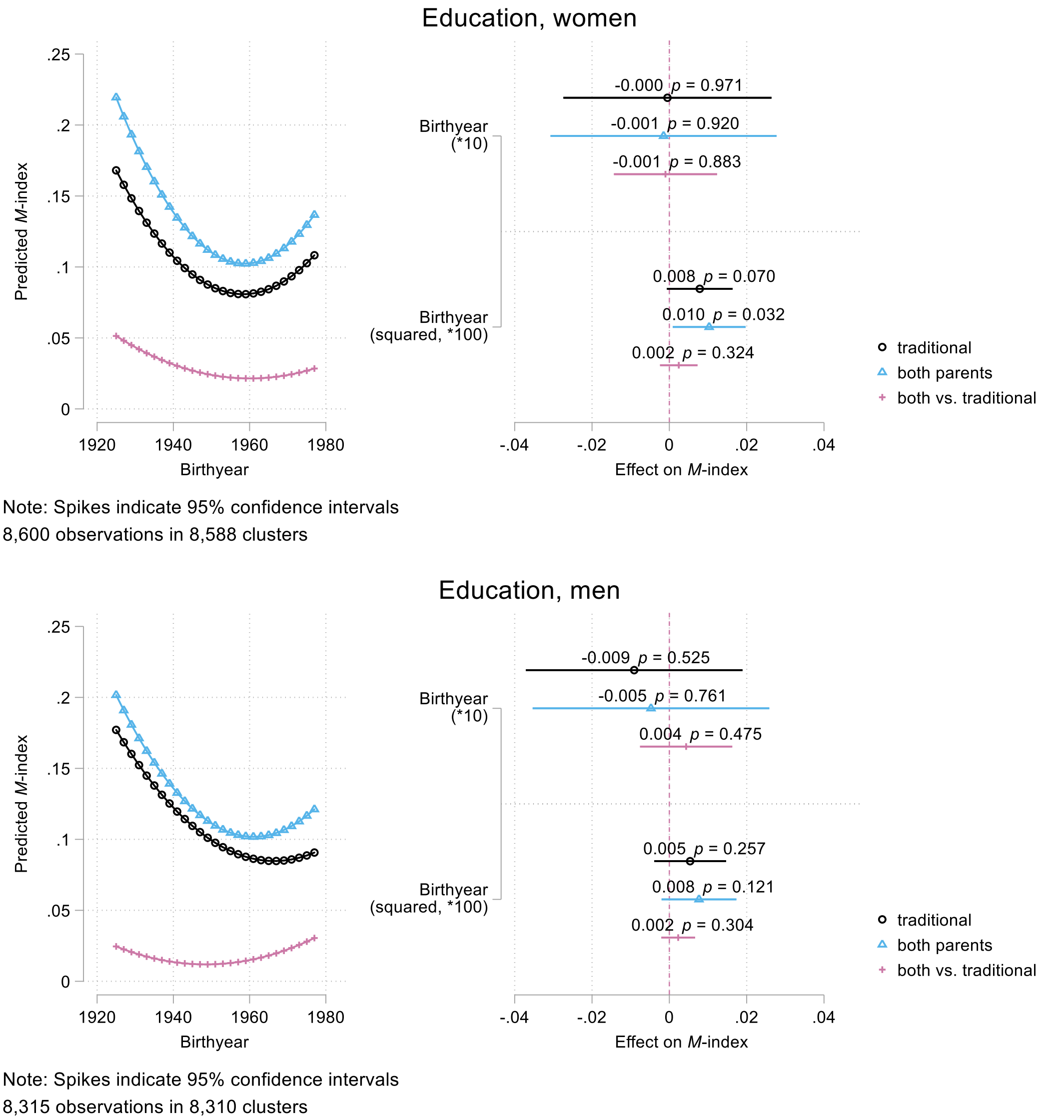


Figure 2-12. Intergenerational linkage of educational attainment: adding information on mothers

Note: Compare **Figure A-4** (p. 264) for predicted time trends with confidence intervals; includes controls for survey- and age-effects; for further notes and source see **Figure 2-8**.

dominance approach is confirmed by taking into account the education of both parents independently. More specifically, there is clear evidence for a curvilinear time trend with decreasing intergenerational linkage at the beginning of the observed period, and some weak evidence for a re-increase for later cohorts (with a slope at 1978 when including both parents: +0.004, p=0.145).

For men, the situation is different insofar as it is unclear whether the mother's educational attainment mattered for early cohorts, while mothers mattered increasingly for later cohorts. Therefore, the curve becomes somewhat more pronounced, but not enough to provide evidence for a significant time trend. If anything, based on both parents' educational attainment, there is some weak evidence for a decreasing linkage

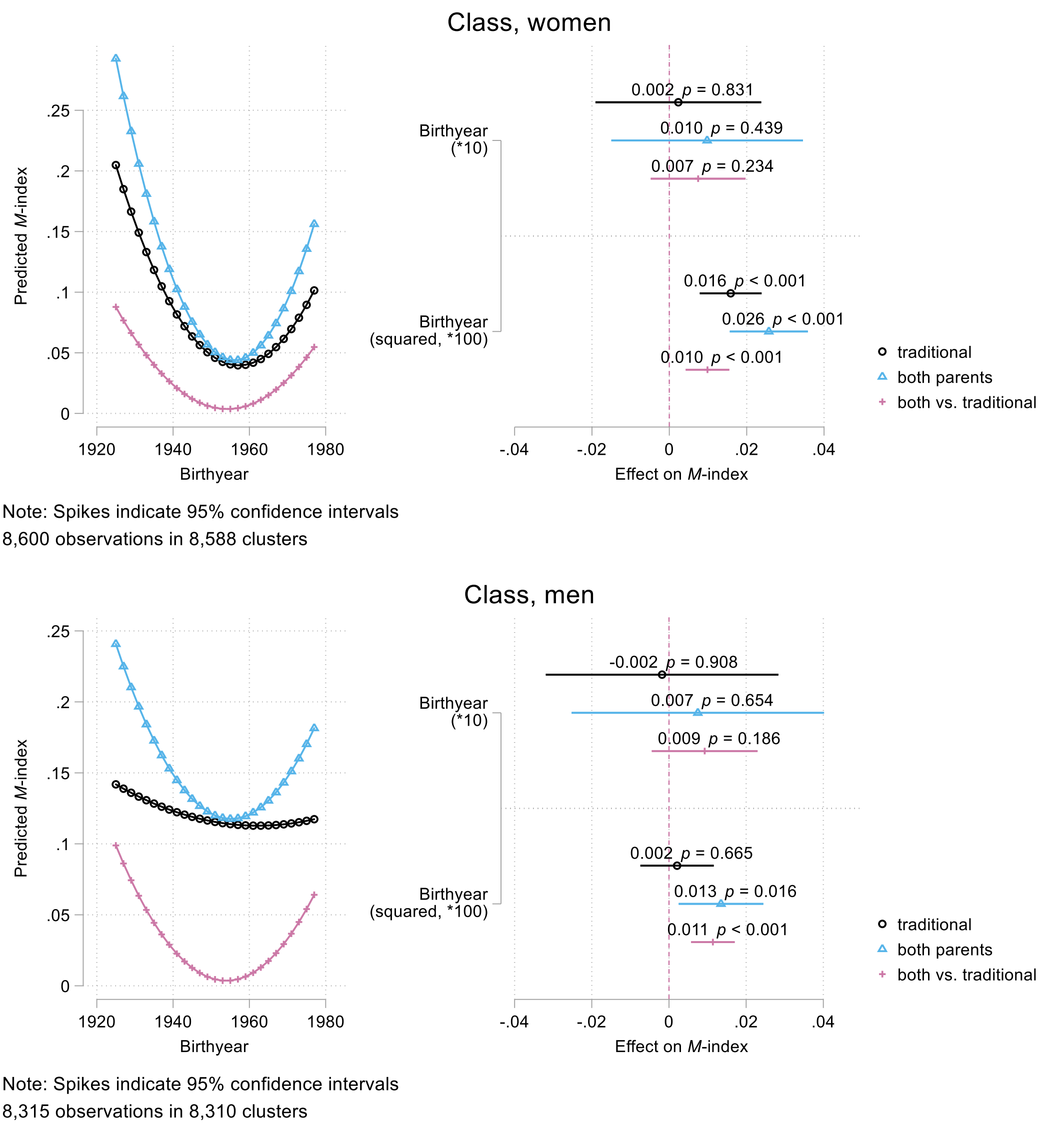


Figure 2-13. Intergenerational class linkage: adding information on mothers

Note: Compare **Figure A-5** (p. 265) for predicted time trends with confidence intervals; includes controls for survey- and age-effects; for further notes and source see **Figure 2-8.**

strength at the beginning of the period under observation (slope at 1925: -0.006, p=0.086).

Turning to class mobility (**Figure 2-13**), a striking result is that the additional relevance of the mother's social class over and above that of the father's social class follows a pronounced U-shaped pattern. While mothers mattered strongly at the beginning and at the end of the observed period, this was not the case in the middle part. In fact, for both women and men born in the 1940s and 1950s, there is no evidence that their mothers' occupation was relevant for the occupational class to which the respondents belonged. For women, we have already found a distinct U-shaped pattern when applying the dominance approach. Because the additional information gained from learning the mother's class follows the same pattern, the resulting time trend is even clearer in its particular shape. Specifically, the relevance of parental class was high at the beginning of the observed period, but clearly decreased (with a slope at 1925: -0.016, $p<0.001$), reached a minimum estimated at 1956.1 (95% CI [1951.3, 1960.9]), and increased again thereafter (with a slope at 1978: +0.011, $p<0.001$).

For men, explicitly considering mothers radically changes our conclusion on temporal changes in the relevance of parent's social class for men's class affiliation. When only considering the dominant parent's occupational class, we did not find any time trend; however, when taking into account each parent's class independently, we find a U-shape for men too – a result of the clear curvilinear pattern of the mother's relevance. Accordingly, we find a pattern that is very similar to that for women, albeit somewhat less pronounced (with a slope at 1925: -0.008, $p=0.028$, a minimum at 1955.2 (95% CI [1943.4, 1967.1]), and a slope at 1978: +0.006, $p=0.045$).

As we are primarily interested in the relevance of social origin for social outcomes such as class and educational attainment, we may want to consider more than one dimension of the origin family's social standing. This could include all sorts of measurements of economic, social, or cultural resources. Following Buis (2013), I measure economic resources based on each parent's occupation, and cultural resources based on each parent's education. In contrast to Buis, who uses a continuous scale for occupational status, I continue to use a parent's occupational class. When reviewing the resulting effects of such a combined origin on both education (**Figure 2-14**) and class (**Figure 2-15**), we reach two general conclusion. First, the traditional approach – considering only the father's class when analyzing class mobility and the father's education when analyzing educational mobility – omits a large portion of the total influence of social origin. Even when compared to the relatively simple construct used here (each parent's class and education, but with other measurements of relevant resources), this traditional approach omits up to 40% of the origin effects when analyzing effects on educational attainment and up to 55% when analyzing origins relevance for the class to which respondents belong. Second, all four analyses suggest that the relevance of the additional dimensions of social origin follow a U-shaped pattern.

In some cases, this additional U-shaped trend simply reinforces an existing, clear trend of the same shape. This is the case for women's class and, to a lesser extent, educational mobility. In the latter case, considering only the education of the parents left us unsure whether the found curvilinear relationship resulted in a U-shaped pattern (decrease–increase) or whether it merely resulted in a "decrease–no change" pattern.

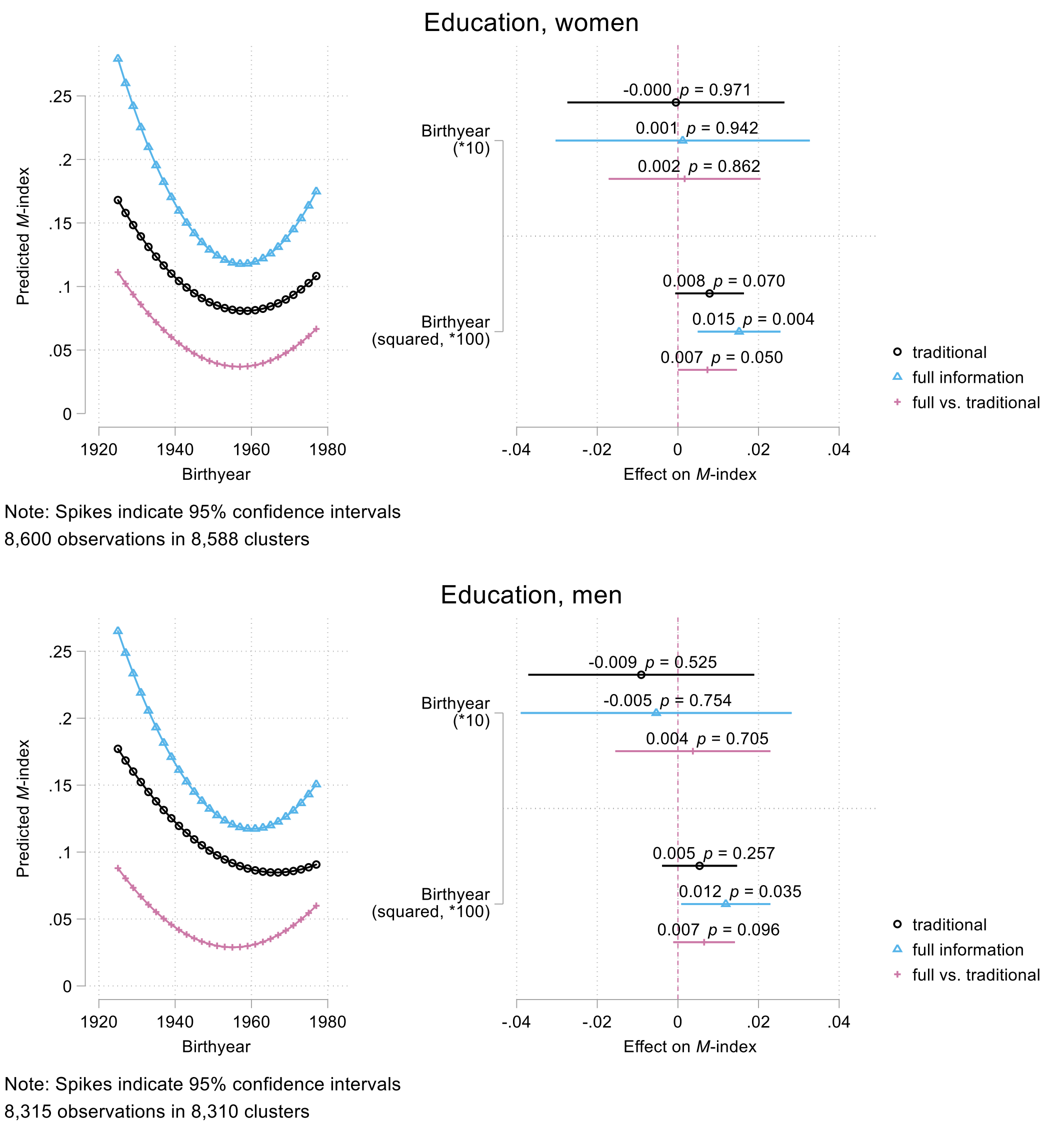


Figure 2-14. Intergenerational linkage of educational attainment: adding information on mother's education and on both parents' social class

Note: Compare **Figure A-6** (p. 266) for predicted time trends with confidence intervals; includes controls for survey- and age-effects; for further notes and source see **Figure 2-8**.

Also considering each parent's social class (**Figure 2-14**), however, allowed us to form the conclusion that the resulting time trend was indeed U-shaped. Thus, the relevance of social origin for women's educational attainment was high for the early cohort but clearly decreased (with a slope at 1925: -0.010, *p*=0.004), reached a minimum estimated at 1957.6 (95% CI [1947.3, 1967.9]), and increased for later cohorts (with a slope at 1978: +0.006, *p*=0.036).

In the case of the relevance of social origin for men's educational attainment, however, adding information on each parent's social class led to a different conclusion on time trends. Based on the full information regarding social origin, the results suggested a curvilinear trend for men as well. There is evidence that the relevance of

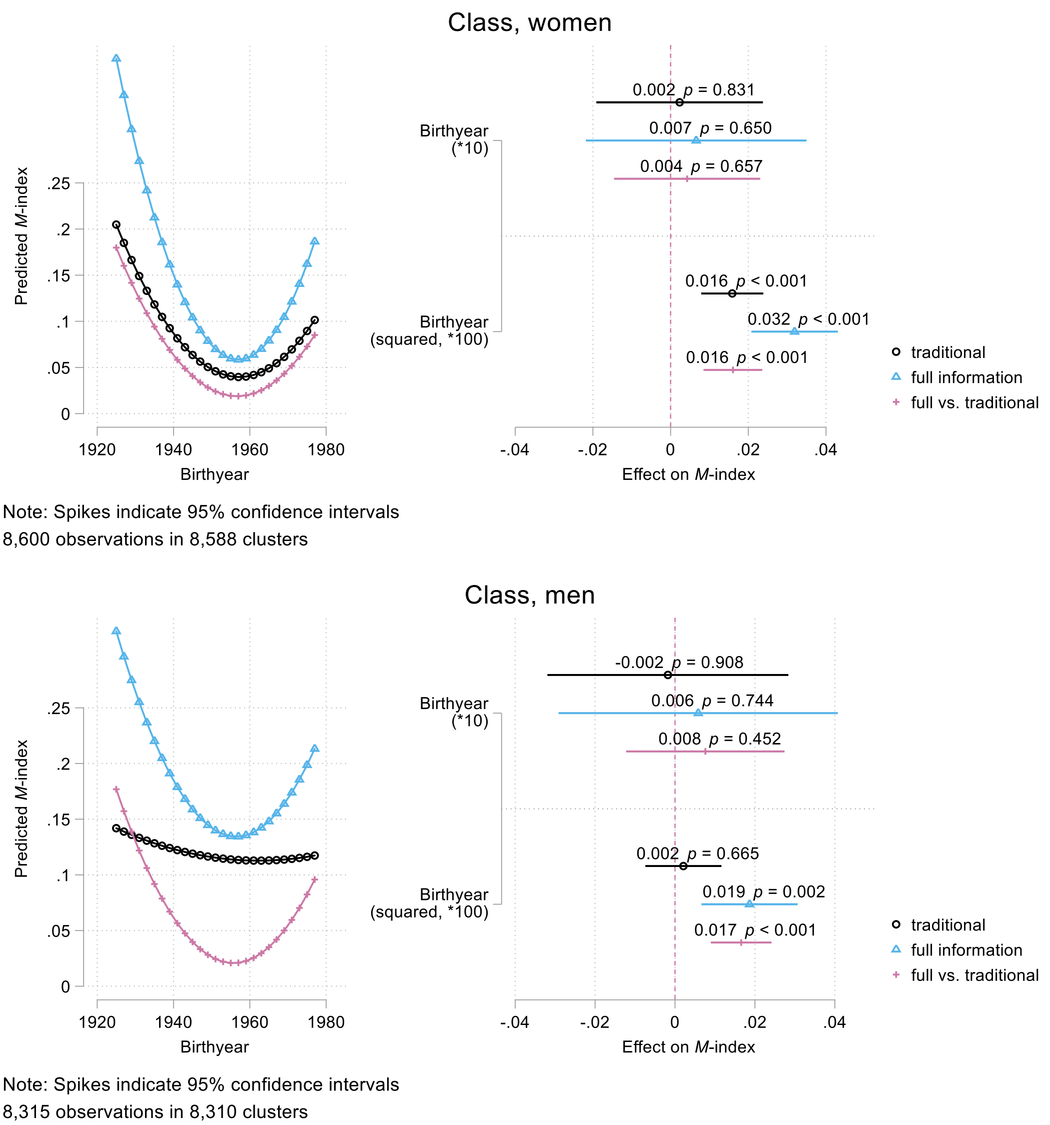


Figure 2-15. Intergenerational class linkage: adding information on mother's social class and on both parents' education

Note: Compare **Figure A-7** (p. 267) for predicted time trends with confidence intervals; includes controls for survey- and age-effects; for further notes and source see **Figure 2-8**.

social origin decreased for early cohorts (with a slope at 1925: -0.008, p=0.021) and reached a minimum somewhere in the second half of the observed period (estimated at 1960.3 (95% CI [1945.4, 1975.1]). Whether or not it increased again for later cohorts remains, however, unclear (with a slope at 1978: 0.004, p=0.187).

Respecting class, the results based on the full set of variables on social origin confirm those based on the class of the mother and father. **Figure 2-15** shows an even further pronounced U-shaped trend for both women[29] and men.[30] For women, the temporal

[29] Slope at 1925: -0.020, p<0.001, minimum at 1957.0 (95% CI [1952.5, 1961.4]), slope at 1978: +0.013, p<0.001.

[30] Slope at 1925: -0.012, p=0.004, minimum at 1956.4 (95% CI [1947.2, 1965.7]), slope at 1978: +0.008, p=0.015.

changes were dramatic: while origin mattered strongly for early cohorts and moderately for the latest cohorts, it had a very weak influence on the occupational class of women born in the 1950s. For men, the change was less dramatic, which was mainly the result of a relatively constant influence exerted by the father's social class. Nonetheless, the strongly curved influence of the additional characteristics of social origin led to the resulting – not dramatic, but still pronounced – U-shaped pattern of the overall relevance of social origin for men's class affiliation.

2.4 Concepts and Measures: Conclusion and Outlook

In this chapter, I have discussed different concepts of "openness" respecting social origin, presented two measures of such an "openness" in detail (including the M-index as the main measure of relevance of social origin used in this thesis), assessed the validity of the M-index, and explored its potential by analyzing the trends in origin effects for 20th century Switzerland.

Respecting the concepts and measures of social origin, I argued that the "margin-free" approach using log-linear models is indeed ideally suited for analyzing specific class barriers and other patterns in the mobility regimes. However, when it comes to measuring and comparing the overall relevance of social origin, the oft-used model within this framework – the unidiff model – may not be an ideal choice. In particular, it seems conceptually questionable whether it is reasonable to measure the general origin effects in a society at the analytical level of the cells of a mobility table. It is also desirable to measure social origin by considering the multiple independent characteristics of family of origin, such as each parents' educational attainment and social class, which is not possible using this model. By contrast, the M-index – which measures "the degree to which the determining factors of our relations account for the phenomenon which they serve to explain" (Theil 1970: 125) – is a valid measure of the overall relevance of social origin for individual's status attainment. In sub-section 2.1.3, I showed that the M-index can be a flexible tool for analyzing questions of social mobility, which includes considering multiple dimensions of social origin, disaggregation by origins or destinations, controls for confounding variables, and more. In sub-section 2.2.2, I then proposed and described procedures for calculating and estimating the M-index in a way that offers all these features and produces the inference statistics necessary to perform statistical tests, such as tests for differences between birth cohorts.

In sub-section 2.3.2, I assessed the validity and usefulness of this measure by comparing it to parameters of the traditionally used unidiff model[31] using a harmonized dataset that included respondents living in Switzerland born between 1925 and 1978. This comparison showed that the two approaches largely lead to the same conclusions. Where there were deviations, it was possible to trace them back to the fact that the M-index takes changes in the marginal distributions into account, a desirable feature for the research questions posed by this thesis. Nonetheless, the decomposition method

[31] More precisely, a newly-implemented model equivalent to the traditional unidiff model but uses individual level data has produced the unidiff parameters; see sub-section 2.2.1.

implemented according to Deutsch et al. (2006) made it possible to obtain (where desired) time trends that are perfectly congruent to the one yielded by the unidiff model.

Exploring time trends in the relevance of social origin in detail for 20th-century Switzerland demonstrated that it is important to control for potentially confounding effects, such as age and survey effects. For this reason, I controlled for these potential confounding variables in all subsequent analyses, which ruled out important sources of bias and increased the robustness of the obtained results.

From a substantive point of view, these first results provided some evidence for a curvilinear relationship for women. This evidence was strong in the case of class mobility, but weak for educational mobility. No evidence for time trends was found for men. Disaggregating the *M*-index made it possible to trace these differences between women and men back to a lower level. They revealed that, for men, inconsistent time trends for different origins or destinations canceled each other out, which was not the case for women. However, further analyses suggest that the differences between the two genders were less fundamental than they appeared when only applying the dominance approach. More specifically, considering both the mother's and the father's educational attainments and social class as multiple measurements of the social standing of the family of origin (which combine to the construct of "social origin") showed that the overall relevance of social origin followed similar trends for women and men. The found U-shaped trend suggests that social origin was of high importance at the beginning and end of the observed period (1925–78), but of much less importance for those born around the 1950s (I will come back to this curvilinear trend at the end of this section).

The fact that the trends found for the two genders converge when considering multiple dimensions of social origin suggests that the contributions of different resources within the family of origin have changed over the course of the 20th century. This conclusion is in direct opposition to the findings of Buis (2013), who tested such a hypotheses for the Netherlands without finding support for it. This diverging finding is a promising starting-point for further research on gender differences in the effects of social origin, as there are indeed various potential explanations for why the relevance of different resources can be expected to have evolved in a gender-specific way over the course of the 20th century. For example, sex role theory predicts that daughters will primarily be oriented towards their mother, while fathers matter more for sons, just as the same-sex parent is more pertinent for a child's own (future) situation (Acock and Yang 1984; Boyd 1989). If this is the case, changes in the labor market participation of mothers can be expected to primarily affect the origin effects of women, while for men, a mother's occupation may provide additional resources without her being the primary role model. Alternatively, one can expect that the emancipation of women opened various occupations to women that were hitherto exclusively open to men. For the first generation of women enjoying these new possibilities, no female role models were available within their family, which could explain why origin was of very little importance for these generations.

For both explanations, it is likely that the mechanisms differ between the effects of educational attainment and the influence of origin on the destination class. In the latter case, a promising first step for further investigations of gender differences could be to analyze the different paths of intergenerational transmissions of social position separately. For this aim, one could make use of the fact that the *M*-index can also help analyze direct effects, net of (for example) an individual's own educational attainment (see sub-section 2.2.2). Proceeding in this way, the various elements of the status attainment model (**Figure 2-1**, p. 15) could be investigated respecting gender differences, producing new insights into the underlying mechanisms.

The found trends in the overall relevance of social origin for the status attainment of individuals is interesting in and of itself, quite apart from what they reveal about gender-specific sub-trends. When Buis (2013) considered each parent's education and social status for explaining individual's educational attainment, he was surprised not to find declining effects of social origin. He concluded that the declining effects found in the previous literature might be an artefact of using single indicators when measuring social origin. Similarly, Bukodi and Goldthorpe (2013) show that different dimensions of social origin have independent effects on educational attainment, and that these effects changed heterogeneously across the cohorts they analyzed. They also found some evidence of the persisting effects of the re-combined black box of social origin, but acknowledged that they were only able to treat this question of combined effects in a limited way. With the *M*-index, I used a measure of intergenerational status-linkage that makes this combination of various dimensions straightforward. Using this measure, I did not only find the persisting effects of social origin; I even found a U-shaped pattern, including a significant re-increase over the second half of the observed period.

This is a novel finding, as other studies have either found no trend or a decreasing trend of origin effects (Ganzeboom et al. 1991; Breen and Jonsson 2005; Hout and DiPrete 2006; Hertel 2017) – maybe with the exception of income mobility (Blanden et al. 2012), where it is equally straightforward to include both parents' contribution, as in the case of the *M*-index. The re-increasing effects of social origin found in this chapter directly contradict the promises of the modernization thesis, which assumes a continuous increase in social fluidity and, thus, decreasing effects of social origin. Consequently, the results of the explorative analyses carried out in this chapter fuel the concerns of the proponents of the “Great Gatsby Curve”, that the increasing income and wealth inequality will also increase the inequality of opportunities by increasing the relevance of social origin (Jerrim and Macmillan 2015).

Because of this significance, future research should extend the analyses in this chapter to contexts beyond 20th century Switzerland. Without such internationally comparative analyses, it remains unclear whether Switzerland is an outlier or whether (once we start to combine multiple dimensions of social origin) the Swiss case represents the norm respecting trends in the relevance of social origin for individual status attainment. By using internationally comparable surveys such as the European Social Survey, such an international study could represent a promising opportunity to analyze the relationship between inequality and the effects of social origin, thus testing the predictions underlying the “Great Gatsby Curve”.

3 Industrialization and Social Origin: The Cantons of Lucerne and Glarus (ca. 1820–80)

At least implicitly, the modernization thesis has been formulated in reference to a pre-modern and especially pre-industrial society. Therefore, it can be most adequately tested on its home ground: in a context of transition from a pre-industrial to an industrial society. The aim of this section is to test this assumed relationship between industrialization and the effects of social origin in areas and time periods with strongly varying degrees of industrialization. I will do so by analyzing the cases of two Swiss cantons in the 19th century: Lucerne (1834–75) and Glarus (1830–80; compare map in **Figure 3-1**). In this respect, the canton of Lucerne marks the lower end of industrialization. It remained largely an agrarian area throughout the century, but included some regions with developing industries (Bossard-Borner 1998, 2008). In the canton of Glarus, by contrast, proto-industrialization had already pushed back agriculture by the end of the 18th century and factory-based textile industries dominated the canton's economy from the 1840s onward (Rohr 2005). These features of the two cases make it possible to analyze the relationship between industrialization and the effects of social origin both between and within the two cantons.

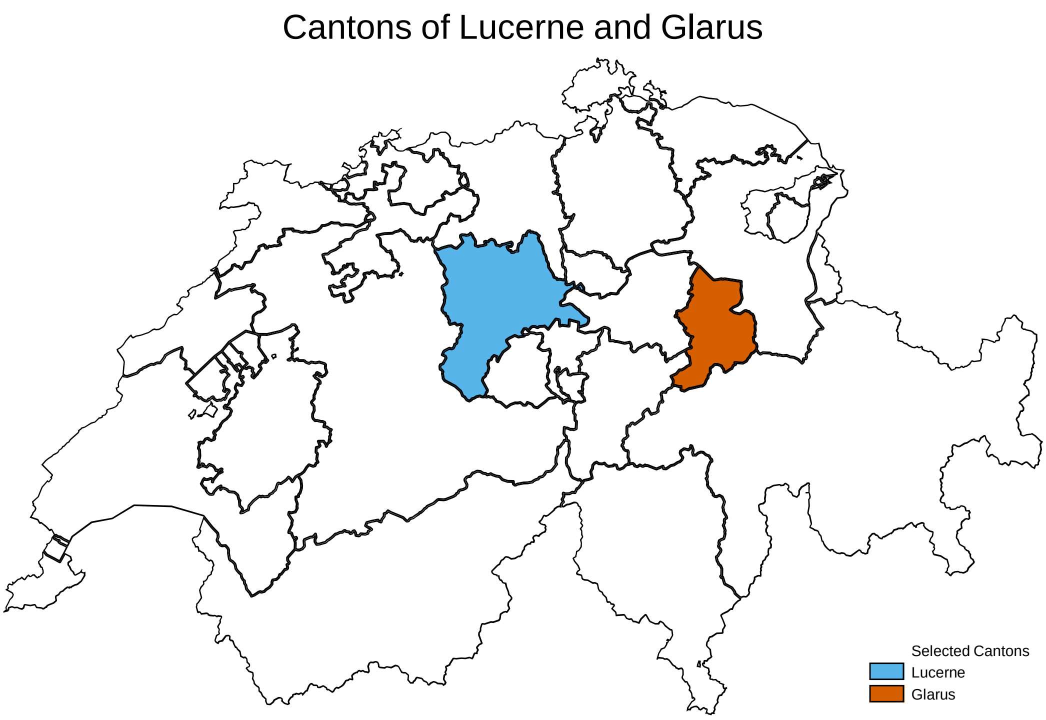


Figure 3-1. Map of the cantons of Lucerne and Glarus within Switzerland

Note: Based on borders for the year 2001 without relevant effects on accuracy for Lucerne and Glarus. Source: author, based on borders from Bundesamt für Statistik (2013).[32]

[32] All maps have been prepared and drawn using user-written software for Stata: 'shp2dta' (Crow 2006) and 'spmap' (Pisati 2017).

The remainder of this chapter is organized as follows: I will start by giving a historical description of 19th-century Switzerland and the two cantons, as this context is relevant for both the description of the data and the substantive investigations in this chapter. This overview will be followed by a documentation of the data collection in the two cantons and the data and measures used for the analyses. Focus will be laid on the assessment of the potential limitations of these historical data. A larger section of the chapter will then be dedicated to the importance of social origin for an individual's own social standing: the first part will compare the two cantons, while the second and third will analyze the effects of social origin over time and across the range of industrialization within each of them. These social mobility-oriented analyses of origin effects will be complemented by an investigation of homogamy in respect to social origin in the canton of Lucerne. The chapter will conclude with an overall assessment of the relationship between industrialization and the importance of social origin.

An important limitation of all analyzes in this chapter should be noted at the beginning, as it concerns at least half of the population: I will analyze only the occupational classes or statuses of men. The reason for this is that occupational titles of women are reported only very inconsistently in the sources. For the canton of Glarus, women's occupational titles have been reported only in about 18% of the cases. With about 57%, this rate is significantly higher for the canton of Lucerne. However, here, it varies strongly between parishes: in some of them, occupational titles are reported for each of the brides in the registers, in others parishes only for about 20% of them. It is very unlikely that this variation is caused only by real differences in the labor force participation of young women. Rather, the writers of the registers seem to have varied by their accurateness in noting the bride's occupational status – an interpretation which is also supported by the fact that the rate of reported occupational titles does not only vary between but also within parishes over time. Whether this is really the case is not clear – vital registers such as marriage registers have been suggested as valuable for studying women (van Leeuwen and Zijdeman 2014). It is beyond the scope of this thesis to investigate this in detail in respect to the two cases. However, such an investigation would be a precondition for using brides' occupations for analyzing social mobility, because the rate of reported occupations likely biases estimates based on such data.

For these reasons, I have decided to limit myself to the analysis of men's occupational status. This is also in line with most of the literature using historical occupational titles for studying topics of social stratification (for an exception, compare Schulz 2013). However, future research should aim to make use of this (albeit scarce) data and include women for historical periods.

3.1 Historical Context: Lucerne and Glarus in 19th Century Switzerland

3.1.1 Switzerland in a Period of Continuous and Disruptive Modernization

In the period studied in this chapter, the area of today's Switzerland was characterized by the later part of a long-lasting period of both continuous and disruptive changes separating the modern from the pre-modern era. From about the early 15th century until 1798, and again 1803 until 1848, the Swiss Confederacy was a combination of independent states tied together by an overlapping system of alliances (Burghartz 2014). The cohesive power of its internal crossing conflict lines, common possessions, external pressure and the Diet as a loose but lasting common institution kept it together (Würgler 2014) – even in face of the decisive confessional cleavage introduced by the Reformation and Counter-Reformation (Head 2014). Beginning with the early 18th century, economic and demographic developments created rising pressure on the old system, increased inequality, and strengthened tensions between different social layers. The speed of these developments varied strongly between areas; as with proto-industrialization, one of the key drivers of these changes was pronounced in some regions but not in others (Holenstein 2014: 314–26).

From the 16th century onward and against the resistance of the guilds, the putting-out system of production relocated increasing parts of the secondary sector from the cities to the countryside (Simon-Muscheid 2015). The central agent (the capitalist) supplied home-based workers with resources and organized transport and vending (Pfister 2014). With this proto-industrial organization, yarn and cloth were produced in most of the northeastern part of Switzerland, around Geneva and Neuchâtel, and in smaller areas of the central part of the Confederacy. The quantity produced strongly increased over the course of the 18th century and the material processed shifted from linen and wool to cotton (Bergier 1983: 159–76; Holenstein 2014: 317–9). As proto-industrial production took place at home and not in factories, the home of the family remained the central place of production, and most families continued to be partly involved in agricultural production. Home industry created opportunities to earn money in a rural context, where money previously was of relatively small importance, which gave rise to an early consumer society (Vries 2008; Pfister 2013). As a consequence, areas with a strong home industry saw a clear rise in marriages and a corresponding growth of this part of the population – which also became more vulnerable to food crises (Holenstein 2014: 314–26).

Thus, changes connected to early industrialization increased the weight of the underprivileged. The population without any political rights (because they did not have the status of a citizen or burgher) grew because of the increasing opportunities to earn money as workers. In addition, the citizen that did not belong to the ruling class became more important because of increasing opportunities to earn a lot of money as agents and traders. At the same time, the political system did not move forward. The elites sported clear signs of closure, both in the countryside and in the cities – in the cities with an additional tendency to aristocratization. And in a sharp contrast to surrounding areas, there was only very weak state-building tendency even in the late 18th century, both at the level of the whole Swiss Confederacy and within the individual states (Capitani 1983; Holenstein 2014; Böning 1998: 1–54).[33]

The French Revolution changed the game. Surrounded by areas under French control, partly occupied by the revolutionary army, and confronted with a multitude of internal revolutionary uprisings, the old system collapsed at the turn of the year 1797/98. Building on a constitution imposed by the French Directory, the liberal part of the elite sought to use the chance of the new Helvetic Republic for a fundamental modernization of the country. The new centrally organized state granted civil rights and economic liberties and aimed at a rational style of governing. It was, however, notoriously short of resources and lacked stability. By two steps, the Act of Mediation in 1803 and the Restauration beginning in 1815 with the Congress of Vienna, the old order was reestablished in large part, but some modern administrative structures remained and continued to develop (Holenstein 2014: 353–7; Fankhauser 2011, 2009; Jorio 2015; Böning 1998).

During the first 20 years of the 19th century, the influence of the surrounding powers and the fear of a reoccurring collapse, prevalent among the elites and large parts of the population, ensured internal stability. However, the pressure rapidly rose again. In most areas, partly driven by a modernizing agriculture that significantly increased production, the population grew substantially and worsened the situation of the precarious part of the population (Herrmann 2014: 381–3). Moreover, the new elite of businessmen and professionals based outside the cities became increasingly dissatisfied with their situation. Some of them had businesses and missed the economic liberties and commercial freedom they had profited from during the time of the Helvetic Republic. In general, they were frustrated because they had only limited political rights, compared to those who lived in one of the capital cities and, more importantly, had been born into the right family (Herrmann 2014: 386–8). Toward the end of the 1820s, large parts of

33 Economic inequalities are difficult to estimate for this period, because most cantons did no longer raise direct taxes (Capitani 1983: 121).

the population joined these elites in embracing liberal ideas – in parallel with a re-vitalizing press landscape that built on an increasingly educated population. As a result, and under the impression of the July Revolution of 1830 in France, 11 out of 22 cantons gave themselves liberal constitutions and governments – they became so-called "regenerated" cantons (Koller 2010; Herrmann 2014: 388–92).

However, it did not take long for it to become apparent that not all of its supporters profited from this liberal project. While it stimulated economic growth and further industrialization, its economic effects were limited by the fact that the national dimension was missing – which would have been necessary to reduce trade restrictions. More importantly, these political changes did not improve the situation of the working class. Instead, structural changes, such as the mechanization of the spinning industry, aggravated their situation in many areas. In addition, important parts of the population rejected the secularization promoted by liberal governments (Herrmann 2014: 393–6). As a consequence, three antagonizing political movements shaped further development (Koller 2010; Herrmann 2014: 403–10). First, classical liberals pleaded for limiting political rights to the capable and for a Swiss nation state (Bouquet 2014). Second, radical liberals shared the national perspective with the former, but advocated universal political rights and emphasized equality and the advancement of welfare (Tanner 2013). Some of their social aims were shared, third, by the conservatives. However, in contrast to the former two, the conservatives fought for the sovereignty of the individual cantons and a strong position of the Church within society (Altermatt and Pfister 2010).

The conflict heated up as the new conflict lines increasingly came into alignment with pre-existing ones. At least from the time that Lucerne moved back to the conservative camp in 1841, the liberal cantons were also the Protestant, industrializing, and economically growing cantons, whereas the conservative were the Catholic, agricultural, and economically stagnating ones (Andrey 1983: 275; Koller 2010). In 1845, seven conservative cantons formed a separate alliance (*Sonderbund*) to defend their causes. This alliance violated some basic principles of the Confederacy and was kept secret first. When it was revealed, the conservative cantons refused the decision of the Diet to dissolve the alliance – which caused the liberal majority to raise an army, enforce its will, and install liberal governments in each of the opponent cantons after a short civil war in November 1847 (Roca 2012; Andrey 1983: 276–80; Herrmann 2014: 410–3). After their victory, the liberals used their momentum and the fact that the surrounding powers were occupied with upheavals on their own territory and wrote a nationwide constitution that was ratified by the cantons in 1848. In contrast to the Helvetic Republic, the resulting state was not a central one but rather a national federal state that kept many competencies at the cantonal level, in particular with respect to the cultural domains of schooling and religion, which appeased the conservatives (Herrmann 2014: 413–7).

With the foundation of the Swiss Confederation in 1848, the political institutions found their outer shape and a 50-year-long transition era came to an end, transforming the pre-modern states that formed the old Confederacy into a modern federal state. In other respects, modernization continued and accelerated. Educational expansion extended to the secondary and tertiary level (Wecker 2014: 441–5), the press landscape stabilized (Clavien et al. 2015), transportation and communication modernized (Generaldirektion PTT 1952), and the industry sector outpaced the agricultural sector as it expanded from specialized areas to most parts of the countries (Bergier 1983: 228–39; Wecker 2014: 435).

The population growth continued to supply the factories of the textile industry with a cheap workforce experienced in a long tradition of home industry, which balanced the costs for transportation to and from Switzerland (Bergier 1983: 192–5). The second quarter of the century saw the rise of the mechanized factory industry. The fast-moving spinning industry led this development; the weaving industry followed slowly (Ruffieux 1983: 27–9; Bergier 1983: 242–7). Because of the geographic situation, coal continued to be expensive and was only used as a complementation to the widely available waterpower – which was one of the main reasons why factories in Switzerland tended to be spread over the countryside instead of being concentrated in cities. New powerful water turbines replaced the waterwheel in driving the machines of the factories and served as the starting point for the emerging machine industry, which replaced the textile industry as the dominant industry in the last quarter of the century (Bergier 1983: 213–21).

The railway was established relatively late in Switzerland; this was also because the road network had been improved quickly in the first half of the century. In 1844, Basel was connected to the French railway system, the first short inland line was inaugurated in 1847, construction work accelerated in the late 1850s, and by 1870, the southwestern Geneva was connected to the northeastern St Gall by a wide net of railway lines (Wägli and Jacobi 2010; Ruffieux 1983: 31–4; Wecker 2014: 436–9).

The time between 1830 and 1880, the period analyzed in this thesis, includes roughly two complete economic cycles. The first one started with a period of growth between 1820 and 1839 (with a short recession around 1833) and concluded with a period of stagnation between 1839 and 1851. The second period of growth spanned

1851 to 1876 (with another short recession around 1871), while the time between 1876 and 1885 again saw economic stagnation (Beck 1983). While the developing industry was mostly able to absorb the growing population during periods of growth, poverty quickly spread in times of recession. During the first half of the century, the so-called pauperism mainly affected the population in rural areas, where the combination of population growth and structural changes left many people without income opportunities (Schnegg 2015). Toward the end of the century, misery was caused increasingly by the precarious situation of the working class: wages were often so low that in many cases all family members had to work ten to 16 hours a day in order to make a living for the family (Wecker 2014: 465–70).

Under the impact of these social problems, institutions of social welfare slowly changed. With some exceptions, the municipality of origin[34] remained responsible for individuals' poor relief. This organization created problems in different ways. For example, in an increasingly mobile society, only about 60% of the population continued to live in her or his municipality of origin by 1860, which resulted in personal difficulties for individuals who were forced to return to their place of origin, but also caused coordination problems between municipalities (Christ and Head-König 2006; Head-König 1989a). Moreover, local authorities had incentives to creatively reduce their burden and did so by restricting access to marriage, hoping to prevent the reproduction of the poor (Head-König 1993, 1989b), or by encouraging migration overseas (Herrmann 2014: 384; Wecker 2014: 472). While in the early 19th century mostly private and church initiatives mitigated the negative impacts of this increasingly inadequate system, in the course of the century coordination at the national level and the first attempts at labor protection legislation on the cantonal level started to alleviate some of the social problems (Christ and Head-König 2006; Wecker 2014: 468–70). Nevertheless, the situation of the working class and the underprivileged part of the rural population remained precarious, which contributed to the fact that Switzerland remained a classic country of emigration until the late 1890s: for example, close to 150,000 left to the Americas in the third quarter of the century (Wecker 2014: 472–4; Arlettaz 1979).

While the poor remained extremely poor, a new, bourgeois upper-class took shape. Besides the old elite consisting of aristocrats, merchants, and financiers from the cities, it now also included entrepreneurs, some wealthy artisans, higher-level officials, and the

[34] In Switzerland, the place of origin designates the municipality from which someone draws her or his citizenship (Christ and Head-König 2006).

liberal professions such as lawyers or medical doctors (Tanner 1995: 33–157). While this new upper-class was open in principle, a new distinction in lifestyle separated it from the rest of the populations. Characterized by demonstrated sociability and an affinity to high culture, this lifestyle required a certain amount of leisure time from the husband and, most importantly, enough resources to free the wife from any income-related duties – because it became the role of the women to organize and represent the cultural and sociable life of the family (Tanner 1995: 159–476). Together with the required distinctive consumption, this way of life exceeded the financial resources of about 90% of the population, and established, therefore, a new closing of the bourgeois upper-class (Wecker 2014: 466–8).

From the literature, it remains doubtful whether the emerging middle class of non-manual employees was able to bridge this gap. On the one hand, some more production-oriented or technical occupations were open to descendants of the lower class; on the other hand, it was specifically these occupations that came with few career opportunities and did not offer a large enough salary for a bourgeois lifestyle (König et al. 1985). Therefore, the scarce existing historiography on social mobility in Switzerland suggests that industrialization changed the occupational structure but less so social fluidity.

3.1.2 Lucerne: Modernizing Agriculture and Regional Industrialization[35]

Lucerne is a medium-sized canton in the middle of Switzerland (see the map in **Figure 3-1**, p. 75). Throughout the 19th century, Lucerne remained a predominantly agrarian canton with a clear capital (the city of Lucerne).[36] At the start of the 19th century, the canton was divided into three agrarian areas. While the partly alpine south was defined by animal husbandry and the production of milk and cheese, the hilly middle part and the flatter north were oriented toward the cultivation of grain. The middle and northern parts differed, however, in their modes of production. In the middle, field crops and fodder for small livestock was produced on mostly private ground within individual farms. In the northern areas, by contrast, production was still organized using the three-field system, which required a collective style of farming (*Flurzwang*), as farmers'

[35] An earlier version of this section forms part of an article on social homogamy accepted by the journal "The History of the Family" (Seiler 2018); compare also the section on social homogamy towards the end of this chapter.

[36] Compared to other Swiss cities, Lucerne was, however, a rather small city. In 1798, it had about 4,300 inhabitants, which made it the 11th largest city – compared to Geneva or Zurich, which had about 25,200 or 21,100 inhabitants, respectively (Holenstein 2014: 313).

properties were dispersed over all three fields (Bossard-Borner 1998: 38–42; Dubler 1983: 71–95).

This *Flurzwang*, and the requirement to deliver tithes in the form of a prescribed composition of field crops, had limited agricultural innovation during the 18th century. This situation changed during the first half of the 19th century, and agriculture in Lucerne witnessed strong modernization over the course of the century. Municipalities were allowed to privatize parts of their commons, which often led to an improvement in the situation of the small farmers, who were able to increase their production above subsistence level (Bossard-Borner 1998: 309–12). In addition, the optional tithe redemption, together with the abolition of the *Flurzwang*, allowed wealthy farmers to change to the more lucrative husbandry, which increased their cash crops and in turn laid the foundation for the mechanization of farming toward the end of the 19th century. These factors were the preconditions for a rational and market-oriented agriculture, which massively increased yields (Bossard-Borner 1998: 306–14; Dubler 1983: 95–113).

In contrast with the rapid development of the agrarian sector, the modernization of other sectors and factory industrialization took longer to take off. There were, however, some areas with growing industry, mainly around the capital and in the northeastern Wiggerthal (Dubler 1983; Bossard-Borner 1998). Before 1850, only a small number of factory workers existed in the canton, many of them employed in factories processing horsehair (a sector that had disappeared by the beginning of the second half of the 19th century). By the time of the second factory census in 1877, shortly after the end of the period analyzed in this article, the situation had partly changed. Although the overall proportion of factory workers remained low and the canton's industrialized area was roughly the same as it had been around 1850, industry became a significant factor in the few municipalities that boasted factories. In the municipalities surrounding the capital, for example, the proportion of factory workers came close to 10% of the population. Steel production, machine construction, and, above all, the textile industry had become key sectors (Schnider 1996: 41–56). Industrialization speeded up with the connection of parts of the canton to the railway system (see **Figure 3-3**, p. 91), which also saw the rise of Lucerne as an important tourist destination (Schnider 1996; Dubler 1983).

The development of Lucerne as a modern tourist destination was also a significant accelerator for strong growth in the city's population, which was mainly driven by immigration, with female domestic workers featuring prominently among the predominantly intra-cantonal immigrants (Balthasar 1988; Head-König 1999). The migration to the city and its surroundings continued after economic growth slowed at the end of the 1840s. The now unemployed migrants became a visible part of the growing number of paupers in these years. In the middle of the century, this political crisis collided with an economically tense situation due to growing competition from more industrialized areas and bad weather conditions, which led to a high price of bread and potatoes (Bossard-Borner 2008: 532–41).

By contrast with other cantons Lucerne did not outsource the resulting burden of poor relief by actively supporting emigration overseas. As in other German-speaking areas (Matz 1980; Mantl 1999) the authorities tried to forbid reproduction among the poor by strengthening existing marriage restrictions. That contributed to a marriage pattern in Lucerne that perfectly fits the "European Marriage Pattern" as depicted by Hajnal (1965: 101) namely "a high age at marriage and a high proportion of people who never marry at all".[37] Marriage restrictions were imposed on men who had either relied on poor relief after the age of 16 and had not repaid it, or who lacked the means the local authorities considered necessary to raise offspring in an "honest way" (Kanton Luzern 1831–1840: 261–70, cited in Bossard-Borner 2008: 545). The central authorities backed up their rigid restrictions. Their judicial response to appeal against refusal of permission to marry was very restrictive until 1857, when as a result of the improved economic situation it suddenly became more liberal (Bossard-Borner 2008: 545). The change in legal practice was reinforced by the fact that during the economic crisis, high marriage fees had become unaffordable to more and more people. One consequence was that the illegitimacy rate, which had been slowly increasing during the first half of the 19th century, rose quickly after 1845 until it peaked at about 15% in 1864, before falling back to about 5% at the beginning of the 1870s (Bossard-Borner 1998: 297–306, 2008: 532–50; Head-König 1993). The interplay of economic and political factors thus led to reinforced demographic characteristics of low marriage and high illegitimacy rates in the 19th century canton of Lucerne. For the present study, those demographic characteristics had three consequences:

37 To the best of my knowledge, no comprehensive demographic statistic exists for the 19th century canton of Lucerne. However, in the sample used for this study the median age at first marriage of women and men was 27.0 and 31.9, respectively. From an additional sample collected from the death registers of five parishes (Altishofen, Entlebuch, Ettiswil, Hitzkirch, Kriens, and Lucerne) it can be estimated that about 20% of men who survived beyond the age of 45 remained unmarried. That corresponds to the number cited by Hajnal (1953: 85) for Switzerland and falls in about the middle of the range for the Austrian alpine region found by (Ortmayr 1995); data based on: StALU, FA 29/8, 51, 64, 91, 118, 119; KZ 33, 35, 37, 39, 41.

1. The marriage restrictions were successful insofar as married individuals indeed belonged to a socially selected population: among those who died aged between 45 and 64, 94% of merchants died married but only 47% of farm workers did so.[38] I will expand on this selectivity problem in sub-section 3.2.1.

2. The high illegitimacy rate may point to existing relationships out of wedlock, which may be relevant for studying homogamy. In many cases however, multiple fathers were involved when women had multiple illegitimate children (Kok and Leinarte 2015). In other words, a high illegitimacy rate might suggest a high rate of unmarried couples although not necessarily so. As there is no systematic source for that time for unmarried couples, the analyses of homogamy in section 3.4 is necessarily restricted to marital homogamy.

3. Increased marriage restrictions in the middle of the 19th century might have affected the relevance of social origin. When analyzing homogamy by social origin in section 3.4, I consider this effect explicitly.

Because of the relatively high proportion of individuals who did not marry at all, marriage registers are a selective source. Nevertheless they are the only available source for the large scale study of both social mobility and parental homogamy in 19th century Lucerne. As I will show in more detail in sub-section 3.2.1, they are even an exceptional source, as most marriage registers in Switzerland do not include occupational titles of parents in any systematic way.

3.1.3 Glarus: Two Worlds of Textile Industry

The canton of Glarus is only about half the size (685 km^2) of that of Lucerne. What makes it definitively one of the small cantons is the fact that the mountainous geography means that about 37% of the total area is unproductive (Head-König et al. 2017). This is visibly reflected by the distribution of the places of residence of the individual men included in the data on Glarus. The map in **Figure 3-4** (p. 92) shows that they are concentrated in a h-shaped area formed by two valleys in the south (the Linth Valley in the west and the Sernf Valley in the east) that come together in the northern part.

In contrast to Lucerne, the 19th century was in Glarus not characterized by a modernizing agriculture but by a pronounced industrialization. As in other rapidly industrializing areas of Switzerland, the basis of this development was laid by the proto-

[38] Source: see note 37.

industrialization in the 18th century that pushed back the primary sector to a share of about 50% of the workforce by 1800 (Janser 2010: 14).

Around 1715, the home-based hand-spinning of cotton was introduced in Glarus and spread quickly in the following years. In the first years, it was agents from Zurich and St Gall that supplied the raw material, organized the work, and sold the yarn. But Glarus-based merchants, experienced in trading cattle and stone plates, soon took over (Dürst 1951). During the first decades of the century, the textile industry of the canton consisted exclusively of spinning; the resulting yarn was woven and further processed in other cantons (Dürst 1951: 92).

The time between 1790 and 1820 was a rupture and turning point in many respects. First, starting from the 1760s, the developing mechanized spinning in the United Kingdom collapsed the prize of yarn. At the beginning of the 1790s, manual spinning in Glarus could not compete anymore with machine-made yarn, the dominating sector of the canton crashed and most spinners lost their livelihoods. At the same time, the lower prizes for yarn enlarged the market for cotton products and some entrepreneurs established weaving and textile printing factories in the same decade (Rohr 2005: 15). However, the optimistic outlook at the end of the century was destroyed when Glarus became a battlefield for French and Austrian troops in 1799. Many people fled from the resulting famine and poverty and migrated overseas (Kubli 1991). The economy stagnated in the first 20 years of the 19th century and the "year without a summer" (1816) in Europe, caused by the Tambora eruption in 1815 (Luterbacher and Pfister 2015; Stothers 1984), added another period of great poverty, with about one quarter of the population of Glarus depending on the poor relief (Rohr 2005: 15).

The situation had changed, however, by the beginning of the 1820s: the economy started to grow again and kept doing so over the next 50 years. In contrast to Lucerne, Glarus was affected only locally by the crises around the middle of the century (Rohr 2005). The main driver for the strong economic and industrial development in most of the parts of the canton was the textile printing industry. The entrepreneurs of Glarus continued the combination of trade and manufacturing known from the proto-industry and ensured exceptional access to the Italian market for printed scarves and cloth – the market quickly enlarged to the Balkan area and the Ottoman Empire (Rohr 2005). The dovetailing of trade and production enabled the textile industry of Glarus to respond rapidly to changes in fashion and to serve specific demands in these and other areas (Bodmer 1960: 345–6). As a result, printing remained the leading industry and kept growing until the end of the 1860s. By then, 22 printing factories employed about 5,500 workers (Bodmer 1960: 346) – in a canton that had about 35,000 inhabitants (Siegenthaler and Ritzmann-Blickenstorfer 1996: 96).

This ability to serve shifting needs in terms of colors, ornaments, and depicted sceneries on scarves and turbans entailed contradictory effects with respect to industrialization and the modernization of the production. On the one hand, textile printing was the first factory-based industry of the canton. The complex tasks, including the production of the colors, had to be carried out centrally. This is why the first printing factories of the canton date back to the beginnings of this industry in the second half of the 18th century (Dürst 1951: 96–8), and the industry continued to lead the process toward a centralized mode of production, organized within factories. On the other hand, the strength of Glarus' printing industry in capturing new fashion trends was only made possible by producing relatively small series in a partly manufactory-style setting. In other words, the production involved a great deal of manual labor on diverse skill levels: the artists, responsible for new designs, were followed by the engravers, who prepared the printing plates for the printers on the next level of the hierarchy, who were assisted by unskilled workers – often children (Dürst 1951: 102). Because the printing industry served a niche in the international market, this mode of production preserved a somewhat artisanal and pre-industrial character of work – despite the fact that over the course of the 19th century, most printing factories increasingly complemented the small-scale printing with large printing machines.

Indirectly, however, the printing industry was important for the industrial modernization of the canton. Because of its high demand for white fabric, the printing industry stimulated the growth of the dynamic spinning and weaving industries (Bodmer 1960: 346). During the first 40 years of the century, home industry remained important for the weaving sector: around 1840, almost 2,300 workers were weaving at home (Rohr 2005: 16). From this point onwards, the number of factory-based and mechanized weaving looms increased dramatically and, by 1870, the small canton had become the second most important producer of white fabric in Switzerland after Zurich, with 3,674 mechanized looms (Dudzik 1987: 501). As the mechanical weaving required far less manpower, this structural change led to a wave of poverty and around 1845, many left for the newly founded New Glarus in Wisconsin (Rohr 2005: 21; Stüssi 1991) – for example from Engi, where the crisis was especially pronounced (Marti-Weissenbach 2016e). Because the manual spinning industry collapsed at the end of the 18th century, it was exclusively mechanized spinning machines that drove the growth of this branch of the textile industry from the 1820s onwards. In many cases, spinning and weaving was combined in a single factory; as with the weaving industry, spinning expanded rapidly – the number of installed spindles increased from 60,000 in 1840 to 250,000 in 1869 (Rohr 2005: 21).

In sum, the 19th century produced two worlds of factory-based textile industries: the labor-intensive printing industry that preserved some traditional, nearly artisanal characteristics and the highly mechanized spinning and weaving industry, where workers supervised large and complex machines (Rohr 2005). The more traditional printing industry was important around the municipality of Glarus, in the middle of the canton, while the more modern spinning and weaving industry was mainly important in the north and in the southwestern valley – with some visible overlap between the two (see maps in **Figure 3-2**). The strong concentration of the spinning and weaving industries in the peripheral southwestern Linth Valley may be surprising at first glance, even more so as it took until 1871 to connect this part of the canton to the railway network, while the railway line to Glarus has been established in 1859 (Hauser 1991; compare **Figure 3-4**, p. 92). However, transportation was less of an issue since the cantonal authority has taken over the maintenance of the road system in 1835 and improved it significantly in the following years (Rohr 2005: 30). In contrast to the area around Glarus, the Linth Valley had large undeveloped areas, access to waterpower that

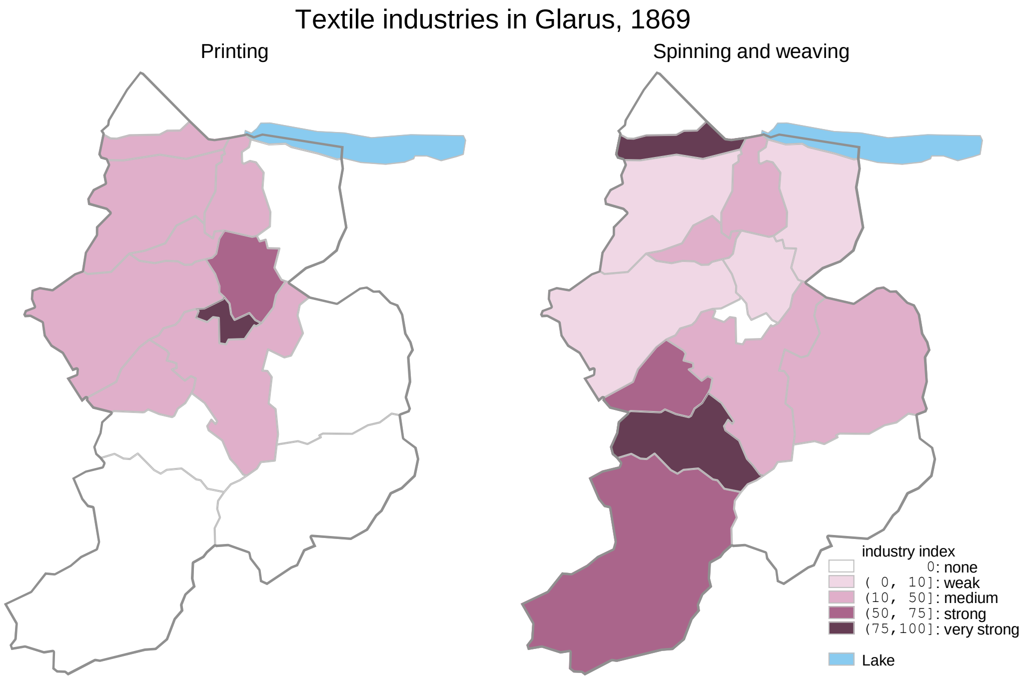


Figure 3-2. Maps of Glarus and its distribution of the textile industry

Note: Industry scores on the level of parishes. Parishes collapsed from municipality borders without taking into account that some municipalities belonged to multiple parishes. Based on borders for the year 2001 without relevant effects on accuracy for Glarus. Source: author; borders based on Bundesamt für Statistik (2013); industry scores based on data from Arx et al. (2005) – see sub-section 3.2.3 for details.

was not taken by established factories, and it was possible to construct canals and reservoirs in order to enhance to usability of the waterpower. As in other areas of Switzerland, access to water power was decisive, because water power remained the most important energy carrier throughout the 19th century – the expensive steam power was only used to bridge the fluctuations of the water stream (Davatz 2005: 51–5; Rohr 2005: 25–8).

The rapid growth of the industries was also made possible by the traditionally liberal economic policy of the canton. For example, guilds had never been important and the policy regarding the use of water was very pragmatic: it was simply granted to the owner of the area abutting the water, which made it relatively easy to adjust the water supply to the changing needs of the industry (Rohr 2005: 30). The precarious and vulnerable situation of the workers, on the other hand, was visible for the whole population in this small and dense canton: housing shortages made the workers dependent on accommodation offered by the factory owners, and health problems were caused by long working hours, dangerous workplaces, malnutrition, and alcoholism (Janser 2010: 20–41). This and the direct democratic system of the canton may be the reasons for the canton's pioneering some aspects of the working conditions legislation (Lehnherr 1991). In the first half of the century, some first privately organized health insurance brought at least some protection. The prohibition of night working in spinning factories in 1824 introduced some first legal improvements, even if it was created to limit the risks of fires. Glarus was the first state in Europe to introduce, in 1846, a labor law that also limited working hours (Janser 2010: 68). It was limited to the spinning industry, where it set the maximum allowed working time at 13 hours a day and prohibited the employment of school-age children (Janser 2010: 99–101). The first general work regulation was introduced with the Factory Act from 1864, which set the maximum working time at 12 hours for all factory workers, limited child labor, banned night working, and introduced protection for women in childbirth (Janser 2010; Lehnherr 1991). The enhanced regulation introduced in 1872, which introduced the ten-hour workday, served then as an example for the introduction of the Factory Act on the Swiss level (Lehnherr 1991).

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In sum, this rough historical overview shows that the period analyzed in this chapter was embedded in an era of fundamental change. Modern state institutions were built up that unified the emerging Swiss nation, agriculture was modernized and produced increasingly for a larger, money-based market, and (proto-)industrialization brought production to the countryside, mechanized it, and concentrated labor within factories. Places became less distant, thanks to new roads, the newly constructed railway network, an improved postal service, and the spreading press. Primary, then secondary education became universally available and higher education increasingly important. In the course of the industrialization process, a new working class emerged, the middle class of the non-manual employees developed in conjunction with the educational expansion, and the elite acquired its bourgeois character and increasingly required higher education. Furthermore, the growth described for the city of Lucerne also indicates some urbanization trends – even if urbanization was less pronounced than elsewhere, because the importance of water power led to the industrialization of rural areas. In short, the developments found in Switzerland correspond largely with the modernization described by the proponents of the modernization thesis (see section 3.3).

However, the above description also shows that these processes differed largely between the areas. Most importantly, industrialization was only locally significant in the canton of Lucerne. And while factory industrialization was almost ubiquitous in Glarus, the literature shows that the more traditional printing and the more modern and efficient spinning and weaving industries were distributed unequally within the canton, which may have resulted in heterogeneous modernization effects.

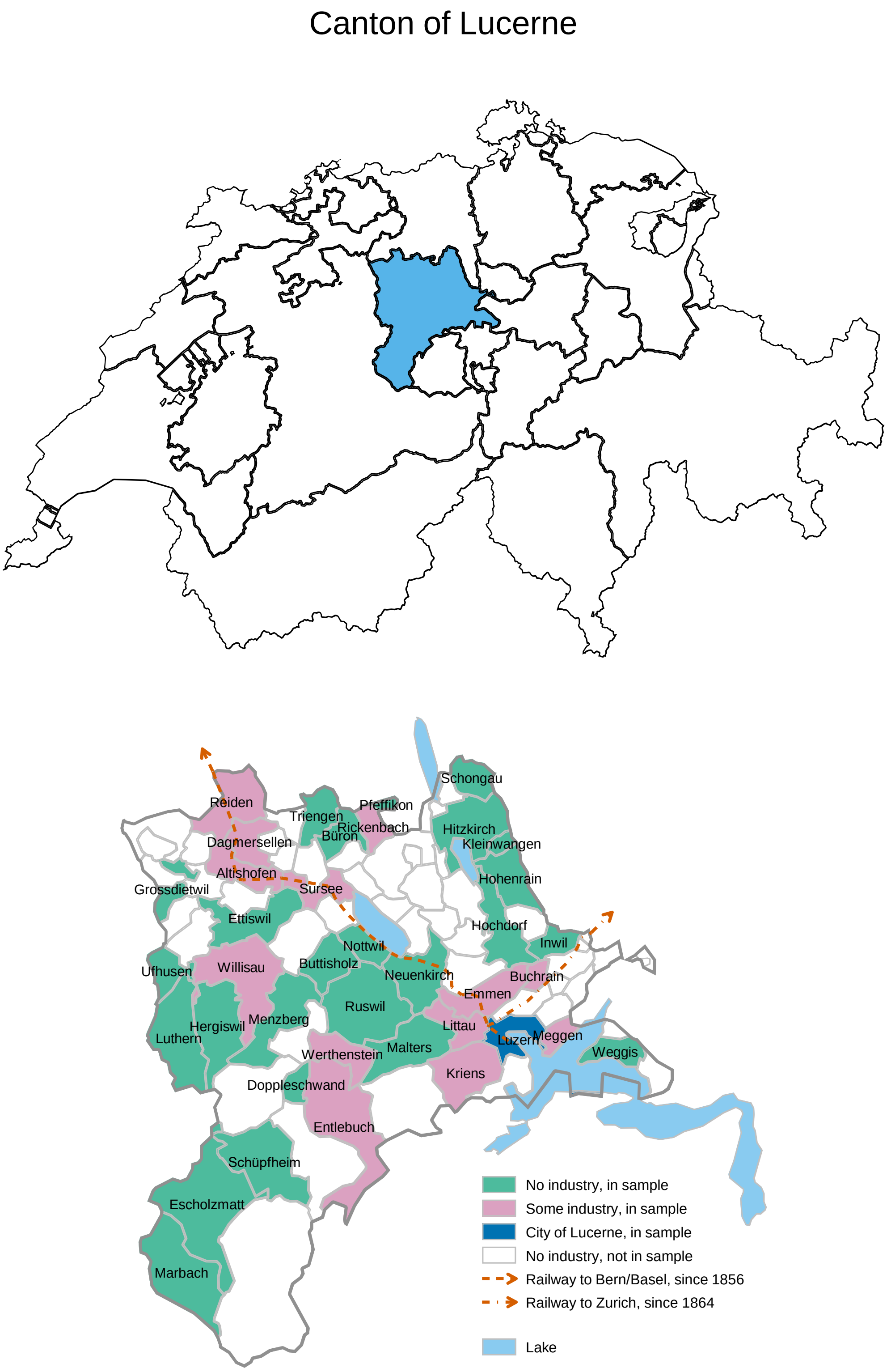

Figure 3-3. Map of the canton of Lucerne with sampled parishes, sampling strata and railway lines

Note: Parishes collapsed from municipality borders without taking into account that some municipalities belonged to multiple parishes. Based on borders for the year 2001 without relevant effects on accuracy for Lucerne. Source: author; borders based on Bundesamt für Statistik (2013); railway lines based on Wägli and Jacobi (2010).

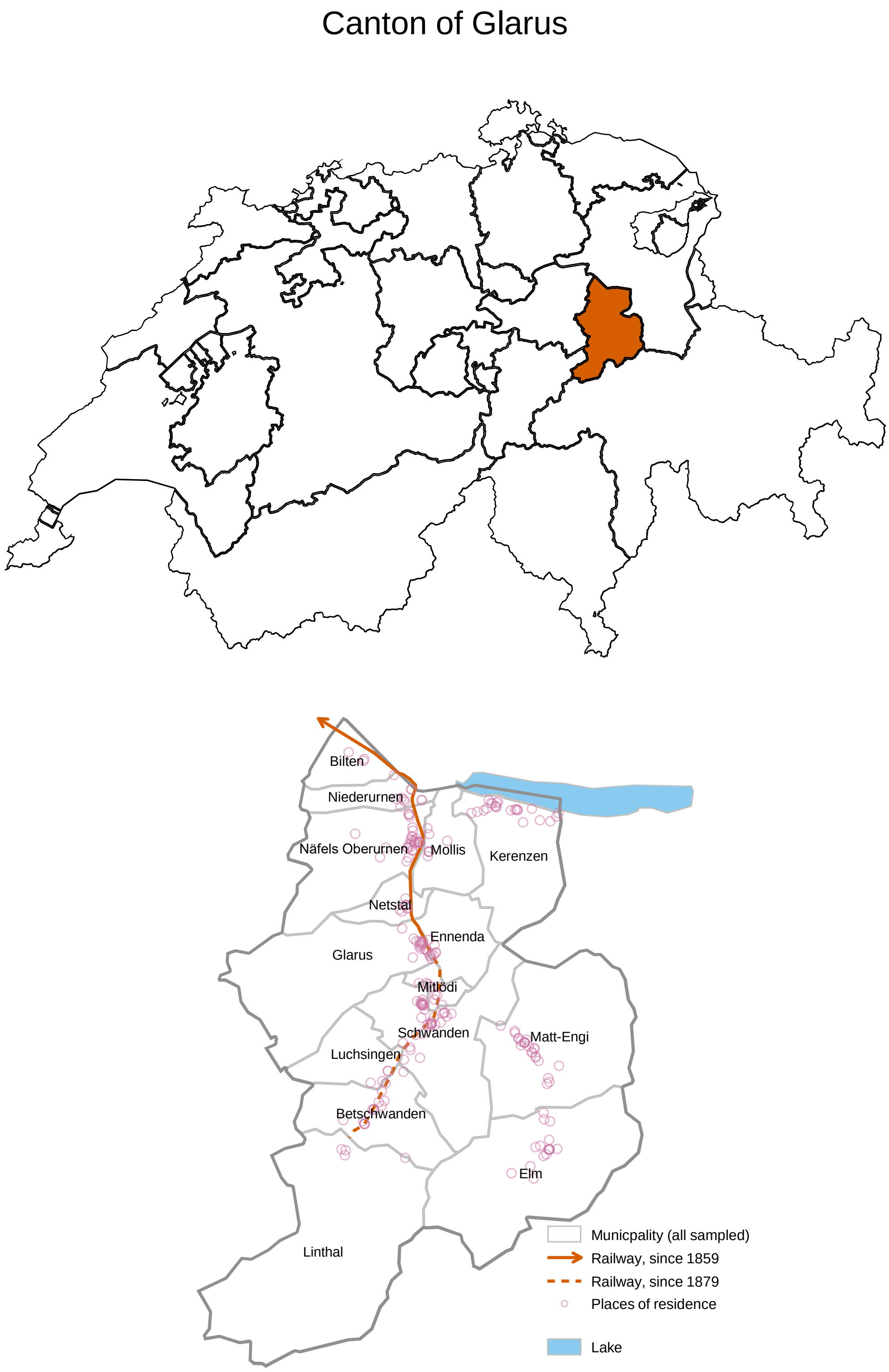

Figure 3-4. Map of the canton of Glarus with parishes, railway lines and places of residence

Note: Data on places of residence differ in their level of detail: in some cases, street-level precision is available, while other cases are only precise to the level of municipality or parish; parishes collapsed from municipality borders without taking into account that some municipalities belonged to multiple parishes. Based on borders for the year 2001 without relevant effects on accuracy for Glarus. Source: author; borders based on Bundesamt für Statistik (2013); railway lines based on Wägli and Jacobi (2010).

3.2 Measures, Sources, and Data Collection

There are two basic requirements for investigating social mobility and the intergenerational class linkage: first, a measure for the social status of a person is needed; and second, it is necessary to be able to link at least two generations. For the 20th century studied in the last chapter, I have relied on surveys that report the occupation and the educational levels of both the respondent and her or his mother and father. No such surveys are at hand for the period analyzed in this chapter of the thesis. Instead, administrative sources kept in archives can be used to analyze questions of social stratification (compare, van Leeuwen and Maas 2010).

In this section, I will outline the basic requirements for analyzing intergeneration social mobility in historical times, both in respect to measurement tools and sources. I will then describe the situation in Switzerland in terms of sources and present the reasons behind the selection of Lucerne and Glarus as the two cases analyzed in this chapter. In two separate sections, I will then describe the sources used from these cantons and document the process of data collection.

An often-used source that meets the requirement of bringing together two generations is marriage registers (van Leeuwen and Maas 1996; Maas and van Leeuwen 2002; Zijdeman 2008). Marriage registers usually include some information on the bridal couple, the parents of the bride and the groom, and the marriage witnesses. Another promising type of source is genealogies (Song and Campbell 2017; Montt and Maas 2015; Dupâquier 2004). Furthermore, linked data from censuses can also be used for studying intergenerational mobility (Long and Ferrie 2013a).

Neither of these types of sources usually includes information on the level of educational attainment.[39] However, they often do contain the occupational titles of the individuals listed in the sources. In the last chapters, we have seen that either a continuous status measure can be assigned to occupational titles or, alternatively, occupations can be grouped into social classes, such as the EGP classes (Erikson et al. 1983). In any case, the ISCO scheme (ILO 1990) usually serves as a starting point. The ISCO scheme makes occupational titles internationally comparable and allows for the establishing of a standardized relationship between coded occupations and occupational status or occupational class, respectively. In order to extend these advantages to data from historical periods, the HISCO scheme, a historical ISCO

[39] However, data based on marriage certificates can include information on the signature of the bridal couple (Dupâquier 2004). This can be used as a proxy for literacy and is thus a rough measure of the level of education.

equivalent, has been established (van Leeuwen et al. 2002). HISCO has at least three key advantages (c.f., van Leeuwen and Maas 2010). First, it has been widely and internationally used for studying topics of social stratification in historical times, and, almost equally important, the available material and tools make the process of coding occupational titles feasible. For example, the HISCO manual (van Leeuwen et al. 2002) comes with a multilingual dictionary of occupational titles that is essential for the international comparability of the scheme. In addition, a web database (IISH 2017) assists researchers in coding occupational titles and reduces the workload associated with this task. Finally, both a class scheme and a continuous status scale is available that builds on the HISCO classification. In other words, it is possible to convert HISCO codes directly into either a categorical or a continuous measure of social stratification suitable for analyzing questions of inequality, social mobility, or social homogamy (van Leeuwen and Maas 2010).

Starting from the occupational categories present in the HISCO scheme and supported by a group of experts, van Leeuwen and Maas (2011) have created HISCLASS, a scheme of 12 historical social classes. In order to achieve this, they classified the occupational categories along four distinct theoretical dimensions: manual versus non-manual work, skill level (up to three), whether or not someone supervises other workers or employees, and whether or not the occupation belongs to the primary sector (van Leeuwen and Maas 2011: 11–27). The resulting 12 classes are listed in **Table 3-1** (p. 98), alongside some example occupations taken from the sources used in this chapter.

However, for many practical applications, the 12-fold classification of HISCLASS is too finely granulated and results in sparsely populated classes. In this chapter, I start from the approach followed by Maas and van Leeuwen (2016), who use a collapsed five-class version of the scheme for their analyses of social mobility in seven European countries during industrialization. They combine the five top classes into a single non-manual one and both the two lower-skilled, non-farming as well as the two farming working classes into one class each. This is a good compromise for comparing Lucerne and Glarus, which have distinct stratification systems (compare the sections 3.1.2 and 3.1.3; also see section 3.3.2). The rural part of Lucerne has very few non-manual workers and does not allow a higher resolution in this part of the occupational stratification. By contrast, Glarus has very few farm workers, which makes it unreasonable to distinguishing more skilled from less skilled farm workers.

Unfortunately, the number of farm workers in Glarus is so low that this five-class version only works for analyzing the canton as whole. For analyzing sub-groups or time trends in the canton of Glarus, unskilled workers and farm workers have to be collapsed. In this context, this is reasonable, because for Glarus, the two classes exhibit a high degree of affinity in the mobility table in **Figure 3-24** (p. 162). The resulting four-class version is, however, not well suited for studying the class structure of the canton of Lucerne, because here the differentiation between farming and non-farming workers is essential. Consequently, I will use two different versions of HISCLASS in this chapter: the five-class version for both comparing Lucerne to Glarus (section 3.3.2) and for the detailed analyzes of social mobility in Lucerne (section 3.3.4), and a four-class version for the analyzes of social mobility in Glarus (section 3.3.5). Both versions are included in **Table 3-1** (p. 98).

HISCLASS makes it possible to analyze the historical data in the same way as I did for the 20th century using the EGP-class scheme. However, for many applications it is useful to have an ordered and continues status scale. Lambert et al. (2013) adapted the so-called Cambridge Social Interaction and Stratification (CAMSIS) approach, proposed by Stewart et al. (1973), to historical data. This approach is based on the assumption that social interactions more frequently take place between individuals from similar levels of the social stratification system. Following this approach, a multi-dimensional scaling algorithm is used to place each occupation on a (possibly multi-dimensional) scale so that the occupations' dissimilarity of socially interacting individuals is minimized (Stewart et al. 1973). Stewart et al. (1973) have shown that the resulting scale of occupational status is indeed a one-dimensional structure. In practice, researchers start with a social interaction, such as friendships or marriages, and record the occupation of the interacting individuals. A status scale value is then assigned to each occupation in a way that satisfies the assumption that the incumbents of two occupations that are close in terms of social status interact more frequently with each other than the incumbents of two dissimilar occupations (e.g., Prandy and Lambert 2003).

Following this approach, and using data on the individual's own and the partner's occupations, Lambert et al. (2013) constructed a historical version of the CAMSIS scale: the HISCAM. The version used for this study[40] has an empirical range from 10.6 (e.g., house servants) to 99 (e.g., medical doctors or lawyers); some important occupations and their HISCAM values include field crop farm workers (HISCAM: 32.1), day laborer

[40] I will use the version 0.1 of the universal HISCAM-scale (HISCAM 2006).

(41.6), spinner (44.4), textile printers (51.1), general farmers (60.9), merchants (70.2), and military officers (98.6).

In this thesis, the HISCAM scale is of smaller importance than the social classes based on the HISCLASS scheme. However, I use HISCAM values as the key measure for social stratification in the last section of this chapter, which is concerned with homogamy by social origin, and, more generally, as a data management tool. In respect of the latter use, a continuous scale is a useful to handle cases with multiple occupational titles per person. In these cases, it can be valuable to be able to rank occupations by social status and identify the highest or lowest of them. I will discuss this problem in some detail in the data section on the canton of Glarus, where this case is of special importance.

Therefore, the availability of HISCO, HISCLASS, and HISCAM satisfies the technical preconditions for studying social mobility during the earlier periods of industrialization in Switzerland. The critical question is whether suitable sources exist for the country, because "historical studies are rooted in and limited by the sources" (van Leeuwen and Maas 2010: 430). In Switzerland, the cantonal archives – officially called "state archives" or "country archives" – are the most important archives for civil or church registers from the 19th century (Santschi 2006). Accordingly, one of the first steps carried out for this thesis was to survey the cantonal archives of all German-speaking cantons of Switzerland.[41] The relevant question was whether the archives know of more or less standardized ("serial") sources that link (or make it possible to link) individuals' own and their parents' occupational status in a systematic way.

The answers[42] showed that the many archives did not include suitable sources – in many cases, occupational information on two generations was available only for some isolated cases.[43] In some other cantons, information for a special sub-population is available, but not for the whole population.[44] Furthermore, the archives of Zug have pointed to the population census from 1850. At least for the second half of the 19th century, when censuses were carried out on a national level (Haug 2013), census data are indeed a very promising source that is rarely used in Switzerland. For the present

41 Including French- and Italian-speaking areas would have been desirable, but a multilingual data collection was clearly out of the scope of the dissertation project.

42 All but the archives of Schwyz and Appenzell Innerrhoden answered the inquiry made by e-mail and provided helpful information.

43 This holds for Aargau, Basel Stadt, Bern, Schaffhausen, Thurgau, and Uri.

44 This is the case for Appenzell Ausserrhoden (only one parish), Nidwalden (family registers (*Stammbücher*; exclude lower social strata), Obwalden (only after 1875), Zug (only a very limited period), and Zürich (eventually applications for citizenship).

purposes, however, they come with some crucial limitations. They present cross-sectional snapshots, which limits their use for analyzing time trends. More importantly, they only bring together multiple generations if they live in the same household, which clearly does not represent the whole population.

Two small groups of cantons remained. The first consists of Solothurn and Lucerne, two cantons that maintained standardized marriage registers including occupational information on both the bridal couple and their parents for a period of about 40 years (mid-1830s until mid-1870s). The second group is represented by the cantons of Glarus, Grisons, and St Gall. In all three cantons, occupational information is available, and it is, in principle, possible to link generations. Linking two generations is a clearly more laborious task then collecting information on two generations directly from a single entry in a marriage register. For practical reasons, it was, therefore, not possible to collect data from all of the cantons from the latter group. Because Lucerne, Solothurn, and Grison were predominantly agrarian areas in the 19th century, I have dropped the case of Grison in favor of the two more industrialized cantons of Glarus and St Gall. In the remaining cantons (Lucerne, Glarus, Solothurn, and St Gall), we[45] have screened the sources in depth to assess their usability for analyzing intergeneration occupational mobility. This screening revealed that in St Gall linking generations is problematic: while straightforward if both generation lived in the same parish, it was unfeasible if they did not. Drawing on these sources would yield a very incomplete dataset leading to biased estimates for social mobility, as geographical and social mobility were most likely linked. The same would be true for estimates based on data from the canton of Solothurn. The screening has shown that the parental information on parents living in a different parish are very incomplete, with missing occupational titles in most of the cases.

Finally, two cantons were left: Lucerne and Glarus. Although largely shaped by the limitation of the sources from other cantons, the selection of these two cases is an advantageous one: it offers clearly varying contexts and includes an urban area (the city of Lucerne), and both agrarian and highly industrialized rural areas. The following two sections will present the sources in these cantons and the data collection in detail.

[45] I wish to thank the two research assistants, Norbert Furrer and Gaudenz Welti, for their excellent work and their valuable contribution to this project.

Table 3-1. HISCLASS classification with examples; original and collapsed versions

Class number	(Original) class label	Examples	5-fold classification	4-fold classification (Glarus only)
1	Higher managers	General Manager (e.g., factory owner), Government Administrator		
2	Higher professionals	Building Architect, Medical Doctor, Teacher		
3	Lower managers	Postmaster, Corporal, Forest Officials	Non-manual	
4	Lower professionals, and clerical and sales personnel	Innkeeper, Trader, Shopkeeper, Artist		
5	Lower clerical and sales personnel	Guardian, Writer, Railway Clerk, Shop Assistant		
6	Foremen	Artisanal Masters, Manufacturing Foreman	Skilled Worker	
7	Medium skilled workers	Craftsmen, Printer, Gilder		
8	Farmers and fishermen	Farmer, Alpine Herdsman	Farmers	
9	Lower skilled workers	Spinner, Weaver, Carter	Unskilled Workers	
10	Lower skilled farm workers	Logger, Small Subsistence Farmer	Farm workers	Unskilled & farm workers
11	Unskilled workers	Day Laborer, Factory Worker	Unskilled Workers	
12	Unskilled farm workers	General Farm Worker, Field Crop Worker, Cowhand	Farm workers	

Source: Based on van Leeuwen and Maas (2011: 57).

3.2.1 Lucerne

The Source

In the course of the accelerated state-building process promoted by the new liberal government of the "regenerated" (compare section 3.1) canton of Lucerne, the state took over the control over the registration of the civil state of its people from the Church. Based on a new civil law, the *Schultheiss und Kleine Rat*, the cantons' executive authority, decreed meticulously in 1833 how the registers of baptisms, marriages, and deaths had to be maintained from the beginning of the year 1834.[46] For the present purpose, this new form of the registers is crucial, because it ensured the quality of the registers and, most importantly, included the occupational titles of both the bridal couple and the parents in the marriage registers. In 1876, the registration of the civil state changed again, when the Swiss Federation prescribed nationally uniform civil registers (Gössi and Huber 2001). Unfortunately, these new registers do not include occupational information on the parents. In other words, registers that directly link occupational titles from two generations exist only for the period from 1834 until 1875.

For the period 1834–75, the books with the registers were still church books, as they were kept in the parishes and the priests carried out the main tasks. However, state officials played a controlling function. For this aim, three copies of each register book had to be kept. The priest, who collected all the information, used the first one. He was obliged to immediately inform the secretary of the municipality where the church was based. Using this information, the secretary had to maintain the second copy of the books. Each January, an official of the canton visited the parishes, compared the copies, asked for corrections or completions where necessary, and signed the copies together with the priest. The revised entries were then transcribed into the third copies of the registers that were archived at the municipality's deposit bank. After 1875, the priest's copy stayed in the archives of the parish, one of the other two in the corresponding municipality, while the third was sent to the cantonal office responsible (Gössi and Huber 2001: 11). Today, these last copies are kept by the State Archives of Lucerne, where we were able to consult them.[47]

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46 The corresponding decrees can be found at the beginning of each of the books. For this project, we used the copies maintained by a municipality official and kept in the State Archives of Lucerne: Staatsarchiv Luzern (=StALU; State Archives of Lucerne), A 975 and KZ 23-27, 54-56; compare Gössi and Huber (2001).

47 Note that these cantonal series (StALU, A 975) are usually not publicly available, because the archives also keep microfilm copies of the parish series. However, handling microfilms in large batches is a very slow task, especially as some of them are of limited quality. Given

This triple-checking process ensures the high quality and consistency of the registers. This consistency was further improved by the fact that the state did not only prescribe the content and the form of these registers and defined how they would be kept, but also issued preprinted tables for the books. Preprinted tables reduced the room for interpretation and increased the pressure to keep the information on each entry as complete as possible because they made missing parts clearly visible.

For the present purpose, the preprinted tables also greatly facilitated the data collection process and reduced the sources of transcription errors, as they made it possible to create a data-entry mask that corresponds one-to-one to the sources and guides through the transcription. **Table 3-2** (p. 103) reproduces the structure of the marriage registers used and gives an overview of the available information. All details printed in bold have been transcribed during data collection. Each entry starts with three pieces of administrative information [1–3]:[48] a running number, starting with the first marriage in a year, the place and the date of the marriage. This is followed by six pieces of information on the groom and the bride [4–10]: their respective name, the places of origin (or citizenship) and residence, the civil state at marriage, the occupational title, and the place and date of birth. The register continues with the names of the two witnesses [11], which we have not included in our dataset.[49] The next part of each entry is dedicated to the parents of the bride and the groom [12–14]: name, place of origin, and occupational title of the two fathers and mothers. The table ends with three columns for information on any possible previous marriage: name and place of origin of the previous spouse, followed by the place and date of this previous marriage. As with the names of the witnesses, we did not collect these additional data.

In sum, for the period from 1834 until 1875, the marriage registers from the canton of Lucerne offer the necessary features for the study of intergenerational social mobility: they combine occupational titles for individuals from two generations – in this case directly in a single row of a table. Furthermore, the high quality and consistency that results from the prescribed process of maintenance offers an important precondition for unbiased estimates of social mobility and the intergenerational class linkage for individuals' own social status. However, the sources do not come without limitations. Two of them have already been mentioned. First, the high consistency of sources does

special permission, we were able to consult and take photos of the originals of the cantonal series.

48 Numbers in square brackets refer to cells in **Table 3-2**.

49 The name alone could be useful to be construct friendship networks. However, this is not possible due to the fact that we sampled only a relatively small percentage of all marriages.

not apply to women's occupational titles. While the occupational title of the bride is given in many cases (but not in a consistent way, see the introduction to this chapter), the occupation of the mother is almost never present in the source – despite the fact that printed tables had a cell dedicated for this piece of information.

The second limitation already mentioned of Lucerne's marriage registers concerns unmarried individuals. This is, of course, a recurring limitation in the stratification literature using marriage registers (Knigge et al. 2014a: 556; Lippényi et al. 2015: 107; Maas and van Leeuwen 2016: 851–2). However, these authors can refer to the fact that the percentage of permanently unmarried individuals was low in their areas of study, and that married and unmarried individuals did not differ importantly in respect of social origin, social status, or social mobility. The description of the historical context has shown that at least the first argument does not hold for canton of Lucerne: from the literature, it is known that the proportion of permanent singles was substantial. Furthermore, if the marriage restrictions were effective in restricting the marriages of the poor, low status individuals can be assumed to be overrepresented among the permanent singles. On the other hand, such a bias in respect of univariate distributions does not necessary translate into biased estimates of associations, such as estimates for social mobility. For example, Breen and Luijkx (2004) have argued that the increasing survey non-response rates would result in a biased class distribution, but did not find any evidence for biased estimates of social mobility. However, some mechanisms are imaginable that link marital status with social mobility. For example, successful individuals could be more likely to be both upwardly mobile and married (Maas and van Leeuwen 2016: 851). Conversely, homogamy in respect to social origin could foster social inheritance among the married population, because class-specific resources are available from the family of origin of both spouses.

While marriage registers have the drawback of representing a possibly selective sample, they have some clear advantages. First, they indicate the occupational title of the groom at an advantageous point in his life course. At the time of marriage, the groom had most likely attained a stable position in an occupational career that allowed him to make a living for a family (Maas and van Leeuwen 2016: 852), while the timing is still close to the period when the father mattered for his status attainment. Furthermore, in most of the cases, the father's occupational title would not be subject of recall errors, as he was still alive at the time of his son's wedding. Finally, marriage registers are the only available source that include not only occupational information on the groom and his father, but also on the bride and her father. While I will not analyze the bride's mobility in this thesis, I will use the information on her father's social position in order to analyze homogamy in respect to the bridal couple's social origin. All this speaks for using marriage registers as the primary source of information for analyzing intergenerational mobility in 19th-century canton of Lucerne – and not the death registers, which, surprisingly, include the occupational titles of the father of the deceased. However, I will use a small additional sample from the death registers in the last part of this section for assessing the potential marriage bias.

A last limitation of the sources is common to all registers of the canton and stems from the fact that writers did not distinguish between different types of general farmer. Of special relevance are the so-called *Tauner*, small subsistence farmers who did not have the necessary draft animals and depended therefore on other, wealthier farmers. In the 18th century, those farmers made up an important part of the rural population, although many sources did not mention them separately (Kurmann 1985: 125–47). While *Tauner* lost their importance in the course of the first half of the 19th century (Landolt 2013), it is likely that important status differences persisted that were not captured by occupational titles used in the registers. This does not mean that the terms used by the writers to describe farmers do not give any hints at social differences. For example, *Landmann* ("countryman") suggests a lower status than *Bauer* ("farmer"). In reading the registers, however, the impression dominates that the writers made no conscious, general, and coherent distinction between different terms for farmers. Rather, the choice of the terms seems to reflect the writing styles of different writers. The coding decision was, therefore, to code *Landmann*, *Landwirt* ("agriculturalist"), and *Bauer* all as "general farmer" (HISCO: 61110).

Table 3-2. Information given in the marriage registers of the canton of Lucerne and its structure

Admin.		Bridal couple					Witness		Parents			Information on spouse from previous marriage, if any
[1] Number	Groom:	**[4] Name**	**[5] Origin**	**[6] Residence**	**[7] Civil state**	**[9] Pl. of birth**	[11] Name	Father:	**[12] Name**	**[13] Origin**	**[14] Occupation**	
[2] Place					**[8] Occupation**	**[10] Dt. of birth**		Mother:	**[12] Name**	**[13] Origin**	**[14] Occupation**	
[3] Date	Bride:	**[4] Name**	**[5] Origin**	**[6] Residence**	**[7] Civil state**	**[9] Pl. of birth**	[11] Name	Father:	**[12] Name**	**[13] Origin**	**[14] Occupation**	
					[8] Occupation	**[10] Dt. of birth**		Mother:	**[12] Name**	**[13] Origin**	**[14] Occupation**	

Sampling and Data Collection

Taking these arguments together, the overall impression of the marriage registers of Lucerne is that they constitute an exceptional source with some undeniable limitations. They are exceptional because most comparable sources in Switzerland do not contain occupational titles – at least not for two generations and in a comprehensive way. From the clearly regulated maintenance process, one can expect a consistent quality of the data, an expectation that was confirmed during the detailed assessment of the registers. Given this overall positive precondition, a data collection process had to be set up that was feasible within the present dissertation project. At the same time, it had to ensure enough statistical power for analyzing the importance of social origin in the context of early industrialization.

A key aspect of such a process is the choice of the sampling routine. As a part of the quality assessment of the registers, we estimated the population size (here, the number of marriages in each parish) by counting the number of marriages on every tenth page of each of parish's marriage register. In total, we estimated the number of marriages concluded between 1834 and 1875 at about 33,700. Drawing a simple random sample from this population would be undesirable for practical reasons. The sampling and preparation work would be extensive, as it would involve taking photos from and handling all the 3,775 register pages in 138 volumes belonging to 78 parishes. Applying a two-stage sampling strategy could reduce this workload, for example by sampling marriages only from a sub-sample of parishes. However, this procedure could exclude the few industrializing parishes or the city of Lucerne, which is at odds with the goal of investigating modernization effects. Dividing the canton into three sampling strata is the obvious solution to this problem: one strata with agrarian parishes, one with parishes that have at least some industry, and the city of Lucerne, which makes up the last strata.

Therefore, as a next step, each of the canton's rural parishes has been assigned to one of two strata based on the proportion of factory workers living in the corresponding municipalities reported by Schnider (1996: 48). Municipalities with a proportion of factory workers exceeding 2% of the population in 1856 or 1877 have been assigned to the stratum with some industry; the rest have been assigned to the stratum with no industry. At this point, it is important to stress that the chosen threshold of 2% factory workers for the definition of a parish with some industry is only of little substantive importance for following analyzes. It has merely the effect that all parishes with at least a small amount of factory workers were included in the dataset. I will not use this threshold for comparing more to less industrialized areas.

In order to reach enough statistical power for the area with some industry and the city of Lucerne, we followed a disproportional stratified sampling design and aimed for about 750 cases in each of the three strata. However, the way to get there differed between the strata. While a simple random sample was used in the stratum with the 13 parishes with some industry as well as in the city of Lucerne, a divided sampling procedure was used for the large stratum without industry (following Jann 2007). More specifically, a simple random sample was drawn in the parishes where at least 30 "hits" could be expected based on the estimated parish size and the drawing probability $p = \frac{750}{\widehat{N}_{no\ industry}} = \frac{750}{22595} \approx .033$ (where $\widehat{N}_{no\ industry}$ is the estimated population size in the stratum with no industry). From the remaining, smaller parishes, a clustered sample was drawn. This design reduced the number of parishes in this stratum from 63 to 25, ensuring that each marriage in the stratum was selected with the same probability, while the statistical efficiency was kept relatively high (Jann 2007). The map in **Figure 3-3** (p. 91) gives an overview of the parishes included in the sample.

Because there is no existing, digitized index of all marriages to draw from, a random route procedure was used to select the individual cases. To this end, I programmed a simple algorithm into the database I had set up for the data collection. Based on the drawing probabilities calculated in advanced for each parish, this algorithm decided for each case randomly how many registry entries had to be skipped between two entries that were to be transcribed.

Because of the clear organization of the registers and the one-to-one correspondence between source and database, the resulting data structure is straightforward, as is the organization of the database. All data related to the individual marriage are kept in a single table; relational tables are only used for auxiliary information on the parish and for assisting the data collection. The database provided the coder with information on all municipalities in Switzerland and all hamlets in the canton of Lucerne, which not only speeded up the transcription process but also helped in the reading of badly written names of places. Most importantly, the system allowed us to code the occupational titles to the HISCO scheme on the fly during the transcription process. The coding of occupational titles was done in two steps. In a first step, it was slightly standardized, eliminating obvious synonyms (e.g., abbreviations or spelling variants, such as *Dachdeck*, *Dachdek*, or *Dachdecker* for "roofer", but also *Bäcker* and *Pfister* for "baker"). This standardized title was then coded to HISCO. When entering an occupational title, the database checked whether there was an existing standardized version of it; otherwise, the coder had to check whether it was a new spelling of an existing coded title. Only if this was not the case was a new standardized occupation created and coded. In this way, we were able to use contextual information (e.g., on frequent occupations in same parish) for the coding decision, without double coding occupations.

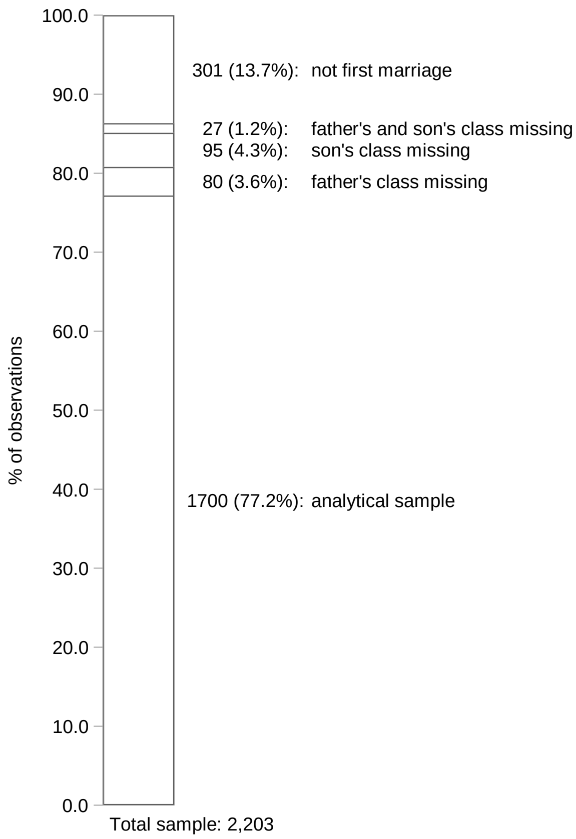

Figure 3-5. Lucerne: Sources of sample reduction

Source: author; data based on the marriage registers of Lucerne.

By following this procedure, information on 2,203 marriages has been collected and coded by me and two research assistants, Norbert Furrer and Gaudenz Welti. In 13.7% (see **Figure 3-5**) of the cases, the groom was widowed at the time of the marriage. For the present purpose, I decided to exclude these cases and to draw only on first marriages. This enhances the comparability with the data from Glarus and makes the sample more homogeneous. Missing values on the key variables (son's and father's social class (HISCLASS)) reduces the sample by a further 9.2%. This results in an analytical sample of 1,700 observations that can be used for analyzing intergenerational social mobility in Lucerne for the period 1834–75. The sample for the analyses of social homogamy differ slightly from this, as missing values on bride's father's status have to be dropped in order to analyze homogamy by social origin. These deviations will be discussed in more detail in the section on homogamy (section 3.3.5).

Assessing the Potential Marriage Bias

This relatively low number of missing occupational titles is a strong argument for the use of the marriage registers of the canton of Lucerne for analyzing the effects of social origin. The question remains, however, how much the comparably high proportion of Lucerne's population that never married counteracts this quality of the registers. Using a small additional dataset including both married and unmarried individuals, I try to assess the significance of the fact that marriage registers exclude this part of the population in respect so to social mobility. In respect to homogamy to social origin, these analyses are insofar relevant as they show to what extend marriage was a socially exclusive institution.

As mentioned above, the death register from the same period also include occupational information on the dead person's father. This is surprising, as in most cases, the father would already have been dead for a number of years at the time of the death of his daughter or son. As mentioned above, this is not the only argument for preferring the marriage registers over death registers for studying intergenerational social mobility. The key argument was that marriage registers measure occupational status at a time in life that is preferable to death registers. This also speaks against inferring directly from the findings based on death registers on possible biased estimates based on marriage registers. For example, it can be assumed that marriage impacts the further career mobility of a men by a "marriage premium" that conforms to male breadwinner model (Schulz and Maas 2010). The differential career mobility of married and unmarried men would lead to differences in intergenerational mobility at the time of the death, even if there was no difference at the average age of marriage. However, death registers are the only available source to compare the mobility of married men to those who never married – and death registers have the undeniable advantage that deaths do not stem from a selective sample. Therefore, death registers can give some hints at the extent of a possible marriage bias.

For this aim, I collected an additional dataset based on a random sample from five larger parishes: Altishofen, Entlebuch, Ettiswil, Hitzkirch, Kriens,[50] and Lucerne.[51] In total, I collected information on 450 men, 335 (=74.4%) with occupational titles that are convertible to HISCLASS for both father and son. Therefore, the number of missing

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[50] In Kriens, the registers were maintained even after 1875. Because death registers include earlier birth cohorts than marriage register, those entries have been sampled with a higher probability.

[51] Staatsarchiv Luzern (=StALU; State Archives of Lucerne), FA 29/8, 51, 64, 91, 118, 119; KZ 33, 35, 37, 39, 41).

occupational titles is much higher than in the marriage registers and varies between 19.1% (Hitzkirch) and 32.6% (city of Lucerne). The latter is mainly driven by the large number of fathers with missing occupational titles. In the other parishes, the father's occupation is only slightly less frequently given than the son's occupation. Given that older registers only rarely contained occupational titles (Gössi and Huber 2001), this suggests that the writers relied on information from the social circle of the deceased – information that was less often available in the city than in rural areas.

Given the amount of missing information and the fact that the five parishes are not randomly selected, the statistics presented below do not allow the drawing of valid inferences from the sample to the canton as a whole. Rather, the test statistics reflect the precision with which the outcomes are measured. Understood this way, the results help to clarify possible associations between dying unmarried and social mobility that may translate into biased estimates based on the marriage registers.

According to this dataset, 62% of men who died after the age of 18 died married, which means that 38% of adult men never ended up in the marriage registers. This is well beyond the numbers cited by Maas and van Leeuwen (2016: 851) from Hajnal (1953: 84–5), which show that in France, Britain, the Netherlands, and Sweden, the proportion of those remained unmarried ranged between 7 and 13%. In the same series (Hajnal 1953: 85), Switzerland is, with 20%, one of countries with the highest proportion of singles. Because Hajnal refers to age bracket 45–49, this number is in line with the results from the death registers, as **Figure 3-6** shows that the proportion of those dying unmarried depends strongly on the age at death, even for higher ages. Of those who survived the age of 45, about 20% died unmarried in the canton of Lucerne.

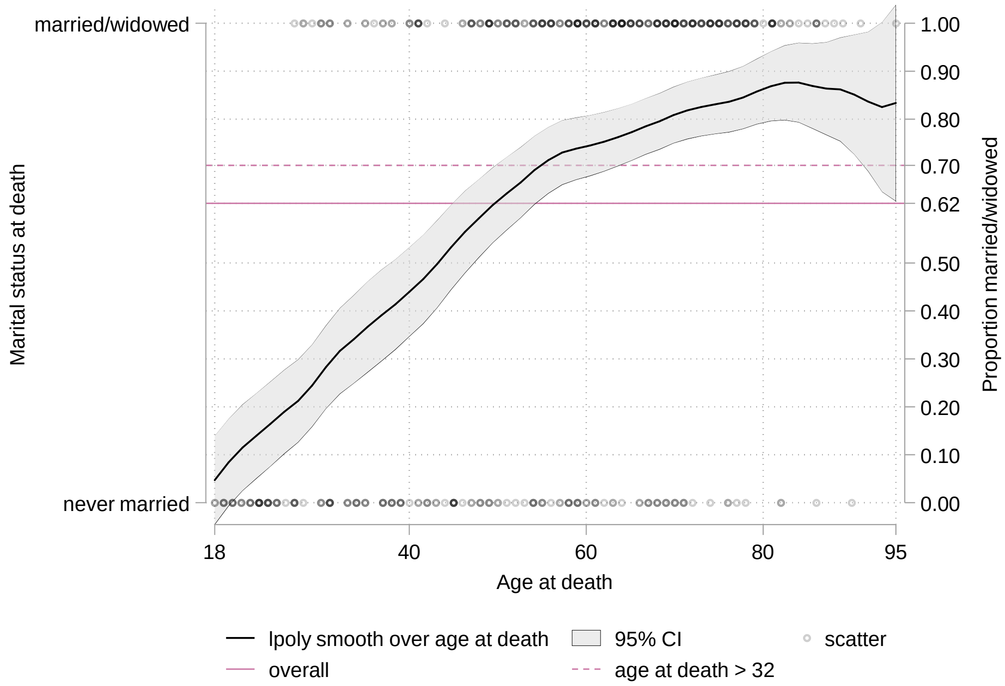


Figure 3-6. Proportion of those who died married or widowed over age at death

Note: Not sampled randomly from whole canton; test statistics for indicative purpose only. Source: author; sample based on death registers (see text for details).

This clear increase of those who died married with age at death highlights the fact that marriage registers did not only exclude those who stayed single but also those who died young (compare the distributions of age at marriage and age at death in **Figure A-8**, appendix, p. 268). On the other hand, there are two reasons to exclude the young from the comparison of unmarried and married in the death registers. First, as discussed above, the age at marriage is a reasonable age to measure occupational status. Second, those who died young made up only a small proportion of a given society – giving them the same weight as those who lived longer would bias the results. Therefore, the remaining statistics are based on individuals that reached at least the age of 32, about the median age of marriage, according to the marriage registers. In this sub-sample, 70% died married or widowed.

Given the increased marriage restrictions around the middle of the century (see section 3.1.1), it is important to know whether this proportion has changed over time. **Figure 3-7** shows the time trend of the proportion of those who died married or widowed.[52] It is indeed broadly in line with the description in the literature: the proportion dropped from almost 79% in 1834 to 64% in 1856, and stagnated some

[52] No linear or quadratic time trend in age at death has been found in this sample, suggesting that this time trend is not driven by an increase in mortality in the middle of the century.

years before it started to rise again. In 1875, the proportion reached 70% and the data from Kriens suggest a slight continuation of this positive trend after that year. Therefore, possible marriage biases can be expected to be slightly stronger in the middle of the century than at the beginning and the end of the observed period.

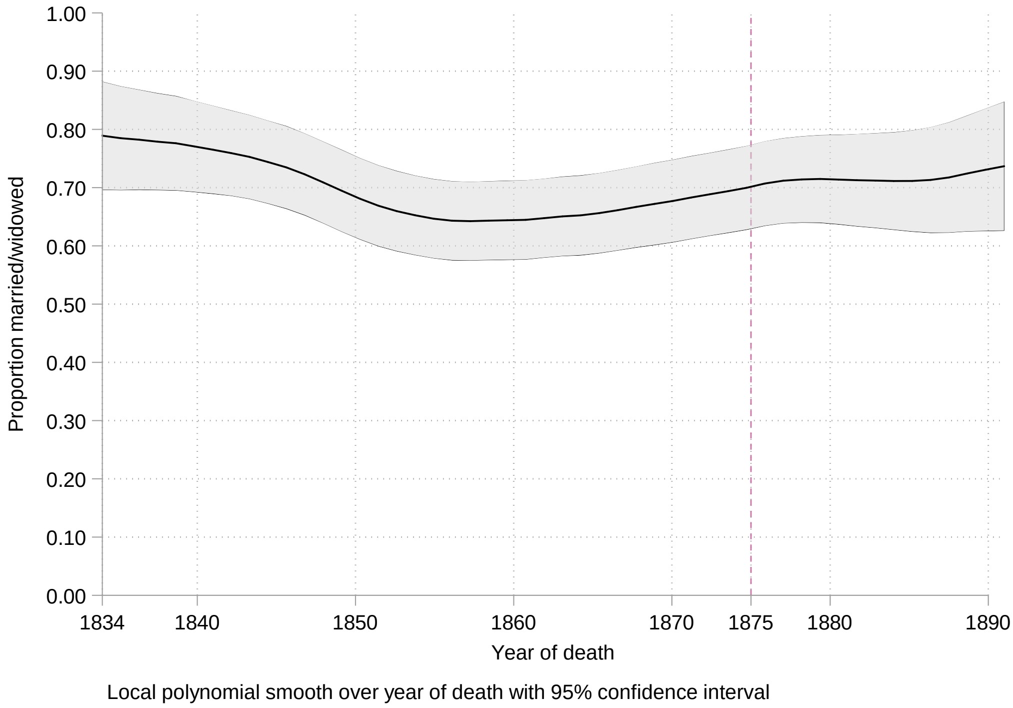
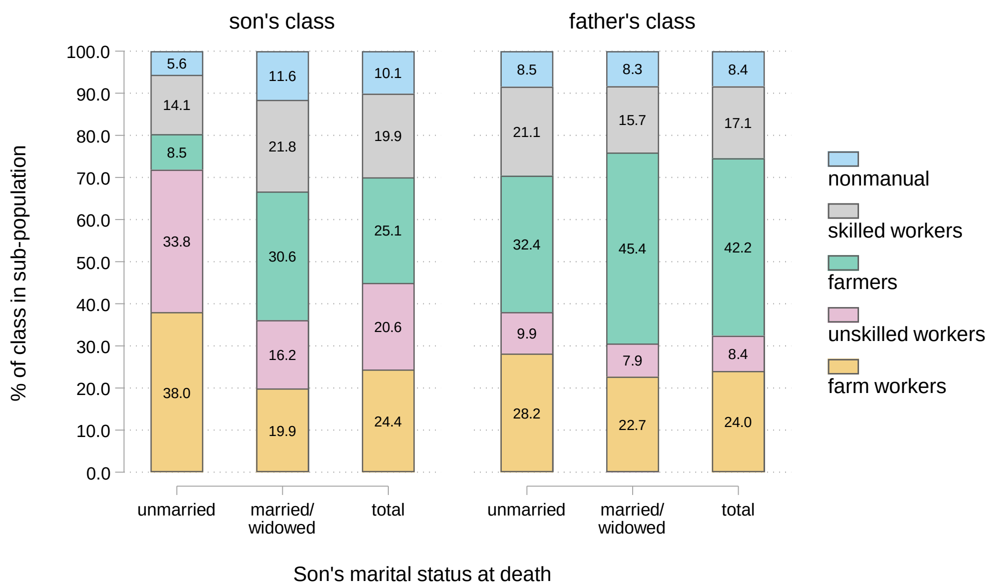


Figure 3-7. Proportion of those died married or widowed over year of death

Note: Data after 1875 stem exclusively from the parish of Kriens; data not sampled randomly from whole canton, test statistics for indicative purpose only. Source: author; sample based on death registers, age at death > 32 (see text for details).

The most important differences between singles and married or widowed men in the death registers can be found among farmers. Farming was a family business (Lemmenmeier 1983: 236–41), so it is not a surprise to find only few farmers among those who died unmarried. **Figure 3-8** gives a first hint that this is the main driver behind the different class distribution of married and unmarried. While the class distribution of the fathers is moderately different for the two groups (with an underrepresentation of farmers and an overrepresentation of skilled workers and especially of farm workers), the class distribution of the sons differs strongly between the two groups. Among the unmarried, farm and unskilled workers combine to 72%, compared to 36% for the group of those who died married or widowed. The remaining three classes are underrepresented in this distribution: strongly in the case of non-manual occupations and skilled workers (together 20% vs. 33%) and dramatically in the case of farmers (9% vs. 31%). From comparing the results based on the married sub-sample with the total samples, it can be concluded that the sample of married men yields relatively unbiased estimations of the father's class distribution but biased ones of the son's class distribution. In respect to the son's class distribution, estimates based on a sample that excludes permanent singles overestimate the proportion of farmers by about 5 percentage points und underestimate the combined proportion of unskilled and farm workers by about 10 percentage points.



χ^2-tests of independence:
Son: $\chi^2(4) = 29.10$, $p < 0.001$
Father: $\chi^2(4) = 03.96$, $p = 0.411$

Figure 3-8. Lucerne: Fathers' and son's distributions of social classes by marital status at death

Note: Not sampled randomly from whole canton, test statistics for indicative purpose only. Source: author; sample based on death registers, age at death > 32 (see text for details).

The mobility tables in **Figure 3-9** support the assumption that the differences in the class distributions are related to the class of farmers. While some areas of the tables are too scarcely populated to allow comparisons, they are clear in respect to the sons of farmers. Half of the married sons of farmers became farmers themselves and the other half can be attributed more or less equally to one of the remaining four classes. By contrast, unmarried sons of farmers most likely ended up in one of the two lowest classes: they became either farm workers or unskilled workers. To a lesser extent, the same pattern can be found among the sons of skilled workers – the dominance of class inheritance among married descendants and downwards mobility among those died unmarried. Thus, analyses of mobility tables without taking into account permanent singles will mainly overestimate the class inheritance of farmers (by about 5 percentage points) and the downward mobility of farmer's sons (by about 4 percentage points).

The mechanism behind this pattern is obviously the inheritance of a farm or business. In some area of the canton, the fragmentation of the land was prevented by a strict rule of inheritance: only one son inherited the farm – the other had either to migrate or remained unmarried on the farm of the brother who had inherited (Dubler 1983: 62; Lemmenmeier 1983: 239–41; also compare Mendels 1976). However, the latter was not the norm: 78% of farmer's sons died married or widowed, which is above the average of 70% among the whole population of those died older than 32.

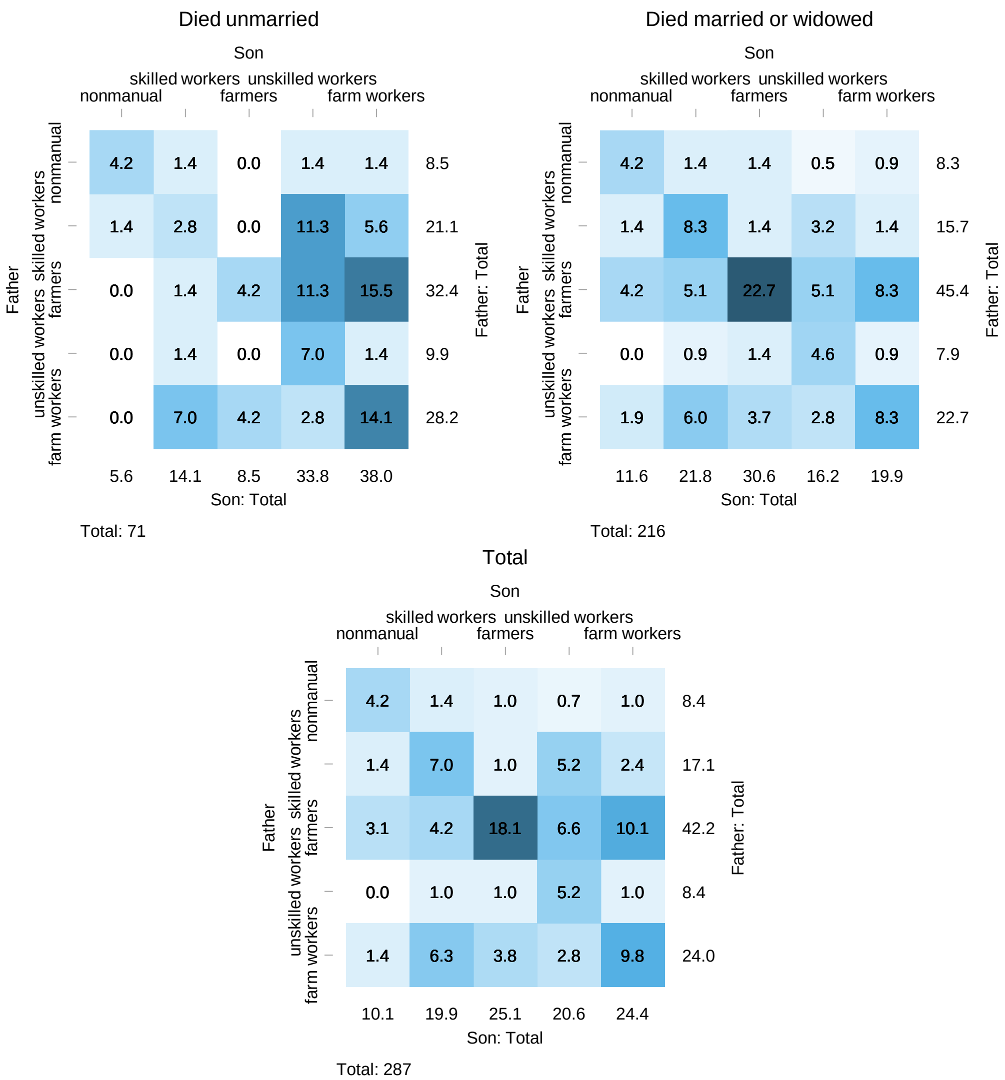


Figure 3-9. Lucerne: Mobility tables by marital status at death

Source: author; sample based on death registers, age at death > 32 (see text for details).

The inheritance/downward mobility pattern within some classes of origin is also reflected in the observed mobility rates. **Figure 3-10** shows that remaining single was associated with a significantly higher rate of observed mobility, leading to an underrepresentation of mobile sons in the sub-sample of those who died married by about 4 percentage points. On the other hand, it also shows that this difference disappears if sons of farmers are excluded from the calculation.

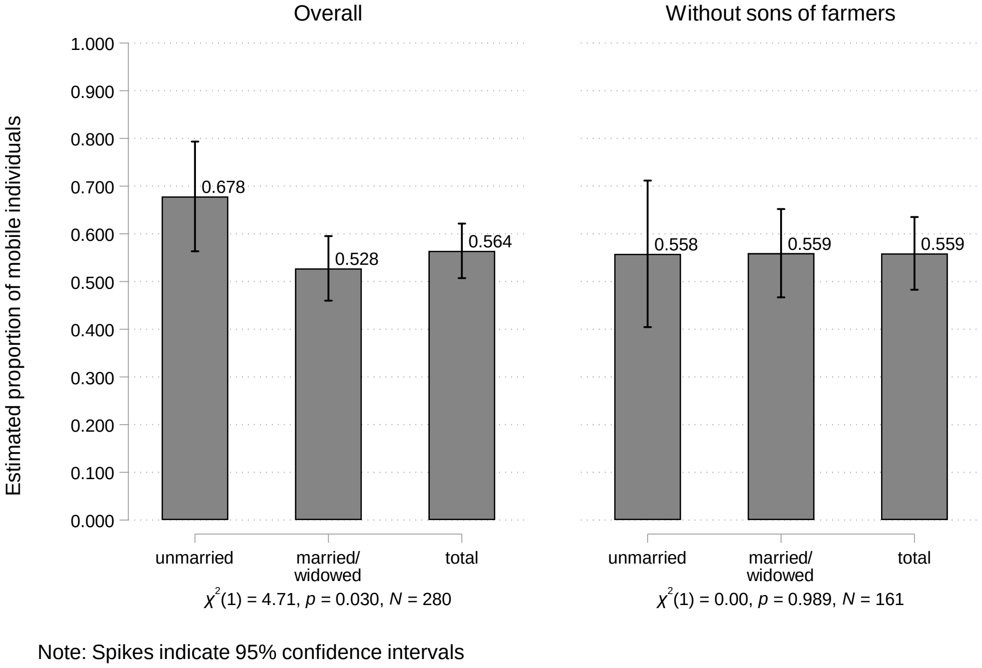


Figure 3-10. Lucerne: Proportions of mobile sons by marital status at death

Note: Predictive margins based on logistic regression models with controls for age and age^2. Not sampled randomly from whole canton, test statistics for indicative purpose only. Source: author; sample based on death registers, age at death > 32 (see text for details).

This higher observed mobility does not necessary mean that social origin was less important for singles' class of destination than for married men. Rather, **Figure A-9** (appendix, p. 268) suggests that the contrary might even have been true: the M-index is non-significantly higher for singles than for those who died married or widowed. However, it is important to stress that the sub-sample of the unmarried is clearly too small for carrying out sound analyses of 5x5-mobility tables. On the other hand, an equivalent result can be found by using the continuous HISCAM scale of social stratification. Regressing the son's status on the father's status yields a higher coefficient for singles (.45) than for those who died married or widowed (.38; for the total sample: .42), suggesting a greater importance of father's status for singles than for married men. However, as in the case of the M-index, this difference is far from being statistically significant (p=.566 for the interaction effect).

In sum, this assessment shows that farmers and class inheritance were overrepresented among those who died married or widowed. In addition, the fact that the proportion of singles likely changed over time could also bias time trends. However, this last bias is unlikely to be substantial. **Figure 3-11** shows estimates of the quadratic time trend of observed mobility, based both on the full sample and on the sub-sample of those who died married or widowed. Both the two lines and the corresponding confidence intervals are virtually congruent and lead to the same substantive conclusion: observed mobility rose in the period 1834–65 and declined afterwards, while the former but not the latter trend is statistically significant.

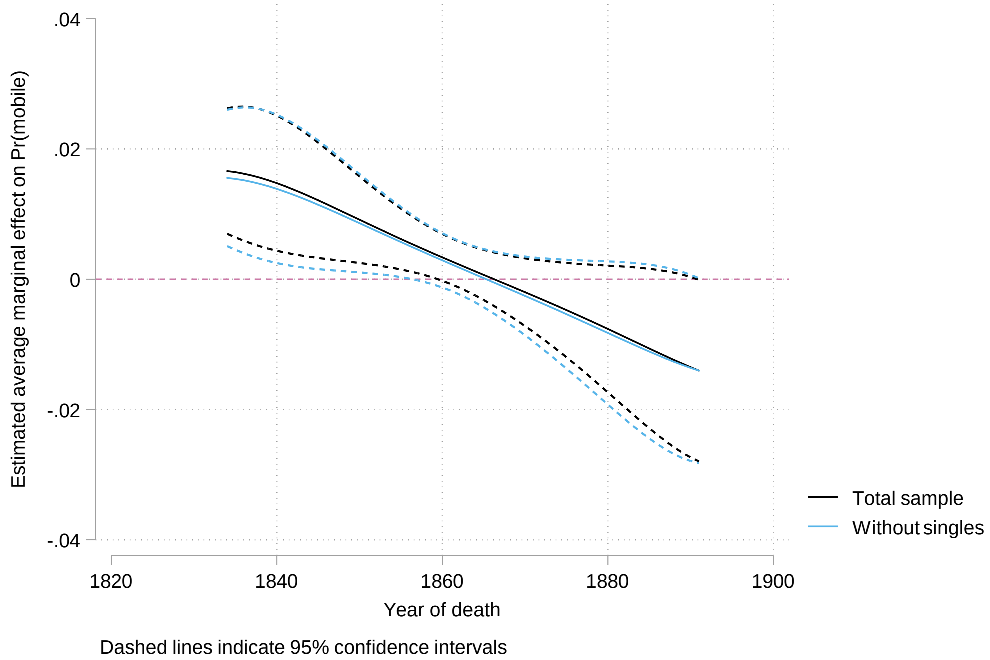


Figure 3-11. Lucerne: Yearly changes of observed mobility rates with and without singles

Note: Average marginal effects based on a logistic regression model with coefficients for linear and quadratic time trends. Not sampled randomly from whole canton, test statistics for indicative purpose only. Source: author; sample based on death registers, age at death > 32 (see text for details).

Because death registers and marriage registers are not directly comparable, one cannot infer from the above analyses to the extent of the bias that results from using the marriage registers. The results suggest nevertheless that the bias is a cause for major concern when it comes to univariate descriptions of the class structure but much less so in respect of bivariate analysis (e.g., overall mobility rates) and almost non-existent in the multivariate case (e.g., time trends in mobility rates). Unfortunately, the size of this additional sample is not large enough to draw robust conclusion on the potential bias of intergenerational class linkage, measured by the M-index. On the positive side, however, the above results suggest that results conditional on social origin and margin-insensitive results are likely to be largely unbiased. Thus, overall, the marriage registers seem to be an acceptable source for analyzing social mobility. While the marriage bias imposes some restrictions, especially for descriptive purposes, their quality stem from the low number of missing occupational titles and from the fact that information on sons and fathers is already combined in a single place, which avoids any linkage errors that may arise from other types of sources.

3.2.2 Glarus

The Source

When Winteler (1946), at that time the archivist of the canton of Glarus, described the church books before 1876, he draw a rather bleak picture of their quality. Not that there were no highlights, but they "leave a lot to be desired"[53] as effective control by the church authorities was missing and only some of the parish priests maintained them with the necessary care. On the other hand, he continued, there existed an equivalent that many envy the canton for. This equivalent is the so-called *Genealogiewerk*, J. J. Kubly-Müller's "oeuvre" consisting of the genealogies of all families of Glarus in 36 volumes.

Over almost 30 years of work, Kubly-Müller composed this genealogy from all the existing church books and completed it with information from all sorts of registers and documents from public and private sources (Winteler 1946). Before Kubly-Müller died, the canton was able to acquire the registers in 1828 under the condition that the genealogy would be continued based on the civil registers (Laupper 1982); since then, it has been kept by the archives of the canton and is accessible by permission.[54] The cantonal archives fulfilled this condition until the end of the 20th century; the latest entry found concerns the first years of the 21st century. In this way, the genealogy covers a very long period, as entries for some families date back to the "1st millennium" (Kanton Glarus 2017). A reference system that is available in both directions (referring both to the family of origin and to the entries for each child, if she or he started a family) allows for the compiling of genealogies of 10–12 generations for many families (Winteler 1946). For more recent periods, however, most families' records are much shorter, as each genealogical sequence starts with the generation that left the first traces in the birth, marriage, or death registers of the canton of Glarus.

From the second half of the 18th century, and with increasing density, most entries include one or multiple occupational titles for the husband and in some case of the father and the wife. Therefore, for the 19th century, this genealogy allows us to combine occupational information for two generations by linking the generations using the

53 "[…] lassen mannigfache Wünsche offen, […]" (Winteler 1946: 4).
54 Landesarchiv Glarus (= LAG; Country Archives of Glarus), GE 1–36.

reference system. **Table 3-3** shows that the available information is comparably rich, as it combines information from all major life events of a person: birth, marriage(s), birth (and death) of children, and death. These basic data are enriched with information on occupations, places of residence, emigration (and sometimes re-immigration), as well as possible curiosities, such as special habits, telling nicknames, press coverage, or committed crimes.

Table 3-3. Information given in the genealogy of the canton of Glarus and its structure

<table>
<tr><td colspan="2">N° {id household}</td><td rowspan="4">children</td><td rowspan="4"><u>From I. marriage:</u>
[example of unmarried child:]
{date of birth} {name} {occupation} † {date of death}
[example of married daughter:]
{date of birth} {name} vide {husband's name} {id household}
[example of married son:]
{date of birth} {name} vide {id household}

[etc.]</td></tr>
<tr><td>husband</td><td>{id household origin} {occupation(s)} {first and last name} from {place of origin} in {place of residence} [son] of {father's occupation(s)} {father's first name} & of {mother's first and last name} N° {id household origin}
born {date of birth} † {date and place of death}</td></tr>
<tr><td>1st wife</td><td>{id household origin} {number of marriage of husband} {occupation(s)} {first and last name} from {place of origin} widow of {name of previous husband} [daughter] of {father's occupation(s)} {father's first name} & of {mother's first and last name} N° {id household origin}
born {date of birth} † {date and place of death}
cop. {date of marriage}
[further information, e.g. on separation or emigration]</td></tr>
<tr><td>Later wives</td><td>[if any, same information as on 1st wife]</td></tr>
</table>

Note: Curly brackets designate a placeholder for the corresponding datum. Information in bold is given in most of the cases; information fields printed in a regular font are given only rarely; square brackets have been added by the author for clarification purposes – the same is true for vertically printed text. Source: author; based on the genealogy of the canton of Glarus.

The most obvious strength of this type of source, however, is the possibility of reconstructing family ties (for a general overview of the use of genealogies for the social sciences, see Song and Campbell 2017). It is, for example, straightforward to collect information on sisters and brothers, uncles and aunts, or grandparents. While straightforward, it can be very time-consuming to do so, without having a fully digitized version at hand. I will come back to this practical problem in the next part of this section. Beside these practical restrictions, the main limitation of this specific genealogy stems from its creation. For almost 30 years, Kubly-Müller invested all his energy into the compilation of these volumes and from all what is known about this man, one can be sure that he did his best to avoid any errors. However, to the best of my knowledge there is no critical assessment of the quality of this source and the most detailed description of its genesis is a rather wordy encomium written by its author (Kubly-Müller 1912). For example, it remains unclear how often he wrongly connected fathers and sons or wife and husband, a problem that is likely to happen in a context with many identical first and family names and one he found in the works of others (Kubly-Müller 1912: 173). Furthermore, it is not clear which piece of information stems from which source. This is less problematic in respect to time-constant data, such as birth dates, but more so when it comes to characteristics that tend to change across life, such as occupational titles – a problem that will be discussed in the last part of this section.

The main reason for not documenting his sources stems most likely from one of the strengths of this work: it includes a plentitude of sources that would not be manageable without Kubly-Müller's experience. For example, he most likely also considered the complete population census for the year 1837, which he seems to have supplemented while doing so.[55] Furthermore, it is also impossible to assess the result of his efforts of completing his work by means of "oral history": Kubly-Müller (1912) describes how he added information based on personal communication, both based on coincidences and systematic work carried out on-site.

Overall, the genealogy compiled by Kubly-Müller is an ambivalent source: overwhelming in its richness but also confusing in its vagueness. Above all, it is also a very versatile source and offers research opportunities that are difficult to underestimate.

Sampling and Data Collection

The full richness of such a genealogical source can only be exploited if it is digitized as a whole. Only in a complete genealogy can unbroken chains of family relationships be analyzed. Currently, a research project in evolutionary biology, funded by the Swiss National Science Foundation (SNFS 2015), based at the University of Zurich and led by Postma (2016), is striving to achieve a complete digitization of the genealogy of Glarus. It is an undertaking that will last for several additional years and was not an approach to follow for the current project. Rather, we randomly sampled from this genealogy in a similar vein as we did for the marriage registers of the canton of Lucerne. Cooperation with the just mentioned research project facilitated this undertaking substantially, as

[55] Dates of birth and deaths have been added in his handwriting. E.g., the volume on Diesbach, LAG, NG Cl. 68 B.

we were able to use the photographs they had taken from every single page of this handwritten genealogical work. Having this series of photographs at hand eliminates some of the practical restrictions of the sampling and data collection process. More specifically, there was no need to reduce the number of volumes to sample from. However, the sampling from the genealogy came with a different practical challenge: the long period covered by the genealogy, in which entries on the 19th century make up only a small fraction.

The aim of the data collection was to obtain a dataset comparable to the one from the canton of Lucerne in respect of intergenerational social mobility. This implies sampling from the generation of the sons married in a comparable period to the one for which data are available for Lucerne (1834–75). For Glarus, we stretched this period slightly: households were eligible for which at least one of the marriages of the head of the household lay in the period 1830–80. In order to be able to draw a sample from this population, we estimated the population size by counting the eligible entries on 433 pages chosen randomly from 11,874 pages in 28 relevant volumes.[56] From the 827 entries counted, we estimated the eligible population to include 22,700 households, from which we aimed to sample 9% (about 2,040 households).

Because of the large number of total pages, the random route sampling procedure used for Lucerne was not an option. As we had a list of all pages in each volume and of the corresponding file with the photograph, we decided to sample 9% of the pages and collect the data from all eligible entries from the selected pages. Of course, many of the sampled pages do not contain a single eligible entry, so the number of primary sampling units realized will be much lower than number of sampled pages (1,070), but with an average cluster-size well above the estimated average number of eligible entries of 1.9.

Following this sampling procedure, information on 1,440 households on 390 pages (primary sampling units) were sampled, which is substantially below the targeted sample size. The reason behind this cleavage is twofold. First, we decided to collect no data from the main parish of Linthal,[57] because the research group from Zurich had already collected the entries from this parish, which accounts for about 15% of the difference.[58] More importantly, we discovered a large number of duplicated entries that

56 The volumes LAG GE 29–36 include no entries from the 19th century.

57 The entries from Catholic Linthal have been appended to the volume LAG GE 10 and are included in the sample.

58 The research group kindly made an extract of these data available to me. However, I will not use these data for the analyses in this thesis, as the conformity of the two datasets needs further discussion and assessment.

we were not aware of at the time of the sampling. The largest part of them concerns the parish of Glarus: two series of volumes exist for this parish and all entries that concern the 19th century are present in both of them. Besides these systematic duplicates, entries were duplicated if the head of the husband married again in another parish. Thanks to the reference system, all these duplications are clearly marked, which makes it possible to exclude them. During the process of data collection, we decided, based on **Table 3-4**, whether or not an entry marked as duplicate should be included in the database. For example, if an entry in the parish of Betschwanden had been selected but a note pointed to a duplicated entry in the volume on Schwanden, we skipped the respective entry. In the reverse case, we transcribed the entry. In this way, the population size shrank without distorting the sample, as a doubled entry was included with the same sampling probability as all other cases.

Table 3-4. Assignment of cases mentioned in multiple registers

	GLARUS ALT	BETSCHWANDEN	BILTEN	ELM	ENNENDA	GLARUS	GLARUS, KATH.	KERENZEN	LINTHAL	LUCHSINGEN	MATT-ENGI	MITLÖDI	MOLLIS	NÄFELS	NETSTAL	NIEDERURNEN	SCHWANDEN	LINTHAL, KATH.
GLARUS ALT		↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑
BETSCHWANDEN	←		↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑
BILTEN	←	←		↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑
ELM	←	←	←		↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑
ENNENDA	←	←	←	←		↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑
GLARUS	←	←	←	←	←		↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑
GLARUS, KATH.	←	←	←	←	←	←		↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑
KERENZEN	←	←	←	←	←	←	←		↑	↑	↑	↑	↑	↑	↑	↑	↑	↑
LINTHAL	←	←	←	←	←	←	←	←		↑	↑	↑	↑	↑	↑	↑	↑	↑
LUCHSINGEN	←	←	←	←	←	←	←	←	←		↑	↑	↑	↑	↑	↑	↑	↑
MATT-ENGI	←	←	←	←	←	←	←	←	←	←		↑	↑	↑	↑	↑	↑	↑
MITLÖDI	←	←	←	←	←	←	←	←	←	←	←		↑	↑	↑	↑	↑	↑
MOLLIS	←	←	←	←	←	←	←	←	←	←	←	←		↑	↑	↑	↑	↑
NÄFELS OBERURNEN	←	←	←	←	←	←	←	←	←	←	←	←	←		↑	↑	↑	↑
NETSTAL	←	←	←	←	←	←	←	←	←	←	←	←	←	←		↑	↑	↑
NIEDERURNEN	←	←	←	←	←	←	←	←	←	←	←	←	←	←	←		↑	↑
SCHWANDEN	←	←	←	←	←	←	←	←	←	←	←	←	←	←	←	←		↑
LINTHAL, KATH.	←	←	←	←	←	←	←	←	←	←	←	←	←	←	←	←	←	

Source: author.

In terms of data collection, the main difference to the process followed for the canton of Lucerne concerned the database. Because of the complex structure of the genealogy, the design of the database is much more important than in the case of Lucerne. Most importantly, the design has to respect the cross-classified structure of the data: individuals are clustered within families but they can belong to multiples of them.

Indeed, they usually belong to a minimum of two: to their family of origin and to the one they have started themselves. Therefore, independently sampled siblings need to be attributed to the same family of origin and women should not be doubled in the dataset if they married twice.

In order to ensure this, the database created to collect the data followed the inherently relational structure of genealogy. More specifically, each entry in the table with the personal information refers to the family of origin, while the entries of the table with the family information refer to the respective wife and husband. This way, the "family" becomes the informational instance that combines husband, wife, and all children of the family. On the basis of this structure, it was possible to maintain the integrity of the database by starting each transcription of the sampled entry by a database query.[59] If this query returned results, the user had to select the adequate database entry or confirm the search result; if not, new entries were created based on the given search terms. For new entries, we collected almost[60] all information available for the selected household: technical data necessary for the reference system,[61] information available on all marriages,[62] personal information of the husband, the wife (or the wives), and all children (see **Table 3-3**).

In a second step in the data collection process, we completed the 1,440 observations by data from the entries of the husband's family of origin. In contrast to the family of the son, we collected only information on the father and the mother (and not on the eventual existing other marriages of the father[63]), as well as some summary data on both surviving and dead siblings of the sampled son.[64] As mentioned in the description of the source, new genealogical sequences start with the generation that left the first traces in the birth, marriage, or death registers. For example, households where the husband

59 Based on a few basic characteristics of the husband and the wife, such as the family name, the sequence number of the household of the family of origin and the year of birth.

60 Data on previous marriages of the wife have been omitted; instead, a categorical variable has been created on her civil state: unmarried, widowed, or other (usually, this means she has given birth to a child out of wedlock).

61 Parish, volume, page, link to the stored photograph, name of family, and number of household within this family.

62 Date of marriage, date of an eventual separation, and year and destination of possible migration.

63 Except the total number of marriages of the father, as well as the information on whether or not there were children from other marriages.

64 The total number of children born in this marriage and the number of boys and girls that survived the age of 20. Furthermore, information on the birth order has been added to all existing entries of children (overall place in the birth order, number of older siblings that survived the age of 20, and the number of siblings of the same sex that survived the age of 20).

originated from a place outside the canton will start such a new sequence. Consequently, for a husband of a household standing in the first position of such a sequence, no entry for his family of origin is available. In such a case, the father's occupational title is only known if it is given as a part of son's entry. **Table 3-5** shows that 389 of the 1,440 cases (27%) do not have a separate entry for the family of origin.

Table 3-5. Missing occupational class by availability of an entry for the family of origin
Source: author; based on the genealogy of Glarus.

	Family of origin has:					
	own entry		no own entry		Total	
Missing class:	Freq.	Col. %	Freq.	Col. %	Freq.	Col. %
not missing	803	76.40	32	8.23	835	57.99
father missing	111	10.56	214	55.01	325	22.57
son missing	108	10.28	5	1.29	113	7.85
both missing	29	2.76	138	35.48	167	11.60
Total	1051	100.00	389	100.00	1440	100.00

Without an entry for the origin family, the father's occupational title is known only in the rare case it is noted together with the son's entry. As a result, the occupational title of both father and son is known in only 8% of these cases. This almost total exclusion of the first generation in the canton of Glarus is the main driver for the high rate of missing values. While from later generations an occupational class can be assigned to son and father in 76% of the case, this is only possible for 58% of the whole population.

As described above, the eligibility criterion for the data collection was that at least one of son's marriages was concluded in the period 1830–80. This criterion facilitated the process of data collection. Moreover, it potentially allows comparing higher-order marriages to those from Lucerne. The latter is not relevant for the present purpose, as I focus on first marriages. Because of this sampling decision, a small number of very early first marriages has been included into the total sample. In other words, it adds a long left tail to the distribution of the dates of the first marriages. As the dates of marriage are essential for many of the subsequent analyses (for example, time-variant contextual variables have been attached according to the date of the son's first marriage – see below), I have limited the analytical sample to those married between 1830 and 1880, which reduces the sample by 126 cases. The final analytical sample for analyzing intergenerational social mobility therefore comprises 759 observations (see **Figure 3-12**).

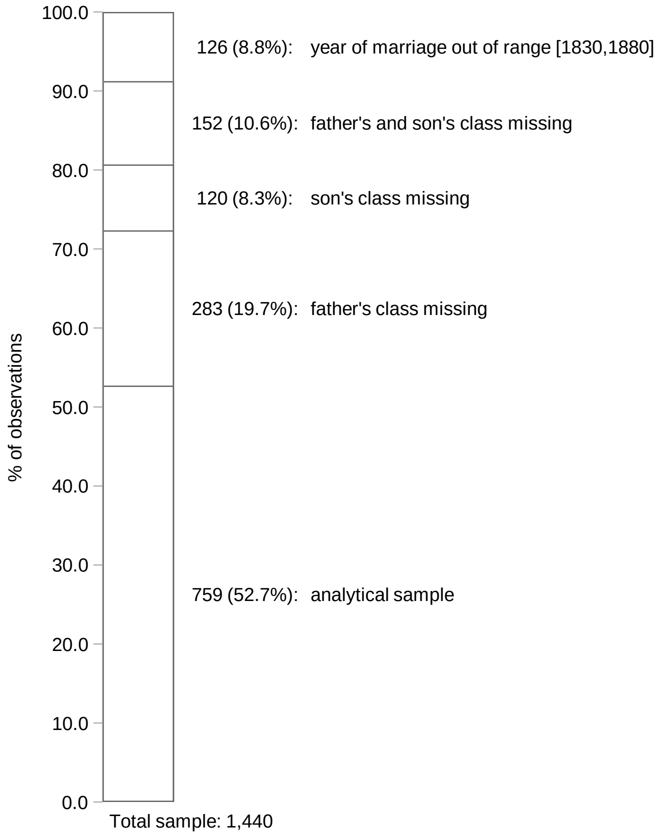


Figure 3-12. Glarus: Sources of sample reduction
Source: author; data based on the genealogy of Glarus.

In sum, the collected dataset is rather small, but rich and with an acceptable proportion of missing values on the essential variables for studying intergenerational social mobility. However, this last statement is only true for the "native" population, which is why reliable data are only available for those who originated from the canton of Glarus.

Multiple Occupational Titles: Which One to Choose?

As briefly discussed, the fact that Kubly-Müller compiled the genealogy from an array of sources can lead to difficulties in respect of occupational titles and other characteristics that may change across life. In some cases, an entry in the genealogy includes a long list of occupational titles. **Table 3-6** and **Table 3-7** give an overview of the number of occupational titles given for sons and fathers, respectively. Unfortunately, these lists of occupations are not ordered in an explicit way and, with some exceptions,[65] there is no hint as to the pertinent period of life. Therefore: which one should be chosen, if there are multiple occupational titles given for an individual?

[65] In some rare cases, occupational titles are given together with a year or even a period.

Table 3-6. Son: Frequencies of numbers of occupational titles given

	Freq.	Percent	Cum.
1 job	798	55.42	55.42
2 jobs	257	17.85	73.26
3 jobs	86	5.97	79.24
4 jobs	24	1.67	80.90
5 jobs	13	0.90	81.81
6 jobs	7	0.49	82.29
job missing	255	17.71	100.00
Total	1440	100.00	

Table 3-7. Father: Frequencies of numbers of occupational titles given

	Freq.	Percent	Cum.
1 job	562	39.03	39.03
2 jobs	239	16.60	55.63
3 jobs	105	7.29	62.92
4 jobs	30	2.08	65.00
5 jobs	16	1.11	66.11
6 jobs	9	0.63	66.74
7 jobs	3	0.21	66.94
19 jobs	1	0.07	67.01
job missing	475	32.99	100.00
Total	1440	100.00	

Source: author; based on the genealogy of Glarus.

The goal is to choose the titles that are, at least on average, the most comparable to the titles from the canton of Lucerne: father's and son's occupations at the time of the first marriage of the son – in other words, in the earlier state of the mature career in the case of the son and toward the end of the career in the case of the father. To approach this, there are several imaginable rules to follow: one could pick the first occupation in the list, the last, or the one with the highest status, pick one at random, or one could combine one of these rules with a procedure that aims at excluding titles that do not designate occupations strictly speaking. The latter refers to the fact that many of the given titles are titles of high prestige functions rather than gainful occupations. Kubly-Müller, for example, was employed as a confidential clerk of a trading company, but he also served as one of the communal councilors of Glarus, as civil judge, and as the commissioner of the local police (Marti-Weissenbach 2007). Much to the chagrin of Kubly-Müller (1912), he was paid for none of these posts. For analyzing social stratifications based on occupation, such titles of functions or public posts are problematic insofar they can mask the main occupation of a person. A wealthy farmer who additionally occupies the post of a communal officer still has the socio-economic resources of a farmer and should be assigned to the social class of farmers, even if he additionally draws on the prestige of the communal officer.

In order to avoid this masking by a function, I have coded each of the titles of non-manual occupations from the canton of Glarus according to whether the title primarily designates a high prestige function and not a gainful occupation. Examples for titles coded this way are all sorts of political functions, many of the public or clerical administrative posts, judges, or military officers.[66] In a second step, I have checked whether the propensity of a title for designating a function depends on the place in the list of occupations reported for a given individual. **Figure A-10** (Appendix A, p. 269) gives these estimates for the son, **Figure A-11** (Appendix A, p. 269) for the father. The results show that the seeming relationship is mainly driven by the fact that for holders of functions more titles are reported than for others (i.e., because those with only one title rarely occupied such a function). Subsequently, the relationship largely disappears when restricting the analyses to those who have at least one function in their list of occupational titles (see the second set of estimates in these figures). The same is true for status: the seeming relationship between the order in the list and the HISCAM value disappears when controlling for the number of titles in the list (see **Table B-2** (son) and **Table B-3** (father) in Appendix B, p. 284).

Therefore, the preliminary conclusion is that there is no evidence for an implicit ordering of the list of occupational status. While it remains unclear how Kubly-Müller proceeded when he set up the genealogy, there are some grounds for the assumption that he started with the marriage registers. The genealogy is structured by household, and most households have been constituted by a marriage. Moreover, within a genealogical sequence, the entries are usually sorted by the date of the first marriage of the household's head.[67] In respect to the son, a reasonable rule to choose from the list of occupational titles is therefore to pick the first one that does not designate a function. Because the ideal title for the father stems from a later time in life, I will choose the occupation with the highest HISCAM-status, while, again, avoiding functions. In respect to class linkage, the *M*-index in **Figure 3-13** shows that this choice leads to moderate results, but also that the rule of choosing from the list of occupational titles does not strongly affect the results.

66 The complete list of high prestige functions is reported in **Table B-1** (Appendix B, p. 284).

67 Unfortunately, a brief comparison of some marriage registers (LAG, Eheregister Schwanden, 1801–1875) and the genealogy neither confirmed nor contradicted this assumption and a systematic assessment is outside the scope of this dissertation project.

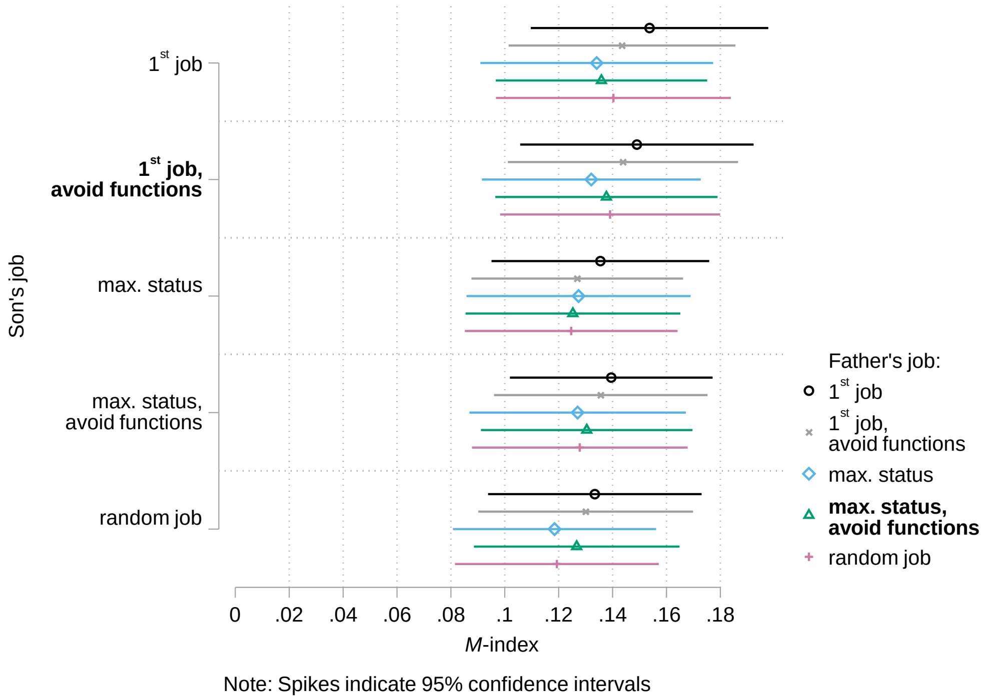


Figure 3-13. Glarus: *M*-index by rule of choosing the occupational titles for son and father

Note: Confidence intervals based on bootstrapped standard errors; 1,000 replications based on 823 observations in 203 clusters. Source: author; based on the genealogy of Glarus.

3.2.3 Auxiliary Data: Measuring Modernization

Testing the effects of modernization and industrialization on the importance of social origin can be done in two ways: indirectly, by comparing areas and/or periods of different levels of modernization; and directly, by specifying indicators for different aspects of modernization. Although limited by data availability, I will do both in the following analyses. While indirect tests have an important descriptive function, direct measures of modernization are of a higher analytical value. This is especially the case when comparing distinct areas or periods, which makes it likely that other processes are at work simultaneously with modernization and confound its effects (in the section 3.3.5 on social homogamy, such a confounding process is discussed in more detail).

Because both status attainment and modernization are complex processes, it seems to be almost impossible to ever rule out all possible confounders. However, direct measures of aspects of modernization are less vulnerable to such confounding than time trends. For example, by placing a new cultural significance on the family, the flourishing conservatism of the 19th century (Altermatt and Pfister 2010) may have bolstered the importance of social origin. Therefore, an increasing conservatism could strongly attenuate the time trend in social mobility, which serves as measure for modernization. Not controlling for this confounding process will attenuate any measure of modernization that follows the same time trend. However, a measure that both varies and works locally will most likely be less affected. An example of such a measure is the proportion of factory workers in a given parish. According to the modernization thesis, an increasing proportion of factory workers will decrease the importance of social origin because it devaluates the resources of the family of origin for an individual's status attainment. Because most inhabitants will work within their parish or municipality, this mechanism of industrialization can be expected to work locally. And while an overall correlation between the proportion of factory workers and the strength of conservatism cannot be ruled out, a close covariation of the two on the level of parishes or municipalities is very unlikely – especially when controlling for time trends. And because the confounding of time-measured modernization by other processes also works in the other direction – i.e., by processes that decrease social mobility without being related to modernization – it is not surprising to find results based on time trends contradicting results based on direct measures (e.g., Knigge et al. 2014b).

Being less confounded than time trends is not the only advantage of more direct and specific measures of modernization. As Zijdeman (2009) demonstrates, they allow for the testing of more particular hypotheses on the way modernization leads to more open societies in respect of social origin. He does so by relying on external data, such as the number of steam engines in a municipality, the presence of railway stations or post offices, or the number of students enrolled in secondary education per capita. Others have used data aggregated from the data used for studying social mobility (Lippényi et al. 2013) or a combination of the two (Knigge et al. 2014a).

Because the sizes of the samples used in this study are much smaller than the sample sizes of the studies mentioned, it is not feasible to calculate aggregated measures per parish. Unfortunately, external data related to modernization on the municipality level are very scarce in Switzerland. Nevertheless, it was possible to combine a small dataset of external data on modernization for each of the two cantons separately.

For the canton of Lucerne, this consists of two variables. The first stands for the presence of modern transportation and indicates that a railway station was available within the parish of marriage. The proportion of factory workers in each parish is the second variable, based on an external source. Schnider (1996: 48) reports harmonized proportions of factory workers in the population of each municipality for the years 1856 and 1877, when factory censuses were carried out. Following his description of the economic cycles and the waves of factory establishments (Schnider 1996: 41–69), we can assume that most of the factory jobs recorded in 1856 were created around 1850, and that many of the additional jobs recorded in 1877 were created around 1865. This gives a rough estimate of the longitudinal distribution of the proportions of factory workers in the parishes.

Schnider (1996: 48) reports the proportions in five categories: 0%, 0.1–2%, 2.1–5%, 5.1–9%, and 9.1–44%. Tests have shown that a proportion of about 5% factory workers marks an important threshold in respect to social mobility: using a parsimonious twofold categorization (0–5% vs. >5%) yields a fit comparable to the much more data-demanding fivefold solution. Therefore, for the analyses of mobility in Lucerne, I will compare parishes with a proportion of factory workers >5% to those with a smaller proportion among their population.

For Glarus, the situation is slightly more comfortable. Drawing on two sources, it was possible to construct a longitudinal dataset of macro-level data. First, thanks to the fact that Marti-Weissenbach was the (main) author of all the articles on each of the former[68] municipalities of Glarus in the Historical Dictionary of Switzerland,[69] coherent data on the population size, and the years of the connection to the railway network and the construction of secondary schools are available from this dictionary. In terms of industrialization, the appendix in Arx et al. (2005) provides valuable data. This lists each factory that has ever existed in the canton and gives the year of its establishment and closure. Further information on the factories is available for selected years; for the present purpose, 1869 and 1911 are the two pertinent ones. For these years, the number of spindles installed is reported for spinning mills, the number of looms for weaving factories, and the number of printing trolleys as well as printing machines for factories producing printed textiles.

In order to produce a longitudinal dataset from this information, I have imputed data based on this information using the following rules. First, for the years before 1869, I have carried backward the data from 1869 to the date of the factory's establishment. Second, the data for the years between 1869 and 1911 have been interpolated linearly. Third, the data for factories closed between the two dates have been carried forward until the date of closure. This is a rough but reasonable procedure because it fits well with the economic cycles and the industrialization process of the time (Rohr 2005,

68 Because of the radical merger of municipalities in 2011, today's canton of Glarus consists only of three municipalities.

69 Articles from Marti-Weissenbach (2016a, 2016b, 2016c, 2016d, 2016e, 2016f, 2016g, 2016h, 2016i, 2016j, 2016k, 2016l, 2016m, 2016n, 2016o, 2016p, 2016q, 2016r, 2016s, 2016t, 2016u, 2016v, 2016w, 2017a, 2017b, 2017c, 2017d, 2017e) and Marti-Weissenbach and Laupper (2016).

compare also section 3.1.3). More specifically, most factories were established between the 1830s and 1869 and only a few minor factories did not survive the year 1869. Furthermore, the growth in this period was mainly driven by the incremental establishment of a relatively large number of small factories and not so much by the growth of a few larger factories, which is not covered by this approach. Finally, the structural change from the 1860s onwards – with a shrinking printing but expanding weaving and spinning industry – is well captured by the combination of the incremental dropout of closing sites and linearly approximated change in the factories that existed both in 1869 and 1911. Overall, this approach underestimates the presence of very early industrialization, overstates the growth during the early wave of factory formation, and over-smooths the period around 1869 – but all on an acceptable level.

In a second step, I have aggregated these factory estimates to the municipality level and put them in relation to the population size. Municipalities population sizes have been estimated based on their actual population size in 1850[70] and data from the whole canton for every tenth year (Head-König et al. 2017). Because the population size changed evenly across the whole canton (Rohr 2005), estimating municipalities population assuming parallel growth is justified.

The obtained municipality level data have then been aggregated to the parish level. The reason for doing so is twofold. First, for a substantial portion of sampled sons we do not know the exact place of residence. For some, it is not known at all and for others the genealogy gives only an ambiguous field name. For all these cases, the parish is the best proxy for the place of residence. Moreover, many municipalities of the canton of Glarus were very small in the 19th century. Especially in the valley of the river Linth, it was easily possible to reach three or more neighboring villages, as they lie all within a radius of about 2km. In this situation, the parish was the natural geographical entity above the village, because the area before the church also served as a market for jobs, ideas, or marriages.

Table 3-8. Glarus:
Factor loadings of measures for spinning/weaving and for printing industry

	Factor1	Factor2
spindles, per 1 inhab.	0.070	0.700
looms, per 100 inhab.	-0.108	0.684
print trolleys, per 100 inhab.	0.917	-0.034
print machines, per 1000 inhab.	0.919	0.061

Note: unrotated principal factors. Source: author; based on data from Arx et al. (2005).

70 For sources, compare note 69.

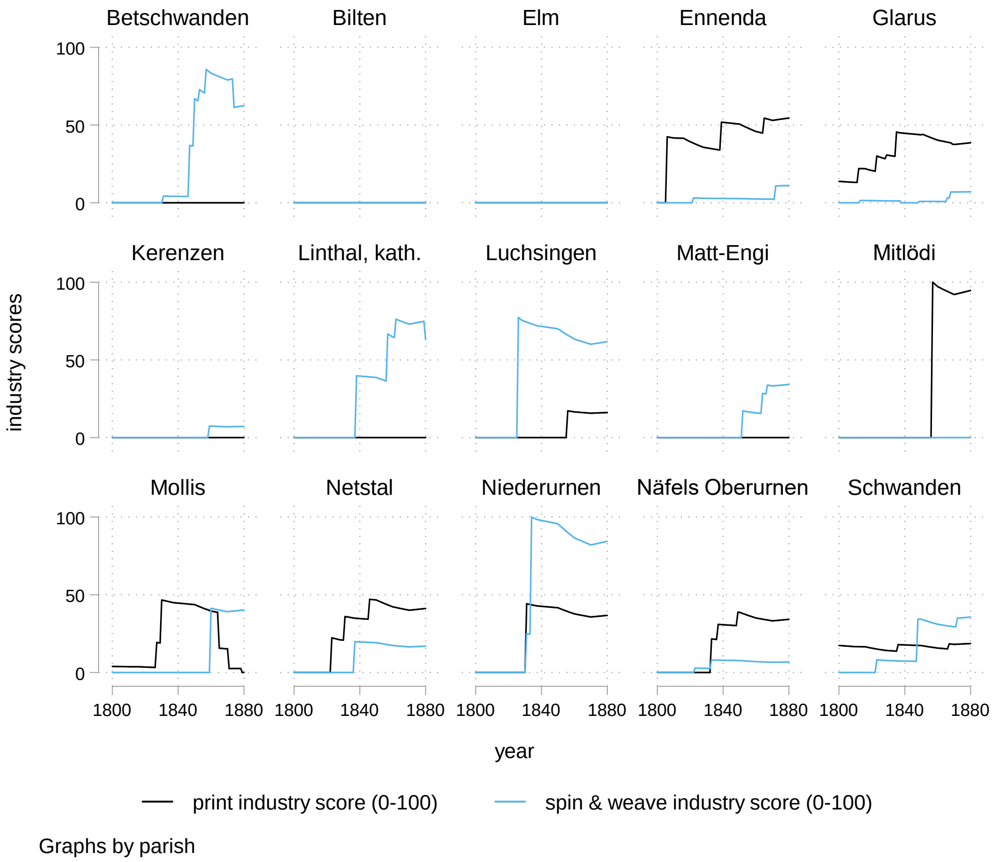


Figure 3-14. Glarus: industry scores by parish and across time

Source: author; based on data from Arx et al. (2005).

In respect to the industrialization of Glarus, the measures should reflect the two distinct types of textile industries depicted in section 3.1.3. Using the parish×year dataset resulting from the procedure described above, a factor analysis shows that the four factory measures derived from Arx et al. (2005) indeed measure two sharply separated dimensions of industrialization, with spinning and weaving loading on the same factor (see **Table 3-8**). Building on this result, two indices of industrialization have been predicted from a principal component analysis (performed individually for each dimension). The resulting scores (transformed to the interval [0,100]) are plotted in **Figure 3-14** and are in line with the picture drawn in section 3.1.3 based on the literature (printing preceding spinning and weaving and the two only rarely coexisting). Because the scores are highly skewed to the right, I use log-transformed versions of them (with $x^* = \ln(x+1)$), which yield much better fits than untransformed versions.

The industrialization indicators and the variable indicating an existing connection to the railway system are attached to the son's parish of marriage using the value corresponding to five years before the date of the first marriage. By contrast, the presence of a secondary school in the parish is measured when the son reached the age of 15.

***

Together, the micro-level data from the marriage register of Lucerne and the genealogy of Glarus and the macro-level data presented from auxiliary sources allow for the analyzing of observed social mobility and the intergenerational class linkage in an industrializing context. As sketched out above, the collected micro-level data are rich and allow us to study a variety of topics. For the present thesis, however, I will limit myself to analyses in direct relation to the nexus between industrialization on the one side and the importance of social origin on the other.

Consequently, I will use only a small subset of variables from the two micro-level datasets: the father's and the son's social classes, and the parish and year of the son's marriage. For the canton of Lucerne, one additional variable is introduced, indicating whether or not the son was locally rooted at his place of residence. This variable defines those grooms as locals, who reside within a radius of 2km of the father's place of origin. In Switzerland, the place of origin designates the municipality from which someone draws her or his citizenship and which was, until the 20th century, responsible for poor relief (Christ and Head-König 2006). Because the place of origin cannot be changed as easily as the place of residence, this variable measures local rootedness in a conservative way. Because the city of Lucerne attracted many migrants from the rural areas (see section 3.1.1), local rootedness can be expected to be an important driver for potential differences in social mobility between the city and rural areas of the canton of Lucerne.

While I will present the distribution of the sons' and the fathers' social classes together with the results of the main analyzes, descriptive statistics of the used covariates are presented in **Table 3-9** for Lucerne and

Table 3-10 for Glarus. For these tables, the variables used for the analyzes are complemented by indicators utilized for the construction of the industrialization scores for the canton of Glarus as well as the age at marriage for both cantons. While not directly used for the analyses,[71] the latter is relevant because it determines the year for which contextual variables were measured. Comparing Lucerne to Glarus, the data suggest that men from Glarus got married when they were, on average, about seven

71 Age at marriage could be an important confounder when comparing social mobility because the importance of social origin can be expected to decline across life. However, preliminary analyses have shown that controlling for age at marriage does not change the results when limiting the sample to first marriages.

years younger than their counterparts from the rural areas of Lucerne.[72] Another striking result it is the very low proportion of local sons in the city of Lucerne: only about 13% of those married in the canton's capitol lived in the place of origin of their fathers.

Table 3-9. Lucerne: Descriptive statistics of covariates

	Rural Lucerne		City of Lucerne		Total		
	mean	sd.	mean	sd.	min.	median	max.
Demographics:							
- Year of marriage	1857.0	13.2	1859.8	13.3	1834	1861	1875
- age at marriage	*33.4*	*7.90*	*31.9*	*7.12*	*18.7*	*31.5*	*70.0*
- son is local	0.47		0.13		0	0	1
Parish-level variables:							
- factory workers >5%	0.12		0		0	0	1
- has railway station	0.15		0.61		0	0	1
Observations	1106		594		1700		

Table 3-10. Glarus: Descriptive statistics of covariates

	mean	sd.	minimum	median	maximum
Demographics:					
- Year of first marriage	1858.2	14.0	1830	1859	1880
- age at 1st marriage	*26.4*	*5.64*	*18.3*	*24.9*	*68.8*
- age at death	*63.2*	*15.0*	*23.1*	*65.0*	*103.8*
Industry measures:					
- spindles, per 1 inhab.	*3.82*	*6.32*	*0*	*1.23*	*32.9*
- looms, per 100 inhab.	*4.00*	*5.75*	*0*	*0*	*29.9*
- print trolleys, per 100 inhab.	*9.53*	*7.42*	*0*	*8.05*	*34.4*
- print machines, per 1000 inhab.	*1.24*	*1.06*	*0*	*1.32*	*4.91*
Industry indices:					
- Printing industry score, ln(x+1)	2.60	1.56	0	3.45	4.58
- Spinning & weaving industry score, ln(x+1)	1.93	1.47	0	2.04	4.61
- Printing industry: above median	0.75	0.43	0	1	1
- Spinning & weaving industry: above median	0.76	0.43	0	1	1
Other parish-level variables:					
- railway station in parish	0.17	0.38	0	0	1
- secondary school in parish	0.48	0.50	0	0	1
- inhabitants ~1850, in 100	*35.3*	*17.1*	*7.33*	*27.8*	*58.7*
Observations			**569**		

Note: Variables reported in italics are not directly used for the analyses. Source: author; for data, see text.

[72] To give a comparison: both values are outside the range of the average age at marriage reported by Maas and van Leeuwen (2016: 852) – the age at the first marriage in Glarus was lower than the country with the lowest value (Britain, 26.9), the one in Lucerne above the country with the highest value (Finland, 28.1).

3.3 Industrialization and Social Mobility in 19th Century Lucerne and Glarus

The aim of this section is to analyze the importance of social origin for individuals' status attainment, while focusing on the question of how this origin effect has changed over the course of the (early) industrialization in the cantons of Lucerne and Glarus. The approach of this section is inherently comparative. I ask whether the importance of origin differed between areas; I compare cohorts and analyze time trends; and I assess the influence of modernization by drawing on measures for the availability of modern means of transportation, educational expansion and the degree of industrialization.

Inheriting a particular occupational class is the most salient result of a social origin effect, and it can be seen as the most traditional form of that effect. Sorokin (1927/1959), for example, concluded that there was “a definite tendency toward a decrease of ‘hereditary’ transmission of occupation” (Sorokin 1927/1959: 421), while the resources of the family of origin “continue to play […] a very considerable part” (Sorokin 1927/1959: 450). Starting from this conclusion, I will begin each comparison with an analysis of the mobility observed. In other words, I will analyze the proportion of sons who belonged to a different class than their fathers. While class inheritance covers an important aspect of the relevance of social origin, two processes of social stratification can be hidden from view in analyses of class inheritance. First, belonging to the same class as the father can also happen by chance, without any inheritance mechanisms involved. This is especially likely if both generations are concentrated in the same class. Simple analyses of observed mobility are blind to the amount of such randomness involved in a particular pattern of mobility. Second, and as discussed in section 2.1, analyses of observed mobility also ignore the influences of social origin that may exist even when son and father do not share the same class – for example, when the likelihood of becoming a medical doctor are higher for the son of an innkeeper than for the son of a shepherd.

Therefore, the analyses of the observed mobility will be presented at the beginning of each of the comparative analyses, but I will then complement them by analyses that focus on intergenerational class linkage, which I will compare by using the *M*-index. Further insights will be gained by decompositions of the *M*-index. First, the decomposition of pairwise differences between two contexts into the portion stemming from differences in the marginal distribution and differences stemming from the internal structures of each context’s mobility table helps to uncover underlying processes. From a more descriptive point of view, decompositions by class of origin or destination deepen the analyses. These analyses answer the question of whether the intergenerational class linkage changed uniformly for all individuals or whether this change was of particular relevance for descendants of a certain class of origin.

The remainder of this section is organized as follows. I will first establish the theoretical arguments by sketching out some elements of a theory of social mobility and how modernization processes may interfere with the underlying mechanisms. On this basis, I will derive hypotheses regarding differences in social mobility between areas, regarding time trends, and regarding effects of more directly measured modernization processes. I will then describe the analytical approach taken to test these hypotheses. The results are presented in three sub-sections: while the first analyzes differences between rural Lucerne, the city of Lucerne, and the canton of Glarus, the second and third investigate differences within Lucerne and Glarus, respectively. The section will conclude with a preliminary conclusion on the relationship between early modernization and social mobility.

3.3.1 Theory and Hypotheses

Explaining changes in intergenerational social mobility requires two steps: answering the question why social origin is assumed to be relevant for an individual's status attainment and answering the questions why, and how far, this influence of social origin has changed over time. In respect to the former, researchers usually refer to the model of status attainment formulated by Blau and Duncan (1967). In its most simple form, this model links origin and destination via two paths: a direct one and an indirect one running through an individual's educational attainment. This model continues to be a helpful guide – especially with respect to the mediating role of an individual's educational attainment (for a recent review in this domain, compare Posselt and Grodsky 2017). However, as Bielby (1981) noted, "a causal ordering that allows the specification of a recursive structural equation model is certainly *not* a model of generative mechanisms" (p. 15, emphasis in original).

To the best of my knowledge, a sound and comprehensive theory of social mobility is still lacking and this thesis will not fill this gap. Rather, my aim is to put together basic theoretical elements in a way that make it possible to derive some fundamental hypothesis that is capable of guiding the analyses in this chapter. In pursuit of this aim, I build on the resource-centered work of Kelley et al. (1981), which I combine with the matching approach inspired by Coleman (1987, 1991) and adapted to the mobility problem by Knigge et al. (2014a), and the distinction between different types of resources mentioned by Goldthorpe (2007: chapt. 7). In order to derive hypotheses regarding changes in social mobility, I will combine these theoretical elements regarding social mobility with the modernization thesis. Furthermore, dualism theory (Nielsen 1994) will be introduced, which leads to hypotheses regarding changes in social mobility that differ from the classical modernization thesis for the early phase of industrialization.

Social Mobility and Modernization

In the literature on social inequality and stratification the term "modernization thesis" usually refers to a construct based on the writings of Kerr et al. (1960), Parsons (e.g. 1960), and other North American social scientists of the 20th century (cf., Erikson and Goldthorpe 1992: 3). In other words it is based on the concept of modernization in its "classical" form, which took shape in the 1950s. In that view, "modernization" is a combination of unidirectional processes mutually reinforcing each other; namely: industrialization, democratization, bureaucratization, rationalization, and secularization (Mergel 2012). The modernization thesis assumes that the change from a pre-industrial to an industrial society was quite fundamental and changed many aspects of life. While many of its aspects have been criticized (e.g., Tipps 1973), the modernization thesis has created influential hypotheses in research on social stratification (Hout and DiPrete 2006). In that respect, the modernization thesis states that as modernization progresses social origin loses its importance. More specifically, modernization is thought to change the process of status attainment, for while the thesis assumes that in traditional societies the direct link between a parent and a child's status is dominant, it presumes that in modern societies an indirect path, via education, will be the main path connecting the status of parents and children. However, the indirect path will not completely replace the direct one, which results in a weakening link between the generations (Blau and Duncan 1967; Treiman 1970).

Modernization processes can influence the effect of social origin in two distinct ways. Either they change the inequality among the families of origin or they alter the transmission of the inequality to the next generation. In order to respect this distinction, I will split "effects of social origin" into two analytical instances: the potential of social origin to steer an individual's status attainment (P) and the realized effect of social origin (Y).[73] Consequently, external processes (X), such as modernization processes, can effect Y either indirectly via P:

[73] In the present thesis, I focus on the class linkage between two generations. Alternatively, this linkage can also be thought of as the result of an underlying latent factor, inherited from one generation to the next across multiple generations. P in the model developed here shares some properties with this latent factor, which opens up the possibility of integrating this first

$$X \rightarrow P \rightarrow Y \quad 3\text{-}1$$

Alternatively, they can moderate *P*'s effect on *Y*:

$$P \xrightarrow{\text{moderated by } X} Y \quad 3\text{-}2$$

For Kelley et al. (1981), social status is a function of an individual's resources (especially physical capital, such as wealth (Killewald et al. 2017), and human capital (Becker 1975)), which partly stem from her or his parents. For the present purpose, it is important to distinguish between two types of resources, both in respect to wealth and human capital (roughly following Jonsson et al. 2009). One is a general 'more-is-better' type of resources: resources that are closely related to socioeconomic status. Such resources comprise wealth, general education, and other forms of general cultural and social capital (Bourdieu 1983). The basic assumption here is that some social destinations need more resources than other destinations, and that some origins contribute more to these resources than the origins do. This is also the assumption behind scoring models (DiPrete 1990: 761). In other words, a steering potential drawing on general resources equips those from higher origins with a greater likelihood of entering higher classes of destination than descendants of lower classes. On the other hand, a second type of resources are those resources that are bounded to a specific social class or occupation (Jonsson et al. 2009), which includes assets and properties tied to the occupation (such as farms, shops, and other businesses), vocational skills (both acquired on the job and by formalized training), and class- or even occupation-specific human, cultural, and social capital (compare Grusky 2005).

Both types of resources are transferable from one generation to the next – by direct inheritance, parents' support, acquiring skills by helping in the parents' workplace, or by implicit learning through discussions at home (Jonsson et al. 2009). This creates, through social origin, inequality in the resources that are relevant for specific occupations or a higher status, which, in turn, is the basis for the potential of social origins to steer an individual to a particular class. The inequality in general status resources creates the potential P_{status} to steer individuals with plenty of these resources towards higher destinations, and to steer individuals lacking these resources towards lower positions. Analytically distinct, class-specific resources create the potential P_{class} to steer individuals towards the class to which their parents belong, because it is in this

sketch into the model proposed by Clark and Cummins (2015) and further developed by Braun and Stuhler (2018).

class that such resources are of value – they are valuable to a lesser extent in an adjacent class.

In other words, the actually realized steering power of social origin (Y) is driven by the combination $P = P_{class} + P_{status}$. Because P is created by unequally distributed resources, the level of inequality in a given society X_{ineq} is a first contextual driver of the importance of social origin:[74]

$$X_{ineq} \rightarrow P \rightarrow Y \tag{3-3}$$

Following Treiman's (1970) restatement of the modernization thesis, structural changes caused by industrialization result in a reduction in the direct effect of social origin on an individual's social position. The decreasing share of the labor force engaged in agriculture, on the one hand, and the creation of new jobs because of technological change and specialization, on the other, reduce the number of jobs for which the skills developed by helping one's parents are beneficial (Lipset and Zetterberg 1959: 57–60; Knigge et al. 2014b). Because occupation-specific skills are learned at home to a decreasing degree, occupation- and class-specific resources differ less by social origin. Therefore, modernization is expected to lead to less immobility because structural change decreases the class-based steering potential of social origin. Because it is the steering power that is reduced by this mechanism, it can be expected both that observed mobility is increased and the intergenerational class linkage is weakened (the relationship between observed and relative mobility will be scrutinized below). Therefore, with X_{struct} referring to structural change and using arrows (↗, ↘) to indicate the assumed direction of change, we can write:

$$X_{struct}^{\nearrow} \xrightarrow{(-)} P_{class}^{\searrow} \rightarrow Y_{inherit}^{\searrow} \tag{3-4}$$

Following the classical modernization thesis, similar changes can be expected in respect of the more general resources fostering P_{status}. This thesis predicts that social and cultural resources will be available to a widening part of the population. Educational expansion not only provides the population with the knowledge and skills necessary for newly created occupations, but also creates an opportunity for them to meet pupils from a different class background (Kerr et al. 1960: 36–7; van Leeuwen and Maas 2005). The emergence of mass media and modern transportation supports the development of a common culture and, thus, the diminution of differences "in attitudes and behavior" by social origin (Treiman 1970: 219). Because of these institutional changes (X_{inst}),

[74] Compare Knigge et al. (2014a) for a discussion of the relevance of inequality for the effects of social origin.

modernization thesis expects the importance of social origin for becoming an incumbent of a given class to decrease. Therefore, we can note:

$$X_{inst}^{\nearrow} \xrightarrow{(-)} P_{status}^{\searrow} \rightarrow Y^{\searrow} \qquad \text{3-5}$$

However, questions have been raised regarding the assumption that the inequality in respect to both class-specific and general resources simply decreases monotonically (Nielsen 1994; Knigge et al. 2014a). In his influential paper, Kuznets (1955) pointed out that it is not only the inequality within each sector that needs to be taken into account: it also needs to be understood how differences between sectors create between-sector inequality (called "sector dualism"; Nielsen 1994). More specifically, assume individuals in sector A have few resources on average and individuals in sector B have many resources, while the inequality is the same within either sector. As long as one sector is much smaller than the other sector, the differences in resources between sectors is of little importance. However, if the two sectors are of about equal size, the difference will contribute significantly to the overall inequality, in addition to the inequalities within each sector (for more detailed simulations see Alderson and Nielsen 2002). Therefore, when a society shifts from being dominated by sector A to being dominated by sector B (process $X_{A \rightarrow B}$), an inverted U-shaped relationship between this change and inequality can be expected. In other words, inequality initially increases, then peaks, and then decreases as a function of the increasing importance of sector B. Because of relationship 3-3, we can expect the same pattern in respect of the importance of social origin:

$$X_{A \rightarrow B} \rightarrow X_{ineq}^{\nearrow\searrow} \rightarrow P^{\nearrow\searrow} \rightarrow Y^{\nearrow\searrow} \qquad \text{3-6}$$

While the theory of sector dualism was formulated for the case of income inequality and similar gradually distributed resources, it can easily be adapted to class-specific resources. Resources inherited from a father who is a farm worker are likely to be of some use in relation to becoming a farmer, as are the resources of a father who is an unskilled worker in relation to becoming a skilled worker. By contrast, a farm worker's class-specific resources are of less use in relation to becoming a skilled worker, while the same can be expected for sons of unskilled workers who want to become farmers. In other words, class-specific resources are, to some extent, also sector-specific resources – an idea that was also important for the development of the model of core social fluidity by Erikson and Goldthorpe (1992: 127). Applying the theory of sector dualism, this difference between agrarian classes and industrial classes initially increases and then decreases the inequality in class-specific resources by social origin when the industrial sector becomes more important at the expense of the agrarian sector. Because in industrial classes, origin can be expected to be less important for the formation of class-specific resources (compare the rationale behind relationship 3-4), we can expect that a less important initial increase in inequality will be followed by a more important decrease in inequality:

$$X_{A \to B} \to X_{ineq:class}^{\nearrow\searrow\searrow} \to P_{class}^{\nearrow\searrow\searrow} \to Y_{inherit}^{\nearrow\searrow\searrow} \qquad 3\text{-}7$$

Whether social origin is effectively relevant for an individual's status attainment depends not only on the level of P but also on the frictions involved in realizing this potential. These frictions also depend on the social context. One of these frictions is structural change, which goes back to Sorokin's (1927/1959) idea and observation that shocks tend to increase social mobility. At this point, an important question is whether these processes equally affect both observed mobility and a more general intergenerational class linkage (relative mobility). In their study on social mobility in seven industrializing European countries, Maas and van Leeuwen (2016: 871) reported the "unexpected finding" that the two evolved in parallel. While consistent with the prediction of the modernization thesis, this is at odds with other conclusions (for example, Breen and Luijkx 2004).

My argument here is that the accordance between observed and relative mobility can be expected if P is dominated by P_{class}, and that the two can (but do not necessarily need to) diverge if the steering potential of origin stems predominantly from general resources.

By definition, P_{class} can only influence the class affiliation of a person by steering him or her to the class of the mother or father. In other words, this potential is only realized in the event of class inheritance – in this case, the part of the immobility rate that surpasses the rate expected by chance alone parallels the general class linkage between the two generations. By contrast, P_{status} is more versatile, and it keeps its steering power even in the case of class mobility. Following the basic idea of Boudon (1974), these types of resources nevertheless tend to steer individuals towards class maintenance. This is because leaving the accustomed social context comes with costs that (at least partially) counteract the benefits of upward mobility.

If we think of the effect of social origin as a combination of steering toward class inheritance and non-hereditary steering off the diagonal of a mobility table (thus: $Y = Y_{inherit} + Y_{odiag}$), we can summarize these relationships as follows:

$$\begin{aligned} P_{class} &\to Y_{inherit} \\ P_{status} &\to Y_{inherit} + Y_{odiag} \end{aligned} \qquad 3\text{-}8$$

To be clear: when individuals are steered towards class inheritance, it means that their likelihood of belonging to the class of their parents is greater than that of individuals from different origins. Steering means an unequal likelihood, and can be measured in terms of relative mobility.

Structural change leads to forced mobility and forced mobility is not relevant for relative mobility. However, forced mobility may weaken the steering potential of social origin. If X_{struct} denotes structural change, a naïve representation of this claim is: $X_{struct} \rightarrow Y_{inherit} \rightarrow P$. This is not sensible, because it reverses the causality in the second part of the path. Rather, structural changes moderate *P*'s effect on $Y_{inherit}$: they do not alter *P* but devaluate it. Thus:

$$P \xrightarrow{\text{moderated by } X_{struct}} Y_{inherit} \quad \text{3-9}$$

In sum, if we assume the existence of a tendency towards class reproduction, we can conclude that structural changes can reduce the importance of social origin by limiting the room for *P* to be realized in the form of $Y_{inherit}$. Because P_{class} can only produce $Y_{inherit}$ but not Y_{odiag}, structural changes can have larger effects if P_{class} makes up a large portion of *P*. In such a case, structural changes will have similar effects on the general intergenerational class linkage (and therefore on relative mobility) as they have on observed mobility. With general resources, the concurrence of observed mobility and relative mobility is not so necessary. If changes in the marginal distribution do not permit class inheritance, P_{status} will steer individuals even outside the diagonal of a mobility table. In such cases, observed and relative mobility will diverge.

For the 20th century, Featherman and Hauser (1978: 97) have calculated that class inheritance accounts for about .75 of the association between a father and son's social position. If we follow Sorokin (1927/1959; compare the introduction to this section), we can assume that the hereditary aspect of this association was even larger in earlier times. For the 19th century, therefore, it is reasonable to assume that structural changes did not only affect observed mobility but also the importance of social origin in general. Therefore, we can generalize the last expression to the relationship:

$$P \xrightarrow{\text{moderated by } X_{struct}} Y \quad \text{3-10}$$

Because structural change during industrialization is an important aspect of the modernization thesis, we can assume that during industrialization, the realization of *P* is limited by structural changes:

$$P \xrightarrow{\text{limited by } \nearrow X_{struct}} Y^{\searrow} \quad \text{3-11}$$

Changes in the occupational structure are not the only friction that may occur in the relationship between P and Y. Occupational positions can usually not been bought as directly as a loaf of bread. Rather, either one needs to be hired to become an employee or worker (Coleman 1987, 1991), or one depends on customers trusting in one's ability to produce good quality goods. Thus, if social origin contributes an essential portion to the resources that are relevant for a specific job, employers (or costumers) will base their decision also on information when screening applicants and placing them in a job queue (Knigge et al. 2014a). Obviously, this is only possible when social origin is known. In a context where information on origin is not available or is uncertain, employers may base their decisions on "transportable information", such as educational certificates. Thus, the realization of origins' steering power (Y) is moderated by the level of information on an individual's origin present in a given social context (X_{info}):

$$P \xrightarrow{\text{moderated by } X_{info}} Y \qquad \text{3-12}$$

Urbanization and increased geographical mobility boosted by new means of transportation can be expected to lower the level of information available on someone's family background, limiting the realization of the steering potential of social origin (Treiman 1970; Knigge et al. 2014a). Thus:

$$P \xrightarrow{\text{limited by } X_{info}^{\searrow}} Y^{\searrow} \qquad \text{3-13}$$

Finally, the prevailing hiring procedures moderate the realization of origins' steering potential in a similar way as the availability of the information on social origin. For example, a rational and bureaucratized hiring procedure will be based less on informal knowledge and more on certificates, by comparison to spontaneous, non-formalized hiring agreements. Thus, even if information on family background is available, direct effects of social origin will be weaker in a context with strongly formalized hiring procedures:

$$P \xrightarrow{\text{moderated by } X_{rational}} Y \qquad \text{3-14}$$

The increasing size of enterprises during industrialization comes with a rationalization and bureaucratization of production. This means that employers increasingly rely on certified achievements (such as education certificates), rather than on ascribed characteristics (like social origin) when hiring new employees, as these characteristics are more pertinent for assessing productivity (Treiman 1970):

$$P \xrightarrow{\text{limited by } X_{rational}^{\nearrow}} Y^{\searrow} \qquad \text{3-15}$$

The above two arguments point to the increasing importance of education for class affiliation. The question remains whether this weakens the importance of social origin. Educational certificates can be understood as costly signals regarding productivity (Spence 1973).[75] Yet, if the required investment for such a signal is unequally distributed by origin, the family background could continue to be important. For example, the investment a baker's son makes to obtain a baking certificate may be lower than the investment made by the son of a carpenter to obtain such a certificate. In this case, the steering potential can nevertheless be realized – to which degree it does so, however, depends on the extent of the prevailing inequality of educational opportunities.[76]

The classical modernization thesis expects education to be a driver of increased mobility and decreased importance of social origin. As discussed above, educational expansion is one of the processes that makes social and cultural resources available to a widening part of the population (process 3-5). Following this argument, we can assume that modernization, including educational expansion, lowers the importance of social origin by distributing general resources more equally:

$$X_{educ}^{\nearrow} \overset{(-)}{\longrightarrow} P_{status}^{\searrow} \rightarrow Y^{\searrow} \qquad \text{3-16}$$

However, Nielsen (1994) has pointed out that the idea of sector dualism can be generalized and may also be of relevance in regard to the inequality of educational opportunities. In this view, education spreads unevenly in a given society during early educational expansion, privileging the elites, while it is only during the later phases that educational expansion is beneficial for all strata of a society. Therefore, educational inequality, as an essential part of differential resources by social origin, can be expected to rise initially and decrease later. Accordingly, we can note:

$$X_{educ}^{\nearrow} \overset{(-)}{\longrightarrow} P_{status}^{\nearrow\searrow} \rightarrow Y^{\nearrow\searrow} \qquad \text{3-17}$$

General Hypotheses

The discussed mechanisms give rise to partly conflicting predictions, especially concerning the early phase of industrialization. However, they can be bundled into two groups of explanations. The first consists of all predictions that are directly linked to the classical modernization thesis. All corresponding relationships (3-4, 3-5, 3-11, 3-13, 3-15,

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75 See Raut (1996) for an earlier formal theorization of social origin as a signal.

76 Bourdieu and Passeron (1970) assume that this path became the dominant path of status maintenance. In their view, the increasing importance of educational credentials opens a pathway to the social and cultural reproduction of the elites. In this way, the upper classes can compensate for the decreasing possibilities of direct class inheritance by securing a cultural superiority. This "no-trend-prediction" is not considered here.

and 3-16) indicate a monotonic decrease in the importance of social origin as a result of the named modernization processes. Therefore, a first, general, hypothesis follows directly from this main statement of the modernization thesis:[77]

> H_{modern} More modernized areas or periods exhibit higher social mobility and the class linkage is weaker in these contexts.

For the second set of mechanisms, we can replace all inequality-related relationships by those inspired by dualism theory (3-6, 3-7, and 3-17 instead of 3-4, 3-5, and 3-16). For the early phase of modernization, these mechanisms assume increasing inequality and therefore an increasing importance of social origin for belonging to a given class. At the same time, bureaucratization and rationalization processes (3-15) that could potentially offset these inequality-driven mechanisms became important only after the early stage of industrialization (in Switzerland after 1880; König et al. 1985: 39–60). Therefore, migration is the only mechanism that could mask an increasing trend in the importance of social origin during initial industrialization, by erasing the information on a person's social background (relationship 3-13). Accordingly, we can assume, overall, an increasing importance of social origin during early modernization when holding migration constant. For later phases, all these mechanisms assume a decreasing importance of social origin. In summary, an inverted U-shaped relationship between modernization and the importance of social origin can be assumed – at least if there are no dramatic changes in migration:

> H_{sector} With industrialization, the importance of social origin first increases, then levels off, and then decreases after the initial phase of industrialization.

In respect to different areas, the obvious comparison is the one between rural Lucerne and Glarus. From the historical description above, it is clear that in the 19th century, Glarus was far more industrialized than Lucerne. According to the modernization thesis, therefore, social mobility can be assumed to have been greater in Glarus than in rural Lucerne. Therefore, we can expect the following hypothesis to be confirmed by the data:[78]

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77 As noted in the last sub-section, for the contexts studied here, there is no theoretical argument for assuming divergent trends in observed mobility and the class linkage. For this reason, the following hypothesis makes the same statement, both on observed mobility and on the importance of social origin. Furthermore, "class linkage" always refers to the linkage between the father's generation and that of the son.

78 In the canton of Glarus, sector dualism peaked before the observed period. However, it remains unclear whether the initial increase in inequality had already been offset by the middle of the 19th century. Therefore, the idea of sector dualism does not lead to a clear alternative hypothesis to H_{GLvsLU}.

H_{GLvsLU} In Glarus, social mobility was higher and class linkage was weaker than it was in rural Lucerne.

I will not put forward a hypothesis regarding a comparison between the city of Lucerne and the canton of Glarus. The two areas are different in too many aspects (industrialization, urbanization, education, etc.) for the interplay between them to be predicted. By contrast, the difference between rural Lucerne and the city of Lucerne can be clearly captured in the framework presented above. According to the modernization thesis, urbanization is a driver of social fluidity. People migrating to a city have to rely on their own achievements (Treiman 1970: 220), because the information on their social origin is not available. Due to the strong migration toward the city in the 19th century (section 3.1.2), we can expect the following:

H_{city} In the canton of Lucerne, social mobility was greater and class linkage was weaker in the city of Lucerne than it was in rural Lucerne.

Finally, the availability of a connection to the railway network is the only direct measure of modernization available for both cantons. The establishment of a railway network allowed individuals to travel further afield and to find work elsewhere. Perhaps it was not used so much for commuting, but the railway network clearly reduced the costs (in terms of time and loss of social contacts) of moving to a different place and working there. For these individuals, employers would most likely not have access to informal knowledge on their social background. Therefore:

H_{rail} In places that were connected to the railway system, social mobility was greater and class linkage was weaker.

Hypotheses Regarding Social Mobility in Lucerne

Above, hypothesis H_{city} expects that the city of Lucerne was more open than rural Lucerne. The main argument was the migration towards the city. Therefore, we can refine this hypothesis:

H_{local} The relatively low proportion of locally rooted individuals was the main driver of the greater social mobility in the city of Lucerne, compared to rural parts.

In respect to time trends, a general trend towards greater mobility can be expected both in Glarus and in Lucerne when applying the classical modernization thesis (the arguments behind hypothesis H_{modern}). However, Lucerne witnessed a clear crisis in the middle of the century: this crisis was not a structural one, caused by an extreme industrialization; rather, it was mainly a traditional crisis, caused by war and food shortages. In such a situation, the resources of the family of origin can be expected to become more valuable. For example, sons may prefer a poor but relatively secure existence on their parents' small farm, rather than heading for a more remunerative but insecure job in a factory. Similarly, a son of a craftsman could decide to follow in his father's footsteps, rather than choosing to pursue a higher education that could, one day, allow him to work as a clerk. Combining this rationale with the modernization thesis (H_{modern}), we can assume:

$H_{LUtrend}$ In Lucerne, the general trend toward openness slowed down around the middle of the century.

Despite the modernization of the canton, Lucerne remained predominantly agrarian throughout the 19th century (compare section 3.1.2). Therefore, it makes little sense to apply the theory of sector dualism to the canton as a whole in order to predict time trends. However, in some limited areas, industrialization was strong enough that effects on the social stratification are plausible. Industrialization, measured by the proportion of factory workers in a parish at a given time, should capture these differences. For such a measure, sector dualism leads to an alternative hypothesis to the prediction based on the modernization thesis. The shift from the agrarian to the industrial sector is one of the modernization thesis's key arguments for the decreasing importance of social origin for individuals' class affiliations. Thus, the classical modernization thesis predicts:

$H_{industM}$ An increasing proportion of factory workers in a location's population increases social mobility and weakens the class linkage.

Yet, even in more industrialized parishes of the canton of Lucerne, the proportion of factory workers remained low (typically well below 20%). Therefore, industrialization means early industrialization for all parishes in the canton of Lucerne – which in turn implies increasing sector dualism, with increasing proportions of factory workers. Consequently, for this specific historical context, a hypothesis regarding the effect of industrialization considering sector dualism directly contradicts the $H_{industM}$:

$H_{industS}$ In 19th-century Lucerne, an increasing proportion of factory workers in a parish's population decreased social mobility and strengthened the class linkage.

Because of the importance of agriculture in the canton of Lucerne, the fate of the large farming part of the population is of special interest. For Xie and Killewald (2013), the unexpectedly increasing importance of social origin found for the United States by Long and Ferrie (2013a) highlights the importance of farmers when analyzing social mobility during the transition from an agrarian to an industrial society. More specifically, they identified a persistently high rate of self-recruitment among farmers: most of the sons of farmers continued to be farmers themselves (Xie and Killewald 2013: 2016). Xie and Killewald's explanation is plausible: because only one son can inherit a farm, there is a constant oversupply of farmers' sons, which is further increased by the shrinkage of the sector. Furthermore, because farming takes place "at home", sons of farmers continued to acquire farming-specific skills during childhood (Laband and Lentz 1983). This last observation contradicts the general trend assumed by the modernization thesis ($H_{industM}$), which states that industrialization diminishes the relevance of occupational skills acquired at home. Therefore:

> H_{farm} For becoming a farmer, social origin continued to be decisive.

The opposite cannot be expected: while the farming-specific resources remained strong among sons of farmers, they became useless for an increasing proportion of them.

Hypotheses Regarding Social Mobility in Glarus

Of course, the equation "more factory workers means more industrialization means more mobility" follows in a universal manner from the modernization thesis. Therefore, it can be expected to be valid for the canton of Glarus, too. However, the historiography on Glarus' industrialization, presented in section 3.1.3, points to a more important point: the differences between areas dominated by the textile printing industry, on the one side, and those where the spinning and weaving industry emerged, on the other.

The printing industry demanded highly skilled labor, similar to artisanal production. Because children started to work in the factories from an early age, a father's experience could be especially valuable for their future career. Generally speaking, the history of the canton's industrialization shows that the success of the printing industry acted as a bulwark against the disruptive force of modernization. Therefore, we can expect:

> H_{print} In Glarus, a strong presence of the printing industry preserved the level of social mobility and the strength of class linkage.

By contrast, the strongly mechanized spinning and weaving industry emerging in the middle of the century resembles much more closely the ideal type of factory industry. Here, the production was organized around rapidly evolving machines (Rohr 2005; Dudzik 1987) and workers were hired because of their labor-power and not for the skills they had acquired from their fathers. Thus:

> H_{spin} In Glarus, the emerging spinning and weaving industry promoted social mobility and weakened the class linkage.

Finally, generally available education can be seen as a driver of social mobility. For Sorokin (1927/1959: 169), "institutions for training and education […] have always been channels for vertical social circulation". The modernization thesis predicts that educational expansion will foster social mobility, because cultural resources become more evenly distributed (Treiman 1970). Therefore, we can expect that:

H_{educ} In Glarus, the availability of secondary school increased social mobility and weakened the class linkage.

3.3.2 Analytical Approach

The main aim of the following empirical analyses is to test the above-formulated hypotheses as rigorously as possible, using the data collected for the cantons of Lucerne and Glarus. Additionally, however, the analyses have a descriptive goal. They should help to understand what happened in the class structure of the two cantons, and how the social standing of individuals' parents influenced their own social class. This descriptive approach is of special interest when comparing the three areas: rural Lucerne, the city of Lucerne, and the canton of Glarus. In this part, I will look at class distributions and mobility tables, before testing the corresponding hypotheses. Furthermore, I will look at the likelihood of attaining a given class, as this gives an intuitive understanding of inequality by social origin. In other words, if origin has no effect on destination, all individuals will have the same probability of entering a given class. If this probability differs by social origin, it follows that some origins steer their descendants more towards certain classes than other classes of origin do.

The analyses will be presented in three empirical sub-sections: the first compares rural Lucerne, the city of Lucerne, and the canton of Glarus; the second analyzes social mobility within the canton of Lucerne; and the last analyzes social mobility within the canton of Glarus. For all sub-sections, I have carried out the key analyses both for observed mobility and for the intergenerational class linkage. In respect to observed mobility, I use logistic regression models in order to analyze effects on the probability of mobility – that is, the probability that the son's own class is different to his father's class. In respect to analyses of the class linkage, I calculate and compare the M-index presented in sections 2.1 and 2.2. To repeat, the M-index measures the information gained about the son's own class by learning his father's class position. A high value means that the amount of information gained is high and, therefore, the father's and son's classes are tightly linked. When comparing two groups, it is possible to decompose the difference in the M-index into the component that stems from differences in the marginal distributions and the component that results from differences in the internal structure of the corresponding mobility tables, net of differences in the margins. For this, I follow the procedures proposed by Deutsch et al. (2006), first applied to the question of social mobility by Silber and Spadaro (2011).

Further insights can be gained by decomposing the effect of social origin, measured by the M-index, by both origin and destination. Calculating local M-values by origin answers the question: how important is a given class of origin for the realized classes of destination? Conversely, calculating local M-values by destination answers the question: how important is social origin for a given class of destination? Finally, the contribution of each cell of the mobility table to the total M-index can be calculated, revealing the underlying mobility pattern. While values close to zero suggest little to no steering, positive values result for cells that are more densely populated than would be expected due to chance alone, given the marginal distribution. In other words, they mark destinations to which descendants of a given origin are steered, because of their origin. Negative values occur in the contrary case; they mark destinations from which descendants of a given origin are steered away, because of their origin.

The main concern when testing the hypotheses is whether the postulated causal effect can be identified. It is probably impossible to obtain an unbiased estimate of the causal effect of a slow process that has happened in the past. Rather, the aim is to obtain estimates that plausibly point to a true causal effect, or – conversely – can plausibly lead to the conclusion that no causal effect exists. Therefore, the analytical approach that should be chosen should exclude as many confounders as possible, without introducing selection biases by conditioning on colliders (Elwert and Winship 2014). For some hypotheses, this will not be possible. For example, it is the nature of a time-based measure of modernization that it co-varies with all sorts of observed and unobserved time-variable characteristics – whether they are related to modernization or not. The same is true for the comparison of areas. Again, different areas can differ by an infinite number of characteristics, and many of them are unobserved. Nevertheless, testing these hypotheses can give first hints, and the results of the corresponding analyses can complement other analyses and thereby contribute to better understanding of the effects of modernization.

By definition, "modernization" is a time-based process. Therefore, the most adequate approaches will analyze its effects longitudinally. Fortunately, a reasonable assumption is that different places start their modernization process at different time-points and that different places modernize at different speeds. If longitudinal modernization measures are available for rather small geographical units, time-invariant confounders of the measured process can be excluded by introducing fixed effects for these geographical units. Furthermore, by controlling for a general time trend, it is possible to further eliminate time-varying confounders that are universal across all analyzed places. What remains are confounding processes that co-vary with modernization on the local level. While these remaining uncaptured confounders will certainly bias the estimated effect, the assumption that this bias will not be substantive seems to be a reasonable one.

Following such an approach, it is essential to analyze the measured processes and test the corresponding hypotheses one-by-one and not simultaneously, because in a simultaneous estimation, additional measures will most likely act as colliders and introduce selection biases. Imagine that we want to study both the effect of industrialization and the establishment of a new railway line. It is likely that the two are correlated – for example, because the new railway line boosts industrialization. In this situation, if we analyze their effect on social mobility simultaneously while controlling for time, our measure for industrialization will be a collider variable ($time \rightarrow industrialization \leftarrow rail$) and will bias the result (Elwert and Winship 2014). Therefore, all results presented below report total effects, with controls for geographic areas and time trends where indicated.

In the ideal case, fixed effects are introduced at the level where the context variables are measured – that is, at the level of parishes. However, a complete implementation of a fixed-effect approach is very data-demanding.[79] Where necessary, I thus follow a stepwise procedure and approach this ideal case by successively introducing more demanding control variables for the geographical areas. For this purpose, I have identified relevant regions for both cantons that make it possible to capture the most important differences. The resulting areas are shown in the maps in **Figure A-12** (Lucerne) and **Figure A-13** (Glarus) in Appendix A (p. 270). For the canton of Lucerne, I differentiate between five areas. First, a clear difference can be expected between the city of Lucerne and the rest of the canton. Second, the area surrounding the city has played an important role in the canton's industrialization (section 3.1.2). Finally, the rural part can be divided into three geographical areas that were also important for the organization of the local agriculture: the pre-Alpine Entlebuch, the mountainous area around Willisau, and the northern part of the canton, shaped by parallel valleys divided by rolling hills (Bossard-Borner 2010). These differences are generally well captured by the official districts: Luzern-Stadt (city of Lucerne), Luzern-Land (Lucerne Countryside),

[79] Of course, models using random effects are less data-demanding. However, they hinge on far-reaching, often untestable, assumptions, which makes their interpretation somewhat vague, as it remains unclear to what extent they are able to filter out between-places differences. Therefore, the resulting effects are within effects "enriched" with an unknown portion of between effects. For this reason, I prefer to follow the approach described hereafter, which is, in my opinion, more transparent – even if a random-effects approach may be more efficient.

Entlebuch, Willisau, Sursee, and Hochdorf (Bundesamt für Statistik 2013); the two last named together form the northern part of the canton. In some cases, the official districts do no capture well the named differences. Most importantly, some of the municipalities belonging to the district of Willisau are located in the flatter, northern part of the canton. Thus, I have re-categorized them to the neighboring district of Sursee.[80] Additionally, the parish of Emmen, while officially part of Hochdorf, has been added to the district of Luzern-Land, as it was part of the industrializing area around the city of Lucerne. For the canton of Glarus, three areas stand out: the two southern valleys (Linth Valley and Sernf Valley) and the capitol Glarus (Marti-Weissenbach and Laupper 2016); the remaining northern part of the canton forms a residual category.

These regions can be used for a less precise but less demanding control for geographical differences. When investigating observed mobility, the analyses at this level can be complemented by models including dummy variables for the individual parishes. If the results of these analyses do not yield a statistically significant result, but the point estimates are essentially the same as those from the model relying on regional controls, the results based on regional fixed effects can nevertheless be said to be substantively confirmed by the later model. This is because the lost precision is likely caused only by the loss of statistical power. On the other hand, if the model with the parish-level fixed effects yields substantially different results than the simpler model, the estimates with controls on the lower level need to be considered as the best estimates.

For the analyses of the general class linkage based on the M-index, an analogous procedure applies. However, these analyses are much more data-demanding, as the models involve fitting a large number of parameters.[81] Therefore, it will not be possible to include parish-level fixed effects, but only controls for regions and time. Even so, statistical power remains a concern for the estimation of the M-index. This is especially true for the canton of Lucerne, even if more data are available for this canton than for Glarus. The reason for this is twofold. First, class inheritance is stronger in this canton, leaving the off-diagonal cells of the mobility table sparsely populated. Second, it was possible to collapse the class scheme to four classes in the case of Glarus, but not in the case of Lucerne, where farm workers need to form a class of their own. The resulting empty cells in several interesting subsamples impede the estimation of the M-index. One

80 This concerns the parishes of Altishofen, Ettiswil, Dagmersellen, and Reiden.

81 For example, if there are K classes of both origin and destination, the estimation of the effect of x on the M-index while controlling for A areas and C cohorts involves fitting a model with $(K-1)[1+(K-1)+(A-1)+(C-1)+(K-1)*(1+(A-1)+(C-1))]$ parameters.

way of dealing with such problems is to add a small number to each cell (PennState 2017). Goodman (1964), for example, recommended to add 0.5 to each cell, a procedure that can bias the estimates under certain conditions (Agresti 2002: 379). In future, we may strive to implement random effects or Bayesian approaches for the estimation of the *M*-index. To date however, no such procedure is available to solve this issue when estimating the *M*-index. Therefore, where necessary, I will augment each relevant cell by .001.

3.3.3 Social Class and Origin Effects: Comparing Lucerne and Glarus

Class Structures

For the observed period, **Figure 3-15** shows that the class structure of both the sons and their fathers differed visibly between the rural part of Lucerne, the city of Lucerne, and the canton of Glarus. Unsurprisingly, in rural Lucerne, the two farming classes dominated the class distribution of the sons – and especially the one of the fathers. In the two other areas, these classes were substantially less prevalent, but with considerable differences between the generations. The fathers of those married in the city of Lucerne were almost as often farmers as in rural Lucerne, whereas farming sons were rare. This is clearly a result of the strong migration to the city: if only locally rooted sons are considered, the proportion of farming sons (16%) and fathers (13%) in the city

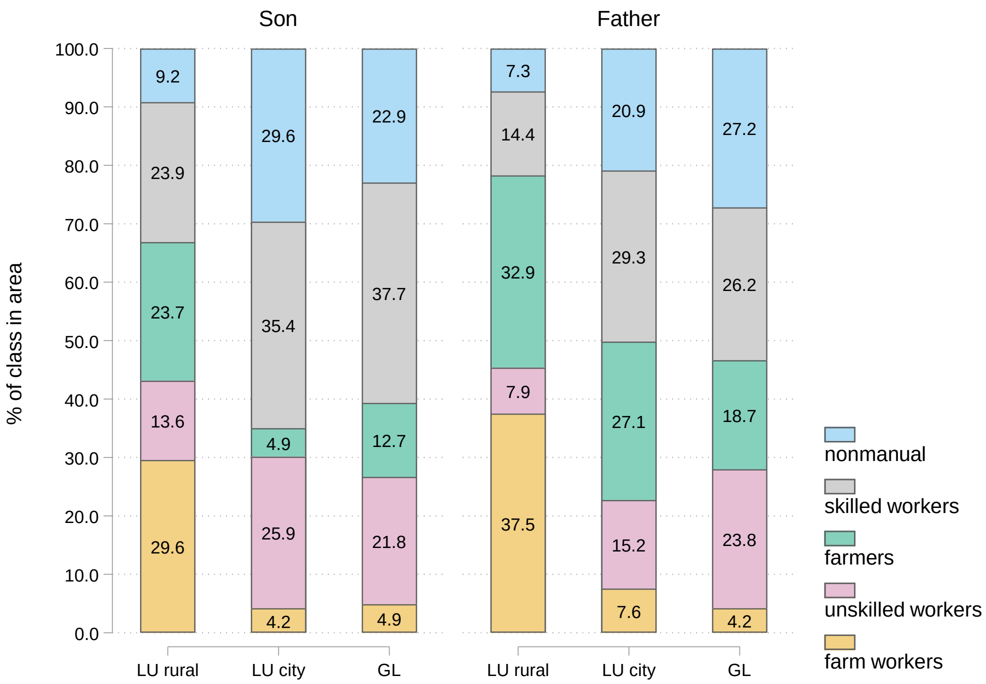

Figure 3-15. Distribution of social classes in rural Lucerne, the city of Lucerne, and Glarus

Source: author, based on data from the marriage register of Lucerne and the genealogy of Glarus.

is very close. A similar, but much less pronounced, difference between the generations can be found for the canton of Glarus. Here, the difference depicts the shrinking proportion of the agricultural section over time (similar to the rural area of Lucerne).

By contrast, the non-farming workers made up a large portion of the class structure in both the city of Lucerne and the canton of Glarus – especially in respect to the sons, where the two classes combined accounted for about 60% of the married male population. The class of the non-manual employees and professionals follows the same pattern: strong in the city of Lucerne and in the canton of Glarus, relatively weak in rural Lucerne. In sum, the class distribution shows a clear distinction between the rural area of Lucerne, on the one side, and the city of Lucerne and the canton of Glarus, on the other side. Furthermore, the shift in the class structure between the generations is most pronounced in respect to the farming classes.

Observed Mobility

In part, these observations find their equivalents in absolute mobility patterns shown in the mobility tables for the three areas presented in **Figure 3-16**. The pattern found for the rural area of Lucerne deviates clearly from the other two, while some similarity can be found between the patterns for the city of Lucerne and those for the canton of Glarus. On an absolute level, the rural area of Lucerne was clearly characterized by farmers and farmworkers who belonged same class as their fathers. The two cells combine to 378 cases (34.2%). Other important combinations of origin and destination are immobile skilled workers, sons of farmers who were farmworkers at the time of their marriage, and sons of farm workers who became skilled workers. The latter can be interpreted as an indication of the commencement of industrialization. For the city of Lucerne and

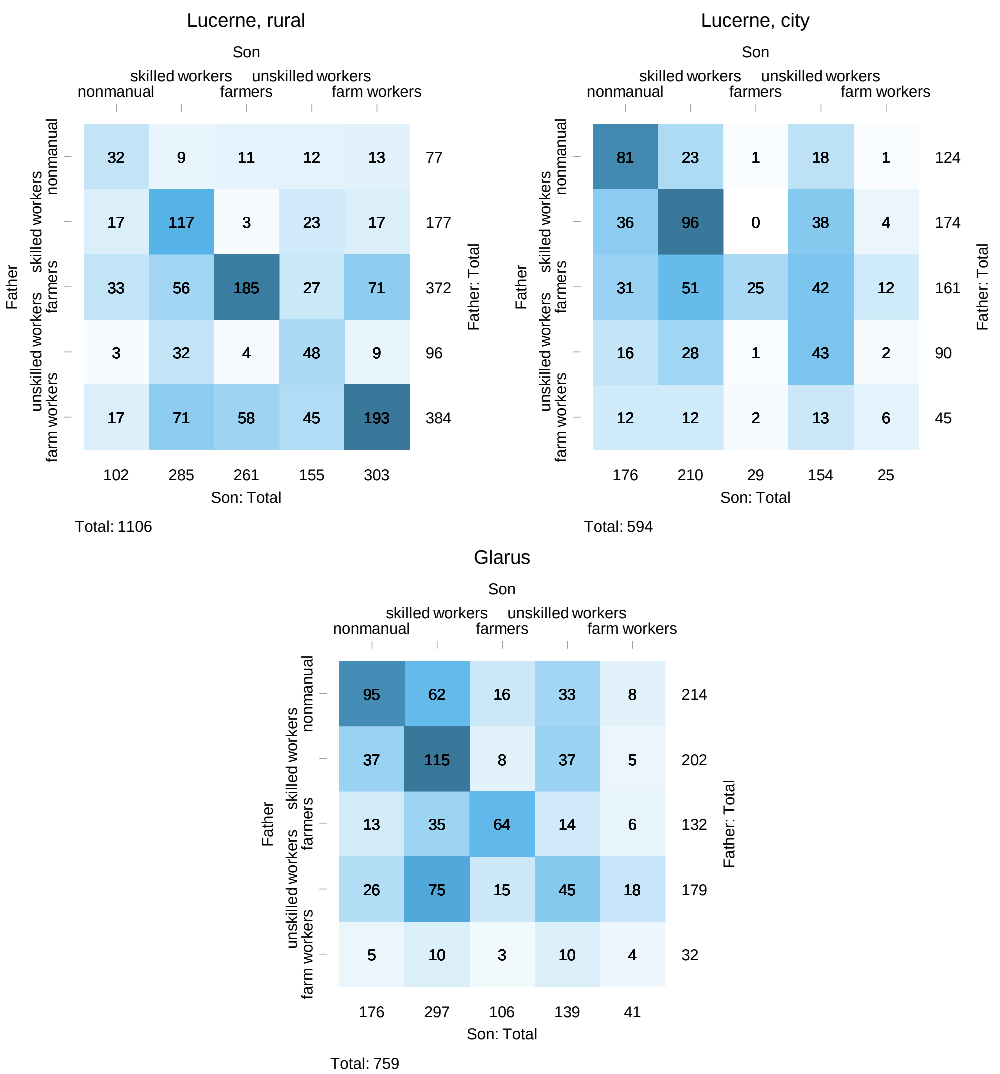

Figure 3-16. Mobility tables: observed mobility in rural Lucerne, the city of Lucerne, and Glarus

Source: see **Figure 3-15**.

Glarus, by contrast, two characterizing patterns can be found: the class inheritance of non-manual workers and skilled workers, and the strong intergenerational mobility between skilled workers and unskilled workers. In respect to the mobility of skilled and unskilled workers, upward mobility was dominant in Glarus, whereas downward mobility was slightly stronger than upward mobility in the city of Lucerne. In the city of Lucerne, the sons of farmers are of special interest, as only very few of them became farmers themselves. Many of them became either skilled or unskilled workers, but a substantial number also entered the non-manual class. Therefore, farmers' sons in the city experienced more upward than downward mobility.

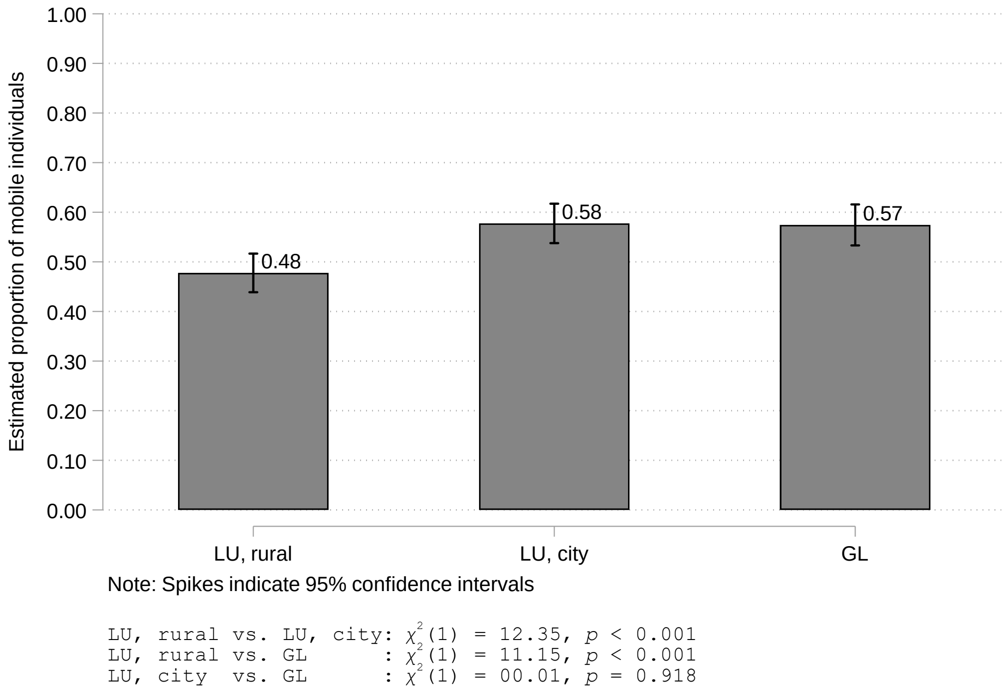

Figure 3-17. Observed mobility in rural Lucerne, the city of Lucerne, and Glarus
Note: Predictions based on the logistic regression model in **Table B-4** (Appendix B, p. 285).

If we compare the main diagonals (the cells populated by class inheritors) of the three mobility tables in **Figure 3-16**, the visual impression is that class inheritance was strongest in rural Lucerne. The estimated proportion of intergenerational mobile individuals presented in **Figure 3-17** confirms this impression. The probability that a son belonged to the same class as his father was about 10 percentage points higher in the rural area of Lucerne than in the city of Lucerne or in the canton of Glarus. These differences are statistically highly significant and confirm hypotheses H_{GLvsLU} and H_{city} in respect to observed mobility. This result also lends support to the general hypothesis H_{modern}, as for the further industrialized canton of Glarus more observed mobility is found than in the more agrarian canton of Lucerne. No difference can be found between the city of Lucerne and the canton of Glarus.

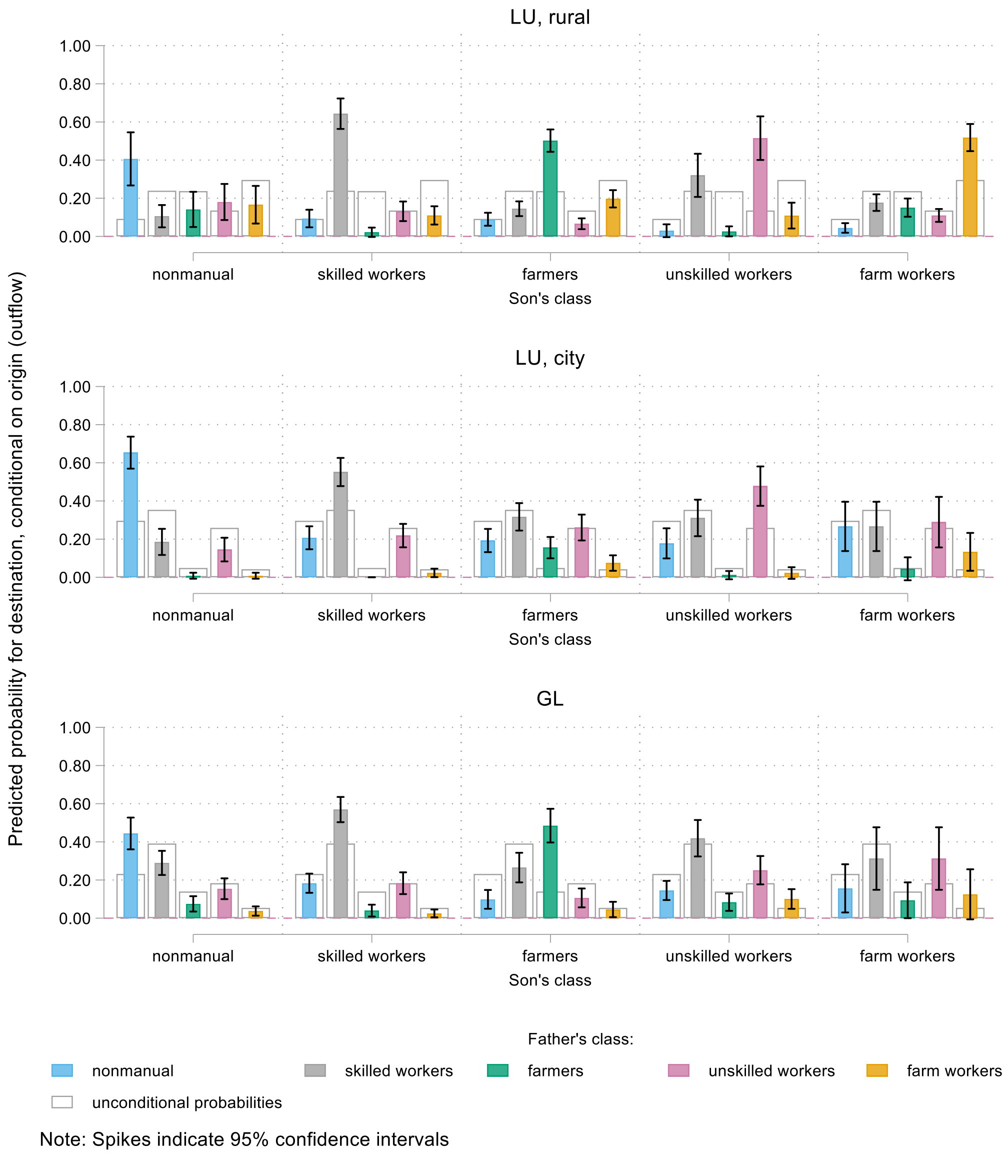

Figure 3-18. Probabilities of classes of destination, conditional on class of origin, for rural Lucerne, the city of Lucerne, and Glarus

Note: Predictions based on a multinomial logistic regression model with no further controls; confidence intervals based on cluster robust standard errors; 2,459 observations in 1,413 clusters. Source: see **Figure 3-15.**

From a descriptive perspective, the pattern behind these total mobility rates can be further studied by estimating conditional probabilities. **Figure 3-18** shows the probabilities of each class of destination, conditional on a given class of origin, while **Figure 3-19** looks at the reverse side of the same coin. If social origin did not have any effect on the class of destination, the class of destination would not differ by the class or origin, and the conditional probabilities would equal the unconditional ones (indicated by the larger, empty, bars – outlined in gray). **Figure 3-18** shows that this was clearly not the case; rather, a definite deviation from the unconditional distribution was the normal case. These deviations make the steering power of class of origin visible.

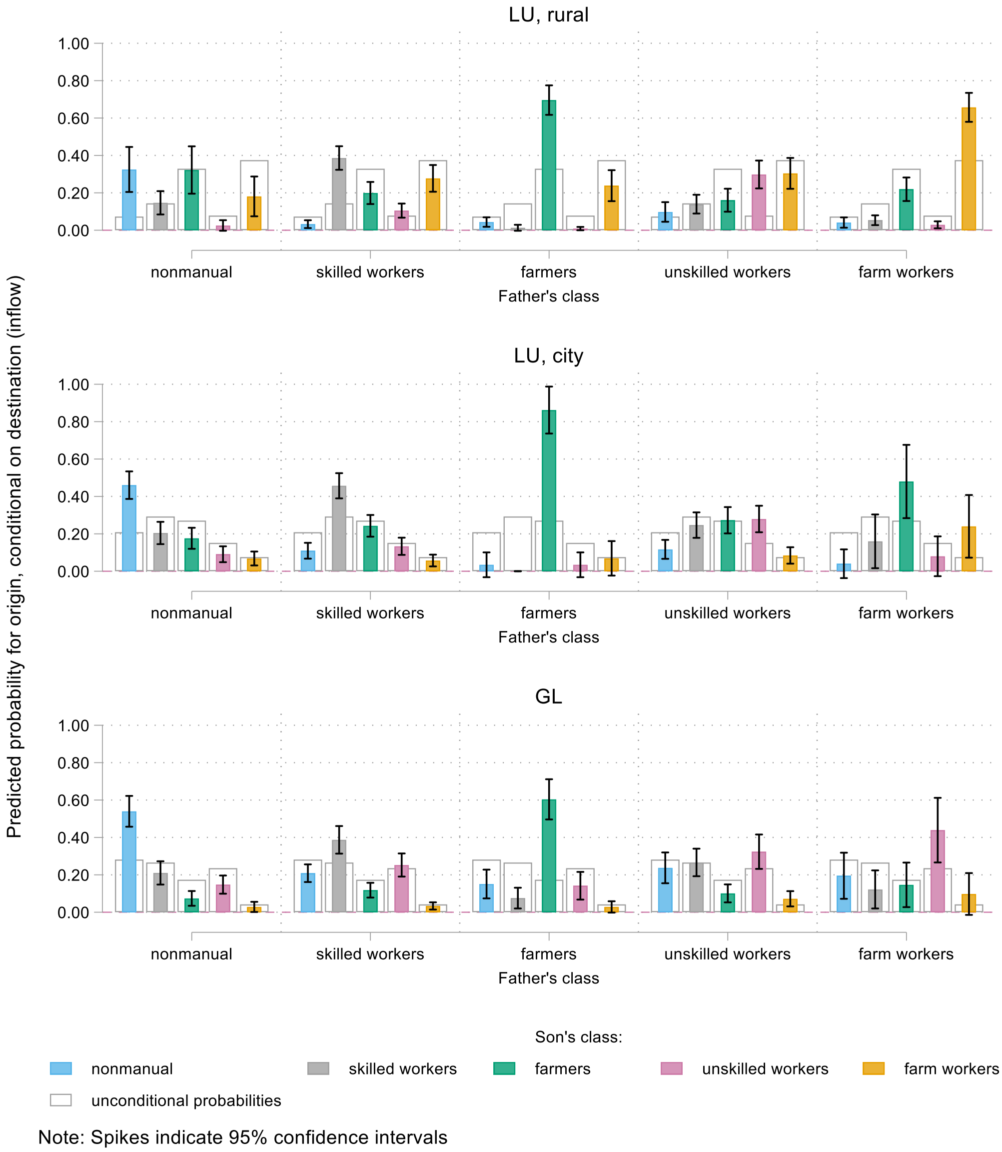

Figure 3-19. Probabilities of classes of origin, conditional on class of destination, for rural Lucerne, the city of Lucerne, and Glarus

Notes and source: see **Figure 3-18**.

In many cases, the driver of these deviations was a strong inheritance pattern, which can be found in all areas. However, there was an important difference between the rural area of Lucerne and the two other areas. In rural Lucerne, class inheritance was the reality for a (at least relative) majority of the sons, irrespective of the class of their fathers. The immobility rate ranged from 41%,[82] for those with a non-manual worker father, to 64% if the father was a skilled worker. By contrast, in the city of Lucerne and the canton of Glarus, inheritance was not dominant in all classes of origin. In the city of Lucerne, it was the dominant outcome among those with a non-agricultural origin, especially if the father was an incumbent of the non-manual (65%) or skilled worker (55%) classes. However, the class-specific resources of those with a farming background were obviously of little use in the city. In Glarus, class inheritance was less a matter of the father's sector, but whether he belonged to one of the three upper classes. Class inheritance among descendants of the upper classes was comparable to rural Lucerne and ranged between 45% (non-manual) and 56% (skilled workers). The destination of those from lower origins was less restricted by the class of the father, and the immobility rate was relatively low.

The view in the other direction complements this picture. The results in **Figure 3-19** answer the question regarding from which social class the incumbents of a given class originated. The results show that in all classes and all areas, the descendants of the same class had a comparative advantage: in all cases, the probability that the father had the same class was higher than the unconditional probability. However, the results also show the power of the marginal distribution. In rural Lucerne, for example, the sons of a non-manual worker father had by far the best chance of entering the non-manual class. But because there were so few sons of non-manual worker fathers, and so many sons of farmers, the share of the two among the non-manual worker sons was the same (32%).[83] The situation was similar for the unskilled workers in both areas of Lucerne and for the farm workers in Glarus. By contrast, the results also show that farmers in all areas were predominantly recruited from the sons of farmers – an observation that is in line with the rationale behind hypothesis H_{farm}. Finally, a strong amount of self-recruitment can also be found among the non-manual class in the city of Lucerne and in the canton of Glarus. This supports the idea that entering the class of the elites required many resources (according to this class definition, not all incumbents (by far) of the non-manual class belonged to the elites, but the whole elite belonged to the non-manual class; compare the class scheme in **Table 3-1**, p. 98).

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82 For reference, **Figure A-14** (p. 272) in Appendix A reproduces **Figure 3-18**, but includes numerical labels for the bars instead the indications for the unconditional probabilities.

83 Again, for reference, **Figure A-15** (p. 273) in Appendix A reproduces **Figure 3-19**, but includes numerical labels for the bars instead the indications for the unconditional probabilities.

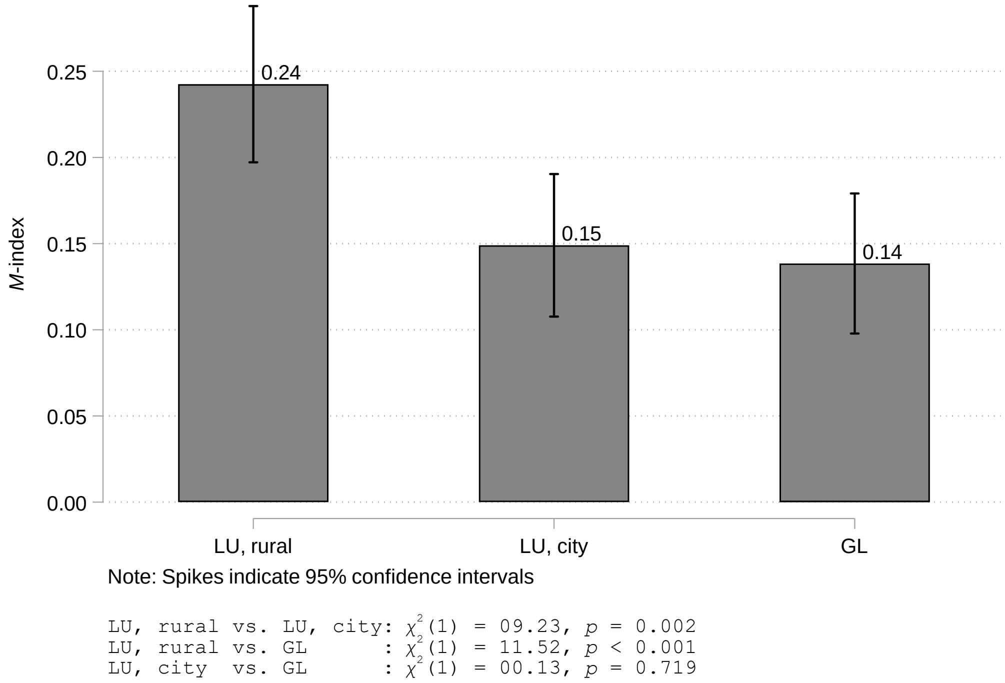


Figure 3-20. Class linkage (M-index) in rural Lucerne, the city of Lucerne, and Glarus

Note: Confidence intervals based on bootstrapped standard errors; 1.000 replications based on 2,459 observations in 1,413 clusters. Source: author, based on data from the marriage register of Lucerne and the genealogy of Glarus.

In sum, compared to rural Lucerne, observed mobility was higher in the city of Lucerne and in Glarus, while, overall, no difference in observed mobility is found between the two latter areas. In Glarus, mobility seems to be driven by an affinity between the classes of skilled and unskilled workers, while initial indications are found that immigrants from the countryside with an agrarian background might have been an important driver of social mobility in the city of Lucerne. The latter hypothesis (H_{local}), will be tested in the next section (3.3.4).

Class linkage in rural Lucerne, the city of Lucerne, and Glarus

The importance of social origin for individuals' class affiliations is not only reflected by class inheritance but also by steering individuals more towards one class than another class, given her or his social origin. Furthermore, the discussion of the conditional probabilities presented in the above paragraph have shown that the marginal distributions – the class structures of the two generations – are important and need to be taken into account. However, **Figure 3-20** shows that the overall conclusion derived from the analyses of observed mobility remains the same if these considerations are taken into account. The intergenerational class linkage (measured by the M-index) was substantially tighter in the rural area of Lucerne than in the city of Lucerne or in the canton of Glarus. These contrasts are statistically highly significant and confirm hypotheses H_{GLvsLU} and H_{city}. Furthermore, they lend some additional support to general hypothesis H_{modern}, as social origin was of less importance in the further industrialized canton of Glarus. No difference can be found between the city of Lucerne and the canton of Glarus.

The above differences may be due to several factors. Social origin may be of higher importance because the class of origin has stronger steering power, because the margins have less steering power, or because certain origin–destination combinations are less frequent. One way of disentangling these influences is to decompose the total differences resulting from pairwise comparisons of two areas into three components, applying the approach proposed by Deutsch et al. (2006). These components are: the portion of the difference caused by the difference in the marginal distribution of the son, the portion caused by the difference in the marginal distribution of the father, and, finally, the portion caused by the differences in the internal structures of the mobility tables, which equals the difference net of differences in the marginal distributions. Together, these components sum to the total difference in the M-index between two areas.

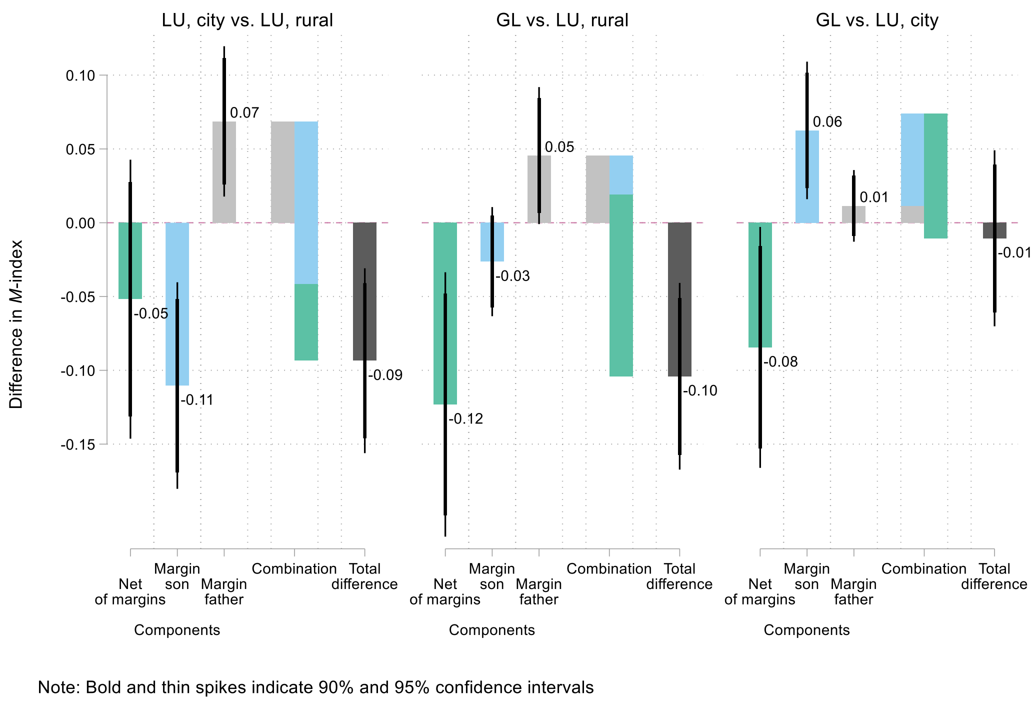


Figure 3-21. Internal structures and margins: decomposed differences in the M-index between rural Lucerne, the city of Lucerne, and Glarus

Notes and source: see **Figure 3-20**.

Figure 3-21 shows the components resulting from this decomposition and how they combine to the total differences. The decompositions show that the difference between the city and the rural area of Lucerne is due both to less steering by social origin in the city and to the difference in the marginal distribution of the sons. Therefore, if the marginal distribution were the same in both areas, the difference would be in the same direction (i.e., origin is more important in the countryside), but the difference would be smaller and not statistically significant. The main reason for this is the difference in the unconditional entropy between the two areas. In rural Lucerne, the class distribution of the sons is much more even than in the city (compare **Figure 3-15**, p. 150); obviously, the main difference stems from the two farming classes, which are almost completely missing in the city, leaving only three relevant classes. This means that individuals in the countryside are less constrained in their "choice" of class by the marginal distribution alone. Consequently, this leaves more room for a steering by origin. For this reason, origin was more decisive for individuals' class affiliations in rural areas than in the city of Lucerne.

In respect to the difference between rural Lucerne and the canton of Glarus, the situation is less complicated. The marginal distributions were about equally important for individuals' class of destination, which means that the difference between the two areas stems almost exclusively from the difference in the internal mobility structure. Consequently, social origin would have been equally unimportant in Glarus and in rural Lucerne in a counterfactual case where the marginal distribution was the same in both areas.

Finally, **Figure 3-21** also shows that there was no difference between the city of Lucerne and the canton of Glarus because the contributions of the internal structure and the marginal distributions cancel each other out. Again, the reason is the lower entropy in the city, but in this case the two components work in opposite directions. Therefore, in the counterfactual case that the marginal distributions were the same in the two areas, origin would have been of less importance in Glarus than in the city of Lucerne.

From a descriptive point of view, it is important to note that the strength of the intergenerational class linkage differs largely by both the class of origin and destination. **Figure 3-22** shows that in rural Lucerne, having a farming father was less decisive for one's own class than having a father that was an incumbent of a non-farming class. A working-class background – whether skilled or unskilled – was even more determining. This is the summary of what can be read from the already discussed **Figure 3-18** (p. 154): sons of unskilled workers factually could only choose from two classes out of five – they became either unskilled workers themselves or they were able to enter the class of the skilled workers. It is not that the fact of being a farmer's son did not matter

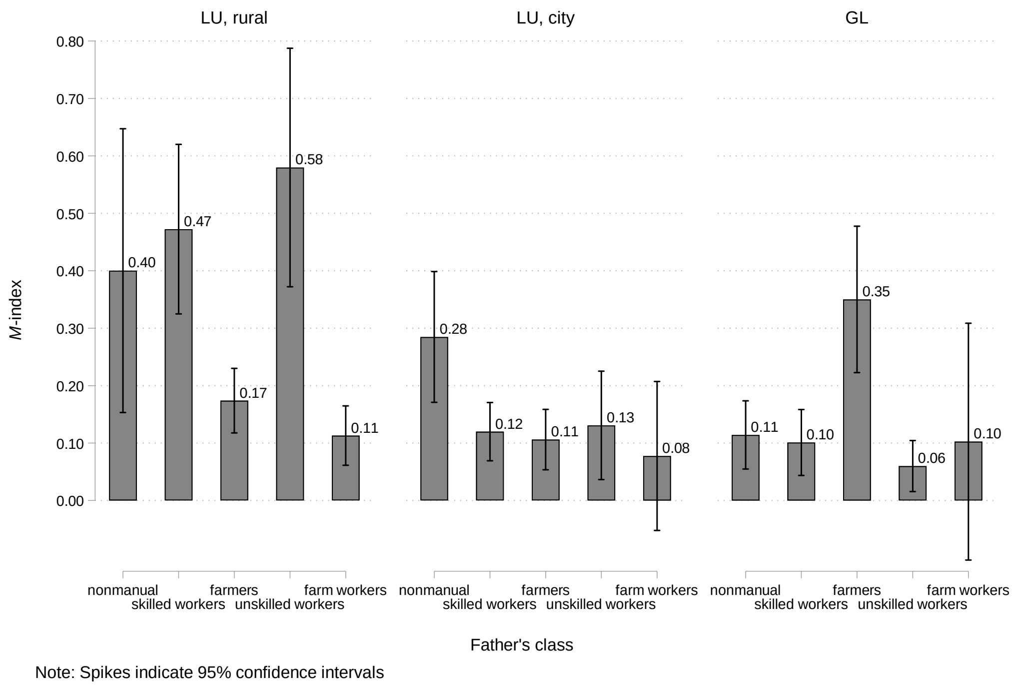


Figure 3-22. Local class linkage by origin in rural Lucerne, the city of Lucerne, and Glarus

Notes and source: see **Figure 3-20**.

at all – their probability of becoming a farmer was clearly elevated – but their probability of entering the non-manual class was about the same as the unconditional probability and a substantial proportion were skilled or farm workers at the time of their marriage.

On first sight, this is a counter-intuitive result as a farming background is usually considered to be one of the most determining classes of origin (Laband and Lentz 1983) – for example, the strong importance of social origin in Hungary and the Netherlands was largely driven by farmers (Maas and van Leeuwen 2016: 865). The contradiction can partly be resolved by considering also the other direction of analysis, depicted in **Figure 3-23**. This shows that for becoming a farmer, the father's class was clearly of importance in the rural area of Lucerne. Nevertheless, the corresponding value does not stand out (as in **Figure 3-19**, p. 155) and the class of farmers was not the one for which the father's class was by far the most important. Because of the large farming class in this agrarian area, the likelihood of a farmer's son inheriting the father's class by chance alone was already high and a relatively weak steering by origin was sufficient to realize a self-recruiting rate of 70% among farmers.

By contrast, having a farming background was decisive in the canton of Glarus. In this canton, where farmers formed one of the smallest classes, it required a strong steering by social origin to realize a self-recruiting rate of 60% among farmers. In Glarus,

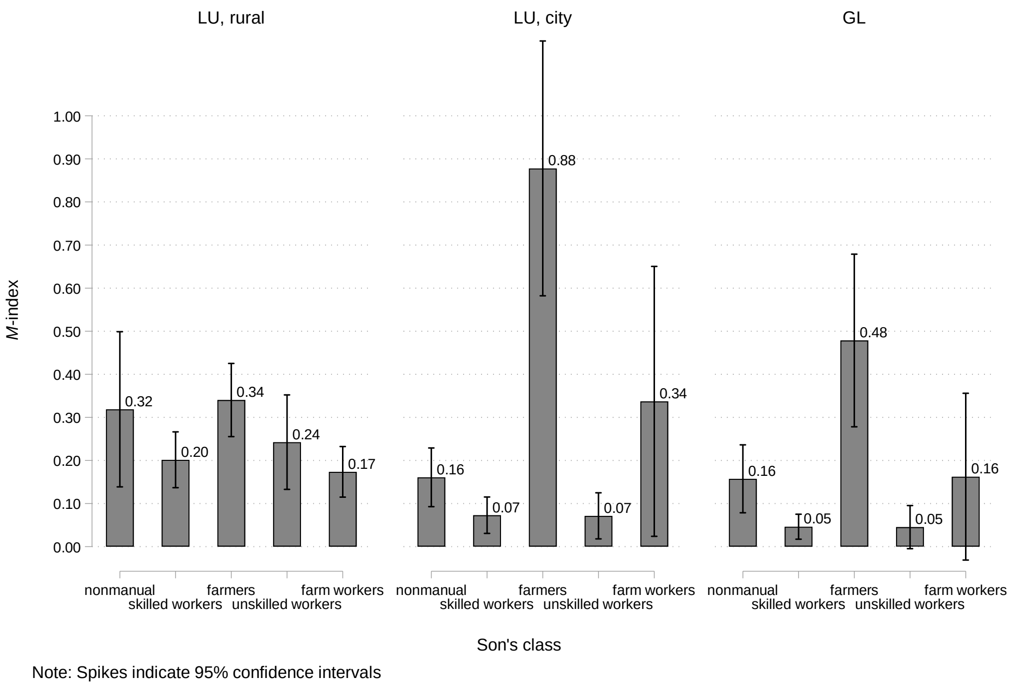


Figure 3-23. Local class linkage by destination in rural Lucerne, the city of Lucerne, and Glarus

Notes and source: see **Figure 3-20.**

the peasants were therefore the class for which origin played by far the strongest role. The immigration of peasant sons to the city of Lucerne was also formative in this respect. Without an important inheritance rate as a driver, origin was of relatively little importance for them. Conversely, for the few farmers in the city, origin was not only decisive but determining. Furthermore, the results also support the observation made above that the elite succeeded relatively well in securing their status – a non-manual origin was most decisive in the city of Lucerne (**Figure 3-22**).

The mobility patterns shown in **Figure 3-24** visualize how origin steered individuals to a given class in the three areas. In doing so, they highlight not only the strong class inheritance, in the form of large values on the main diagonal, but also the affinity between some classes. These patterns confirm the already-mentioned proximity between skilled and unskilled workers in rural Lucerne, and especially in Glarus. They also show that in rural Lucerne, sons of farmers, skilled – and even unskilled – workers had relatively good chances of entering the non-manual class. Finally, they highlight the affinity between the lower classes in Glarus (i.e., between unskilled and farm workers) and to some extent farmers. The proximity of the two lower classes was also an important argument for collapsing the classes of unskilled and farm workers for the analyses of social mobility within the canton of Glarus.

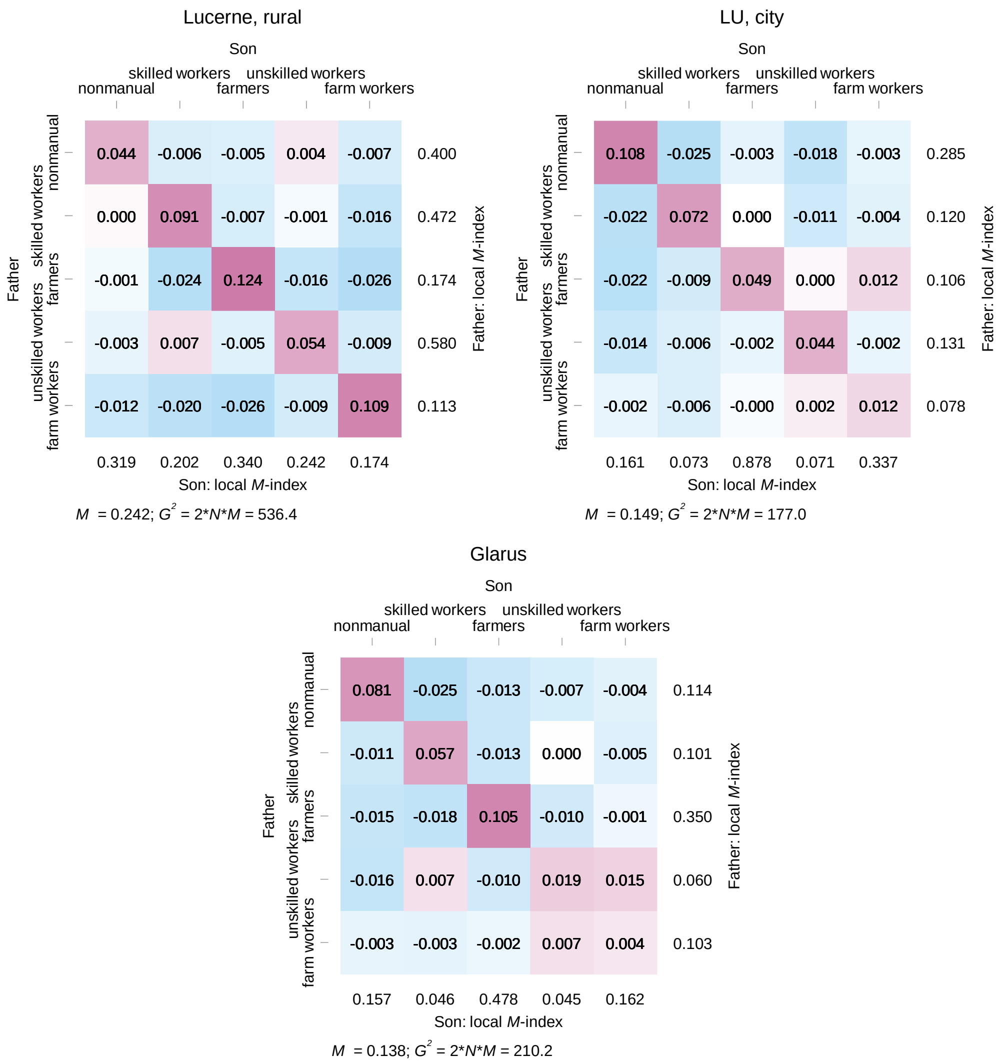


Figure 3-24. Mobility patterns: cell contributions to the *M*-index in rural Lucerne, the city of Lucerne, and Glarus

Source: see **Figure 3-20**.

In sum, the results confirm hypotheses H_{GLvsLU} and H_{city}, and lend some support to general hypothesis H_{modern}, based on the modernization thesis. Glarus and the city of Lucerne were socially more mobile and social origin was less decisive than in the agrarian rural area of Lucerne. From a descriptive point of view, two findings are worth highlighting. First, the migration of individuals with a farming background to the city of Lucerne was a formative feature of the city's social stratification. Because for most of them, it was not possible to inherit the class of their fathers, sons of peasants were relatively free to "choose" their class of destination in the city, albeit downward mobility was more prevalent than upward mobility. The second feature concerns the importance of origin for farmers. The results show that self-recruiting was important among farmers, which is in line with the literature on the early 20th century, both in the US (Blau and Duncan 1967) and Switzerland (Girod 1957). In other words, for becoming a farmer, origin was important in all areas. By contrast, the reverse was not generally true: in the largely agrarian rural area of Lucerne, having a farming background was less decisive for individuals' class than having a non-farming father.

3.3.4 Early Industrialization and Origin Effects on Social Class in Lucerne

While the last section dealt with differences between regions, the present section is concerned with processes within the canton of Lucerne. The focus is on time trends, the influences of the introduction of modern means of transport, and increasing industrialization. In addition, the influence of migration to the city of Lucerne will be investigated in more detail.

Because the above results have exposed important differences between the city of Lucerne and the remaining rural area, all analyses in this section were carried out independently for the two areas. However, the effects of the two directly measured processes will be studied only with data on the rural area. First, because the proportion of factory workers in the city remained very low throughout the 19th century (Schnider 1996), which eliminates relevant variation on this measure. Second, because estimating the effect of the connection to the railway network in a single place is not sensible, as it merely captures a time effect that is not captured by other parameterizations of time trends: whether the effect was driven by the new railway line or by something else would remain completely unclear.

Descriptive Overview

Figure 3-25 shows that the number of marriages concluded in the canton of Lucerne increased rapidly during the last third of the observed period, both in the city and the rural area of the canton. As already discussed, this was not only due to a significant population growth during a time of economic recovery, but also due to the liberalization of the marriage policy in this period. Therefore, the constructed marriage cohorts, used in some of the analyses in order to capture temporal changes, cover very different numbers of observations. However, the chosen equally spaced periodization (1834–47, 1848–61, and 1862–75; compare the vertical lines in Figure 3-25) fits well the economic development and its consequences, as described in section 3.2.1.

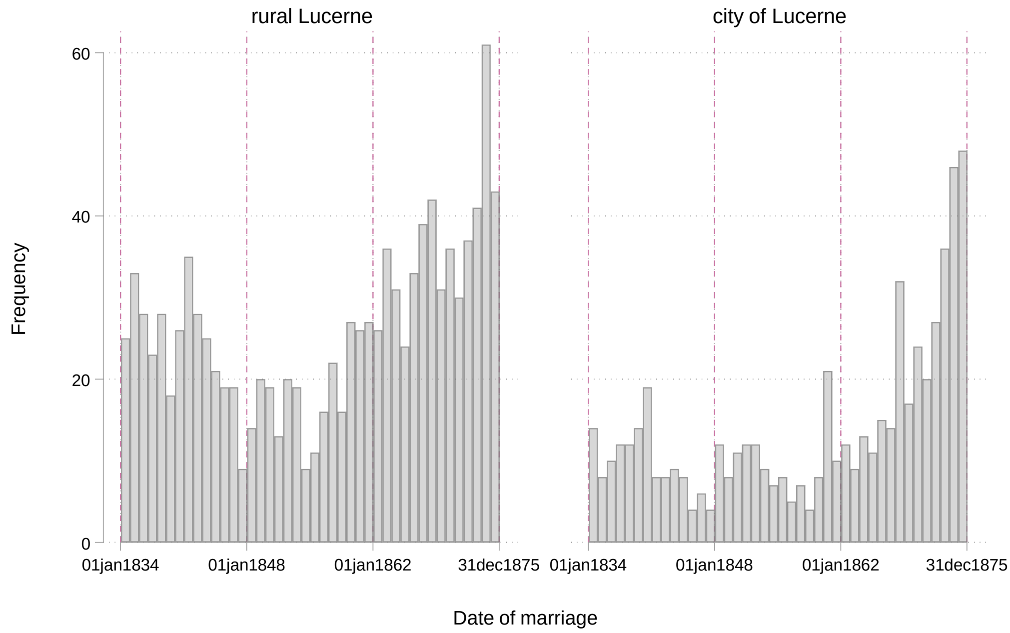


Figure 3-25. Lucerne: histogram of sampled marriages per year, with cohort cut-off points

Source: author, based on the marriage registers of Lucerne.

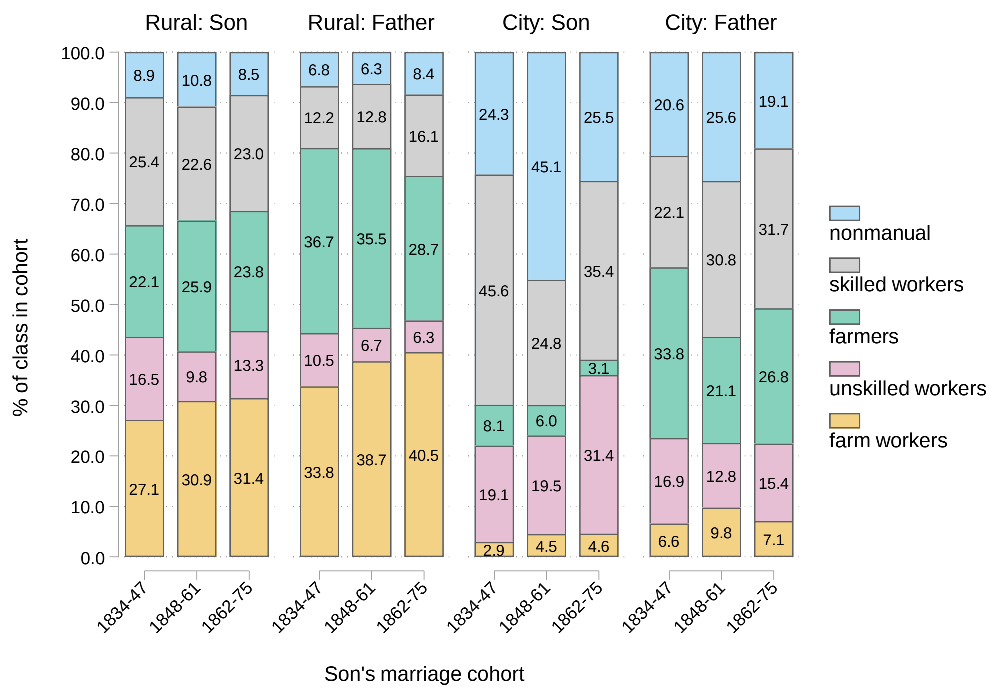


Figure 3-26. Lucerne: Distribution of social classes by son's marriage cohort

Note: Weighted proportions. Source: author, based on the marriage registers of Lucerne.

As discussed above (section 3.2.1), the marriage restriction likely biases univariate descriptive statistics, and the liberalization could bias time trends. This could be one of the drivers behind the changes in the class structure shown in **Figure 3-26**, especially in respect of the city of Lucerne. In the city, the class structure changed from the first to the second cohort, and changed back, in many respects, from the second to the third cohort. This could be a result of the tightened marriage restriction around the middle of the century. More specifically, in the class distribution of the sons, the non-manual class grew considerably from the first to the second cohort and fell back to the initial proportion in the last cohort, while the class of the skilled workers changed inversely.[84] Over the whole period, the proportion of unskilled workers grew at the expense of skilled workers and farmers. While for the sons' generation, the class in the middle cohort that shrank was the skilled workers, for the fathers' generation it was the farming class. By contrast, the proportion of skilled worker fathers in the city grew from the first to the second cohort, and remained constant for the last one.

Outside of the city, the data show less fluctuation. This is especially true for the sons' classes, where no significant change can be found. In respect to the fathers, the distribution shows overall growth for skilled workers, while the classes of farmers and unskilled workers shrank. The pronounced growth of the farm worker class in the fathers' generation is imprecisely measured and not statistically significant (p=0.156, when comparing the last with the first cohort).

To repeat: because of the large and changing proportion of unmarried people in the canton, these results are likely to be biased. Whether univariate patterns or simple time trends can be generalized to the population as a whole is questionable, but the above results serve the purpose of providing a description of the data in the sample.

Observed Mobility

When comparing the city to the rural area of Lucerne, the much higher mobility found in the city is striking. The mobility pattern studied in the last section suggests that this difference may have been caused by the strong migration of farmers and farm workers to the city. Moving to the city implied, for most of those migrants, being socially mobile, as their fathers' class was not available in the city for most of them.

84 All changes reported in the text are statistically significant at least at the 10% level.

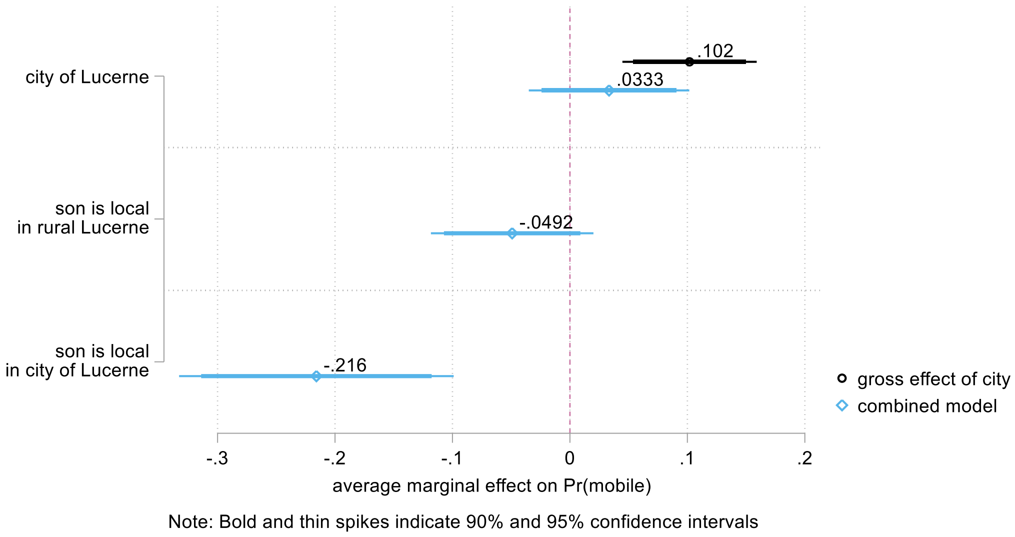
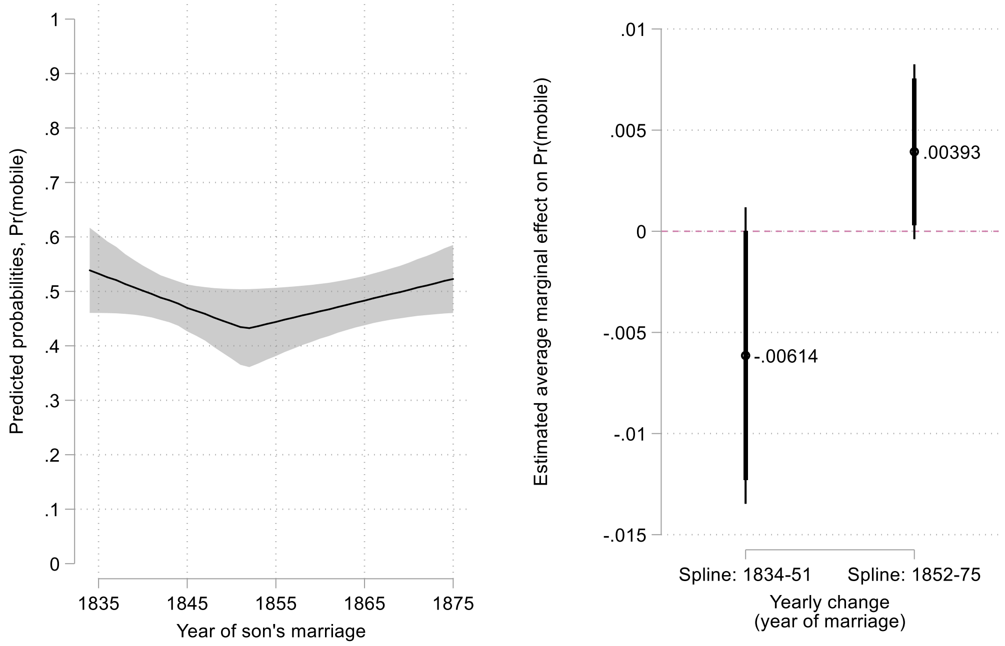


Figure 3-27. Lucerne: Observed mobility and local rootedness in rural Lucerne and the city of Lucerne

Note: Predictions based on the logistic regression model in **Table B-5** (Appendix B, p. 285).

Figure 3-27 suggests that this difference in observed mobility was indeed the result of the fact that in the city, far fewer individuals were locally rooted than in the rural area of the canton. While, overall, the proportion of mobile sons was about 10.2 percentage points higher in the city compared to the rural area (gross effect), this difference shrinks to (statistically insignificant) 3.3 percentage points when taking into account the different composition of the two areas in respect to locally rooted sons (combined model). Furthermore, the results show that the mobility rate between locals and non-locals differed more strongly in the city than in rural Lucerne. While this difference between locals and non-locals was small and not statistically significant in the latter area, the proportion of mobile sons was 21.6 percentage points smaller among those who were not locally rooted, compared to those whose father's place of origin was the city of Lucerne (p=0.016 for the difference between the two effects). This confirms hypothesis H_{local} in respect of observed mobility.

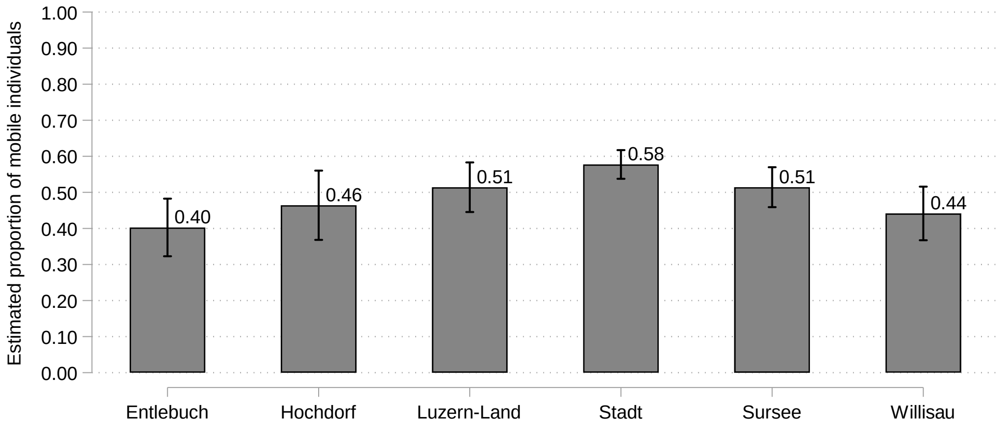


Note: Shaded area and thin spikes indicate 95% and bold spikes 90% confidence intervals

Figure 3-28. Lucerne: Observed mobility by year of marriage

Note: Predictions based on the logistic regression model in **Table B-6** (Appendix B, p. 285).

In respect to time trends in observed mobility, two linear splines with a knot at 1852 yield the best fit compared to a variety of other specifications tested (no trend, linear, quadratic, and cubic trends, and linear splines with different knots). Using this specification, **Figure 3-28** suggests that observed mobility decreased until 1852, and increased after this year. This roughly matches the contextual changes described in section 3.1.2: a crisis around the middle of the century, which caused, among other things, the marriage restrictions to peak around 1860. Therefore, the time trends identified lend some support to $H_{LUtrend}$, stating that in Lucerne, the general trend toward openness, assumed by the modernization thesis (H_{modern}), was slowed down by the crisis around the middle of the century. Because no general trend towards higher mobility was found, the crisis resulted not in a slowed increase, but in a V-shaped pattern, depicted in **Figure 3-28**. The main driver of this non-linear trend was the changes in the rural area of the cantons: here, the changes were more pronounced than in the city of Lucerne (compare **Figure A-16** and **Figure A-17**, p. 273, Appendix A).



Note: Spikes indicate 95% confidence intervals

Entlebuch vs. Hochdorf : $\chi^2(1)$ = 00.94, p = 0.333
Entlebuch vs. Luzern-Land: $\chi^2(1)$ = 04.31, p = 0.038
Entlebuch vs. Stadt : $\chi^2(1)$ = 14.76, p < 0.001
Entlebuch vs. Sursee : $\chi^2(1)$ = 05.09, p = 0.024
Entlebuch vs. Willisau : $\chi^2(1)$ = 00.49, p = 0.485
Hochdorf vs. Luzern-Land: $\chi^2(1)$ = 00.69, p = 0.407
Hochdorf vs. Stadt : $\chi^2(1)$ = 04.55, p = 0.033
Hochdorf vs. Sursee : $\chi^2(1)$ = 00.79, p = 0.375
Hochdorf vs. Willisau : $\chi^2(1)$ = 00.14, p = 0.713
Luzern-Land vs. Stadt : $\chi^2(1)$ = 02.43, p = 0.119
Luzern-Land vs. Sursee : $\chi^2(1)$ = 00.00, p = 0.996
Luzern-Land vs. Willisau : $\chi^2(1)$ = 01.98, p = 0.159
Stadt vs. Sursee : $\chi^2(1)$ = 03.27, p = 0.070
Stadt vs. Willisau : $\chi^2(1)$ = 09.98, p = 0.002
Sursee vs. Willisau : $\chi^2(1)$ = 02.38, p = 0.123

Figure 3-29. Lucerne: Observed mobility by region

Note: Predictions based on the logistic regression model in **Table B-7** (Appendix B, p. 285).

As discussed in section 3.2 on the analytical approach, regions (districts) can be used to control for heterogeneity between geographical contexts in a parsimonious way. **Figure 3-29** shows that observed mobility actually differed between these regions: the city was the most mobile of the regions, followed by the partly industrialized Sursee and Luzern-Land. The least mobile were the two mountainous regions, Entlebuch and Willisau. Therefore, the distribution of observed mobility is roughly in line with the expectations of the modernization thesis.

These regions can be used as controls when analyzing the effects of directly measured dimensions of modernization on observed mobility. **Figure 3-30** shows that in parishes with a railway station, observed mobility was higher by about 9 percentage points. While this effect just scratches the conventional level for marginally significant effects (p=.100), the introduction of controls for time and geographical area reduces the effect significantly. This implies that the correlation found between the presence of a railway station and observed mobility is likely spurious. Therefore, there is no evidence to defend the claim that the introduction of such a station enhanced (or otherwise altered) mobility. The latter claim is best approximated by the estimate from the model that includes parish fixed effects and controls for time trends (same splines as in **Figure**

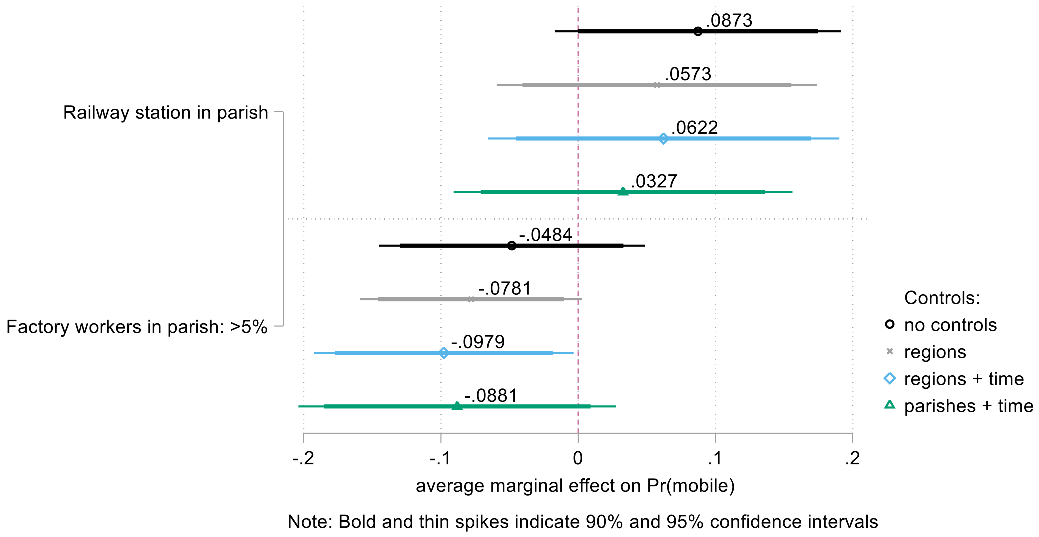


Figure 3-30. Lucerne: Observed mobility, railway station and proportion of factory workers in a parish

Note: Each estimate is based on a separate logistic regression model: railway station in **Table B-8** (Appendix B, p. 286), factory workers in **Table B-9** (Appendix B, p. 287).

3-28). Consequently, hypothesis H_{rail} cannot be confirmed in respect of observed mobility in the canton of Lucerne.

The situation is different in regard to the proportion of factory workers, which serves as a longitudinal measure for the industrialization of a given parish. The simplest model states that, over the whole period, and comparing all areas, individuals were less mobile in contexts with higher proportions of factory workers. This is completely at odds with hypothesis $H_{industM}$ (based on the modernization thesis), but is in line with $H_{industS}$ (based on dualism theory). However, the effect is imprecisely estimated and could be spurious, as areas tend to differ by more dimensions than just the degree of industrialization. However, this does not seem to be the case: when controlling for differences between regions, the estimates suggest that the negative association between the proportion of factory workers and observed mobility was even partly masked by such differences between regions. Furthermore, this effect was not a result of a general time trend, associated with both industrialization and mobility: when controlling for time trends using splines, the estimated effect is again slightly stronger. Therefore, the results suggest that an increasing proportion of factory workers decreased their observed mobility in this context. The last model, which includes parish-level fixed effects, further supports this conclusion. While not statistically significant on conventional levels, the loss in precision seems to be mainly caused by the loss of statistical power, as the point estimate is roughly the same as the one from the more parsimonious model. In other words, the data from Lucerne contradict the modernization-based hypothesis $H_{industM}$ but support hypothesis $H_{industS}$: in the 19th-century canton of Lucerne, more industrialization came with lower observed mobility.

In sum, the results show that the differences in observed mobility between the city of Lucerne and the rural area were indeed mainly caused by the lower proportion of locally rooted sons in the city, compared to the countryside. This lends support to hypothesis H_{local}. Furthermore, the crisis around the middle of the century seems to have lowered mobility, which is in line with the rationale behind $H_{LUtrend}$. However, no evidence for a general temporal trend toward more mobility has been found, which is at odds with overall hypothesis H_{modern}, based on the modernization thesis. In addition, no support was found for the hypothesis that access to the railway network boosted mobility (H_{rail}). In respect of industrialization, the data from the canton of Lucerne support the hypothesis based on dualism theory ($H_{industS}$) and not the one based on the classical modernization thesis ($H_{industM}$).

Class Linkage

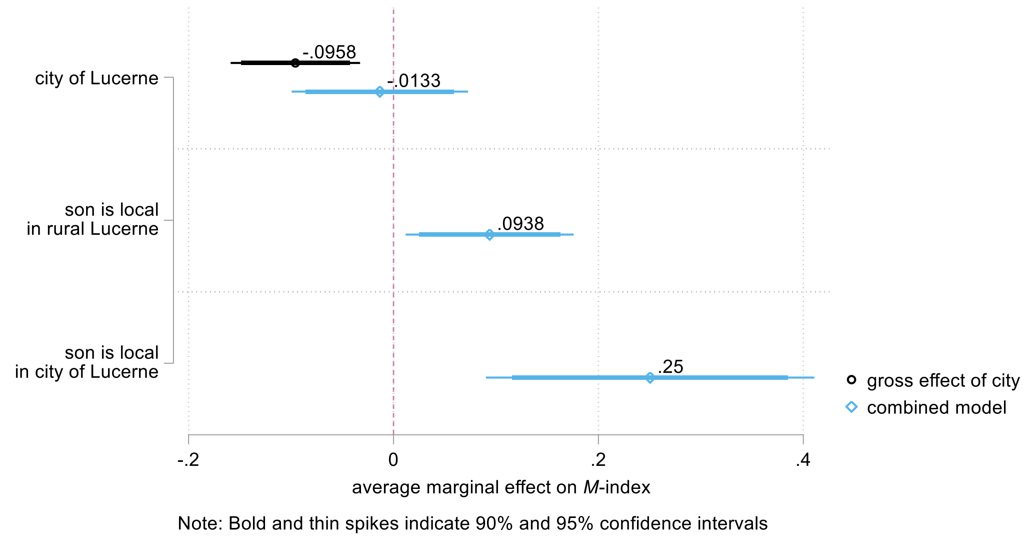


Figure 3-31. Lucerne: Class linkage and local rootedness in rural Lucerne and the city of Lucerne

Note: Predictions based on the GMM estimator in **Table B-10** (Appendix B, p. 288).

Figure 3-31 shows that analyzing the *M*-index confirms the results on the importance of migration for the difference between the city and the rural area regarding social mobility. The results suggest that social origin was more important for locally rooted sons than for those living in a different place than the father's place of origin. This was true both in rural Lucerne and in the city of Lucerne, but in the latter, the difference was more important (p=0.088 for the interaction effect). Controlling for local rootedness reduces the difference between the city and rural Lucerne from substantial -.096 to insignificant -.013. Therefore, for locally rooted sons, social origin was roughly equally important in the city and in rural Lucerne. Thus, these results further confirm hypothesis H_{local}.

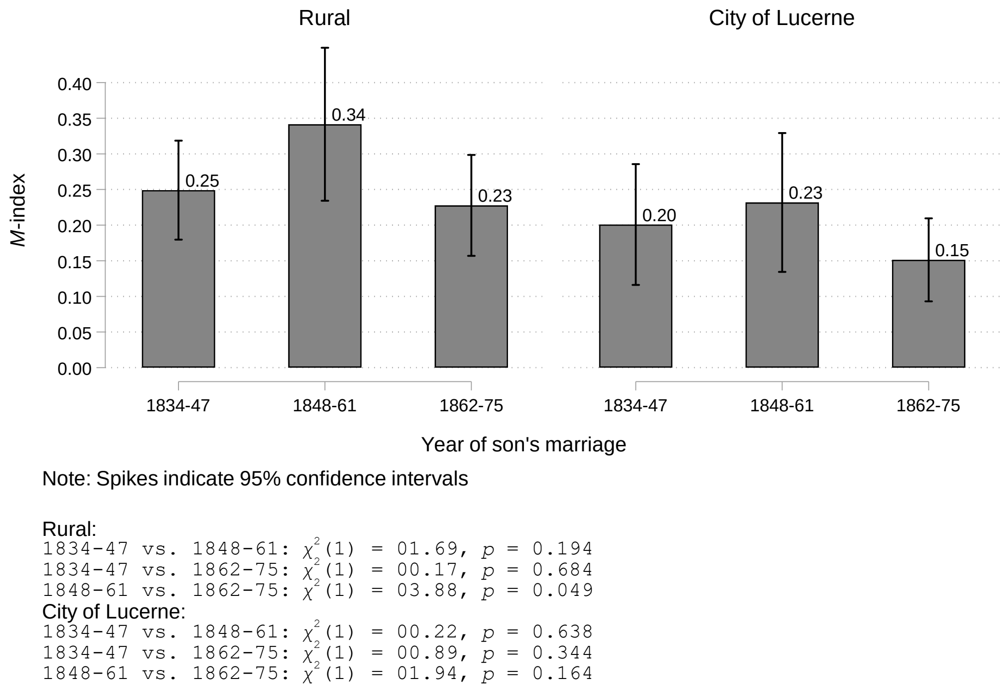


Figure 3-32. Lucerne: Class linkage by marriage cohort

Note: Predictions based on the GMM estimator in **Table B-11** (Appendix B, p. 288).

In respect of time trends, the identified V-shaped pattern in observed mobility is insofar confirmed by the analyses of the class linkages using the *M*-index, as it shows the same trends. According to **Figure 3-32**, the intergenerational class linkage was the highest in the middle of the century.[85] This pattern was more pronounced in rural Lucerne than in the city of Lucerne and confidence intervals are large for all estimates. No differences between cohorts are statistically significant, except the substantial reduction of the class linkage from the middle to the last cohort in rural Lucerne.

[85] Because of sparsely populated cells, it was not possible to estimate time trends using linear splines. In contrast to a linear specification, the cohort-based analysis allows us to reach a stable estimation using data augmentation, as described in section 3.3.2.

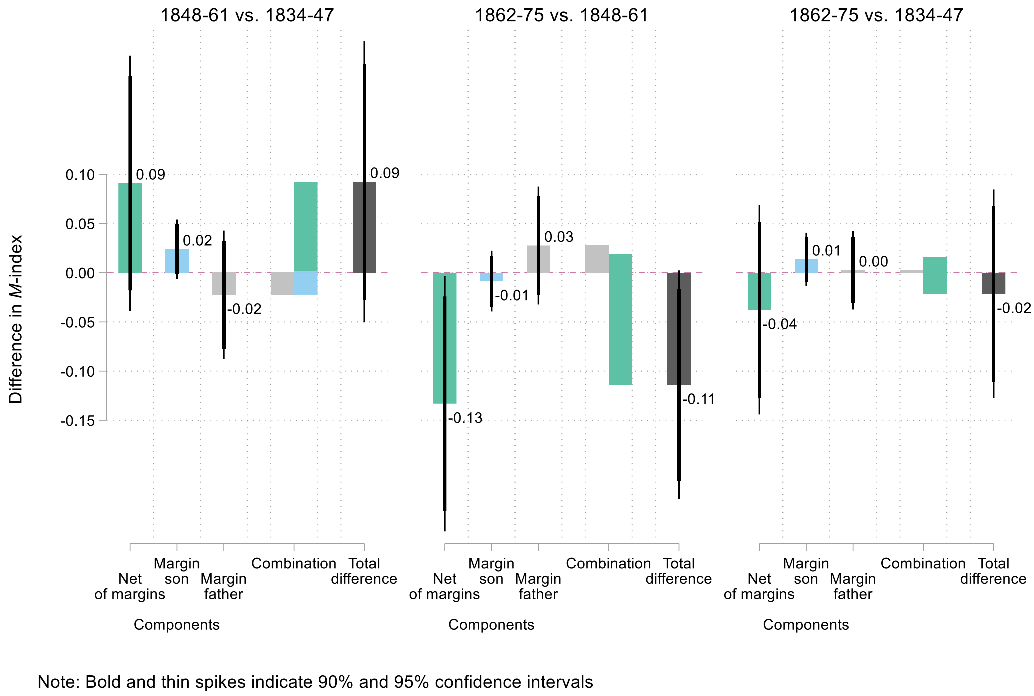


Figure 3-33. Rural Lucerne: Decomposed differences in the *M*-index between marriage cohorts

Note: Confidence intervals based on bootstrapped standard errors; 1,000 replications based on 1,106 observations in 647 clusters. Source: author, based on data from the marriage registers of Lucerne.

The decomposition of the differences in rural Lucerne, depicted in **Figure 3-33**, indicates that the changes were driven by changes in the associations between a father's and a son's class, and not by changes in the marginal distribution (for the decomposition of the insignificant differences in the city, compare **Figure A-18**, p. 274 in Appendix A).

According to the results in **Figure 3-34**, the increase and decrease in the importance of social origin in the rural area was mainly driven by those from non-manual origins and by unskilled workers (both origin and destination). The reason why the decrease is statistically significant but the increase is not seems to stem from the sons of skilled workers. In the section comparing different areas (3.3.2), we have seen that a skilled worker father was one of the most decisive classes of origin for one's own class affiliation (**Figure 3-22**, p. 160). This origin remained equally important from the first to the second cohort, but its decisiveness for the status attainment of sons decreased significantly from the second to the last cohort. The decreasing importance of a skilled workers origin fits into the narrative of the modernization thesis: in a traditional society, skilled workers were self-employed owners of small businesses who were able to hand their property down to the next generation, whereas in industrialized

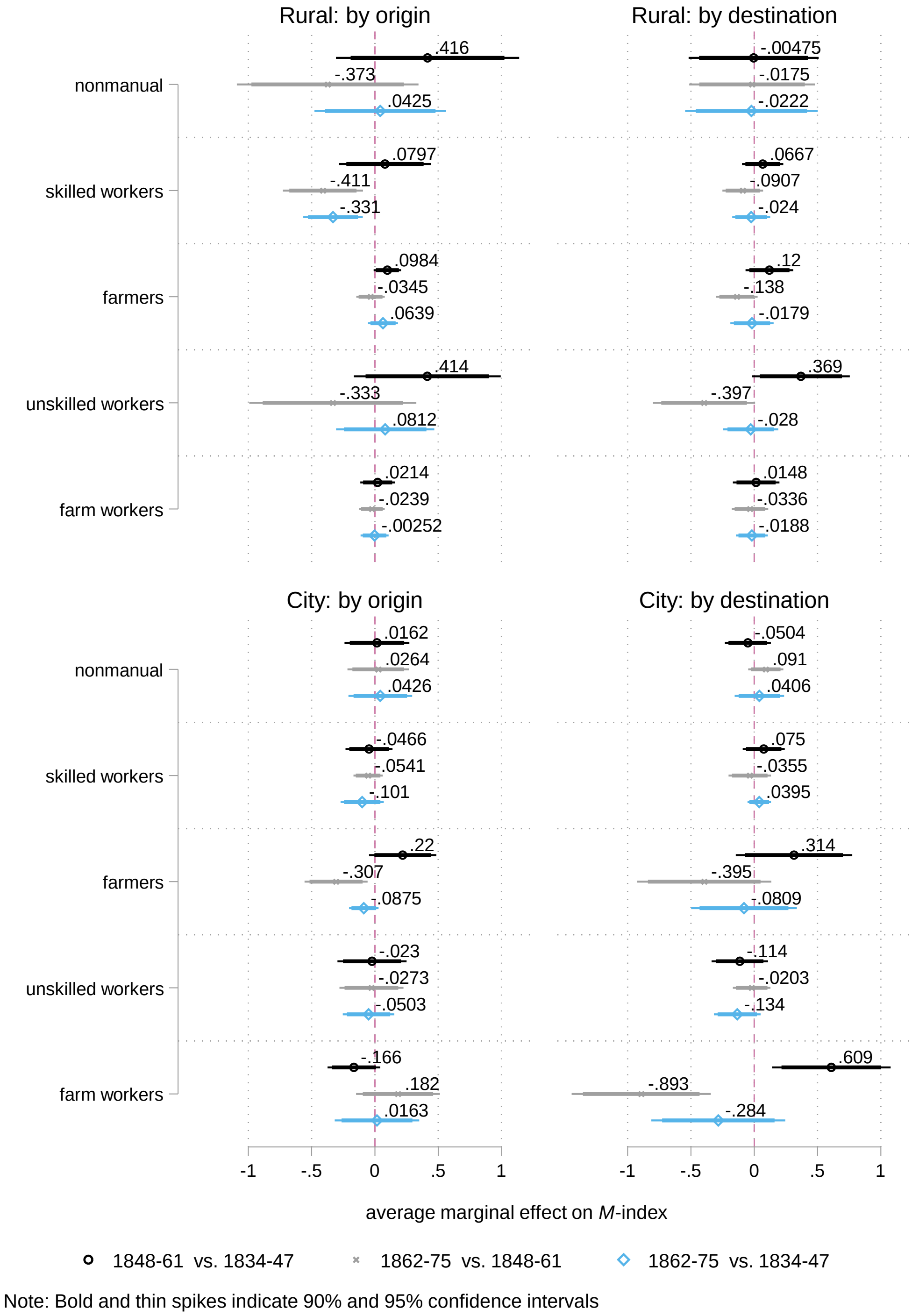


Figure 3-34. Lucerne: Local class linkages: differences between marriage cohorts
Note: Predictions based on the GMM estimator in **Table B-12** (Appendix B, p. 289).

society, skilled workers are thought to be foremen in a factory without occupation-related, hereditary property.

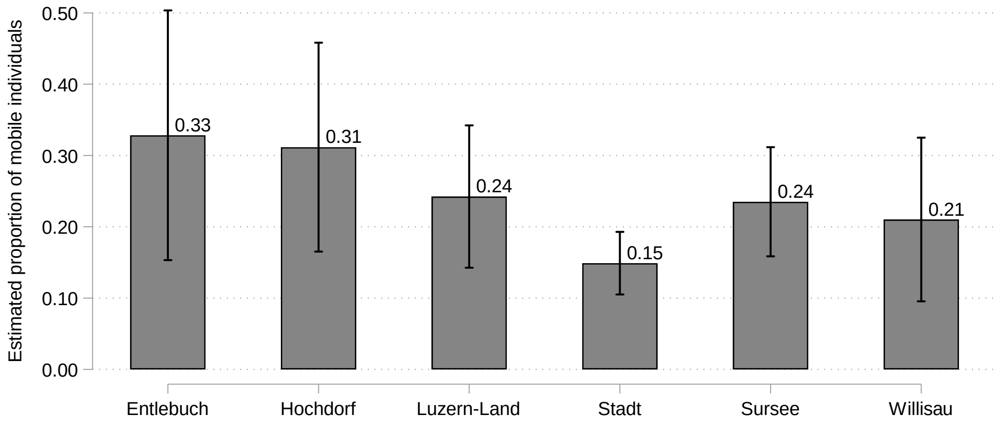
This interpretation is speculative and likely not directly applicable, as the overwhelming majority of the skilled workers in rural Lucerne remained skilled workers in the traditional sense: they were shoemakers, carpenters, tailors, bricklayers, millers, and so forth. However, the mobility pattern presented in **Figure A-19** (Appendix A, p. 275) lends some support to the assumption that the decreasing importance of a skilled worker's origin was related to modernization processes. In contrast to the other panels, the panel for the last cohorts shows the centrally placed X-pattern already discussed with reference to the canton of Glarus and the city of Lucerne (compare **Figure 3-24**, p. 162). This pattern suggests an affinity between skilled and unskilled workers not found in early cohorts in rural Lucerne, and appears to be a characteristic of more modern societies. In respect of farmers, the rationale behind hypothesis H_{farm} states that the self-recruitment rate among farming sons remains stable or increases with industrialization. However, looking at temporal changes, the results do not support this view, as the importance of origin for becoming a farmer changed roughly in parallel with the general development.

In the city of Lucerne, the main driver of the weak overall pattern (**Figure 3-32**) seems to have been the changing importance of a farming origin. Having a farming origin was more decisive in the middle cohort than in the other cohorts. A possible explanation for the increased decisiveness of a farming background in the middle cohort could be the lower proportion of immigrants among those with a farming background in this cohort.[86] Interestingly, sons of farmers belonging to the first two marriage cohorts had a tendency to experience downward mobility, whereas those belonging to the last cohorts had a tendency to experience upward mobility (compare the mobility patterns in **Figure A-20**, Appendix A, p. 276).

In respect of differences between regions, the results based on the *M*-index, presented in **Figure 3-35**, roughly match the ones regarding observed mobility. The results confirm that the city of Lucerne was the most open of the regions. Furthermore, in the two other relatively open regions (Sursee and Luzern-Land) social origin was of comparatively little importance. According to the *M*-index, the mountainous Willisau was one of the more open areas – which is in contrast to the fact that it was one of the least mobile regions, when considering observed mobility. However, because of sparsely

86 Because of the extended agricultural areas in the northeastern part of the city's territory, the city's population included a small but not negligible portion of locally rooted farmers. Due to an absence of sources, the literature does not provide any exact data on changing immigration rates for this period (Schüpbach 1983). The data derived from the marriage registers suggest that the proportion of locally rooted sons of farmers increased from about 7% in the first cohort to about 14% in the second cohort, and dropped back to about 6% in the last cohort. These changes are not statistically significant at conventional levels (p=.222 for the increase, p=.142 for the decrease).

populated cells, the only statistically significant differences are those between the city of Lucerne and other areas.



Note: Spikes indicate 95% confidence intervals

Entlebuch	vs. Hochdorf	$\chi^2(1)$ = 00.02	p = 0.885
Entlebuch	vs. Luzern-Land	$\chi^2(1)$ = 00.70	p = 0.403
Entlebuch	vs. Stadt	$\chi^2(1)$ = 03.76	p = 0.053
Entlebuch	vs. Sursee	$\chi^2(1)$ = 00.92	p = 0.338
Entlebuch	vs. Willisau	$\chi^2(1)$ = 01.24	p = 0.265
Hochdorf	vs. Luzern-Land	$\chi^2(1)$ = 00.59	p = 0.443
Hochdorf	vs. Stadt	$\chi^2(1)$ = 04.27	p = 0.039
Hochdorf	vs. Sursee	$\chi^2(1)$ = 00.81	p = 0.367
Hochdorf	vs. Willisau	$\chi^2(1)$ = 01.15	p = 0.283
Luzern-Land	vs. Stadt	$\chi^2(1)$ = 02.76	p = 0.097
Luzern-Land	vs. Sursee	$\chi^2(1)$ = 00.01	p = 0.909
Luzern-Land	vs. Willisau	$\chi^2(1)$ = 00.16	p = 0.685
Stadt	vs. Sursee	$\chi^2(1)$ = 03.52	p = 0.061
Stadt	vs. Willisau	$\chi^2(1)$ = 00.97	p = 0.325
Sursee	vs. Willisau	$\chi^2(1)$ = 00.13	p = 0.720

Figure 3-35. Lucerne: Class linkage by region

Note: Confidence intervals based on bootstrapped standard errors; 1,000 replications based on 1,700 observations in 1,241 clusters. Source: author, based on data from the marriage registers of Lucerne.

When considering observed mobility, the presence of a railway station did not have any effect. In respect to a more general class linkage, the results in **Figure 3-36** support the finding: no relevant difference in the *M*-index can be found between parishes with and without a railway station. In contrast to observed mobility, however, when controlling for both time and region, the estimated effect is stronger than without controls (**Figure 3-38**). While this effect points in the presumed direction, it remains too weak and imprecisely estimated to lend support to hypothesis H_{rail}.

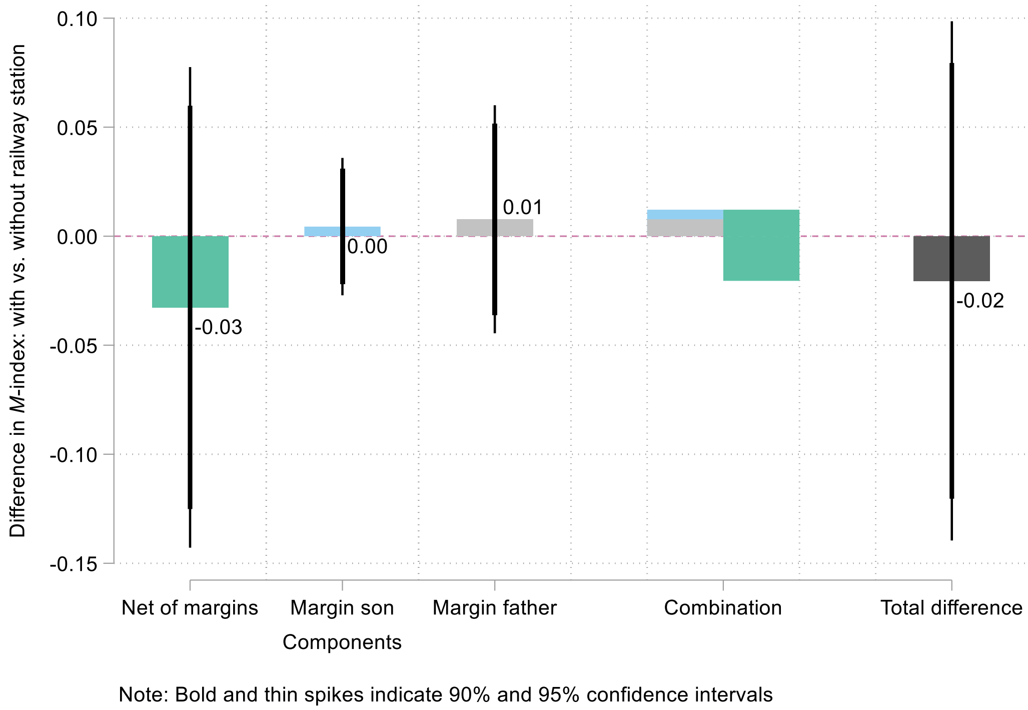


Figure 3-36. Rural Lucerne: Decomposed differences in the *M*-index between parishes with and without railway station

Note: Confidence intervals based on bootstrapped standard errors; 1,000 replications based on 1,106 observations in 647 clusters. Source: author, based on data from the marriage registers of Lucerne.

The analyses of the class linkages confirm the analyses of observed mobility in respect of the effect of industrialization, measured by the proportion of factory workers in the parish. In other words, social origin was more important in parishes where the proportion of factory workers exceeded the threshold of 5% than in those with smaller proportions of factory workers. As shown in **Figure 3-37**, this difference can be attributed to differences in the internal structure of the mobility tables and not to differences in their marginal distributions. Going a step further, **Figure 3-38** suggests that this effect was not significantly driven by differences between areas or time cohorts, other than the proportion of factory workers. The effect identified does not change substantially when introducing controls for regions, nor when controlling for marriage cohorts. When controlling for cohorts and the regions simultaneously, the effect becomes slightly weaker but remains significant at the 10% level. These results support the idea that in early phases of industrialization, increasing sector dualism increases inequality (and therefore the importance of social origin), as stated by hypothesis $H_{industS}$, and disapproves the claim of the modernization thesis that social origin loses its importance monotonically with increasing industrialization ($H_{industM}$).

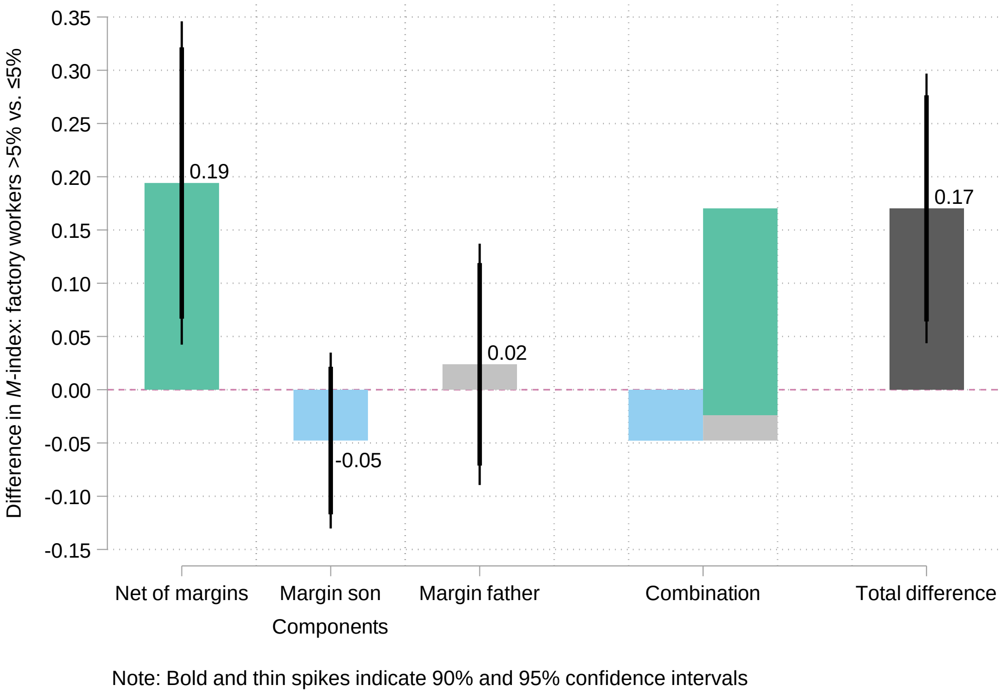


Figure 3-37. Rural Lucerne: Decomposed differences in the *M*-index between parishes with and without a proportion of factory workers >5%

Note and source: See **Figure 3-31.**

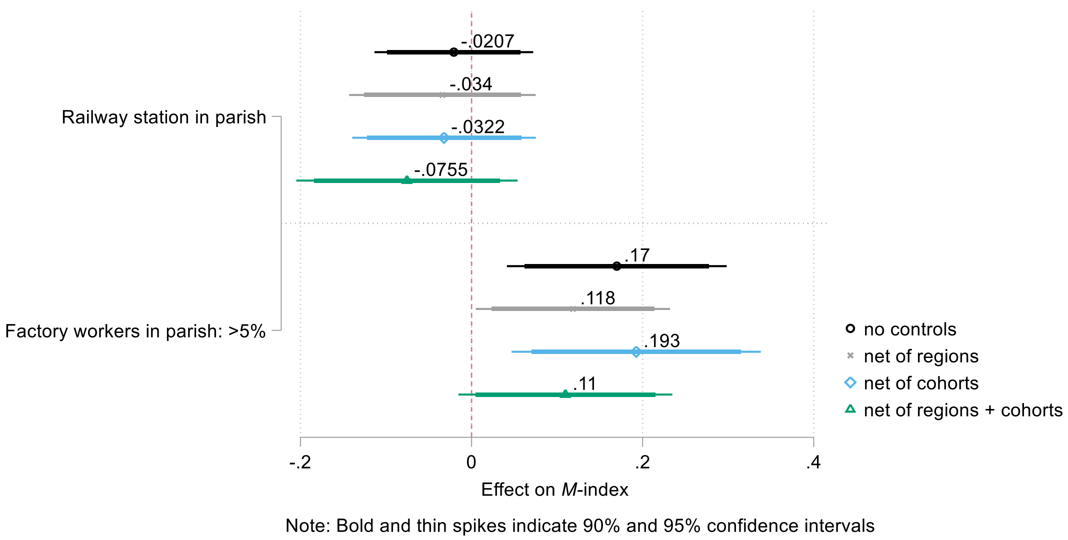


Figure 3-38. Rural Lucerne: Effect of the presence of a railway station and proportion of factory workers on the class linkage (*M*-index), with controls

Note: Average marginal effects based on separate GMM estimators: effect of railway station in **Table B-13** (Appendix B, p. 290) and effect of factory workers in **Table B-14** (Appendix B, p. 290).

Figure 3-39. Rural Lucerne: Industrialization effects on local class linkage

Note: Average marginal effects based on the GMM estimator in **Table B-15** (Appendix B, p. 291).

Going into more depth, the decomposition of the *M*-index in respect of both origin and destination in **Figure 3-39** suggests that the strengthening class linkage with increasing shares of factory workers in the parish mainly stems from the incumbents of the farming class. This result is partly in line with the rationale behind hypothesis H_{farm}, which predicts that the importance of social origin for becoming a farmer persists during industrialization. **Figure A-21** (Appendix A, p. 277) shows that there was a general tendency toward less equal probabilities by origin for attaining a certain class. However, the increased propensity of a farmer's son to become a farmer himself (net of differences between regions and cohorts) is striking. While in parishes with lower proportions of factory workers, sons of farmers inherited their father's class in about 49%[87] of cases, this share rises to 69% in parishes with more than 5% factory workers (p=0.024 for the difference).

***

Overall, the data on social mobility during the early industrialization of the canton of Lucerne refute the very general predictions of the modernization thesis but support alternative hypotheses regarding the effects of processes linked to industrialization. First, the results confirm the assumption that the higher mobility and lower importance of origin found in the city of Lucerne can be attributed to the strong migration to the city (H_{local}). Second, the crisis around the middle of the century boosted the importance of social origin and lowered social mobility, which is in line with the argument behind

[87] Predictive margins, based on a multinomial logistic regression model, including controls for regions and cohorts.

hypothesis $H_{LUtrend}$. In contrast to this hypothesis, however, no evidence can be found that the canton of Lucerne was more open in respect of social origin at the end compared to at the beginning of the observed period. In other words, no overall time trend was found, either for observed mobility or for intergenerational class linkage, measured by the M-index. Third, no relevant effect of the connection to the railway network was found. Therefore, the data on Lucerne do not support the corresponding hypothesis H_{rail}. Fourth, the data clearly refute the assumption that more industrialization, measured by the proportion of factory workers, attenuates the importance of social origin and boosts social mobility – as stated by hypothesis $H_{industM}$, based on the modernization thesis. Rather, the increasing proportion of people employed in the industrial sector increases the importance of social origin for belonging to a particular class during the early phases of industrialization (hypothesis $H_{industS}$, based on dualism theory). Finally, the results underline the role of farmers during the transition from an agrarian to an early industrial society, highlighted by Xie and Killewald (2013): to a large extent, the increasing importance of social origin during early industrialization can be attributed to the increasing propensity of farmers' sons to inherit their father's occupation.

3.3.5 Industrialization and Origin Effects on Social Class in Glarus

While the key aspect in Lucerne was early modernization and the beginning transition from an agrarian to an industrial society, the decisive factor in Glarus was the specific shape of industrialization within a local context (compare section 3.1). To a large extent, the sectoral transition had already been completed in 1830, the beginning of the period under study. Therefore, the hypotheses (section 3.3) to be tested in this section are less concerned with the spread of industrialization than with the degree of modernization of the existing industry.

Descriptive Overview

While Glarus suffered harsh crises over the first 20 years of the 19th century, it was, in contrast to Lucerne, only very locally affected by the crisis around the middle of the century. This is also reflected in the histogram of the dates of sons' first marriages in **Figure 3-41**. During the first two decades of the observed period (the 1830s and 1840s) the number of marriages increased as the economy recovered from the mentioned crises. This growth slowed considerably around the year 1845, after which the sampled marriages fluctuate at around 16 per year. The histogram also indicates the cut-off points for constructing three marriage cohorts used for some analyses. For this, the total observed period of 51 years has been divided into three periods of 17 years.

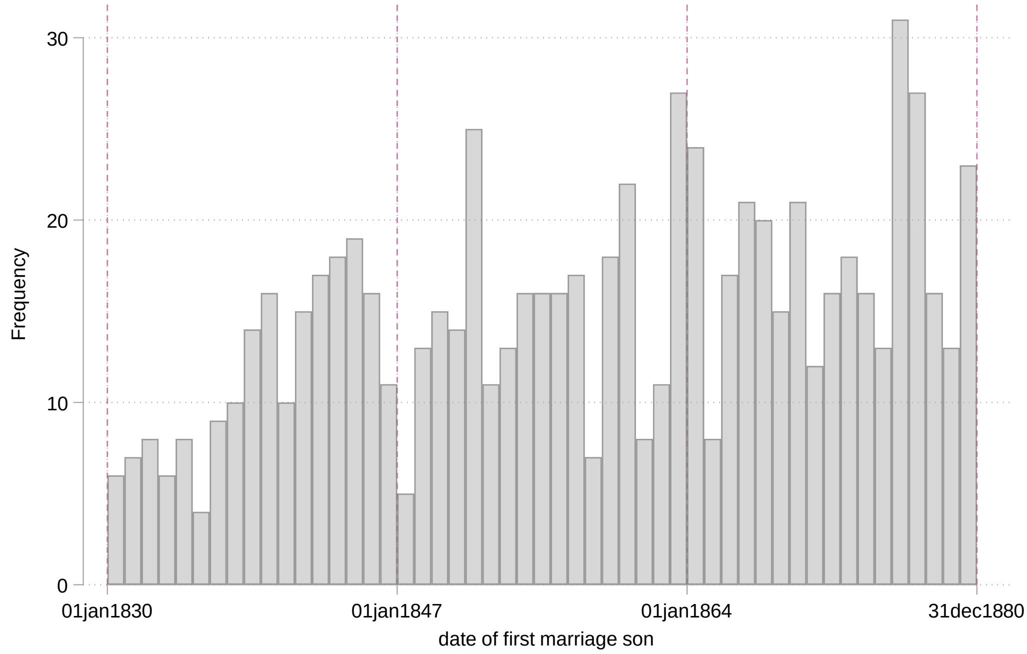


Figure 3-40. Glarus: histogram of sampled marriages per year, with cohort cut-off points

Source: author, based on the genealogy of Glarus.

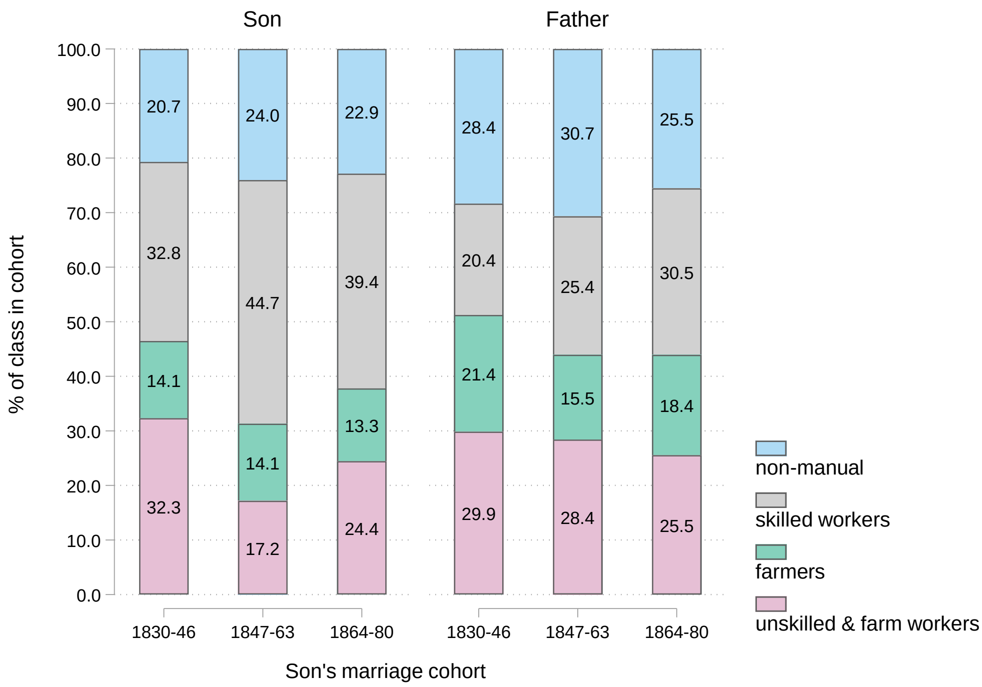


Figure 3-41. Glarus: Distribution of social classes by son's marriage cohort

Source: author, based on the genealogy of Glarus.

Comparing the four social classes used for the analyses of social mobility in the canton of Glarus across these marriage cohorts (see **Figure 3-41**) does not reveal important changes in the class structure between 1830 and 1880. The clearest change concerns the growth of the class of skilled workers from the first to the second cohort in the generation of the sons. This growth was at the expense of the class of unskilled and farm workers and can be attributed with some certainty to the spread of the printing industry in this period. The opposite trend from the second to the third cohort is in line with the stagnation of this industry and the simultaneous growth of the spinning and weaving industry, described in section 3.1.3. In respect of the fathers, the distribution of the classes remained remarkably stable. Nevertheless, two minor changes can be noticed: some shrinkage of the class of farmers from the first to the second cohort, and growth of the class of the skilled workers from the second to the third of sons' marriage cohorts. The former seems to be the last sign of the sectoral change, while the latter parallels the mentioned growth within sons' class distribution from the first to the second cohort.

Observed Mobility

In respect of observed mobility in the canton of Glarus, **Figure 3-42** indicates a slight positive linear time trend, which is not statistically significant at conventional levels. Alternative model specifications (quadratic, splines, non-parametric) do not fit the data any better. Predictions from the linear model suggest that observed mobility increased from about 48% in 1830 to 58% in 1880. This result is in line with hypothesis H_{modern}, which predicts increasing observed mobility in a modernizing context. However, the result is too imprecisely estimated to confirm the corresponding hypothesis.

Before turning to the results based on more direct measures of modernization, **Figure 3-43** reports the results for each of the regions that will be subsequently used for controlling for differences by geographical context. Most noteworthy, these results reveal a significant difference between the parish of Glarus as the "capital" of the canton and each of the other regions. In contrast to Lucerne, Glarus was, strictly speaking, not a city, but it was nevertheless the home of the ruling class and the old elite of merchants from which many of the manufacturers were recruited (Oberhänsli 1982). Therefore, the driver for the low mobility rate (35%) in Glarus was presumably the concentration of the closed elite in this area, which resulted in strong inequality. On the other end of the scale stands the Linth Valley, where the mobility rate reached 64%. Considering the strong industrialization of this valley, this top position is in line with the modernization thesis. On the other hand, the observed mobility in the Linth Valley was not significantly higher than in the much less industrialized Sernf Valley.

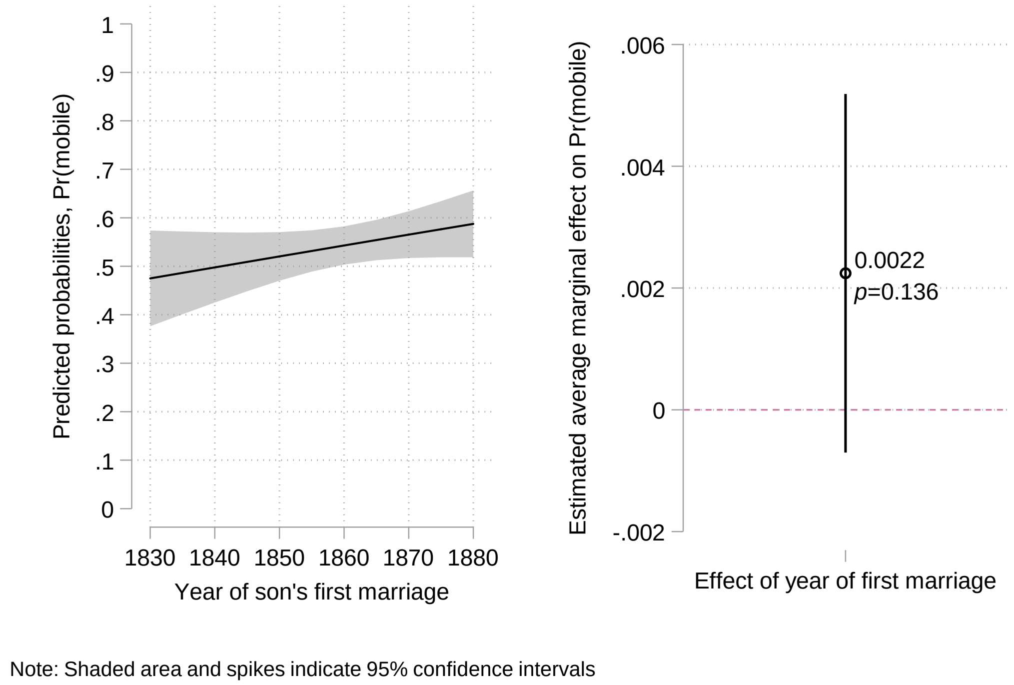
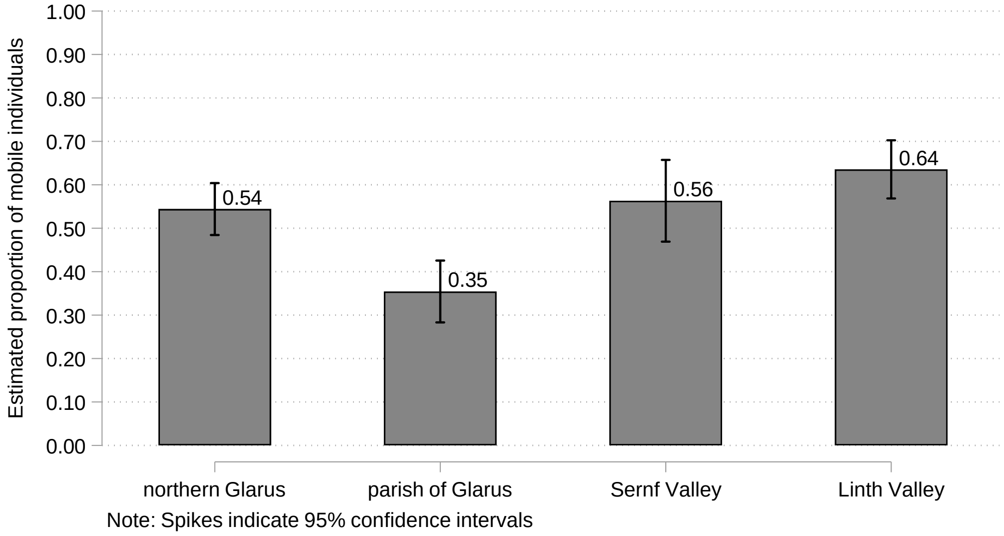


Figure 3-42. Glarus: Observed mobility by year of marriage

Note: Predictions based on the first logistic regression model in **Table B-16** (Appendix B, p. 292).



northern Glarus vs. parish of Glarus: $\chi^2(1) = 16.03$, $p < 0.001$
northern Glarus vs. Sernf Valley : $\chi^2(1) = 00.11$, $p = 0.737$
northern Glarus vs. Linth Valley : $\chi^2(1) = 03.98$, $p = 0.046$
parish of Glarus vs. Sernf Valley : $\chi^2(1) = 12.03$, $p < 0.001$
parish of Glarus vs. Linth Valley : $\chi^2(1) = 31.81$, $p < 0.001$
Sernf Valley vs. Linth Valley : $\chi^2(1) = 01.50$, $p = 0.220$

Figure 3-43. Glarus: Observed mobility by region

Note: Predictions based on the second logistic regression model in **Table B-16** (Appendix B, p. 292).

As in Lucerne, therefore, the results on observed mobility only partially confirm the very general hypothesis H_{modern}, which follows directly from the modernization thesis and predicts higher mobility in more modern and industrialized periods and areas. The positive time trend identified was fragile and while the highly industrialized Linth Valley was indeed very mobile, the modernization thesis fails to explain the low mobility in the industrialized but highly unequal context of the capital as it fails to explain the high mobility in the weakly industrialized and very poor context of the Sernf Valley.

Turning to more direct measures of modernization, the evidence remains mixed. Hypothesis H_{educ} predicts that educational expansion, measured by the introduction of a secondary school, increases observed mobility. The results presented in **Figure 3-44** do not support this hypothesis. First, observed mobility in parishes that had a secondary school did not differ significantly from those without such a school (result from the model without controls). Introducing controls for regions and linear time trends does not alter this conclusion substantively. However, introducing controls for each parish (parish fixed effects) and controlling for a general time trend results in an estimate that suggests that the introduction of a secondary school decreases observed mobility. This result is substantial (-12.4 percentage points), statistically marginally significant (p=.096), and directly contradicts the corresponding hypothesis.

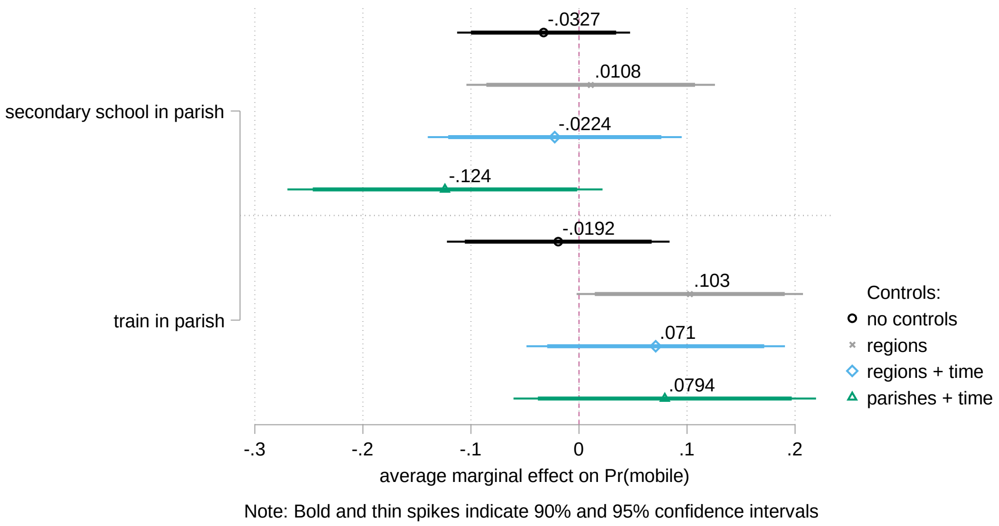


Figure 3-44. Glarus: Effects of the presence of a secondary school or a train station on observed mobility

Note: Each estimate based on a separate logistic regression model: secondary school in **Table B-17** (Appendix B, p. 293), railway station in **Table B-18** (Appendix B, p. 294).

In respect of the assumed positive effect of having a train station in the parish (hypothesis H_{rail}), the results are slightly more favorable. While there is no gross difference between parishes with and without a train station (model without controls), an effect emerges when introducing controls for geographical contexts. However, this effect appears to be partly spurious: additionally controlling for a linear time trend diminishes the effect and the estimated effect is no longer statistically significant at conventional levels. Therefore, the data from Glarus do not contradict the corresponding hypothesis H_{rail}, but they fail to clearly support it.

The strong industrialization and the rapid growth of the factory-based textile industry was the decisive characteristic of the modernization of the canton of Glarus in the 19th century. However, because of its traditional character, the printing industry was hypothesized to have a conserving effect on observed mobility (hypothesis H_{print}). This hypothesis is largely supported by the data (**Figure 3-45**): the gross association (estimated by the logit model without controls) is non-significantly negative, while the effect net of regional differences and net of a linear time trend is virtually zero.[88] Therefore, the results suggest that the importance of the printing industry does not affect observed mobility.

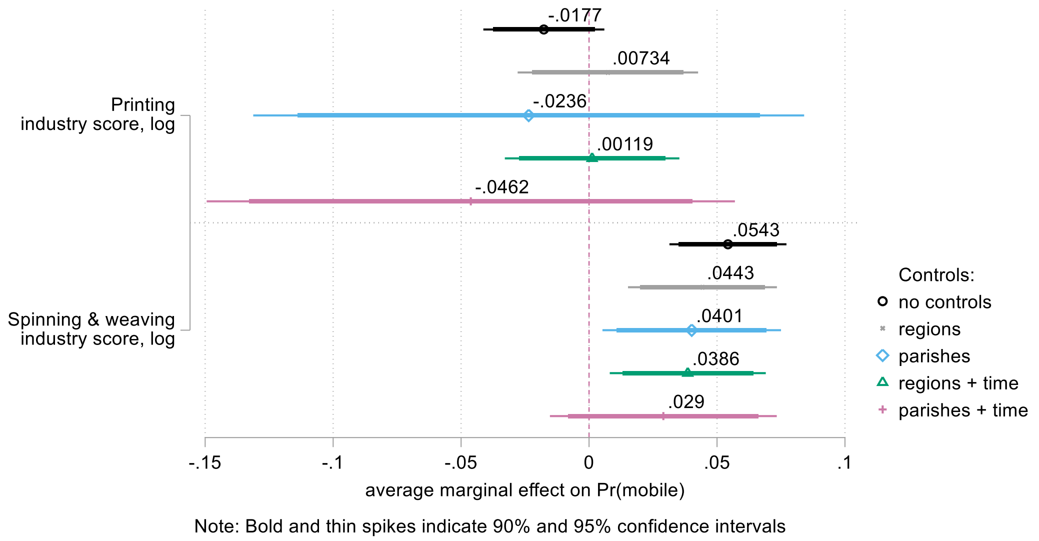


Figure 3-45. Glarus: Observed mobility and industries in a parish

Note: Each estimate based on a separate logistic regression model: printing industry in **Table B-19** (Appendix B, p. 295), spinning and weaving industry in **Table B-20** (Appendix B, p. 296).

In contrast to the printing industry, the spinning and weaving industry of the 19th century can be assumed to have had an effect on mobility. Based on the modernization thesis, hypothesis H_{spin} assumes mobility will increase with the growth of the modern and mechanized spinning and weaving industry. The results reported in **Figure 3-45** indicate, indeed, that parishes with a weak spinning and weaving industry have, on average, lower mobility rates than those with a strong spinning and weaving industry (result from model with no controls). However, this effect is at least partly spurious as

88 Introducing parish-level fixed effects adds no additional information as the very large confidence interval of the corresponding effect suggests that the data do not allow a stable estimation of all the necessary parameters.

controlling for both geographical context and linear time trends decreases the estimated effect. The effect remains significant even when controlling for parish-level fixed effects or for regions plus time trends. However, the effect becomes insignificant when introducing a time trend in addition of the parish-level fixed effects. Because of the large confidence interval of this last estimate, it remains unclear whether the effect found by the other models is the result of a conflation with other relevant characteristics or whether the lack of statistical power does not make it possible to identify an effect of the spinning and weaving industry in the presence of parish-level fixed effects. Therefore, the results on observed mobility are generally in line with hypothesis H_{spin}, but the robustness is questionable.

In sum, the results for observed mobility in the 19th-century canton of Glarus point in the direction predicted by the hypotheses. However, because of the lack of statistical power, it is not possible to fully confirm these hypotheses. Furthermore, the data clearly disprove the hypothesis that the expansion of education will in any case lead to greater mobility. If the opening of new school buildings in the canton of Glarus had an effect on mobility, then this effect was negative.

Class Linkage

The not statistically significant positive time trend in observed mobility found above is paralleled by an insignificant weakening of the intergenerational class linkage over time. **Figure 3-46** shows the predicted linear time trend of the M-index: it falls from .21 in 1830 to .09 in 1880. However, the slope is imprecisely estimated and not statistically significant at conventional levels.

Tests with other specifications than linear trends do not suggest the existence of a non-linear trend. Because of the imprecise estimation, no decomposition of the time trend is shown here. However, a decomposition of the differences in the M-index between the three marriage cohorts (1830–46, 1847–63, and 1864–80) suggests that the decline was largely driven by a change in the internal structure of the mobility table and not by changes in the marginal distribution.[89]

[89] To give an idea, despite the imprecise estimation: from the first to the third cohort, the M-index dropped by -.052 (standard error: .063); if the marginal distribution had not changed, this change would have been -.048 (.062).

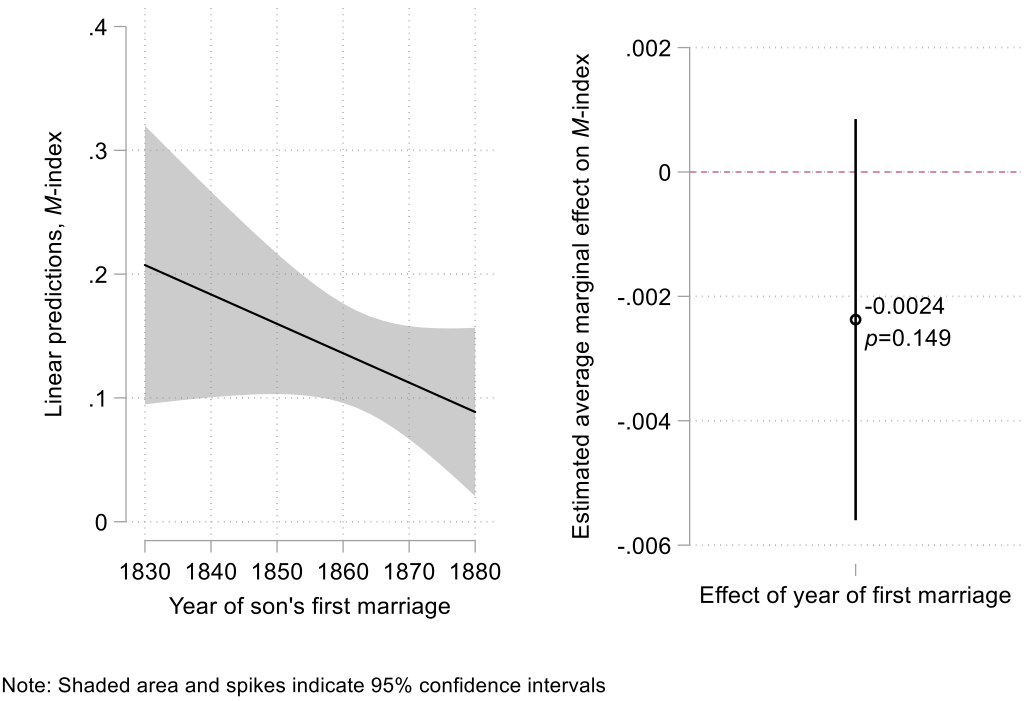


Figure 3-46. Glarus: Class linkage by year of marriage

Note: Coefficients from a GMM estimator; confidence intervals based on cluster robust standard errors; 759 observations in 172 clusters. Source: author, based on data from the genealogy of Glarus.

The contributions of each cell in the mobility table to the total *M*-index reported in **Figure 3-47** give further insights into the changing class linkage. In the first marriage cohort, only the immobile sons contributed to the *M*-index. That is, for all those who had a different class than their father, learning the father's class does not add any information on the son's class over and above the information known from the marginal distribution. The concentration in the main diagonal of the table decreases for the later cohorts, mainly because, for these cohorts, the affinity between the two working classes discussed above (section 3.3.2) starts to show up. However, this new sorting regime is not strong enough to compensate for the weakening of the inheritance pattern. In consequence, the trend in observed mobility parallels the one in the general class linkage between the generations. In sum, the results for time trends are generally in line with hypothesis H_{modern}, but they cannot strictly confirm this hypothesis because of the imprecise estimation of the results.

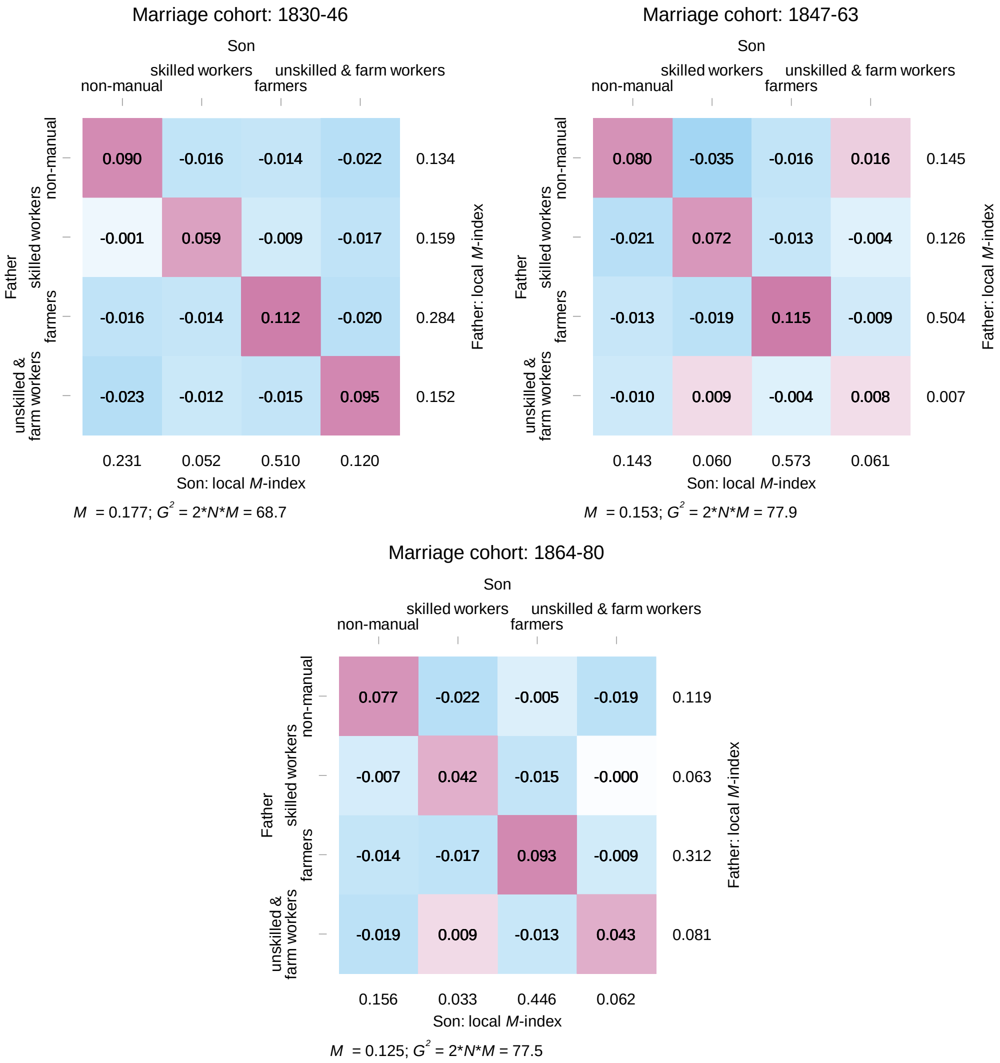


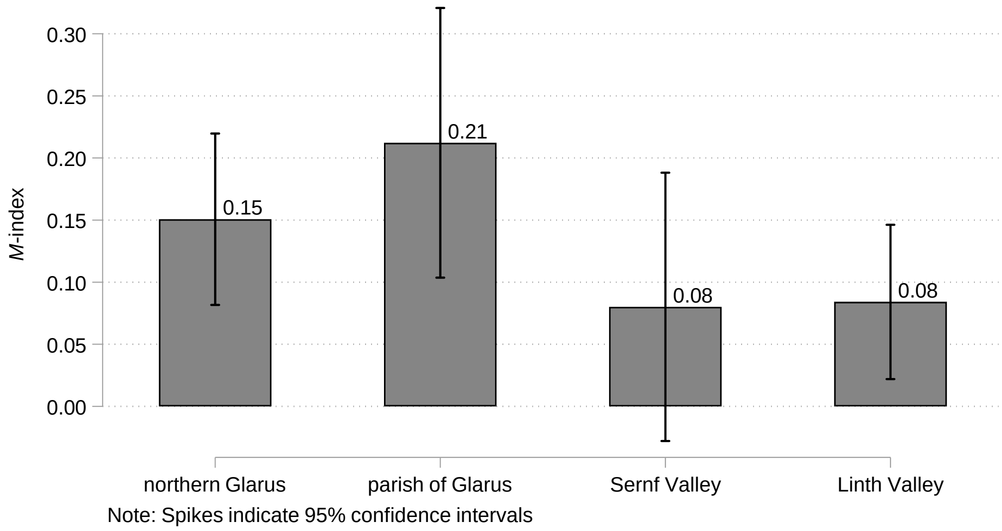
Figure 3-47. Glarus: mobility patterns by marriage cohorts

Note: Cell contributions to the *M*-index. Source: author, based on data from the genealogy of Glarus.

This concordance of mobility and intergenerational linkage measured by the *M*-index can also be found in respect of the differences between the regions. The results presented in **Figure 3-48** suggest that social origin was most decisive for the class affiliations of individuals living in the parish of Glarus and least decisive for those from the two southern valleys of the canton (Sernf Valley and Linth Valley).

In direct opposition to the corresponding hypothesis H_{educ}, the results presented above suggest that observed mobility decreases with the presence of a secondary school when controlling for regions and a linear time trend. This result is exactly reflected by the results for the effect on the linkage between a father's and son's social class, measured by the *M*-index (**Figure 3-49**). Without controls, the *M*-index in parishes with a secondary school is only insignificantly higher than in parishes without such a school.

However, the decomposition of this difference (see **Figure A-22**, p. 278, Appendix A) suggests that this difference would be stronger and statistically significant if the marginal distribution was the same in the two contexts, because the differences in the margins work in the opposite direction. Furthermore, once we control for regions and linear time trends, the total effect also becomes much stronger and more significant. In other words, the results suggest that the introduction of a secondary school lowers observed mobility because it strengthens the intergenerational class linkage.



northern Glarus vs. parish of Glarus: $\chi^2(1) = 00.91$, $p = 0.340$
northern Glarus vs. Sernf Valley : $\chi^2(1) = 01.16$, $p = 0.282$
northern Glarus vs. Linth Valley : $\chi^2(1) = 01.98$, $p = 0.160$
parish of Glarus vs. Sernf Valley : $\chi^2(1) = 02.96$, $p = 0.086$
parish of Glarus vs. Linth Valley : $\chi^2(1) = 03.98$, $p = 0.046$
Sernf Valley vs. Linth Valley : $\chi^2(1) = 00.00$, $p = 0.948$

Figure 3-48. Glarus: Class linkage by region

Note: Confidence intervals based on bootstrapped standard errors; 1,500 replications based on 759 observations in 172 clusters. Source: author, based on data from the genealogy of Glarus.

The results in **Figure 3-49** also confirm the absence of an effect found by analyzing observed mobility in respect of the effect of the presence of a train station, assumed by hypothesis H_{rail}. While for observed mobility the gross effect went in the expected direction, no effect at all can be found on the intergenerational linkage of social class, either with or without controls for area and time. Note that it was not possible to estimate a model that includes controls for regions but not for time, which calls into question the robustness of the three remaining models. Finally, the decomposition presented in **Figure A-23** (p. 278, Appendix A) suggests that neither the internal structure nor the marginal distribution differs between the two contexts.

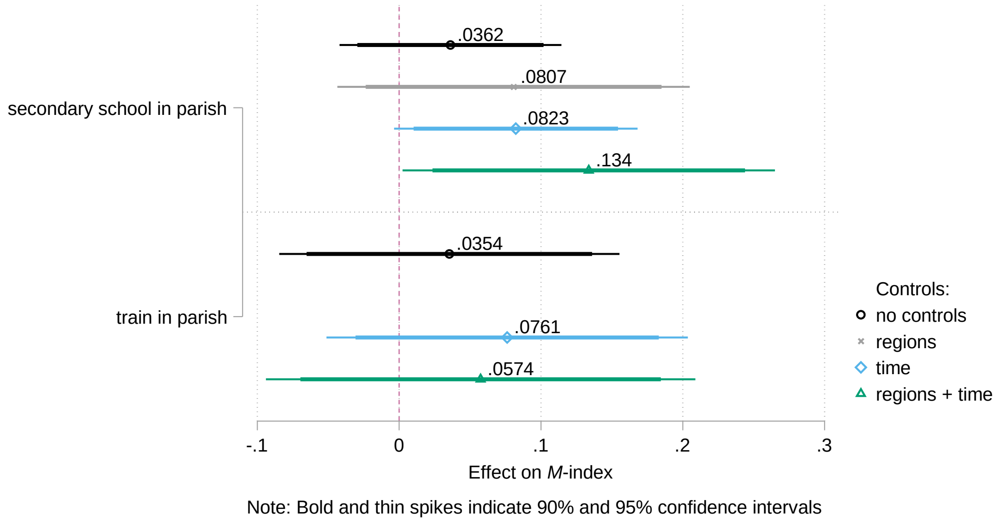


Figure 3-49. Glarus: Effects of the presence of a secondary school or a train station on the *M*-index with controls

Note: Average marginal effects based on separate GMM estimators: effect of secondary school in **Table B-21** (Appendix B, p. 297) and effect of railway station in **Table B-22** (Appendix B, p. 297).

In respect of the two types of industry, analyzing observed mobility confirms the corresponding hypotheses H_{print} and H_{spin}: while a spreading spinning and weaving industry came with an increase in observed mobility, no effect of the printing industry is found. Unfortunately, when controlling for the Sernf Valley, the data do not allow us to identify the effect of these industries on the *M*-index. For this reason, I have decided to exclude the 87 cases from the Sernf Valley from all but the very first of the following analyses. Comparing the first two estimates for each of the two industry scores in **Figure 3-50** suggests that this is only a minor limitation in the case of the spinning and weaving industry, as the estimate for the whole canton is very close to the one based on the sub-sample that excludes the cases from the Sernf Valley. In respect of the printing industry, by contrast, the difference between the two estimates is slightly more pronounced. However, there are good reasons to assume that only the between-regions effect is affected by the exclusion of the cases from the Sernf Valley, and that the difference would disappear if it were possible to control for the Sernf Valley. First, **Figure 3-14** (p. 129) shows that the printing industry score for Matt-Engi and Elm, the two parishes of the Sernf Velley, were constant over the whole observed period – there was simply no printing industry in this part of the canton. Therefore, the data from the Sernf Valley cannot contribute to the estimated effect of the printing industry when controlling for regions. Second, when comparing the class linkage between regions in **Figure 3-48**, we have seen that the *M*-index estimated for the Sernf Valley was among the lowest of the four regions. Consequently, the between-effect of the printing industry (but not the within-effect) is necessarily higher, when including the cases of the Sernf Valley. Finally, checks indicate that the only remaining possibility regarding how the outcome could be affected by the omission of the Sernf Valley cases is implausible. While the cases from the Sernf Valley cannot contribute to the identification of the printing industry effect once regions are controlled for, they can contribute to the identification of the general time trend in the model that includes controls for both regions and time. If the estimated time trend changes due to the omission of the data from the Sernf Valley, the estimate of the effect of the printing industry could also change. However, this is unlikely: estimating the linear time trend (net of regions) with and without the data from the Sernf Valley leads to very similar results.[90]

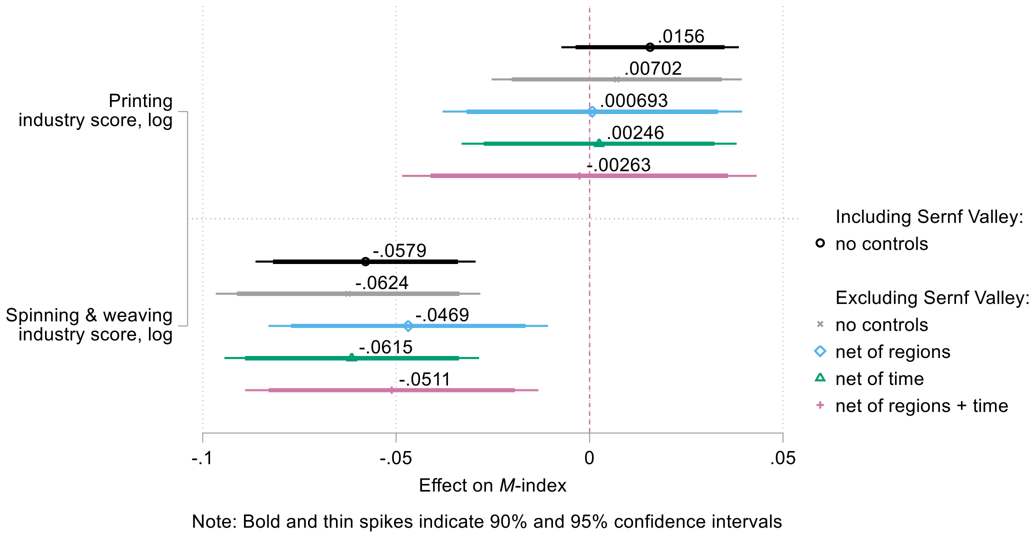


Figure 3-50. Glarus: Class linkage and industries in a parish, with controls

Note: Average marginal effects based on separate GMM estimators: effect of printing industry in **Table B-23** (Appendix B, p. 298) and effect of spinning and weaving industry in **Table B-24** (Appendix B, p. 298).

Figure 3-50 shows that the spread of the printing industry did not affect intergenerational class-linkage. Already, the gross effect is very small and is not significant. The decomposition of the difference between contexts with and without a printing industry (**Figure A-24**, p. 279, Appendix A) suggests that net of the marginal distribution, the linkage between a father's and son's social class would be insignificantly stronger in areas with a printing industry than in areas without such an industry – a counterfactual difference that was, however, cancelled out by differences in the marginal distribution of the sons. More specifically, the unconditional entropy in a son's class distribution was higher in the contexts with printing industry. If it had been the same in both contexts, the difference between them would be higher. However, the

90 Coefficient (and standard errors): -.00202 (.00153) when including the Sernf Valley, -.00192 (.00157) when excluding the Sernf Valley.

effect of the spreading printing industry disappears almost completely when controlling for regions and/or time. In other words, analyzing the *M*-index again confirms the results from analyzing observed mobility: the spread of the printing industry in the canton of Glarus did not affect the relevance of social origin for individuals' class attainment. This is in line with hypothesis H_{print}.

In contrast to the gross effect of the printing industry, the gross effect of the logged score of the spinning and weaving industry is negative, is much stronger, and is statistically highly significant (p<.001). The difference between contexts with and without such an industry was decomposed into the portion stemming from the internal structure of the mobility tables (net of differences in the margins) and the contributions of the marginal distributions of the classes of the sons and the fathers (**Figure A-25**, p. 279, Appendix A). This decomposition indicates that the lion's share of the difference goes back to differences in the internal structure of the mobility tables, but the difference in sons' marginal distribution further contributes to the total difference. The gross effect of the spinning and weaving industry remains robust when controlling for linear time, but slightly decreases when controlling for regions (**Figure 3-50**). Additionally controlling for time does not further attenuate the effect. This is in contrast to the analyses of the observed mobility above (**Figure 3-45**), and gives some confidence that the reported effect is not caused by unobserved characteristics not captured by the combination of regional and temporal controls available.[91]

As the industry scores were log-transformed, it is not straightforward to interpret the estimated coefficients. For this reason, **Figure 3-51** shows the predicted values of the *M*-index over the whole scale of the industry scores (back-transformed from the log-scale). Based on the full model in **Figure 3-50**, it shows that the predicted value of the *M*-index is .265 for contexts with a spinning and weaving industry score of 0, drops to .109 for a spinning and weaving industry score of 20, and becomes insignificantly different from zero for industry scores above 41. In contrast to this clear decline, the values predicted for different printing industry scores do not show any trend.

[91] Note that the introduction of parish-level fixed effects is not feasible for the data-demanding analysis of the effect on the *M*-index.

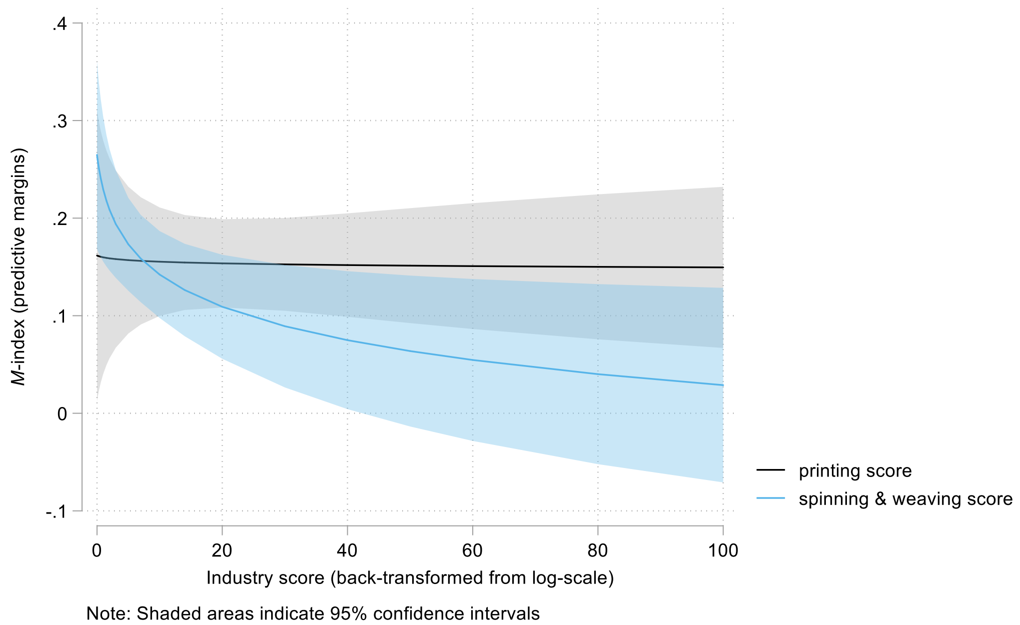


Figure 3-51. Glarus: Predictions for the *M*-index over industry scores

Note: Predictions based on models with controls for regions and time (excluding the Sernf Valley) in **Figure 3-50**.

Given these results, the question arises: what happened to the mobility regimes when one of the two industries grew. **Figure 3-52** gives some answers to this question. While the spread of the printing industry did not affect the overall class linkage, it did strengthen the decisiveness of having a farming origin and, less clearly, the importance of origin for becoming a farmer. The conditional probabilities of attaining a certain class (**Figure A-26**, p. 280, Appendix A) illustrate this trend. While the unconditional propensity for becoming a farmer more than halved (dropping from 20.7% to 8.8%) as the printing industry score rose from zero to 100, this propensity decreased only by one fifth (from 52.4% to 41.8%), when considering only sons of farmers.

Decomposing the effect of the spinning and weaving industry on the overall *M*-index shows that it was mainly at the poles of the class structure that the class barriers became more fluid (**Figure 3-52**). Having a non-manual class background became clearly less decisive for a son's class affiliation; the same is true if the father belonged to the unskilled and farm workers class. The picture is the same when looking in the other direction: social origin became less important for attaining the non-manual class or the unskilled and farm workers class. Again, the predicted conditional probabilities, plotted in **Figure A-27** (p. 281, Appendix A) are illustrative in this respect: they converge for all classes of destination, but most prominently for the non-manual class and the unskilled and farm workers class.

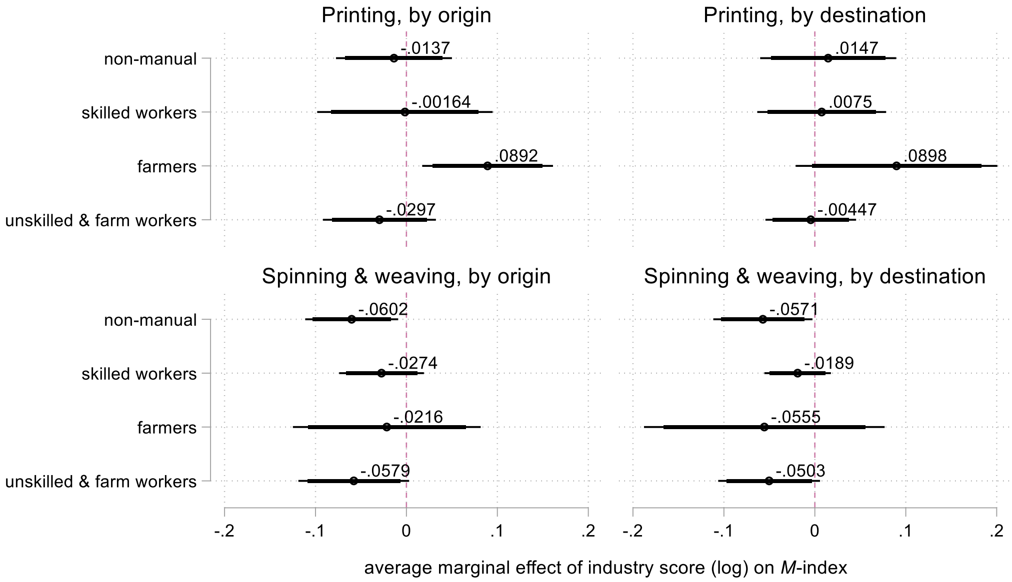


Figure 3-52. Glarus: Industrialization effects on local class linkages

Note: Average marginal effects based on coefficients from the GMM estimator (net of regions and linear time) in **Table B-25** (Appendix B, p. 299).

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In sum, the results based on the data from the canton of Glarus are at least in some aspects in line with the assumptions of the modernization thesis. While they cannot strictly confirm an overall trend towards social fluidity, the results for both observed mobility and the linkage between a father's and son's social class point in the direction assumed by the modernization thesis. The results cannot confirm the modernization thesis, as the increase in observed mobility and the decrease in the *M*-index measuring the intergenerational linkage are not statistically significant at conventional levels. However, the combination of the two results suggest that something was changing, with a move in the direction of more openness in respect of social origin. The results for the different regions, mainly introduced to partly control for unobserved heterogeneity, confirm this ambivalent conclusion. While the Linth Valley, with its strong spinning and weaving industry, indeed had the highest mobility rates and was the place where social origin was of the least importance, the modernization thesis fails to explain the low mobility in the highly industrialized parish of Glarus, and the high mobility in the poor and weakly industrialized Sernf Valley. At best, the data from Glarus furnish weak empirical evidence for confirming the general modernization thesis H_{modern}, which states that more modernized areas or periods exhibit higher social mobility.

The hypotheses regarding the positive effects of educational expansion (H_{educ}) and the construction of railway lines as modern means of transportation (H_{rail}) on mobility do not receive any reliable support from the data from Glarus. While there is no robust evidence for an effect of a connection to the railway system at all, the opening of a secondary school seems to have had an opposite effect to what the hypothesis based on the modernization thesis assumes. Generalized dualism (Nielsen 1994; Knigge et al. 2014a) may provide a *post-hoc* explanation for this observation. It assumes that education expanded heterogeneously across social positions: it was faster in upper strata and slower in lower strata. Because of these differences in speed, educational expansion is thought to have increased inequality until it reached a certain level. This fits the results from the 19th-century canton of Glarus, where we observe only the first stage of educational expansion.

In respect of industrialization, the results for social mobility confirm the existing literature on the canton's industrialization, stressing the differences between the printing industry and the spinning and weaving industry. In the 19th century, both industries concentrated their production in factories. But while important steps within the printing process conserved an artisanal character, craftsmen skills transferable from one generation to the next no longer mattered in the mechanized production of yarn and textiles. Because of this argumentation, hypothesis H_{print} does not assume that the spread of the printing industry will affect social mobility, while hypothesis H_{spin} assumes the spinning and weaving industry will loosen the linkage between a father's and son's social class and, thereby, increase observed mobility. Overall, the analyses of both observed mobility and the intergenerational linkage measured by the M-index support these hypotheses. However, the data do not make it possible to establish a robust causal relationship between the growth of the spinning and weaving industry and the decreased relevance of the intergenerational class linkage. Most prominently, this becomes clear when analyzing observed mobility: when controlling simultaneously for parishes and time, the otherwise clear effect becomes insignificant. This is likely due to the limited statistical power, but the finer control for geographical context could also block a spurious relationship between industry and mobility, caused by unobserved heterogeneity.

3.3.6 Industrialization and Social Mobility in 19th-Century Lucerne and Glarus: A Preliminary Conclusion

The primary aim of this section has been to test the modernization thesis in respect of social mobility in the context of the 19th-century cantons of Lucerne and Glarus. In pursuit of this aim, hypothesis regarding differences and trends in the importance of social origin for the class an individual were derived from the modernization thesis (hypotheses H_{modern}, H_{GLvsLU}, and H_{city}). In order to clarify the strengths and limitations of the modernization thesis, these general hypotheses have been complemented in two ways. First, hypotheses regarding the effect of more directly measured aspects of modernization have been formulated. The spread of modern means of transportation (H_{rail}), educational expansion (H_{educ}), urbanization (H_{local}), and especially industrialization ($H_{industM}$, H_{print}, and H_{spin}), are thought to boost social mobility and to weaken the linkage between a father's and son's social class. Second, differentiating as well as contrasting hypothesis have been derived and tested.

The contrasting hypotheses are based on dualism theory: the idea that the transition from one sector (agriculture) to a second sector (industrial sector) first increases inequality before inequality decreases again (H_{sector}). This idea is of special relevance for explaining industrialization effects within the canton of Lucerne, where the share of the industry sector remained low over the whole period observed in this study. Accordingly, hypothesis $H_{industS}$ assumes for the canton of Lucerne that industrialization led to lower mobility and to a stronger intergenerational class linkage. Finally, the historiography of the canton of Glarus suggests that a distinction should be made between two different industries in the canton of Glarus. Consequently, hypothesis H_{spin} assumes that the spinning and weaving industry led to more mobility, while H_{print} assumes that the more traditional printing industry did not have such an effect.

The key conclusion resulting from the analyses carried out is the following: the modernization thesis captures some relevant trends of Lucerne's and Glarus' modernization, but it fails to explain important aspects. Where applicable, sector dualism theory performs better. Because dualism theory focuses on inequality, this suggests that the modernization thesis underestimates the role of inequality and is wrong regarding trends in inequality during early modernization. Already for this period, the modernization thesis predicts a monotonically decreasing importance of social origin for individuals' class affiliations, while dualism theory assumes the contrary. For later periods, the two predictions converge.

If sector dualism is indeed an important driver of modernization effects, this convergence explains why the identified differences between the areas in terms social mobility and intergenerational class linkage are in line with the modernization thesis. More specifically, mobility was higher and the intergenerational linkage weaker in the strongly industrialized canton of Glarus than in the very agrarian rural part of Lucerne. The same pattern was found when comparing the city of Lucerne to the rural part of the canton. Further analyzes have shown that the weaker linkage in the city can be attributed to the large proportion of non-locals. This finding clarifies the role of cities and urbanization in the modernization process, on which the modernization thesis often remains vague. Symptomatically, Treiman (1970: 219, 221) makes a theoretical distinction between the urbanization of a society and the level of geographical mobility, but combines the two when presenting empirical evidence. From a theoretical point of view, the city of Lucerne can be expected to be more open because, first, information on the family of origin is less reliably available in a city than in a small village, and, second, because it may not be available at all for all those who migrate to city. While the latter has been confirmed, no evidence has been found for the former claim. In other words, the city of Lucerne was more open not because it was urban but because of the process of urbanization – that is, the fact that people moved to the city.

When analyzing differences between areas on a smaller scale, the results match the predictions of the modernization thesis only partly. While observed mobility in the regions of the canton of Lucerne followed a pattern that was in line with the modernization thesis (the highest mobility rate was in the city, followed by the rather industrialized regions of Luzern-Land and Sursee), the low (but imprecisely estimated) *M*-index for the mountainous region of Willisau deviated from this pattern. Furthermore, the modernization thesis fails to explain the strength of the intergenerational linkage in two out of four regions of the canton of Glarus. It is likely that, for both deviations, inequality plays an important role: a strong linkage was found in the strongly industrialized parish of Glarus where the elite was powerful, while the linkage was weak in the weakly industrialized, but "homogeneously poor" Sernf Valley.

In respect of time trends, the data from the two cantons call into question the classical modernization thesis that assumes a monotonically decreasing importance of social origin. In Glarus, the identified trends in observed mobility, as well as in the intergenerational class linkage, were found to be in the predicted direction. However, the imprecise estimates not only point to insufficient data, but also suggest that there may be counteracting tendencies. In Lucerne, such interfering processes were obviously at work. Here, no overall trend towards more intergenerational openness was found. Rather, an inverted U-shaped pattern emerged, which suggests that social origin was most important around the middle of the century. On first sight, this pattern is in line with the theory of sector dualism, which also predicts that, in the course of industrialization, a trend towards more fluidity is preceded by an opposite trend. However, sector dualism did not play a relevant role for general time trends in the 19th-century canton of Lucerne, as industrialization remained too weak over the whole century. Rather, the crisis around the middle of the century can be assumed to have caused sons to make increased use of the resources of their family of origin, which strengthened the intergenerational linkage during this period.

The results were also mixed in respect of specific measures of modernization. For neither of the two cantons was any robust evidence found for the hypothesis that assumed that trains increase mobility as they allow people to move further and increasingly outside of the area where information on social origin is available. If the connection to the railway system did have this presumed effect, the 20 years for which trains existed in this period were not enough to produce this effect. In respect of educational expansion, the results based on the data from the canton of Glarus were clearly at odds with the modernization thesis. Educational expansion did not lead to a weaker intergenerational class linkage, but rather to a stronger one, and, thus, decreased observed mobility. As only early educational expansion was observed in the canton of Glarus, this result can be explained by the idea of generalized dualism, which predicts that in early stages, educational expansion boosts inequality of educational opportunities.

The relevance of sector dualism (in the narrow sense) became apparent when analyzing the effect of industrialization in the canton of Lucerne. In this canton, the transition from an agrarian to an industrial economy was far from complete, even in the areas with an emerging industry. In such a situation, dualism theory predicts increasing inequality, which entails a strengthening of the intergenerational class linkage, while the modernization thesis predicts a monotonically weakening linkage. The results from Lucerne favor the former prediction: observed mobility decreased and the relevance of social origin increased with an increasing proportion of factory workers in a given parish.

In Glarus, sector dualism was not relevant, as the sectoral transition was already complete at the beginning of the observed period. The data confirm, however, the need to differentiate between the two main industries in the canton. The conclusion that some industries are more "modern" than others and, thus, affect the social stratification differently is not at odds with the modernization thesis. However, such differences can easily be overlooked, especially because both industries shared an important defining feature of modern industries: concentrating their production in factories. Despite this modern feature, the printing industry in the canton of Glarus was largely based on traditional craftsmanship and thus required skills that were transferable to the next generation. While the printing industry hired a wide range of specialists, such as designers, engravers, and printers, the spinners and weavers working in the spinning and weaving industry of the 19th century were first of all laborers. Thus, they had few occupation-specific skills to pass on to the next generation. The results suggest indeed that these differences translated into industry-specific effects on social mobility. While the strength of the printing industry in a given parish did not affect the importance of social origin for individuals' class affiliations, a spreading spinning and weaving industry did weaken the intergenerational linkage.

In respect of the relevance of the modernization thesis, this last result is of special importance, as the spread of genuinely modern industry touches its core. This relatively direct evidence that industrialization *can* lead to more fluid class barriers, together with the differences identified between Glarus, rural Lucerne, and the city of Lucerne allow the conclusion I gave away at the beginning of this section, namely that the modernization thesis captures some relevant trends of Lucerne's and Glarus' modernization. However, the presented results clearly show that the modernization thesis does not apply as universally as is often asserted. Other processes, such as the crisis in the middle of the century in Lucerne, can override its effects. Furthermore, the modernization thesis seems to be wrong in respect of very early modernization and industrialization. The effects of modernization cannot be extrapolated to these early phases; rather, the theory of (sector) dualism seems to apply here. In early phases, processes like industrialization or educational expansion tend to intensify the existing inequality. Finally, the results also remind us that qualitative differences in industrialization are decisive. It matters how different industries organize their production within their factories.

From a conceptual point of view, the above results expose a generally close agreement between observed mobility and the more general *M*-index, which summarizes the power of social origin to steer an individual to a particular class. This highlights the importance of class inheritance for intergenerational class linkage in the 19th century. For this period, class-specific resources were much more important than general, status-related resources. If these class-specific resources lose their relevance, observed mobility will increase. Conversely, more observed mobility would destroy such class-specific resources, as they are of little use in other classes, which, in turn, weakens the intergenerational class linkage.

This high relevance of class-specific resources (compare section 3.3) may also explain why, for the 19th century, analyzing observed mobility leads to the same conclusion as when analyzing measures of intergenerational class associations that are blind to differences in the marginal distribution, as found by Maas and van Leeuwen (2016). In general, the above results confirm this parallel between trends or differences in observed mobility and marginal insensitive measures. The conducted decompositions have shown that most of the analyses of the *M*-index would not yield different results if the marginal distributions had remained constant. There are two exceptions to this conclusion. First, the gross difference in Glarus between contexts with and without secondary schools would have been larger if changes in the marginal distribution had not masked this difference in the internal structure of the mobility tables. However, only the gross difference was concerned, as the difference was much stronger when controlling for areas and time. Second, the same masking has been found in Lucerne in respect of differences between contexts with and without a connection to the railway system. In other words, there is some evidence that a nearby railway station led to less rigid class barriers, an effect that was counteracted by changes in marginal distribution.

The results presented in this section are not without their limitations. In many cases, the evidence remains weak, because the limited number of observations in the data provides only insufficient statistical power for some of the analyses. Furthermore, the modernization measures used for testing the hypothesis are rough, especially as data had to be interpolated between different points in time, in order to construct a longitudinal dataset. Finally, other long-term processes are an important source of unobserved heterogeneities that may confound the effects that were identified. The use of controls for geographical context and time at the lowest possible level reduces the risk that the reported effects were spurious, but they cannot rule out this possibility.

Nonetheless, analyzing social mobility both between and within two distinct historical contexts has made it possible to generate novel insights into the relationship of industrialization and the relevance of social origin for individuals' status attainment. For the studied contexts, these insights did not disprove the modernization thesis but they highlight the need for a more differentiated view than that offered by this thesis. First, the city of Lucerne was indeed more open in respect of social origin than rural Lucerne – but only because of its high proportion of non-locals and not *per se* because it was a city. Second, industrialization increased social mobility in the canton of Glarus, but the effects differed by industry. Finally, the effect of industrialization does not seem to be as linear as is assumed by the modernization thesis. In the very early stages of industrialization, as found in the canton of Lucerne, industrialization seems to boost and not to attenuate the relevance of social origin. Thus, focusing on the early phases of modernization, this finding relativizes the claim of the universality of the modernization thesis.

3.4 Social Homogamy and Early Industrialization in Lucerne[92]

So far, I have analyzed the relevance of social origin in a direct manner, by analyzing social mobility or, more generally, the intergenerational class linkage. While this is interesting enough in its own right, an additional motivation for doing this is that analyzing social mobility not only tells us something about the association between a parent's and a child's social status, it also tells us something about the relevance of social origin for individuals' social standing in more general terms. For example, Kerr et al. (1960) contrast the relevance of the family in traditional societies to its relevance in industrial societies. In traditional societies, "the behavior and careers (including marriages) of its members are the close concern of the elders in the extended family" (p. 79). In their view, this is in clear opposition to the demands of an industrial society: "The logic of the industrialization process requires that selection and promotion be made on the basis of ability and competence. Thus, Industrialization inexorably clashes with the joint family" (p. 81–82).

If we aim for such a broader understanding of the relevance of social origin, the analysis of intergenerational class linkage may be missing important aspects. A father's occupational class is certainty only one of many aspects of an individual's social background and an individual's social standing is not perfectly measured by her or his occupational class. Given my data, I am not able to improve the measurement of an individual's social origin or social standing. In respect to social positions, the sources simply do not contain any further information, beyond occupational titles. Furthermore, it was not feasible to collect information on brothers, which would make it possible to infer the relevance of the family of origin by analyzing sibling similarities (Knigge et al. 2014a). However, the marriage registers of the canton of Lucerne include occupational information on the fathers of both spouses, which makes it possible to analyze the relevance of social origin for spouse selection and family formation.

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92 This section is based on parts of the authors accepted manuscript of an article published as the version of record in *The History of the Family* © 2019 Informa UK Limited, trading as Taylor & Francis Group:
https://www.tandfonline.com/doi/full/10.1080/1081602X.2018.1431559 (Seiler 2018).
My thanks are due to Ineke Maas and Marco H.D. van Leeuwen and two anonymous reviewers of this journal for their valuable thoughts and comments on this study. Earlier versions of the paper were presented in the session entitled "Social Homogamy in Comparative Perspective" of the European Social Science History Conference in Valencia (March 30–April 2, 2016), and in the MaSS seminar of the Department of Social Sciences at Utrecht University (October 19, 2016). I wish to thank the participants for their helpful and detailed comments.

Although selection of a spouse is a very personal decision for the partners, it is always shaped by personal as well as structural factors, such as education, social origin, or the opportunity structure of a given context. One result of such assortative mating is homogamy, by which is meant that on average people choose a partner who is in many ways more similar to themselves than a randomly chosen other (Schwartz 2013; Kalmijn 1998). In this section I shall analyze homogamy by reference to the social status of parents. The underlying assumption is that a strong link between social origin and a variety of aspects of the lives of brides and grooms means that we may presuppose strong homogamy regarding parental status. A weakening relevance of social origin, as presumed by the modernization thesis, will in turn – all other things being equal – result in a declining influence of social origin on the selection of spouses (Zijdeman and Maas 2010; cf., Kalmijn 1991). Therefore, analyzing homogamy in respect of social origin (subsequently abbreviated to "social homogamy" or simply "homogamy") is another possible way to study the importance of social origin for individual lives. Furthermore, homogamy by social origin is an important element of the persistence of inequality across multiple generations. If the effect of social origin is the result of an underlying latent factor inherited from one generation to the next and affecting an individual's social position, as proposed by Clark and Cummins (2015), the persistence of this underlying factor depends strongly on the degree of homogamy in a given population (Braun and Stuhler 2018: 582–3). An analysis of social homogamy might therefore complement other analyses of intergenerational social mobility.

While homogamy might have changed in the period of industrialization according to the modernization thesis, modernization is unlikely to be the only relevant factor affecting changes in homogamy over time. For example, it is not only the question of who marries whom that can be related to social origin: so can the question of who gets married in the first place. The relationship itself may also change over time. As a reaction to 19th century pauperism many local and central authorities in Switzerland and other German-speaking areas reinforced existing marriage restrictions, with the aim of preventing the poor from proliferating (Head-König 1993; Mantl 1999; Matz 1980). By placing an emphasis on inherited property rather than on personal income, strong marriage restrictions helped to maintain unequal access to marriage (Mantl 1999). In other words, the strengthening of marriage restrictions may have counteracted the general decreasing importance of social origin over the course of modernization. It is worth noting here that modernization and increasing marriage restrictions were not independent trends. For many commentators of the 19th century, the widespread pauperism was caused by industrialization (Mantl 1999) – which meant that stricter marriage restrictions were an indirect reaction to modernization.

Using the data drawn from the canton of Lucerne in the 19th century (section 3.2.1), I aim in this section to analyze the combined effects of industrialization and marriage restrictions. Lucerne operated some of Switzerland's most severe marriage restrictions (Head-König 1993) and, as discussed above (section 3.1.2), certain areas experienced industrialization, even while the canton remained primarily agrarian (Dubler 1983; Schnider 1996). The period for which data are available (1834–75) covers the early industrialization of certain areas of the canton but coincides too with a peak in marriage restrictions, around 1865; thereafter, toward the end of the period, they were relaxed again (Bossard-Borner 2008: 532–50). These features of the data allow us, at least partly, to disentangle the effects of industrialization and changing marriage restrictions, even though only indirect measurements, such as illegitimacy rates, are available, which do not make it possible to estimate the severity of the marriage restrictions at the local level.

Similar to the above analyses of social mobility, I use two direct measures for a parish's level of modernization. A variable in respect of the presence of railway stations measures the availability of modern means of transport, and the proportion of factory workers serves as a proxy for the level of industrialization of a given parish. Although relatively crude, both of these measures complement the indirect test of modernization effects using time trends. This is of special significance because most previous studies have found no clear time trends (Maas and van Leeuwen 2005; van Leeuwen and Maas 2002; Bull 2005; Dribe and Lundh 2009), but have been able to identify the effects of more directly measured industrialization (Maas et al. 2011; Zijdeman and Maas 2010).

Research on social homogamy in 19th century Switzerland is actually very scarce and the two existing studies examine only the two, Protestant, cities of Winterthur (Schumacher and Lorenzetti 2005) and Geneva (Widmer 1993). This analysis of new data from a Catholic and predominantly agrarian canton like Lucerne therefore addresses an area for which nothing was previously known about homogamy. Consequently, one of the aims of this section is to describe the homogamy by social origin seen in the city of Lucerne and the rural area around it, and to trace changes in that homogamy over the 40 years of the observed period (1834–75). However, the main goal remains to derive and test hypotheses regarding how social homogamy changed with modernization, and how the process was affected by changing levels of marriage restriction in the canton.

3.4.1 Theoretical Considerations and Hypotheses

To explain changes in homogamy by a parent's social status two basic theoretical questions must be addressed: first, why such homogamy can be expected in the first place and, second, why the extent of homogamy may be assumed to change.

A useful framework for the analysis of spouse selection and the factors driving homogamy is the concept of the "marriage market". In a marriage market men and women seek partners according to their individual preferences but face constrained opportunities (Becker 1973; Goode 1964; Schwartz 2013). Preferences and constraints alike can then lead to social homogamy, as the actors in the marriage markets tend to favor status maintenance (Boudon 1974), wish to maximize the socioeconomic resources of a future family, and prefer a partner with whom they share at least some cultural values (Kalmijn 1998). The preferences for similarity and for more resources both lead to homogamy, since if both partners want more of the same and neither wishes to marry down, "everyone ends up with someone roughly similar to themselves" (Schwartz 2013: 453). Of course, "everyone" is an exaggeration, as few will be able to satisfy all their preferences: in order to satisfy certain of these preferences, they may reduce their expectations in respect of others. This provides room for exchange; for example, a relatively aesthetically unattractive but influential person might be able to marry an uneducated but wealthy partner (cf., Merton 1941), which explains a mating process with a heterogamous outcome. However, if it makes sense to pool the resources of both partners, with resources seen as complements, not substitutes, the resulting partnership will nevertheless tend to be homogamous (Edwards 1969; Becker 1973). In other words, if both partners value a particular resource, then having more of it (all else being equal) will improve the chances of mating with someone who possesses the same resource.

Modernization Thesis: The Changing Importance of Social Origin

My intent in this section is to analyze homogamy by the status of the parents of a bridal couple. Homogamy, in this respect, can exist only if the resources of the bride and groom are linked to those of their parents. In other words, homogamy by social origin is a consequence of the association between the particular status of individuals and that of their parents. Because of this, the arguments presented in the theory sub-section of the section on social mobility and industrialization (compare sub-section 3.3) apply here as well. Later in this section, I will present hypotheses relating to the question of homogamy by social origin, but I will start with general hypotheses regarding modernization effects. In pursuit of this aim, I will first briefly reconsider the main arguments of the modernization thesis. In order to keep things simple, in deriving the hypotheses in this section I will focus on the modernization thesis and ignore explanations based on dualism theory.

According to the modernization thesis, structural changes caused by industrialization result in a reduction in the direct effect of social origin on an individual's social position. First, the reduction in the proportion of the labor force engaged in agriculture, on the one hand, and the creation of new jobs following technological change and specialization, on the other, reduce the number of jobs for which skills developed by assisting parents are beneficial (Lipset and Zetterberg 1959: 57–60; Knigge et al. 2014b). Second, the increasing size of enterprises brings with it rationalization and bureaucratization of production. Rather than relying on ascribed characteristics like social origin, employers therefore increasingly consider such things as achievements in formal education, for such characteristics are more relevant to an estimation of likely productivity (Treiman 1970). Together, such changes make it more difficult to use existing socioeconomic resources directly to achieve the status maintenance of the succeeding generations.

Conversely, these changes ought to be expected to open formerly closed social positions to individuals less well endowed with resources of social origin. Furthermore, the modernization thesis predicts that political, social, and cultural resources will be available to more people. In this view, democratization improves the ability of the disadvantaged classes to profit from the economic growth generated by industrialization (Simpson 1990). Furthermore, educational expansion not only provides the population with the knowledge and skills necessary for newly created occupations, but also creates an opportunity for pupils to meet others from different class backgrounds (Kerr et al. 1960: 36–7; van Leeuwen and Maas 2005). The emergence of mass media and modern transport supports the development of a common culture, and with it the diminution of differences "in attitudes and behavior" by social origin (Treiman 1970: 219).

Taken together, these arguments imply a decreasing influence of social origin over the course of modernization, which also means that homogamy should decline in respect of the social status of parents, for at least two reasons. First, according to the modernization thesis cultural resources depend decreasingly on social origin. Consequently, the cultural similarity preferred by actors in the marriage market depends less and less on social origin. Second, when actors try to maximize resources for their future family, social origin is of decreasing relevance, because the modernization thesis assumes the weakening of links between an individual's own resources and those of his or her family of origin (Kalmijn 1991). This leads us to this first hypothesis:[93]

H1 Social homogamy has decreased over time.

Because urbanization is viewed as being inherently a driver of modernization (Treiman 1970; Kuznets 1955), we may expect the importance of social origin to decrease more significantly in cities than in rural areas. Furthermore, the city of Lucerne was more advanced than other parts of the canton in many of the aspects discussed above. It had better schools and provided education to a higher level (Pfenniger 1998; Boesch and Kottmann 1974), offered a wider variety of occupations (Dubler 1983), and was the home of most of the canton's early entrepreneurs (Bossard-Borner 1998: 318) and of its intellectual elite (Bossard-Borner 1998: 353–60). It was also the capital, and the canton's central administration and its civil servants were based there (Lischer 2016). This leads us to this second hypothesis based on the modernization thesis:

H2 Social homogamy was stronger in rural areas than in the city of Lucerne.

The Effect of Marriage Restrictions

However, for the period that is of interest to us here the assumption implicitly made by the modernization thesis that "everything else was equal" is clearly not correct. With the marriage restrictions discussed in the section on the historical context (3.1.2) and the one on the data (3.2.1), an important constraint on the selection of spouses changed significantly in the period studied in this section. In the canton of Lucerne the marriage restrictions did not refer directly to the resources of a potential couple's parents, but the authorities considered property rather than income as being important in relation to the ability to raise offspring in an "honest way" (Kanton Luzern 1831–1840: 261–70, cited in Bossard-Borner 2008: 545). An individual's wealth and property depended much more on his or her parents' resources than on income (Mantl 1999; Head-König 1993). Wealth and property inherited from the family of origin therefore became more decisive than other resources which were not directly linked to the family of origin. Conversely, marriage may be expected to be increasingly homogamous in respect of resources related to social origin and less in respect of other characteristics. In short, the marriage restrictions of Lucerne probably increased the importance of the family of origin and, consequently, of homogamy by parental status. If we assume at least some degree of social homogamy, the selection of their spouses by high status individuals should not have been substantially affected by marriage restrictions, because high status

[93] For a similar hypothesis, see (Zijdeman and Maas 2010: 399).

individuals only rarely chose their partners from the strata affected by marriage restrictions. This leads us to this third hypothesis, which is in two parts:

H3a Social homogamy increases with marriage restrictions.

H3b Marriage restrictions mainly affect homogamy among individuals of lower and middle social origin.

Modernization and Marriage Restrictions Combined

It is as impossible to perfectly measure Lucerne's modernization as it is to measure the extent of its marriage restrictions. Nevertheless, we can make certain assumptions about the combined effects of the two. From the literature summarized in the last sub-section, it is relatively well known how marriage restrictions changed over time: they increased in the first part of the analyzed period, reached a peak around 1865, and then declined rapidly (for the exact timing, see sub-section 3.4.2). By contrast, the typical interpretation of the modernization thesis assumes the modernization process to be a more or less linear development over time (cf., Erikson and Goldthorpe 1992: 21). It is therefore possible to deduce a basic hypothesis for how homogamy changes over time, given the presumed effects of marriage restrictions and modernization.

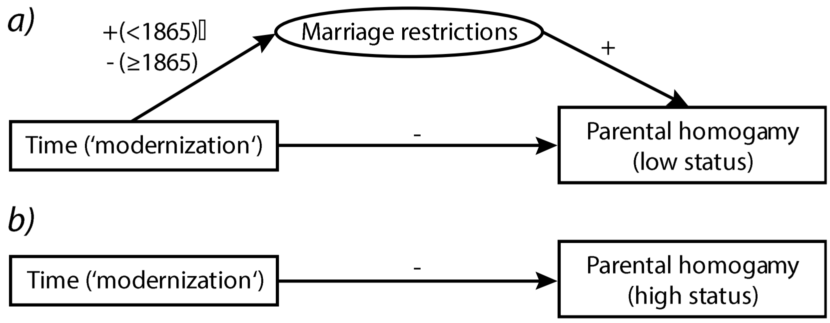

Figure 3-53. Scheme of the combination of the effects on homogamy of modernization and marriage restriction among individuals of (a) a low to middle and (b) a high social origin

Source: author.

Figure 3-53 shows the combination of the effects of marriage restrictions and modernization. Because marriage restrictions are relevant primarily for individuals of a lower and middle social origin, the combination of the two effects does not affect the relationship between modernization and homogamy. Therefore, the hypothesis of decreasing homogamy over time (*H1*) remains directly applicable to individuals from a higher social origin, irrespective of any marriage restrictions (**Figure 3-53**b). By contrast, for individuals of a lower and middle class origin (**Figure 3-53**a) the increasing marriage restrictions in the first part of the observed period might be expected to cancel out or even reverse the diluting effect of modernization. For the period after 1865, however, both changes worked in the same direction, so that we may expect a clear decrease in social homogamy for that period. The combined effects on homogamy of marriage restrictions and modernization can therefore be summarized by these hypotheses:

H4a Homogamy among individuals of a higher social origin decreased over the whole period (1834–75).

H4b Homogamy among individuals of a lower and middle social origin stagnated or increased in the period 1834–64.

H4c Homogamy among individuals of a lower and middle social origin clearly decreased in the period 1865–75.

Direct Measurements of Industrialization: The Proportion of Factory Workers and the Presence of Railway Stations

Similarly to the section on social mobility in the canton of Lucerne, I will use two direct measurements of industrialization for further testing the modernization thesis: the presence of a railway station and the proportion of factory workers in a given parish. Two lines of reasoning lead us to expect the availability of a rail connection to be related to the extent of homogamy. First, modern transport may be assumed to contribute to a common culture in which people do not differ greatly by geographical and social origin (Treiman 1970). In other words, modern means of transport tend to reduce homogamy by social origin by loosening the link between the status of parents and children. A second line of reasoning considers the impact of things like railways at the individual level, for although rarely absolute, geographical boundaries can severely reduce the likelihood of ever meeting a person from the other side of such a barrier. Modern transport therefore widens the "marriage horizon" of those looking for a spouse and thereby extends the boundaries of the marriage market (van Leeuwen and Maas 2005). The scope of the marriage market can affect parental homogamy via two paths. First, in wide marriage markets the likelihood of meeting someone of a different social background will be higher than in a narrow market, since living close-by makes having a similar social background more likely (van Leeuwen and Maas 2005: 5–10; Kalmijn and Flap 2001; Goode 1964: 34). Second, a widening of the marriage market over time means that the social contacts of young people tend to go beyond the social networks of their parents, in both geographical and social terms.[94] Both lines of reasoning lead to the same hypothesis:

H5 Homogamy was lower in parishes with a rail connection than in parishes without one.

[94] Blossfeld and Timm (2003: 10–1) have made this point about educational expansion.

The argument for an existing relationship between the proportion of factory workers in a given area and the level of social homogamy follows similar lines of reasoning. A high proportion of factory workers is in the first place a proxy for the industrialization of an area and, according to the modernization thesis, may be associated with lower overall homogamy by social origin than in areas with a low proportion of factory workers (Treiman 1970). Furthermore, factories bring together workers of a different but low to middle social origin, which might contribute to the fading of the distinctiveness of social origin. Social networks formed in a factory can lay the foundations for a future marriage. In mixed industries like the textile industry factory workers might meet a future spouse at work (Maas et al. 2011). As individuals of a high social origin rarely became factory workers the proportion of factory workers is mainly relevant to individuals of a lower or middle social origin.

H6 Homogamy among individuals of a low and middle social origin was weaker in parishes with a high proportion of factory workers than in other parishes.

3.4.2 Measures and Methodological Approach

The analyses relating to homogamy are based on the same data as the analyses regarding social mobility in the canton of Lucerne, presented in section 3.3.5. However, the analytical sample differs, as I had to discount all marriages for which the social status of either partner's father is unknown. As a result, the analyses build on data on 1,499 marriages (excluding missing values).[95]

Measuring Homogamy

In this section social homogamy is taken to mean that individuals tend to select a spouse of similar social origin. Thus, as a first step, the social status of fathers must be measured to estimate the strength of social homogamy for a given area and period. In contrast to the analyses of social mobility, I use the continuous status scale HISCAM (Lambert et al. 2013), because it fits more closely the concept of homogamy understood as similarity. Furthermore, it makes the results presented in this section more comparable to studies such as Zijdeman and Maas (2010) or Lippényi et al. (2017). Such a measurement of the status of the fathers of brides and grooms means we can use the correlation between the two as a measure of homogamy by social origin, as it indicates how strongly parents' statuses are associated (graph (a) in **Figure 3-54**). Regression models yield an estimate of the effect of the social status of one father on the social status of the other, so that interaction effects can then be used to explain those effects and so to test the hypotheses

[95] 380 cases were discounted because either the bride or the groom had been married before; 333 cases were discounted because of missing values for one of the relevant variables.

(graph (b) in **Figure 3-54**; for details, see the technical discussion at the end of this section).

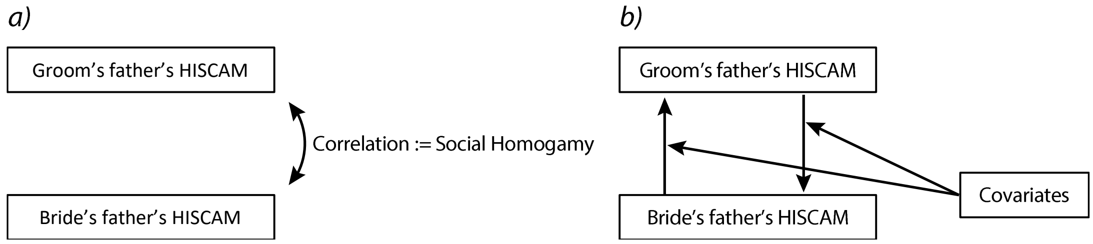

Figure 3-54. Measuring (a) and explaining (b) social homogamy
Source: author.

Some of the hypotheses presented in the last section distinguish between homogamy among individuals of a lower to middle and high social origin. To include that distinction in the analyses I split the explaining status variable into two linear splines. This means that the relationship between the statuses of the two fathers is not modeled as a single linear function, but rather as two linear functions knotted together. Separate estimates are therefore yielded for the association between the statuses of the fathers of each spouse, one for fathers of a low to middle status and one for those of a higher status. For this study I set the status of general farmers as the threshold between lower and higher status (i.e., a HISCAM value of 60.9) so that farmers are at the top of the range of occupations defined here as of a "low to medium status". My reasoning for this decision is that the occupational structure of the canton of Lucerne was strongly marked by two occupations, namely those of farm workers and of general farmers (compare **Figure 3-55** and its discussion in the next section). While the former were at the low and precarious end of the distribution of fathers' statuses, the latter occupied the highest position in the agrarian sector. Considerably higher positions existed (father's HISCAM values range from 32.5 to 99), but they applied only to a clear minority of the fathers (about 20% in the city of Lucerne, and only about 6% in the countryside). From this point of view, general farmers therefore stood at the transition point from the lower and middle to the higher social status.[96] I therefore used two linear splines with a knot at the HISCAM value for general farmers to estimate homogamy simultaneously among individuals of a lower and middle origin, and of a high social origin, within the framework of regression models.[97]

[96] **Figure 3-55** (p. 215) provides an additional argument for setting the threshold at the HISCAM value of a general farmer (60.9), as the relationship seems to change at this point.

[97] To enhance the interpretability of the interaction effects the explaining status variable is first centered on the knot, before it is transformed to the two splines. When HISCAM is the original status value, the two splines are defined as follows:

Variables Explaining Homogamy

The same spline-based approach can be used to model time trends in homogamy based on the date of a marriage. To test the hypotheses resulting from combining the effects of modernization and marriage restrictions the model should allow the time trend to change at the moment marriage restrictions began to be loosened again. As discussed in the section on the history of the canton of Lucerne, the marriage restrictions there peaked somewhere between 1856 and 1864 (Bossard-Borner 2008: 544–8). Because the restrictions were relaxed more rapidly than they were tightened, the turning point appears to be towards the end of that period. Furthermore, the data suggest that the effect on homogamy probably lagged behind the marriage restrictions. I tested three plausible spline definitions and although the differences are small, the solution best fitting the data is one with a knot at the end of the year 1864.[98] While hypothesis *H1* predicting decreasing homogamy will be tested by means of linear overall time trends, all other time-based hypotheses can be tested by means of two linear splines, one for marriage dates before 1865 and one for marriage dates thereafter.[99] I modeled those time trends for both the city of Lucerne and the countryside (all other parishes) using three-way interactions between the two splines for the status of fathers, the two splines for dates of marriages, and the indicator for Lucerne city.

As for the section on social mobility in 19th century Lucerne, I will also use the two external variables described in section 3.2.3. In other words, I will analyze the effect of the presence of a railway station in the parish where the marriage took place, and I will use a three-fold categorization of the proportion of factory workers in a parish (0–2%, 2.1–5%, and >5%) as a measure for the industrialization of that parish.

Methodological Approach

As pointed out when discussing the correlation between the fathers' statuses as a measure of homogamy, interaction effects in regression models can be used to test

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$$HISCAM_1 = \begin{cases} HISCAM - 60.9, & \text{if } HISCAM \leq 60.9 \\ 0, & \text{if } HISCAM > 60.9 \end{cases}$$

$$HISCAM_2 = \begin{cases} 0, & \text{if } HISCAM \leq 60.9 \\ HISCAM - 60.9, & \text{if } HISCAM > 60.9 \end{cases}$$

98 Bayesian Information Criteria (BIC) for the basic model are 333190.8 (knot end of 1860), 333160.7 (end of 1862), 333140.9 (end of 1864), and 333142.4 (end of 1866), respectively.

99 As with the explaining status variable, the date of marriage is first centered on the knot before it is transformed to the two splines. When the date is the original date of marriage, the two splines are defined as follows:

$$date_1 = \begin{cases} date - 31\text{dec}1864, & \text{if } date \leq 31\text{dec}1864 \\ 0, & \text{if } date > 31\text{dec}1864 \end{cases}$$

$$date_2 = \begin{cases} 0, & \text{if } date \leq 31\text{dec}1864 \\ date - 31\text{dec}1864, & \text{if } date > 31\text{dec}1864 \end{cases}$$

hypotheses regarding factors affecting homogamy. In other words, to test the effects on homogamy of time, city, proximity of railway stations, and the proportion of factory workers, the corresponding variables interact with the two splines representing a father's status. However, the directed nature of regression models (one or multiple independent variable(s) explain one dependent variable) does not directly reflect the more or less symmetrical and mutually dependent nature of how spouses select each other. More technically, regression coefficients are sensitive to variance of both the explained and the explaining variable, which can lead to contradictory results. For example, imagine a shrinking variance over time in the status of the groom's father but not of the bride's father, while the correlation between them remains unchanged. In that situation a model explaining the groom's father's status by the bride's father's status will indicate decreasing homogamy, while the model for the opposite direction of explanation will lead to the opposite conclusion. This is problematic because there is no reason to favor one of the two directions of explanation. A solution to this problem is to estimate both directions of explanation simultaneously, and to constrain the coefficients related to homogamy to be equal for both directions of explanation.[100] Unobserved differences between contexts can confound the results, and one way to control for this at least partly is to include random effects at the levels of parishes by estimating multi-level models.[101] Multi-level models with constrained effects but simultaneously

[100] Constraint across the two directions of explanation are the two splines for father's status and the interaction effects of the covariates with those splines. Not constrained are the constants and the main effects of the covariates.

[101] Random slopes for the two status splines allow us to control for differences in social homogamy between parishes. Preliminary results showed, however, that the estimated variances of the random slope for the lower status spline was very small. Consequently, the results remain qualitatively the same when removing the random slope. Favoring the more parsimonious of the otherwise equal models, I therefore used multilevel models clustered by parish, with random intercepts and a random slope for the higher (but not for the lower) status splines. The equations read as follows:

$$\left| \begin{array}{l} HISCAM_{bf_{ip}} = \beta_{ip}^{low} \cdot HISCAM_{gf_{ip}}^{low} + \beta_{ip}^{high} \cdot HISCAM_{gf_{ip}}^{high} + \gamma^{b} \cdot X_{ip} + \mu_{p}^{b} + \varepsilon_{i}^{b} \\ HISCAM_{gf_{ip}} = \beta_{ip}^{low} \cdot HISCAM_{bf_{ip}}^{low} + \beta_{ip}^{high} \cdot HISCAM_{bf_{ip}}^{high} + \gamma^{g} \cdot X_{ip} + \mu_{p}^{g} + \varepsilon_{i}^{g} \end{array} \right|$$

$$\beta_{p}^{low} = \alpha^{low} + \delta^{low} \cdot X_{ip} \qquad \beta_{p}^{high} = \alpha^{high} + \delta^{high} \cdot X_{ip} + \tau_{p}$$

where $HISCAM_{bf_{ip}}$ and $HISCAM_{gf_{ip}}$ is the HISCAM of the fathers of bride and groom, X_{ip} is a set of covariates (varying either at individual or parish level (subscript i, and p, respectively)), β_{ip}^{low} and β_{ip}^{high} are the homogamy parameters for low and high status homogamy, α and β are parameters explaining homogamy (constraint to be equal for both equations), τ_p is a random slope, γ are the equation-specific parameters of the main effects, and μ_p an equation-specific random intercept.

estimated equations for both directions of explanations can be fitted within the framework of structural equation models.[102]

The results for homogamy presented in the next sub-section are based on four such models. The first model uses linear time trends to estimate homogamy over time for rural areas and for Lucerne city. The second replaces the overall time trend by two linear splines, in order to test changing trends. The third and fourth models additionally include the variables for a nearby railway station, or dummy variables for parishes with, respectively, a factory worker proportion of 2.1–5% and more than 5%.[103] For these models, the observations from the city of Lucerne have been excluded, as there is not enough contextual variation to estimate the effect of the two variables. To enhance the readability of the results only post-estimation results (such as average marginal effects or linear combinations of the coefficients) and graphical representations of the coefficients are reported in the main body of the section (but compare the full regression tables for all models in Appendix B; **Table B-26** and **Table B-27**, p. 300).

3.4.3 Results

As outlined in the last sub-section, I understand social homogamy here as the correlation between the statuses of a bride's father and that of a groom's father; it is an inherently bivariate concept, which cannot be measured at the individual level or reported in tables with descriptive statistics. Nevertheless, **Table 3-11** gives a first overview of the measures behind homogamy: the status of the groom's and bride's fathers measured on the HISCAM scale. Overall, the distribution of the two are similar. They range from 32.5 (HISCAM value for 'workers' (with no more specific definition)) to 99 (HISCAM value assigned to occupations such as medical doctors, lawyers, or professors), have a mean of between 51 and 52 ('cartwright' is a frequent occupation in this range) and a standard deviation of about 12. The fathers of a couple who were married in the city had a status on average about half a standard deviation higher than the fathers of those who married in the countryside. While the average of the bride's father's status is slightly higher than that of the groom's father, the mean difference and the individual difference are marginally significant at most (unpaired: $t(2996) = 1.27, p = .20$ and paired: $t(1498) = 1.77, p = .08$ respectively).

[102] I would like to thank here one of the anonymous reviewers of the journal *The History of the Family* for the suggestion to use structural equation models to combine the advantages of the constraint approach with those of multi-level models. Models estimated are using Stata 15 (StataCorp 2017).

[103] To avoid biases caused by collider variables I used separate models to estimate the effects of the existence of a nearby railway station and of industrialization (Elwert and Winship 2014).

Table 3-11. Descriptive statistics of variables used

	Mean (standard deviation)			Minimum	Maximum
	Rural Lucerne	City of Lucerne	Total	Total	Total
Groom's father: HISCAM[a]	51.8 (12.4)	57.1 (12.5)	53.5 (12.7)	32.5	99
Bride's father: HISCAM[a]	51.1 (11.6)	56.7 (12.2)	53.0 (12.1)	33.6	99
Date of marriage (years)[b]	1856.9 (13.2)	1860.7 (13.1)	1858.2 (13.3)	1834	1875
Railway station in parish*	0.14	0.64	0.31	0	1
Factory workers in parish: 0–2%*	0.76	1	0.84	0	1
Factory workers in parish: 2.1–5%*	0.13	0	0.086	0	1
Factory workers in parish: >5%*	0.12	0	0.077	0	1
Observations	1002	497	1499		

[a] If used as independent variable: centered around 60.9 before being transformed into two linear splines: one below and one above this value.
[b] Centered around December 31, 1864, before being transformed into two linear splines: one before and one after this date.
* Dummy variables, mean = proportion.
Source: author, based on the marriage registers of Lucerne.

Figure 3-55 gives a first impression of the association between the statuses of the two fathers. The scatterplots, both for the countryside and for the city, are characterized by a square in the lower left corner, formed by farm laborers (HISCAM: 37.1) and general farmers (HISCAM: 60.9). The graph shows too that a daughter or son of a farm laborer rarely married the son or daughter of a man whose occupational status was higher than that of a general farmer. Although the social stratification of the fathers of those married in the city was also marked by farming occupations, their statuses were clearly more evenly distributed around the mean. In the countryside, by contrast, the picture is dominated by occupations with rather low statuses.

The local polynomial (lpoly) smooth plots in the same graph show how the two statuses were locally associated. Three observations from those smooth plots are noteworthy. First, the relationship in the countryside was steeper overall than that in the city. Simple correlations confirm this observation, as it was substantially tighter outside ($r = .54$) than inside the city of Lucerne ($r = .31$). Second, for rural Lucerne, the lpoly line bends just above the status of general farmers (HISCAM 60.9), while the relationship is otherwise rather linear, both inside and outside the city. Third, whereas the two

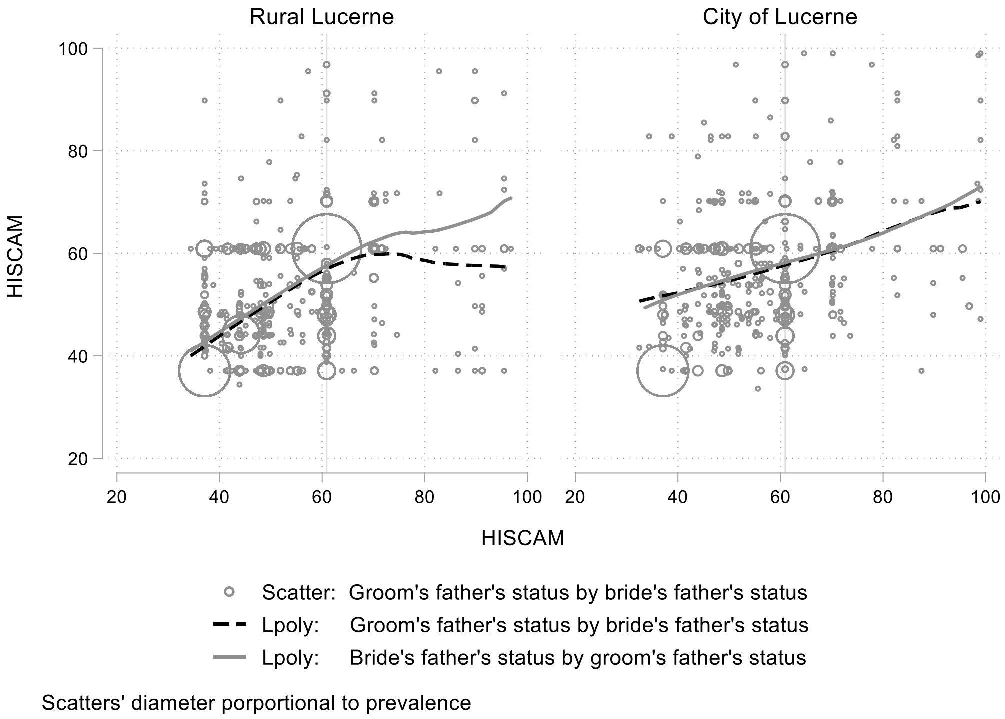


Figure 3-55: Groom's father's and bride's father's status for rural Lucerne and Lucerne city: scatterplots and local polynomial (lpoly) smooth plots

Note: circle sizes are proportional to the prevalence of the status combinations. Source: author, based on the marriage registers of Lucerne.

directions of explanation generally agree very well, that is less true for higher status in the countryside.

Two aspects relating to the other variables should be highlighted. First, the means of the year of marriage lie after the middle of the observed period (1834–75), especially in the city. This is due to an increase in marriages towards the end of the period. Second, although the factory-based industry particularly flourished around the city of Lucerne, the proportion of factory workers in the city itself never surpassed the threshold of 2%.

City Versus Countryside

Comparing homogamy in rural Lucerne and the city of Lucerne, the results presented in **Figure 3-56** show distinct results for homogamy for individuals of a lower and higher social origin. In rural Lucerne, a high level of homogamy can be found for marriages of couples of a low and middle status origin. On average, one partner's father's status is .63 points higher on the HISCAM scale if the other partner's father had a status that is one point higher. At the same time, homogamy among high origin individuals was very low in the countryside, and cannot be said to be significantly different from zero – also because of the low number of observations. In the city of Lucerne, the situation was different. On the low to middle origin side, the association is estimated at .25 – about .38

lower than in the countryside ($p < .001$). In contrast to the countryside, homogamy among high origin individuals in the city seems to have been higher than among those of low to middle origin, although the difference between low and high origin homogamy is not statistically significant ($p = .177$). However, homogamy among those of a higher social origin was clearly stronger for couples married in the city than for those married in other parishes. Because of the low number of cases, that difference is imprecisely estimated and only marginally significant ($p = .052$).

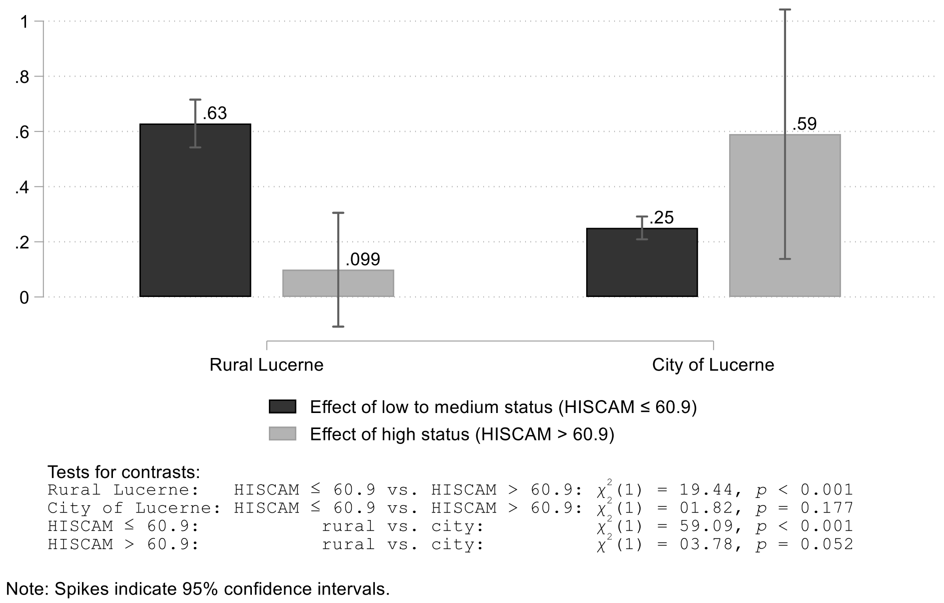


Figure 3-56: City vs. countryside: parental status homogamy by social stratum

Note: average marginal effects based on model 1 in **Table B-26**, p. 300. Source: author, based on the marriage registers of Lucerne.

In sum, the model yields mixed results for the contrast between the city and the countryside. For individuals of a lower or middle social origin (the vast majority of the population), social homogamy according to parental status was considerably lower in the city than in rural Lucerne. This is in line with the prediction of the modernization thesis (hypothesis *H2*), although this conclusion is not valid for the elites. Homogamy among individuals of a high social origin was notable in the city of Lucerne but very low and perhaps even non-existent in rural areas.

Time Trends

Turning to time trends in social homogamy, the distinction between homogamy among couples from a lower and middle origin, on the one hand, and those from a high origin, on the other, is again important – especially in the rural part of the canton. I estimated two models (**Table B-26**, Appendix B, p. 300) to test the hypotheses regarding general time trends (*H1*), changing trends due to changing marriage restrictions (*H3*), and the combination of the two (*H4*). While the first includes one linear time trend for the whole period, the second uses two linear splines.

Figure 3-57, based on this latter model, displays the estimated association between the two fathers' statuses by date of marriage separately for lower and higher origin individuals, and for the city of Lucerne and for parishes outside the city. The figure gives a straightforward overview of the different time trends. For a more precise interpretation of the strength and statistical significance of the time trends, **Table 3-12** reports the estimated yearly changes separately for the overall trend and for the two splines.

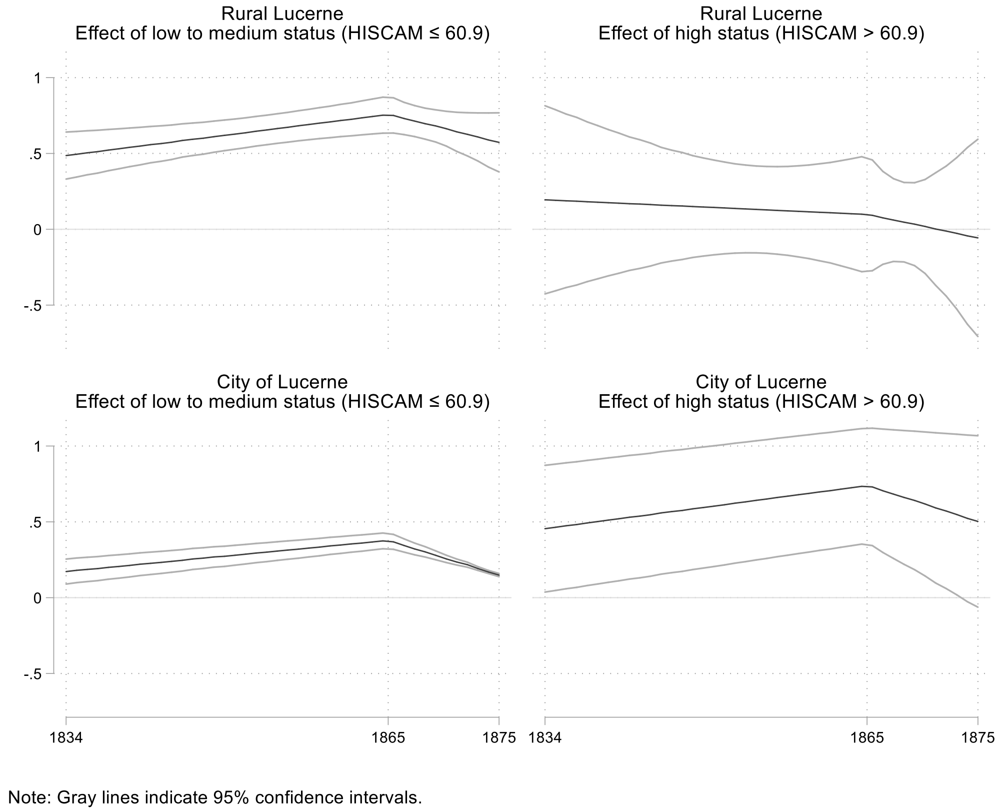


Figure 3-57: Time trends: parental status homogamy by date of marriage and social stratum in the city of Lucerne and in the countryside

Note: average marginal effects based on model 2 in **Table B-26**, p. 300. Source: author, based on the marriage registers of Lucerne.

Figure 3-57 does not reveal a pronounced overall trend. While in rural Lucerne homogamy among higher status individuals was declining over the whole period, the very wide confidence intervals suggest imprecisely estimated trends. **Table 3-12** confirms that impression, for with one exception the overall trends are neither strong nor statistically significant. The exception concerns homogamy among higher status individuals married in the city of Lucerne, which slowly but significantly increased over time.

If we look at the periods before and after 1865 separately, we see that the trends were more pronounced. With the exception of higher status homogamy in rural areas all trends followed the same pattern as homogamy increased from 1834 to 1864 but decreased after then (all of these remaining trends are statistically significant, except the decrease of homogamy among individuals from a lower and middle origin in rural Lucerne ($p = .119$)).

Table 3-12 Time trends: yearly changes of parental status homogamy in rural Lucerne and Lucerne city

	Overall trends	Linear splines
Low to medium status:		
overall (rural)	0.00385	
1834–64 (rural)		0.00886^{**}
1865–75 (rural)		-0.0176
overall (city)	-0.000548	
1834–64 (city)		0.00672^{***}
1865–75 (city)		-0.0217^{***}
High status:		
overall (rural)	-0.00492	
1834–64 (rural)		-0.00315
1865–75 (rural)		-0.0148
overall (city)	0.00217^{*}	
1834–64 (city)		0.00929^{***}
1865–75 (city)		-0.0226^{*}
N	1499	1499

$^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$
Note: linear combinations based on models in **Table B-26**, p. 300.[104] Source: author, based on the marriage registers of Lucerne.

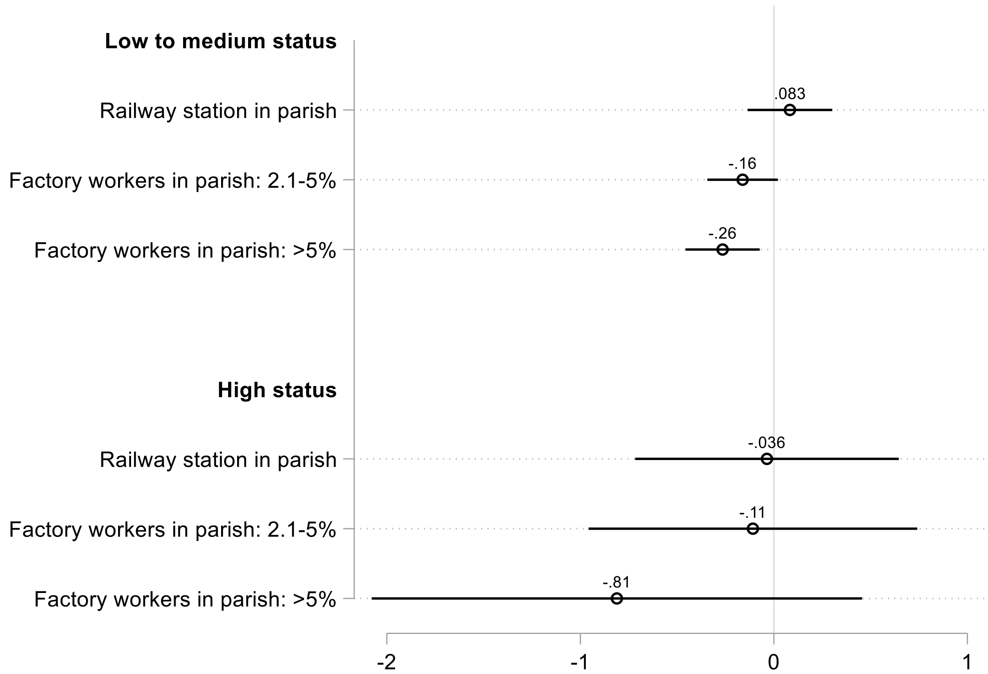
From these results we can infer that the changing severity of the marriage restrictions was the main driver of the trends in homogamy (hypothesis *H3*). In other words, development of homogamy paralleled the changing nature of the marriage restrictions, as described in the literature (Bossard-Borner 1998, 2008). In Lucerne city this was true for individuals from all social strata, while in rural Lucerne no clear trends have been found for those from higher social origins. This is only partly in line with the rationale behind the hypotheses for the combined effect of modernization and marriage restrictions (*H4*), which assumes that only the lower strata were affected by the changing marriage restrictions.

[104] For rural Lucerne, these are merely the interaction effects between the splines for marriage date and fathers' HISCAM, from **Table B-26** (p. 301, Appendix B). For the city, the table shows the linear combination of these interaction effects and the three-way interactions among year, status, and the indicator for the city of Lucerne.

No evidence was found to support the hypothesis that modernization caused homogamy to decrease over time (*H1*). It is possible that such a trend did exist but that it was completely masked by other processes, such as the changing marriage restrictions. However, the fact that the only significant overall trend points in the opposite direction suggests that the modernization thesis is missing an important aspect, at least for this early phase of modernization.

Direct Measures

While the time trends do not directly reflect the effects of modernization on homogamy, the story told by the direct measures of industrialization and modernization is more nuanced. While the results presented in **Figure 3-58** do not suggest that a rail connection affected homogamy, the proportion of factory workers in a parish did matter.



Note: Spikes indicate the 95% confidence intervals for the estimates.

Figure 3-58: Effects on parental status homogamy of railway station in a parish, and of proportion of factory workers by social stratum

Note: graphical representation of selected coefficients from models 2 and 3 in **Table B-27**, p. 301. Source: author, based on the marriage registers of Lucerne.

Regarding homogamy among individuals of a low and middle origin, the results are in line with hypothesis *H6*. In that part of the population homogamy decreased with the proportion of factory workers in the parish. It was moderately and marginally significantly lower in parishes where the proportion of factory workers surpassed 2%, and clearly and highly significantly lower where it exceeded 5%. In respect of homogamy among high origin individuals, the results remain unclear. While the coefficients are strongly negative, the very large confidence intervals do not permit us to come to any conclusion.

3.4.4 Social Homogamy and Early Industrialization in Lucerne: A Preliminary Conclusion

In addition to new data, three original features of the study presented in this section have made possible new insights into the effects of social origin on the spouse selection process during the course of modernization, both in general and specifically with respect to the canton of Lucerne. First, regarding the marriage restrictions, I have explicitly considered a phenomenon which interferes with the effects on social homogamy of modernization and industrialization. Next, I have presented theoretical arguments and empirical evidence for a fruitful separation of the analysis of homogamy by social strata. Finally, I have proposed to analyze homogamy using multi-level models with constraint simultaneous equations for both directions of explanation. This has provided a way of making available the advantages of multi-level models for the analysis of homogamy by social origin, while respecting its symmetrical and mutually dependent nature.

The results yielded by this approach lead to three conclusions. An interesting first finding is that the homogamy of couples of a lower and middle origin was far stronger in rural areas than in the city, while the opposite was true for couples of a high social origin. In rural areas the strong homogamy among lower origin individuals was probably the result of the strong homogamy within the farming community (Bull 2005; Dribe and Lundh 2009), whereas the very weak high status homogamy may be attributed to the fact that in rural areas it was difficult to find a partner of similarly high origin (van Leeuwen and Maas 2005: 10). Differences in social homogamy between the rural part of the canton and the city of Lucerne were probably caused by two things. First, long-standing specificities in the patterns of family formation in the cities (Lynch 1991), and, second, strong migration to the city, which itself affected the processes behind family formation (Schumacher et al. 2013; Moreels and Matthijs 2010). The section on social mobility in the canton of Lucerne (3.3.4) has shown that migration was the main driver of the difference in social mobility between the city and countryside. Future research focusing on the differences in social homogamy between the city and the countryside should therefore consider both the bride's and the groom's migration background in order to further assess the relevance of migration for this difference.

A first conclusion from the tests of the derived hypotheses is that they are generally supported by the data, but mainly in respect of homogamy among individuals of a lower and middle social origin. For that part of the population, the time trends found in homogamy were in line with presumptions about the effect of marriage restrictions. In other words, homogamy in the canton of Lucerne was strong around 1865 when the marriage restrictions peaked, but was weaker before and after that peak. This is in line with hypotheses *H3* and *H4* and fits neatly into the picture of the inequality-preserving effects of marriage restrictions suggested by Mantl (1999). In that part of the population the modernization thesis, too, receives support – at least partially. On the one hand, the higher homogamy found in the countryside than in the city (*H2*), and the existing negative relationship between the proportion of factory workers and homogamy (*H6*), both support the modernization thesis. On the other hand, a general modernization trend in homogamy (*H1*) was either too weak to offset the effect of the increasing marriage restrictions in the period before 1865 or did not exist at all. Furthermore, the presumed negative relationship between an existing connection to the railway system and homogamy (*H5*) could not be confirmed by the data from Lucerne. As described in the section on the canton of Lucerne, the canton was clearly modernizing during the 19th century – for example in agriculture and education – but industrialization was limited to a few areas. We may therefore interpret the results as suggesting that industrialization alone, and no other aspects of modernization, affected homogamy in the canton of Lucerne.

While the results for homogamy among individuals of a lower and middle origin are essentially in line both with my hypotheses and with previous research, this is not true for homogamy in couples of a higher social origin. Although the small number of cases mean that the estimates are imprecise, two results clearly contradict the hypotheses derived from the modernization thesis: Higher stratum homogamy was much stronger in the city than in rural Lucerne, and in the city the overall trend towards homogamy was positive, not negative as would be expected by reference to the modernization thesis. In contrast to the results for homogamy in couples of a lower social origin, these results fit with the conclusion drawn from the analyses of social mobility in the canton of Lucerne: for this stratum, dualism theory (Nielsen 1994; Knigge et al. 2014b) yields better predictions for the changing relevance of social origin during early industrialization. If the increasing concentration of income and wealth was relevant to homogamy it is probable that it mainly affected individuals of a high social origin. Consequently, for those couples increasing inequality might have counteracted the otherwise decreasing importance of social origin and led to the observed increase in homogamy by social origin in couples of a higher social origin but not in couples of a lower or medium social origin.

4 Discussion and Conclusion

I started this thesis with the claim that, in times of rising economic inequalities, it is all the more important for opportunities to be evenly distributed. With equal opportunity, many people may even prefer somewhat unequal societies over perfectly equal ones (Starmans et al. 2017). Reversely, while unequal opportunities are certainly unfair, so long as outcomes are relatively equal, this unfairness is of limited consequence. If, however, unequal opportunities come together with highly unequal outcomes, this unfairness will be multiplied (Breen 2010b).

Economists such as Piketty (2013) and Krueger (2012) have warned that exactly this last scenario will occur. However, such a development would be in complete opposition to the predictions of the liberal theorists of the modernization thesis, who hope that modernization and growth would both bring lower inequality (Kuznets 1955) and a vanishing relevance of characteristics that a person cannot change themselves, such as race, sex, and social origin (Kerr et al. 1960; Treiman 1970; Landes 2003). In other words, the modernization thesis provides ground for the hope that the processes grouped under the umbrella of "modernization" (Mergel 2012) will eventually lead to an open and socially mobile society.

In this thesis, I approached this promise of increasing openness from three angles. I first asked how we can conceptualize and measure this "openness" in a form that allows us to trace changes across the modernization process. Second, I applied the measure found thereby to data from 20th century Switzerland, which yielded exploratory insights complementing the existing research and pointed to avenues for filling other gaps in the literature. Third and finally, I focused on the 19th century and studied the relevance of social origin in detail in the context of both early modernization and fierce industrialization, using new data from the cantons of Lucerne and Glarus.

4.1 The *M*-Index for Measuring the Relevance of Social Origin

The modernization thesis predicts the decreasing general relevance of social origin for an individual's social standing over the course of modernization. Testing this thesis thus requires a measure that makes it possible to determine and compare this general relevance over time and across multiple states of modernization. Therefore, the aim pursued in the first section of chapter 2 was to evaluate the various existing measures used for studying aspects of social mobility and to assess their conceptual fit for testing the modernization thesis. I came to the conclusion that often-used measures building on log-linear models (such as the unidiff model and its parameters) are not ideally suited for this purpose. More specifically, I argued that an approach that weights each origin–destination-combination equally might not capture the general relevance of social origin, as they do not take into account the number of individuals affected by rigid class barriers. I also claimed that a good measure of the relevance of social origin should make it possible to take into account multiple characteristics of social origin, which includes, first, the social class of both mother and father, but also other measures of parental resources, such as a parent's highest educational attainment.

Given these requirements, I suggested considering the index of Mutual Information (M-index), proposed by Theil (1970) for measuring the degree to which an outcome is determined by a given set of explaining factors. This index is borrowed from information theory and has an entropy-based interpretation of information gain. The principle is simple: if an individual's social position is strongly determined by the characteristics of their parents, knowing these characteristics will make it easy to guess the actual social position of an individual correctly.

In the second section of chapter 2, I presented implementations of procedures that make it possible to estimate or calculate the M-index in a way that is tailored to the needs of studying questions of social mobility comparatively. In addition, I demonstrated that some of the limitations of the unidiff model (traditionally used for comparing the general level of origin effects) could be avoided by re-specifying it at the individual level. The implementation of this individual-level unidiff model equipped me with a tool for evaluating the validity and usefulness of the M-index by comparing it to the results from these unidiff models.

4.2 The U-Shaped Time-Trend in Origin Effects in 20th Century Switzerland

In the third section of chapter 2, I applied the M-index approach to data from Switzerland, making use of a harmonized dataset that made it possible to study the relevance of social origin for those born between 1925 and 1978. As a first step, doing so allowed me to compare the M-index to the results from the unidiff models. This comparison demonstrated the validity of the M-index as a measure for the relevance of social origin, as the two approaches led to the same conclusions and because the existing differences can be traced back to known conceptual differences between the two measures. Moreover, decomposing changes in the M-index into the portion stemming from differences in the origin–destination associations and the portion stemming from differences in the marginal distributions showed that results that were perfectly equivalent to the unidiff parameters can be retrieved from the M-index.

As a second step, I explored time-trends in the relevance of social origin from a substantive point of view. The first results from basic models suggested gender-specific time-trends. The relevance of social origin for women's social class and (to a lesser extent) educational attainment followed a U-shaped pattern. In other words, women's social positions were relatively strongly but decreasingly determined in early cohorts. However, after the degree of determination reached a minimum for cohorts born in the 1950s, it rose again for later cohorts. By contrast, no time-trends have been found for men arising from these basic models. Further analyses nevertheless suggested that the results were biased by following the conventional dominance approach. According to this approach, only the social class of the parent with the highest social status has been considered when studying class mobility, while only the educational attainment of the highest educated of the parents has been used in the case of educational mobility. When I successively included both parent's characteristics and simultaneously considered parents' class and education, the results suggested a different conclusion. While for women, the additional measurements of social origin only accentuated the found time-trends, the results for men changed and no longer suggested that the relevance of social origin remained at the same level as before. Rather, when considering multiple dimensions of social origin, men's time-trends approached the ones found for women.

From these explorative analyses, two findings call for a closer examination, both for Switzerland and internationally. First, while the time-trend of the relevance of a more comprehensively measured social origin seems not to differ by gender, the result suggest that the effects of different aspects of social origin changed heterogeneously for the two genders. Further analyses of these differences and how they emerge over the life-course could provide valuable insights into the process of status transmission in general. Second, the increasing time-trend in the effects of social origin found for later cohorts not only points in the opposite direction to that predicted by the modernization thesis; it also opens the possibility that time-trends found in studies using single indicators when measuring the effects of social origin may be biased. This possibility, first formulated by Buis (2013), calls for internationally comparative studies analyzing time-trends of the relevance of multi-dimensionally measured social origin.

4.3 Lessons from Adopting a Historical Perspective

The main aim of the chapter on industrialization and social origin (chapter 3) was to test the hypotheses regarding the changing relevance of social origin over the course of modernization. The most influential hypotheses regarding this changing relevance of social origin usually are bundled under the label of the modernization thesis. Implicitly or explicitly, these predictions were formulated by contrasting traditional with industrial societies. The basic assumption of the modernization thesis is that social origin strongly determines individuals' social position in traditional societies but does so only insignificantly in industrial societies (e.g., Kerr et al. 1960). Because of this contrast, the modernization thesis can be tested most convincingly in contexts of a transition from a traditional to an industrial society (Maas and van Leeuwen 2016).

In order to carry out analyses that allow such tests of the modernization thesis, I studied two differently industrialized contexts in 19th-century Switzerland: the cantons of Lucerne and Glarus in the period between the 1830s and 1880s (see section 3.1). The canton of Lucerne remained predominately agrarian throughout the 19th century, but included some areas of significant early industrialization. Furthermore, it was characterized by a strong distinction between the rural areas and the growing city of Lucerne. This is of interest, as urbanization is seen as an important driver of modernization (Treiman 1970). In Glarus, by contrast, the proto-industrialization of the 18th century prepared the strong and comparably early factory industrialization the canton saw in the 19th century. These features of the two cantons allowed both a comparison of three differently modernized areas (rural Lucerne, the city of Lucerne, and the canton of Glarus) and the analysis of temporal changes within each of the two cantons. Considering direct measures of the state of modernization at a given time and place within these cantons gave further insights into the relationship between industrialization and the relevance of social origin.

To pursue the aim of testing the modernization thesis, we collected new data from archival sources from the two cantons (section 3.2). The sources used for the two cantons differ, but each of them is unusual in its way. In 1834, the newly elected government of the canton of Lucerne issued a law defining the form and content of church books, which were previously completely under the control of the clerics. The situation changed again in 1875, when the civil registers were unified at the level of the federal state of Switzerland. For this reason, the marriage registers of the canton of Lucerne include the occupational titles of the groom and of the fathers of both the bride and groom in a systematic way for the period between 1834 and 1875. This is unusual for Switzerland, as the registers of most cantons did not contain any occupation information – at least not systematically for two generations. For the canton of Glarus, by contrast, we were able to draw on the *Genealogiewerk* by J.J. Kubly-Müller, a genealogy of all Glarus families in 36 handwritten volumes, compiled by Kubly-Müller, who took into account all sources available to him. In order to make the dataset comparable to the one of Lucerne, I only considered those men whose (first) marriage was concluded between 1830 and 1880.

In section 3.3, I used these two datasets to test the predictions of the modernization thesis by analyzing differences in intergenerational social mobility, both within and between the two cantons. In order to do so, I presented theoretical arguments for why we can expect social origin to affect an individual's own social status, and for how this effect is assumed to change over the course of modernization. For the latter, I not only considered arguments provided by the classical modernization thesis: I also considered arguments provided by the theory of sector dualism. The modernization thesis and sector dualism both predict decreasing effects of social origin for later states of modernization, but sector dualism predicts increasing effects during early modernization, while the modernization thesis assumes a monotonous decline over the whole course of modernization. Based on these arguments, I derived hypotheses regarding differences in social mobility and the intergenerational class linkage between areas, regarding changes over time, and regarding the effects of three aspects of modernization: industrialization, educational expansion, and the presence of modern means of transportation. The conflicting hypotheses regarding the effect of early industrialization resulting from considering both the modernization thesis and the theory of sector dualism allowed a more differentiated test of the modernization thesis.

In order to test these predictions on the changing importance of social origin I analyzed two social phenomena driven by origin effects: intergenerational class mobility and social homogamy in respect of parents' social status. The analyses of intergenerational class mobility made it possible to investigate the relevance of social origin for individuals' social standing in a direct way. These analyses answer the questions whether the proportion of mobile individuals changed over the course of industrialization; whether in more modern contexts, individuals' class position is less strongly determined by their parents' class; and how the steering patterns resulting in this intergenerational class linkage differs between more and less modern contexts. The analysis of homogamy by social origin complemented the investigation of social mobility: while it does not focus directly on the intergenerational linkage, the similarity of both partners' social backgrounds highlights the relevance of social origin for an individual's life course. A high level of homogamy by social origin results from the fact that social origin is either directly considered as an important criterion for spouse selection and/or it is tightly linked to other relevant criterions, such as the social status of the future spouse. Furthermore, homogamy by social origin is an important precondition for status inheritance across multiple generations (Braun and Stuhler 2018).

Before coming to some key conclusions that can be drawn from the results of analyzing the importance of social origin during early modernization in the cantons of Lucerne and Glarus, I want to stress that this study is limited in several ways. To begin with, I limited myself to the study of social positions derived from occupational titles of two generations. Necessarily, this means that only a part of the overarching phenomenon of intergenerational transmission of social inequalities can be reflected by the analyses carried out in this thesis. First, the growing literature that uses information from more than one generation highlights the fact that results based on only two generations underestimate the steering power of the family of origin (Anderson et al. 2018; Braun and Stuhler 2018; Clark and Cummins 2015; Knigge 2016; Liu 2018; Mare 2014). This means that the level of intergenerational linkage reported in this thesis is probably underestimated, but Clark and Cummins (2015) conclude that the ignorance of earlier ancestors is “not a significant obstacle” (p. 607) for understanding differences in the importance of social origin between contexts.

Second, and perhaps more significantly, both the class linkage between father and son and homogamy by social origin are only partial measures of the relevance of social origin for individuals' social standing. Because the modernization thesis refers to a holistic concept of the effects of social origin, tests of this thesis based on analyses of social phenomena such as social mobility or homogamy hinge on the assumption that changes in the effects of social origin can be inferred from changes in these phenomena. Whether this assumption holds is unclear and presumably depends on the specific context in which these phenomena are analyzed. This issue not only concerns the present study but a large part of the literature on the changing effects of social mobility. Thus, I will come back to it in the last sub-section in this section, when I discuss the conclusions that can be drawn from the existing studies on modernization and the effects of social origin.

Finally, this study is limited by the data, especially with respect to the population from higher origin brackets. Although the newly collected dataset used for chapter 3 includes close to 2,500 usable observations, it is still relatively small, especially when compared against other historical datasets that have grown over time, like the databases from Sweden (Landsarkivet i Lund 2016; Umeå University 2016) or the Netherlands (Centraal Bureau voor Genealogie 2016). This relatively small size naturally limits the data’s statistical power, especially if a number of sub-groups are analyzed. This resulted in several inconclusive results: for example, when results with controls for geographical context and time confirmed the trend found by less demanding analyses, but without meeting conventional levels of statistical significance. Furthermore, additional high quality indicators for modernization at the level of the individual parishes would clearly extend the scope of those aspects of modernization which could be analyzed. Despite these limitations the new data allowed us to study aspects of social stratification in a hitherto unstudied context with varying degrees of industrialization during the 19th century. Most importantly, they made it possible to arrive at three important lessons that can be drawn from studying the relevance of social origin in historical contexts of early industrialization. First, the identified alignment of observed mobility and class linkage suggest that during early industrialization, origin effect were strongly driven occupational resources. Second, the relevance of inequality is generally neglected by the modernization thesis, which goes together with the ignored role of the farmers in a large part of the literature. Finally, the existing evidence suggests that modernization is a more complex process than described by the modernization thesis.

4.3.1 Alignment of Observed Mobility and Class Linkage: Evidence for the Dominance of Occupational Resources during Early Industrialization?

In addition to presenting theoretical arguments for differences in social mobility both between time periods and areas, I also theorized that analyses of both observed mobility and more general measures of social fluidity would lead to similar results. My argument was that rapid structural changes tend to devalue class- or occupation-specific resources and weaken class barriers. Following this argument, both higher observed mobility and weaker intergenerational class linkage can be expected in contexts of structural change entailed by industrialization. This resembles the argument of Sorokin (1927/1959), who stated that there is (a) no general trend in social mobility (p. 153), but (b) shocks tend to increase mobility (p. 142).

The hypothesis that observed mobility and intergenerational class linkage, measured by the M-index, would lead to mutually supporting results is confirmed by the analyses based on the data from the two cantons. In other words, increasing observed mobility has been found where the class linkage weakens, and vice versa. This contradicts results from more industrialized contexts, where clear trends in observed mobility have been found but no systematic trends in class linkage (e.g., Breen 2004a; Erikson and Goldthorpe 1992). This contradiction is in line with my theoretical distinction between class-specific and general resources. If the former dominate, as is presumably the case in pre-industrial and early-industrialized contexts, observed mobility and intergenerational class linkage can be assumed to change hand in hand. Conversely, if the general resources matter strongly, this is not necessarily the case, as forced mobility does not necessarily devalue general resources. This is the case with education in a (post-) industrialized context, which is why the divergence of the trends in observed mobility and class linkage found for social mobility in 20th century Europe (Breen 2004a) are in line with the presented theoretical arguments.

In contrast to such results for more industrialized contexts, the pattern of the mutual affirmation of the results for mobility and class linkage emerging from my results is in line with research on contexts of early industrialization. For example, Lippényi et al. (2013) have studied the case of Hungary in the period 1864–1950 and they have found that observed mobility increased while intergenerational class linkage weakened. This consistence of the two measures has been confirmed by Maas and van Leeuwen (2016) based on data covering the pre-industrial and early industrialization period in seven European countries. Furthermore, some studies on early industrialization in late industrializing countries have also confirmed this observed concordance, although the authors apparently did not (at first) acknowledge this fact. Ishida (2001), for example, presented very consistent results for Japan for the period 1955–65 (clear increase of observed mobility, weakening of class linkage measured by odd ratios), but less so for the period 1965–95, for which he found a stabilization in observed mobility rates and a fluctuation in the odds ratios over time. Despite this good concordance of the two measures, especially in the early phase of industrialization, the author summarizes that "the results of cross-temporal comparisons of mobility pattern report some systematic trends in total mobility […]. The pattern of association between class origin and class destination, however, was stable in postwar Japan" (Ishida 2001: 579).

An illustrative case for how structural changes during early industrialization not only lead to increased observed mobility but also weaken class linkages is Ireland. First using data for the period 1972–94, Whelan and Layte (2002) reported a diverging pattern: increasing observed mobility, but no change in intergenerational class linkage. Later, extending the observed period to the year 2000, they reported a concordance of observed mobility and class linkage (Whelan and Layte 2006). The difference in the result stems not so much from differences in the period under consideration, but from the fact that the increasing fluidity stems from a change in a specific aspect of the mobility pattern, that was apparently overlooked in the first study. In fact, the most significant change in class linkages stems from the improved probability of the lowest classes entering the service class (Whelan and Layte 2006: 200). This change went hand in hand with a strongly growing service class over time. Whelan and Layte (2006) concluded that when hiring or promoting employees, employers were increasingly forced to consider even those with a social origin that was considered inadequate. In other words, the forced mobility that resulted from the changes in the class structure increased the probability of the lowest classes entering the topmost class. An important driver of this connection between observed mobility and the probability of entering the service class could be related to the fact that the immobility rate in the service class was already very high in 1973 (Whelan and Layte 2006: 197). Because the self-recruiting potential was exhausted, the growth of the service class had to be fostered by an inflow from the lowest classes. It can be argued that employers had to change their preferences regarding social origin in order to fill their vacancies. As a consequence, long range mobility was facilitated, which connects (forced) observed mobility to intergenerational class linkage.

The distinction between class-specific and general resources proposed in the theory section (3.3) helps us to draw substantive conclusions from the identified alignment between results based on analyses of observed mobility and those referring to the intergenerational class linkage, measured by the *M*-index. To repeat, class-specific resources have no influence outside the class to which they pertain. For example, farm-specific resources inherited from a farming mother steer a son towards the farming class, but if he will not end up in the farming class, those resources have no steering power at all. By contrast, the educational advantages of a daughter of a teacher will continue to steer her to higher classes even if she will not end up in the same class as her father. Both steering powers combined make up the set of intergenerational class linkages of a certain mobility regime. If structural changes force a mobility regime to change, this means that general resources either played a minor role in this regime or that the potential for supplying a given class with individuals with inherited general resources is already exhausted. Presumably, the latter was the case in Ireland. This can be assumed because only a small subset of the class linkages changed and because the probability of attaining the topmost class were not very unequal in the three upper classes. The latter suggests that it was general resources, rather than class-specific resources, that ensured the influence among the upper classes. In contrast to this 20th century example of the effect of early industrialization, the 19th century examples presented in this thesis (and also by Lippényi et al. (2013), and Maas and van Leeuwen (2016)) suggest that the overall level of class linkages – and not only specific associations – changed in accordance with observed mobility. This close accordance of the two measures of the importance of social origin for the class to which an individual belongs suggests that in this period it was mainly class-specific resources that mattered for the intergenerational transmission of social positions – general resources mattered to a far less extent. Note, however, that this does not mean that cultural resources did not matter in this period. On the contrary, in the description of the historical context I pointed to the bourgeois upper class, which was establishing itself at this time, which distinguished itself by means of cultural practices that required both a high level of education and important amounts of financial resources. However, as resources such as a high-level education were exclusive to the topmost class, they were class-specific and not general resources, as in later stages of modernization. Therefore, a first conclusion that can be drawn from this thesis, and from other studies on similar periods, is that there is indirect evidence for the assumption that it was class-specific resources that mainly mattered for the intergenerational transmission of social status during the early phases of industrialization in the 19th century.

4.3.2 The Critical Role of the Farming Classes and the Relevance of Inequality

Since Krueger's (2012) presentation made to the Center for American Progress, the term "Great Gatsby Curve" has been used to refer to the negative relationship between income inequality and intergenerational social mobility, which has been found by multiple studies that have received considerable attention (Corak 2013; Chetty et al. 2014b; Chetty et al. 2014a; Jerrim and Macmillan 2015). Analyzing spatial variation in income mobility within the US, Chetty et al. (2014b) found a clear negative relationship between income inequality and intergenerational mobility. In a companion study, however, the same authors did not find any time trends in mobility, despite the growing inequality in the US (Chetty et al. 2014a).

In the sociological literature on social mobility, however, the relationship between income inequality and social mobility has rarely been analyzed thoroughly. Both Erikson and Goldthorpe (1992), and the studies in the volume edited by Breen (2004a), neglected this relationship in the main body of their studies but treated it in the form of post-hoc analyses as part of the concluding part. While Erikson and Goldthorpe (1992: 379–89) found a negative relationship between inequality and social fluidity, the relationship found by Breen and Luijkx (2004) was in the opposite direction. In one of the few existing sociological studies dedicated to the relationship between inequality and intergenerational social mobility, Mitnik et al. (2015) found time trends in social mobility that mirrored the ones in income inequality.

In respect of early industrialization during the 19th century, Knigge et al. (2014a) referred to dualism theory (both sector dualism and generalized dualism), which predicts increasing inequality in resources in the early phases of industrialization and modernization (cf., Nielsen 1994), and they further theorized that the effect of the family of origin would increase with increasing inequality. Using data from the Netherlands from a comparable period to the one analyzed in this thesis (1830–95), they were indeed able to provide both direct and indirect evidence for key aspects in the relationship between modernization, inequality, and the importance of the family of origin for individuals' status attainment (measured by sibling similarities). While they found a decreasing time trend in sibling similarities, in line with the predictions of the modernization thesis, they were not able to confirm the thesis's prediction using more direct measures of modernization and industrialization. In sum, they found indirect evidence that is in line with the modernization thesis, but their direct evidence favors dualism theory.

In its narrow sense, dualism theory predicts an inverted U-shaped relationship between industrialization and the effects of social origin because the weight of the inequality between agrarian and industrial sectors first increases and then decreases during a transition from an agrarian to an industrial society. In addition, Nielsen (1994) demonstrated that the idea of the dualism between sectors can be generalized, leading to the prediction that other processes of modernization, such as educational expansion, first increase inequality before decreasing it. This is because such innovations tend to be diffused unevenly across the population, producing dualism effects – for example, because it was the urban elites that mainly profited from early educational expansion. Thereby, dualism theory identifies inequality as a key factor in the relationship between modernization and the effects of social origin. Furthermore, this rationale also suggests that some modernization processes mainly increased inequality in the upper part of the income and wealth distribution, whereby origin effects in the upper strata of the society were the ones that were affected most by these processes.[105]

Dualism theory, therefore, provides an important theoretical element for analyzing the link between modernization and the effects of social origin. First, it highlights the neglected but central role of inequality and, second, it alters the prediction of the modernization thesis insofar as it does not predict a linear relationship but rather an inverted U-shaped relationship between modernization processes and the effects of social origin. Before I discuss how far the results of the present thesis are in line with the predictions of dualism theory and these previous findings, I would like to highlight that dualism theory also connects to the decisive role of farmers. This last element

[105] For this "top income hypothesis", compare Mitnik et al. (2015).

follows directly from the core of dualism theory, because during early modernization, focusing on sectors means focusing on farmers (and farm workers).

More specifically, because sector dualism focuses on the inequality between sectors, it stresses the relevance of the inequality in resources between farming classes and the other classes. According to dualism theory, this between-sector part of the overall inequality gains in weight compared to the within-sector inequality during the early phase of the transition from an agrarian to an industrial economy. Put differently, as long as the farming classes dominate the class structure, it is only of minor importance that the skills and resources of farmers are of little use outside of the farming classes. In this situation, most sons of farmers or farm workers will end up in one of the farming classes, irrespectively of their origin, simply because the class structure demands large numbers of farmers and farm workers. In such a context, the demands for non-farmers with a farming origin can easily be covered by "never-takers" – by those individuals with a farming origin who would never become farmers because they have special interests, talents, or because of special circumstances. Conversely, there are relatively few potential candidates for farming positions who do not have a farming background.

For illustrating this, we can assume that about 80% of farmers are recruited from among those with a farming background.[106] Such a self-recruiting rate reflects the fact that those with a farming background are especially suited for farming positions, because they have acquired farming skills within their family of origin. At the same time, it also reflects the fact that a minority of farming positions will always be filled with individuals without a farming background. In a context with a class structure dominated by farming classes, this high self-recruiting rate can be attained without forcefully steering those without a farming background away from farming positions. In such a situation, the steering of individuals because of their origin is of relative little importance. This situation changes as soon as the farming classes start to lose their dominant positions in the class structure. If there are equal numbers of candidates for farming positions with and without a farming background, a high self-recruiting rate of farmers, as described above, can only be attained by a strong steering by origin. Individuals with a farming origin will be steered toward their class of origin and those

[106] The numbers found for Lucerne (70%) and Glarus (60%) are high, but below this rate (with the exception of the few farmers within the city of Lucerne (86%), who belong to a special case). However, the 80% used in this example is not unrealistic, as Xie and Killewald (2013) report self-recruiting rates in that order of magnitude for the US over a large time range.

with another origin will be steered away from the farming classes. In such a situation, the steering of individuals because of their origin is of relative high importance.

Deduced from dualism theory (Nielsen 1994), this conclusion on why farmers were decisive in the transformation from an agrarian to an industrial economy is relevant insofar as it delivers a theoretical underpinning for the decisive role of farmers, as discussed by Long and Ferrie (2013a, 2013b), Hout and Guest (2013), and Xie and Killewald (2013). What sparked this debate was Long and Ferrie's (2013a) unexpected findings suggesting that in the US, social mobility was greater at the end of the 19th century compared to the period around 1970. While part of the debate focused on methodological issues (compare section 2.1), the substantive discussion focused on the role of farmers. In this part of the discussion, Xie and Killewald (2013) presented the same argumentation sketched out above (albeit without reference to dualism theory) and concluded that "the literature on social mobility largely overlooked the uniqueness of farmers" (p. 2017). Therefore, dualism theory provides a possible theoretical basis for the analysis of this unique role of farmers by highlighting the inequality in resources between farmers and non-farmers.

Unlike Knigge et al. (2014a), who found a direct link between inequality and the effects of the family of origin, I was not able to directly test the core of dualism theory, because data limitations did not allow me to construct a measure of inequality that varies between municipalities and across time. Nonetheless, it was possible to formulate and test hypotheses that make it possible to discriminate between the predictions of the modernization thesis and those of dualism theory. As noted when discussing the results, the empirical evidence stemming from the cantons of Lucerne and Glarus favored, overall, the prediction of dualism theory. Most notably, I found that the effects of social origin were positively associated with industrialization in Lucerne, where industrialization was about to start, were not associated with the rather conservative printing industry in Glarus, and were negatively associated with the more modern and machine-driven spinning and weaving industry in the same canton. In other words, the association between industrialization and the effects of social origin followed the inverted U-shaped pattern predicted by dualism theory. Furthermore, the analyses also revealed that the positive association in Lucerne was mainly driven by farmers, which is in line with the special role of farmers in this theory discussed above. Finally, the results in relation to homogamy in the upper social stratum further suggest that inequality in resources may be decisively involved in the relationship between modernization and the effects of social origin.

In sum, we find that farmers are of special importance when analyzing effects of social origin during the transition from an agrarian to an industrial economy and society. Therefore, we should definitively not "gloss over" their influence on this process by "blocking" cells in mobility tables (Xie and Killewald 2013; Long and Ferrie 2013b), but instead should give them their appropriate (thus: high but shrinking) weight. However, dualism theory suggests that farmers may be important not because they are an "unique case" (Xie and Killewald 2013), but simply because they form one of the two decisive sectors in the transition from an agrarian to an industrial industry. In addition, we can also learn that inequality should not be overlooked when analyzing the relationship between modernization processes and the effects of social origin. Finally, the case of homogamy in the canton of Lucerne has shown that in some contexts it may also be worthwhile to analyze this relationship by social strata, as different strata may react heterogeneously to the changes that come with modernization.

4.3.3 Modernization Is More Complex

A third lesson that can be learned from investigating the relationship between modernization processes and the effects of social origin in the historical context of early modernization is that modernization and its effects are more complex than the usual interpretation of the modernization thesis suggests. This is not a surprising finding, but is a reminder of the fact that historical processes are rarely unidimensional and monotonous in nature. In this chapter, we have encountered three elements of additional complexity.

First, in the last sub-section, I discussed the fact that there is significant empirical evidence in favor dualism theory, rather than the modernization thesis, as regards the early state of modernization. While the modernization thesis predicts a monotonic decrease in inequality and the effects of social origin over the course of modernization, dualism theory expects a curvilinear, inverted U-shaped relationship (Nielsen 1994). The first qualification which therefore suggests itself is that the modernization thesis does not apply to the early phases of modernization. This does not invalidate the modernization thesis, but it does rule out its functionalist interpretation in which higher social mobility is viewed as a prerequisite for industrial development (Kerr et al. 1960).

Second, it is obvious that modernization may not be the only process influencing the effects of social origin, and that there may be other processes overlaying the effects of modernization. Lippényi et al. (2013), for example, considered the shock of the Second World War, when analyzing the effects of modernization in industrializing Hungary. Such overlaying processes are especially problematic if we approximate the processes of modernization by historical time, without being able to measure confounding processes in order to take them correctly into account. Furthermore, other historical processes may not only simply overlay the effects of modernization, they may be directly related to modernization. In Lucerne, pauperism was attributed to industrialization outside the canton, and the authorities reacted by tightening marriage restrictions. The time trends found in relation to homogamy support the assumption that Lucerne's tightening of its marriage restrictions amplified the importance of social origin in relation to spouse selection, counteracting the effect of modernization. In such cases, modernization provokes a reaction that counteracts the eventually existing primary effects of modernization, producing uneven instead of steady modernization effects.

Finally, the example of Glarus teaches us to look closely when measuring modernization processes. In Glarus I did not find a homogeneous effect of industrialization, but rather two different types of industry that produced different industrialization effects in respect of social mobility. Both the growth of the printing industry and the growth of the spinning and weaving industry can be qualified as industrialization, as they increased the industrial production, while concentrating the workforce in factories. However, the organization of the production within these factory was different in the two industries, as the highly flexible printing industry remained much closer to an artisanal mode of production, while the spinning and weaving was machine driven and required much fewer skilled workers. It is in line with the modernization thesis that only the growth of the latter was found to decrease the effects of social origin, but it refutes the idea of proponents of this thesis that there was only one "logic of industrialization" (Kerr et al. 1960), which produces homogeneous effects on the relevance of social origin for individuals' status attainment.

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In the last sub-section, I presented three lessons that can be learned from analyzing the effects of social origin in historical contexts of early modernization and industrialization. They contribute to what we know about social mobility in such contexts, they may help to improve future research, and they suggest that the modernization thesis should at least be qualified in relevant aspects. However, the predictions of the modernization thesis are more fundamental than those that are touched on by these lessons. What the modernization thesis promises is that modernization will lead to a (more) open society, in which the ascribed characteristics of a person – characteristics that cannot be altered by a person, such as social origin, but also gender or race – lose their relevance for an individual's status attainment, and will be replaced by a person's own merits. This promise is so general that, to the best of my knowledge, no existing single study nor any review article has been able to evaluate it in its totality. While assessing the validity of the modernization claim in respect of the relevance of social origin in general is out of question, the existing and growing literature, together with the evidence from this dissertation, makes it possible to qualify it in its home context. The modernization thesis was first formulated in connection with northwestern societies that were industrialized relatively early, and involved explicitly or implicitly contrasting traditional agrarian and modern industrial societies. It is this context on which the chapter on industrialization and social origin has focused, and it is in relation to this context that I now want to provide a provisional assessment of the modernization thesis.

Tests of the modernization thesis in relation to the importance of social origin can be grouped by their fundamental conceptualization of modernization in order to identify the relationship between modernization and the effects of social origin. The first conceptualization analyzes time trends, taking for granted the teleological implications of modernization. In other words, it assumes that, eventually, a modernizing society will become a modern society. The advantage of this conceptualization is that it covers well the "promise" aspect of the modernization thesis, saying that, one day, if we keep running the modernization machine, we will end up in an open and meritocratic society. On the other hand, the problematic aspect of this conceptualization is that we need to know – or assume – the relationship between time and modernization, and we need to assume that there are, at least in the long run, no other processes that confound the relationship between modernization and the effects of social origin. The second conceptualization operates at the level of individual modernization processes, such as industrialization, urbanization, educational expansion, or the diffusion of means of mass transportation or communication. Approaches for testing the modernization thesis based on this conceptualization do not suffer from the disadvantages of those based on the first conceptualization. On the other hand, however, 'modernization' is such an all-embracing concept – which also makes it difficult to define (Tipps 1973) – that we will never be able to distinguish between all its sub-processes, let alone measure all of them. Nonetheless, testing hypotheses regarding individual modernization processes derived from the modernization thesis makes it possible to test the validity of the claims made by the modernization thesis (e.g., Zijdeman 2009). Therefore, the two approaches, based on different conceptualizations of modernization, can be viewed as complementary, but because of their differences it is not surprising that they lead to partly different conclusions.

In respect of time trends, the previous literature is mainly in line with the predictions of the modernization thesis. For example, studies focusing on Berlin (van Leeuwen and Maas 1996), the United Kingdom (Miles 1993; Montt and Maas 2015), or over the very long run France (van Leeuwen et al. 2016), have found declining effects of social origin on individuals' status attainment. Other studies have not find conclusive evidence (e.g., Fukumoto and Grusky (1993) for France) or heterogeneous trends for different class barriers (Maas and van Leeuwen (2002) for Sweden). For Hungary (Lippényi et al. 2013) and the Netherlands (Knigge et al. 2014b; Knigge et al. 2014a), persisting or even increasing effects of social origin have been found for the early phases of modernization, while robustly decreasing effects have been found for later phases. Using large datasets from seven European countries, Maas and van Leeuwen (2016) arrived at the same conclusion. Especially given this last contribution, we can conclude that there is ample evidence supporting the modernization thesis in phases of rapid, mechanized industrialization, but no clear evidence for the early phases of modernization.

In contrast to these relatively coherent findings on time trends, the results yielded by analyzing individual modernization processes are more mixed. For Hungary, Lippényi et al. (2015) found increasing mobility with educational expansion and industrialization, but only within the non-agrarian, manual class, and no effects of urbanization or geographical mobility. For the Netherlands, mixed evidence has been found. While Zijdeman (2009) found increasing mobility for some indicators (mass transportation and geographical mobility – the latter not so robust) and decreasing mobility for other indicators (mass communication, industrialization, and for early industrialization also urbanization), Knigge et al. (2014b) found that higher degrees of urbanization, geographic mobility, mass communication, and mass transportation went hand in hand with lower effects of social origin. However, using a similar dataset but brother correlation as a more encompassing measure of effects of family origin, Knigge et al. (2014a) found effects of industrialization, educational expansion, in-migration, and mass communication that contradict the predictions of the modernization thesis. In other words, they found increasing effects of social background with increasing values for these measures.

This somewhat inconclusive result in respect of the modernization thesis is partly paralleled by the results from the analyses carried out in this thesis. The results from comparing social mobility and intergenerational class linkages between the rural Lucerne, the city of Lucerne, and the canton of Glarus, are clearly in line with the modernization thesis, as rural Lucerne, the least modernized area, was clearly the least open area in respect of the effects of social origin. The analyses also indicate that the difference between rural Lucerne and the city of Lucerne are largely driven by the process of urbanization – that is, by the strong migration to the city. Furthermore, analyzing the effect of the machine-driven spinning and weaving industry, I found direct evidence for the assertion that more advanced industrialization increases social mobility. Finally, for Glarus, I found a negative time trend for the effects of social origin that, however, did not meet conventional levels of statistical significance. These findings are in line with both the modernization thesis and dualism theory, as they concern states of industrialization in which agriculture, as the leading sector, has already largely been pushed back. By contrast, the results in relation to earlier modernization are less conclusive. With respect to educational expansion, the data from Glarus provide empirical evidence suggesting that the early stage of educational expansion observed in Glarus went hand in hand with decreasing mobility and tightening class linkages between the generations. Similarly, I found a negative relationship between social mobility and industrialization in Lucerne. However, this result was not confirmed by analyzing homogamy by social origin. In line with the modernization thesis, I found, at least for lower strata, that homogamy decreased with early industrialization.

The question, then, is how we can explain the diverging results found both in the existing literature and in this thesis. One possible explanation ties in with the lessons discussed above. Dualism theory (Nielsen 1994) implies a curvilinear relationship between modernization processes and the effects of social origin, and for many such processes, Knigge et al. (2014a) have provided evidence for such an inverted U-shaped pattern. If the relationship is indeed curvilinear, the timing of the observation is crucial – especially when the curving is not very pronounced and can only be detected over the long term. In such a case, the same process may appear to first affect the effects of social origin positively and later to do so negatively – and in between, no relationship at all can be found. Because these processes kick in at different points in time, the time trend resulting from the combination of them may follow a different pattern than the single processes. Most likely, the initial increase in the time trend will be flatter than for a single process, while the subsequent decrease will be steeper. While this partly fits the empirical evidence discussed above, it remains problematic that, in general, the time trends identified were so much clearer than the relationships with the measured processes. Therefore, future research should try to further improve the measurements used for capturing modernization processes, and to better understand how the observed time trends resulted from the interaction of these processes. Furthermore, the discussion of the marriage restriction as a confounding process for the relationship between modernization processes and homogamy by social origin highlights the importance of taking into account processes that are not, or are only indirectly, connected to modernization. Even more so, as this makes it possible to test the alternative explanation that time trends in social mobility or homogamy by social origin are unrelated to modernization processes.

Two further inconsistencies in the existing findings pose questions that have to be answered in order to conclusively test the implications of the modernization thesis for the relationship between modernization and the relevance of social origin for an individual's own life. The first inconsistency stems from the diverging finding for the Netherlands discussed above: in other words, the differences between analyzing brother correlation (Knigge et al. 2014a) and the association between a father's and son's social status (Knigge et al. 2014b). The second inconsistency refers to the (partly) diverging effects of industrialization on social mobility and homogamy, found in this thesis. These inconsistencies are irrelevant for research questions that are only interested in the respective phenomena (brother correlations, associations between father and son, or homogamy by social origin). As discussed in the introduction to the section on homogamy (section 3.3.5), however, these phenomena are not only interesting by themselves, but also because they serve as proxies for the general relevance of social origin for individuals' status attainment. Inconsistencies in modernization effects between multiple proxies call into question the – often implicitly made – inference from these proxies to the general relevance of social origin. The diverging results from analyzing brother correlations and the intergenerational status association suggest, for example, that the contribution of the father–son linkage to the total relevance of social origin has changed.[107]

Social origin is a black box that includes, among other things, each parent's occupational status, educational attainment, wealth and other social, economic, and cultural resources (Blau and Duncan 1967; Buis 2013; Bukodi and Goldthorpe 2013; Andersen and Jæger 2015; Scheeren et al. 2017; Killewald et al. 2017; Hällsten and Pfeffer 2017). Measuring only one of these dimensions will never account for the full social origin, although these dimensions are correlated. The omission of each parent's education may be problematic. For example, the classical status attainment model of Blau and Duncan (1967: 170) assumes an independent effect of the father's education, affecting the son's occupation via the son's education. This effect, and, equally important,

[107] This interpretation is implied by the fact that brother correlations provide an encompassing measure of the relevance of the family of origin without measuring "social origin" directly.

the relevance of the mother's educational attainment (Knigge 2015) can be assumed to increase over the course of modernization – and thus omitting it when measuring social origin could bias our understanding of the modernization effect. Such omissions when measuring social origin are most likely important drivers behind the diverging results based on sibling correlation, an encompassing measure of social origin effects, on the one hand, and analyses based on father–son linkages in social status, on the other (Knigge et al. 2014a). Without a holistic measure of social origin at hand, it remains unclear whether this bias also effects the analyses carried out in this study. There are arguments that suggest that the omission of a parent's education was of minor importance in Switzerland. This is because it was only after the middle of the 19th century that the educational expansion also started to encompass secondary and tertiary education (Wecker 2014: 441–5), and it is secondary and tertiary education that is most directly related to social status. This means that the father's status was only marginally affected by educational expansion, as fathers went to school before the relevant part of the education expansion took place. Consequently, it can be argued that the shifting relative importance of education as a part of social origin is a minor concern for this early phase of modernization. This view receives some support from the fact that the analyses of observed mobility and class linkage yielded mostly equivalent results. As discussed above (sub-section 4.3.1), this can be interpreted in the sense that it was mainly the occupational-specific resources of the father that mattered for the intergeneration transmission of social status in the studied contexts.

For the divergence between social mobility (class linkages between father and son) and homogamy by social origin, the changing importance of a wife's gainful activities for a family's income may be of greater relevance. For the Netherlands, Schulz et al. (2014) have showen that the strong decline of the female labor market participation resulted first in a decline but then in an increase in the occupational status of the women remaining in the labor market. While the decline was the result of economic necessities (women tended to remain in the labor market only when their contribution to the family income was necessary to make a living), the later increase was a consequence of the improving educational opportunities, which allowed women to become, for example, teachers. Ignoring local specificities, a large part of the high labor market participation of women found in traditional societies took place within the common household economy (Horrell and Humphries 1995; Pfau-Effinger 2004). In such a situation, a good fit between a wife's and husband's occupation is important, which leads to homogamy in respect of the spouses' occupations. If this aspect is eliminated because females withdraw from the labor market (the first phase described by Schulz et al. (2014)) or because they have a profession that is independent of their husbands (second phase),[108] homogamy also decreases. In other words, the negative relationship between industrialization and homogamy by social origin found above (section 3.3.5) may not be the result of a decreasing relevance of social origin for the two spouses' situation, as hypothesized based on the modernization thesis, but rather the result of the changing role of the wife within a family.

While these arguments may explain the inconsistencies in the conclusions that arise from analyzing brother correlations, social mobility and homogamy, this also means that we may not be able to generalize from either of the latter two to the changing general relevance of social origin. This limitation is unfortunate, but it is not surprising. Tests of macro-level theses not founded on micro-level mechanisms, such as the modernization thesis, will never be strictly conclusive – also because macro-level units can differ across a multitude of other observed and unobserved characteristics than those we can analyze or control for (e.g., Coleman 1987). If we additionally have to assume that father–son class linkages provide an unbiased proxy for analyzing the effects of social origin over time or between contexts of varying degrees of industrialization, the test becomes even less conclusive.

Seen from a narrow hypothesis-testing perspective, this is a devastating conclusion for both the modernization thesis and a vast part of the literature focusing on testing hypotheses derived from it. Indeed, for such aims, a non-falsifiable thesis is as useless as conclusions that hinge on far-reaching assumptions – especially if there is evidence from other contexts suggesting that these assumptions do not hold. This is the negative side. However, I would like to argue and to stress that there is a clear positive side. Concerning the modernization thesis itself, an important value can be seen in the fact that it has inspired and driven an important part of the literature on changes in social mobility and the effects of social origin. For the future, however, researchers may be well advised to be even more cautious in considering hypotheses derived from the modernization thesis. When it comes to the empirical analyses – both in this thesis and in the existing literature – the above-mentioned limitations are important. Nonetheless, they definitively do not make the results worthless – rather, these analyses make an important contribution to the understanding of social mobility and the effects of social origin. First, in some cases, the findings on father–son linkages contribute to our

[108] Note that this second case was rare, as women with a high-status occupation (such as teachers) experienced strong pressure to withdraw from their employment as soon as they got married (Grunder 2008).

understanding of changes in the total effects of social origin. For example, it is difficult to imagine a plausible explanation for why the total effects of social origin should not have increased, although the results in relation to the effects of early industrialization on father–son class linkages suggest that this is the case. Similarly, it is also difficult to assume plausibly that other effects of social origin compensated for the much lower father–son linkage found among migrants to the city of Lucerne, compared to their locally rooted rural counterparts. Second, and perhaps more importantly than such exceptions, the evidence generated on homogamy by social origin or linkages between a father and son's social class or status may not be very conclusive in relation to the total effects of social origin, but it is certainly very informative regarding the respective individual social phenomena. It *is* important to know that migration to the city weakened the influence of the family of origin, both for partner selection and status attainment, that social mobility was higher in the more industrialized context of Glarus, where it further increased with the spread of "modern" industries, compared to Lucerne, where initial industrialization made class barriers even more rigid. By identifying these processes at the local level, the present study contributes to the literature on changes in the effects of social origin. It does so by highlighting the relevance of occupational resources in the early phase of modernization, the relevance of inequality, and the fact that these changes are complex historical processes that require that both the precise timing and the historical and local specificities of the context be taken into account.

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Appendix A Additional Graphs

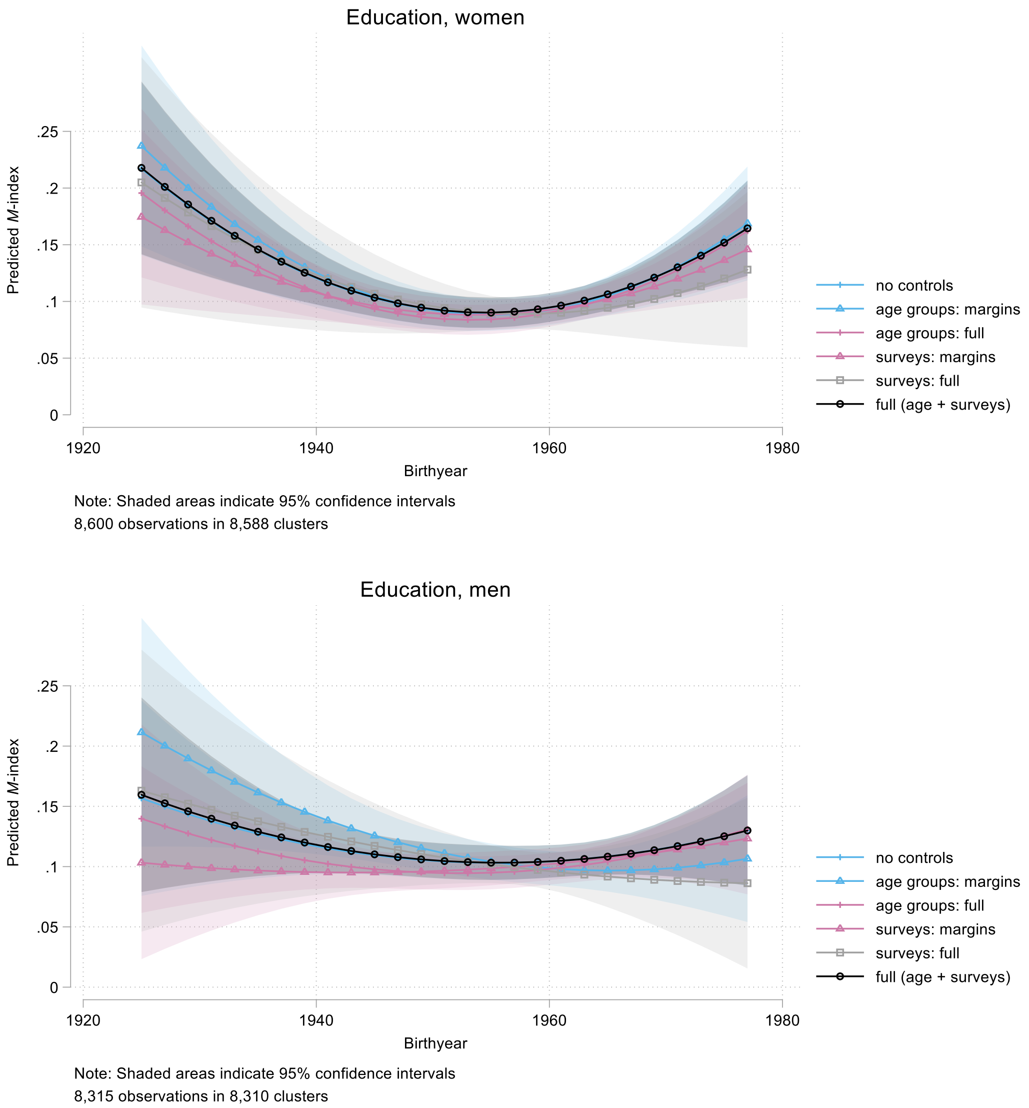


Figure A-1. Intergenerational linkage of educational attainment: controlling for age and survey effects (model predictions with confidence intervals)

Note: compare **Figure 2-8**, p. 58.

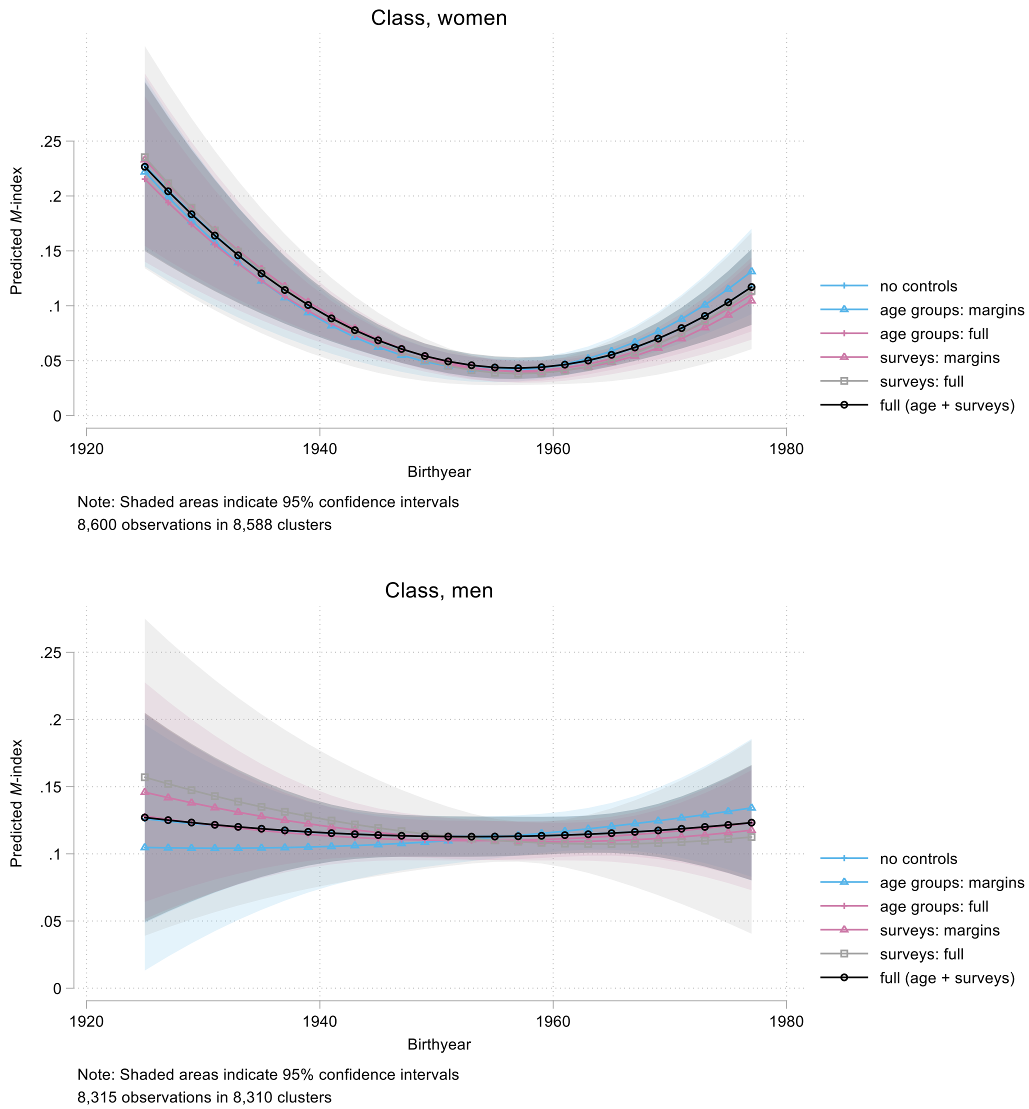


Figure A-2 Intergenerational class linkage: controlling for age and survey effects (model predictions with confidence intervals)

Note: compare **Figure 2-9**, p. 59.

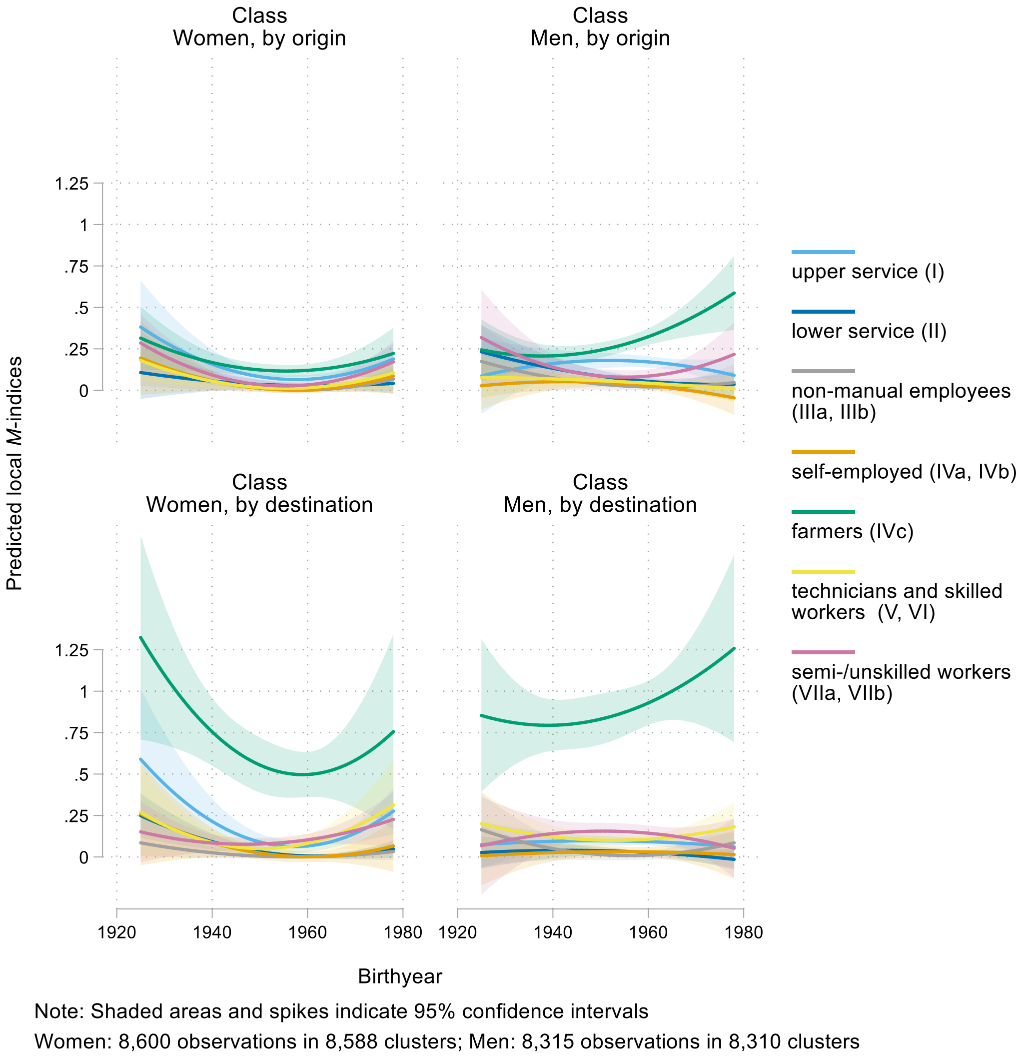
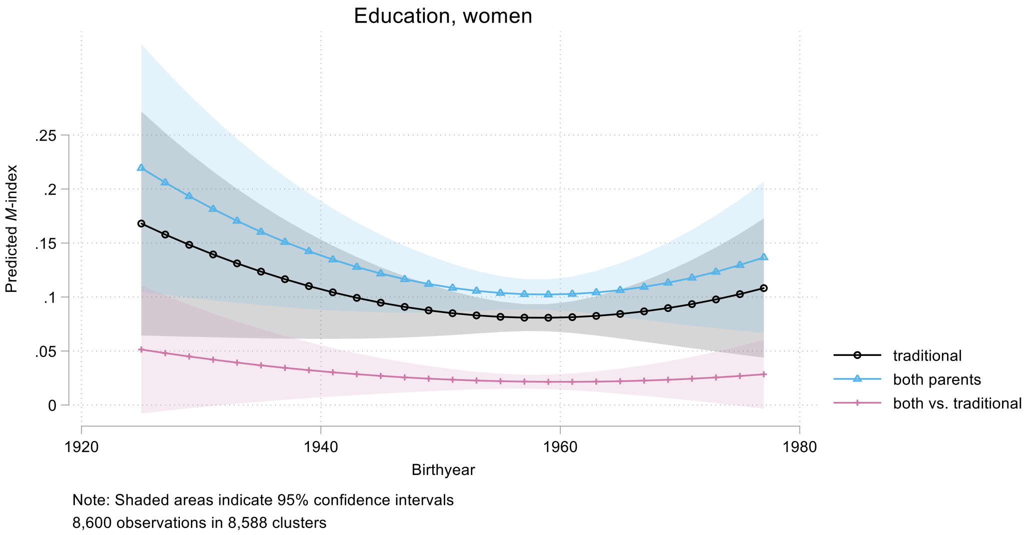


Figure A-3 Local class linkages: *M*-index by origin and destination (model predictions with confidence intervals)

Note: compare **Figure 2-10**, p. 62.



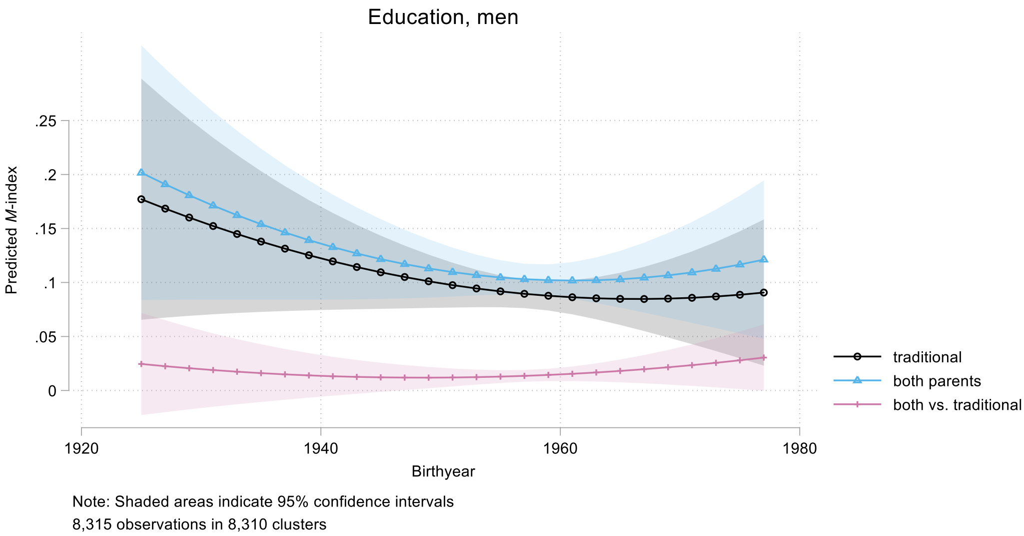


Figure A-4. Intergenerational linkage of educational attainment: adding information on mothers (model predictions with confidence intervals)

Note: compare **Figure 2-12**, p. 65.

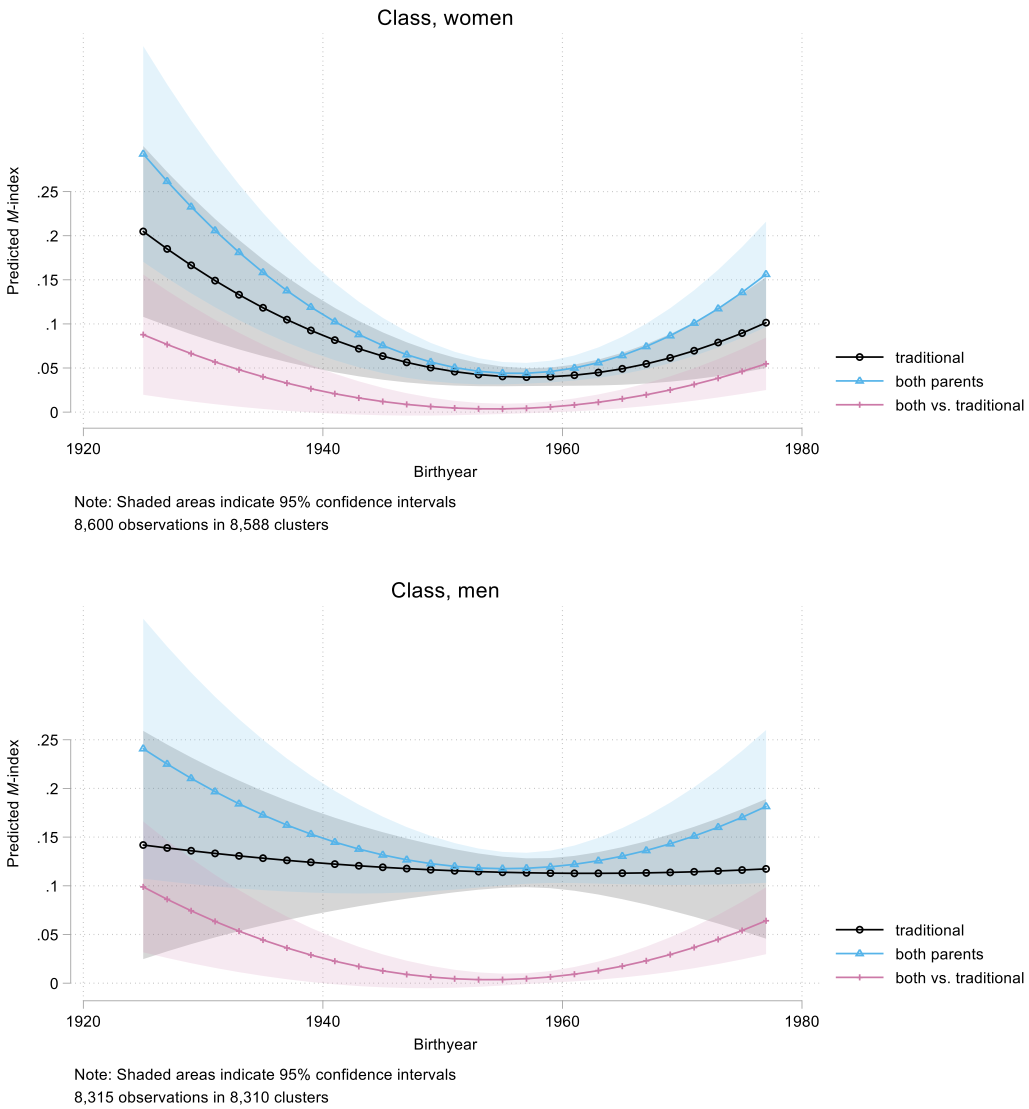
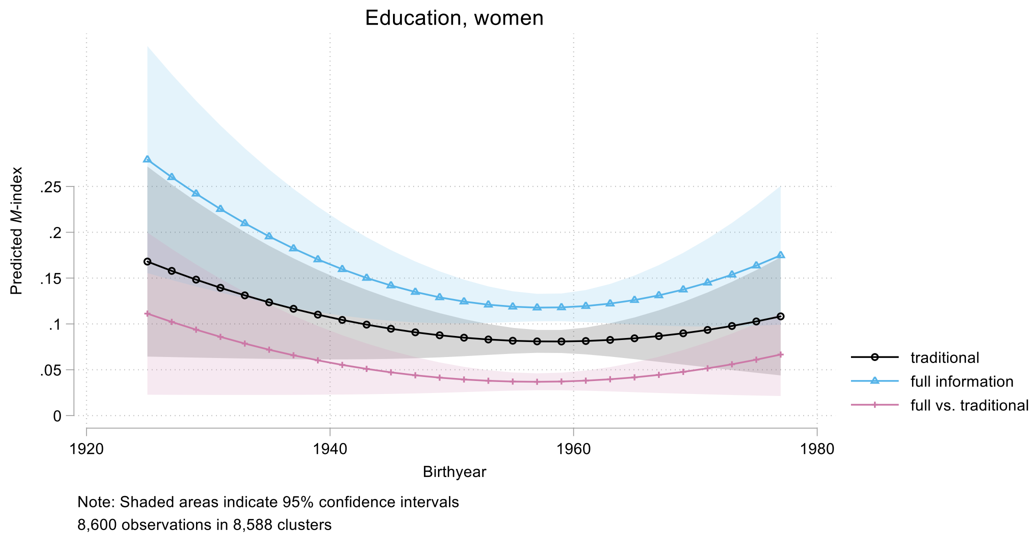


Figure A-5. Intergenerational class linkage: adding information on mothers (model predictions with confidence intervals)

Note: compare **Figure 2-13**, p. 66.



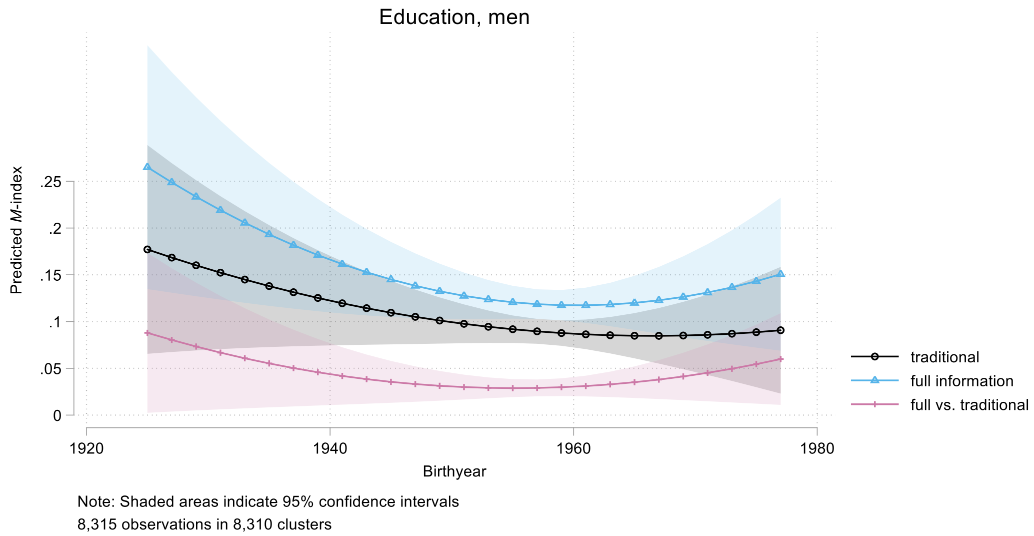
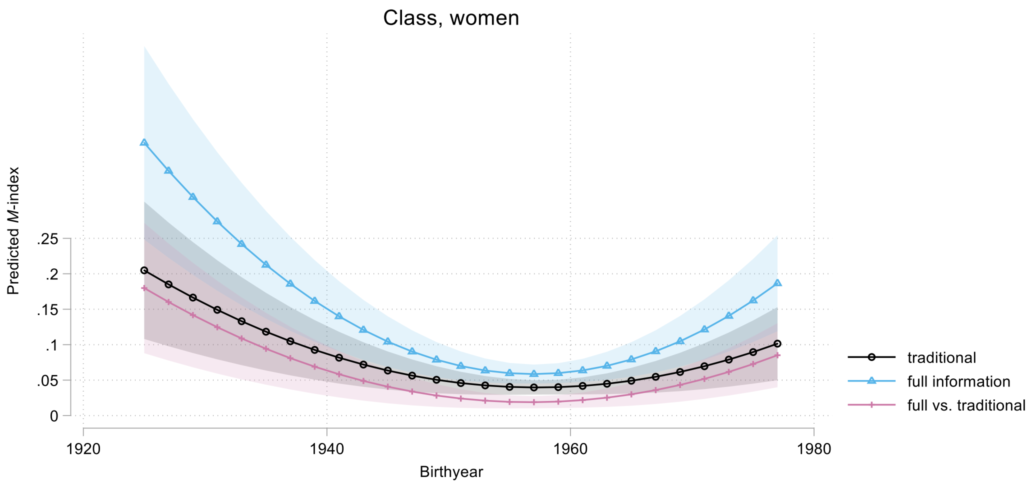
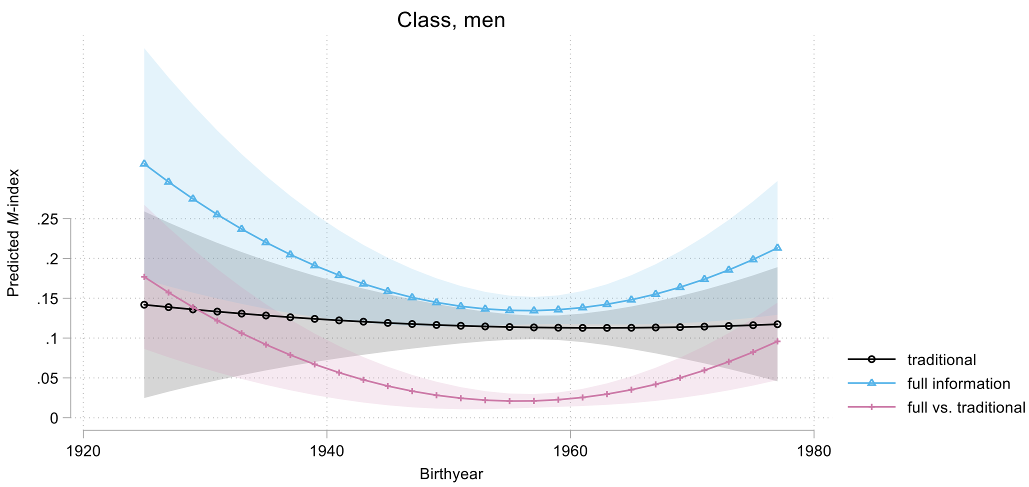


Figure A-6. Intergenerational linkage of educational attainment: adding full information on origin (model predictions with confidence intervals)

Note: compare **Figure 2-14**, p. 68.



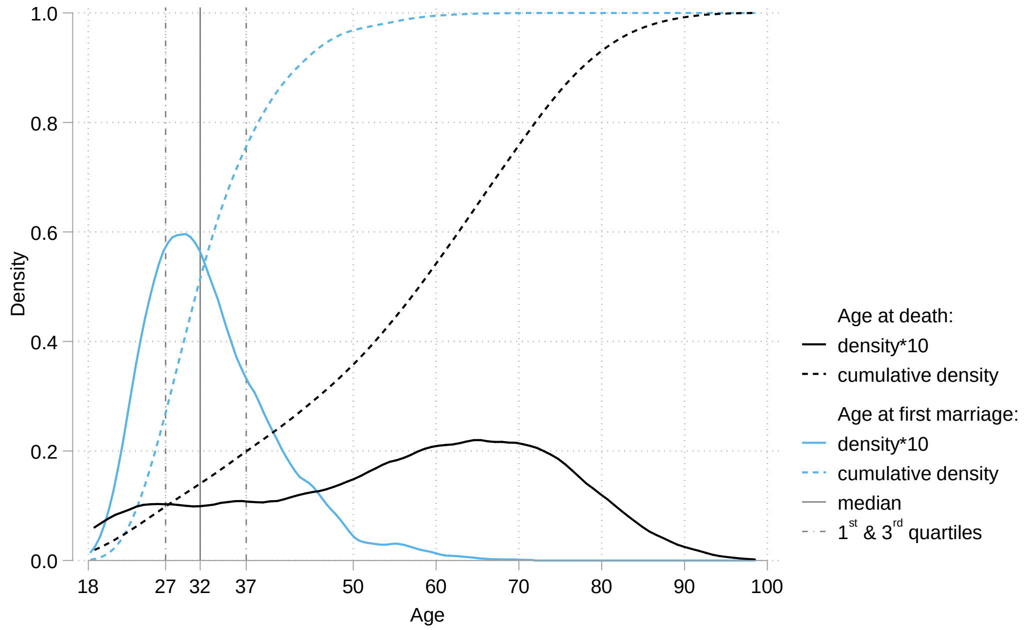
Note: Shaded areas indicate 95% confidence intervals
8,600 observations in 8,588 clusters



Note: Shaded areas indicate 95% confidence intervals
8,315 observations in 8,310 clusters

Figure A-7. Intergenerational linkage of educational attainment: adding full information on origin (model predictions with confidence intervals)

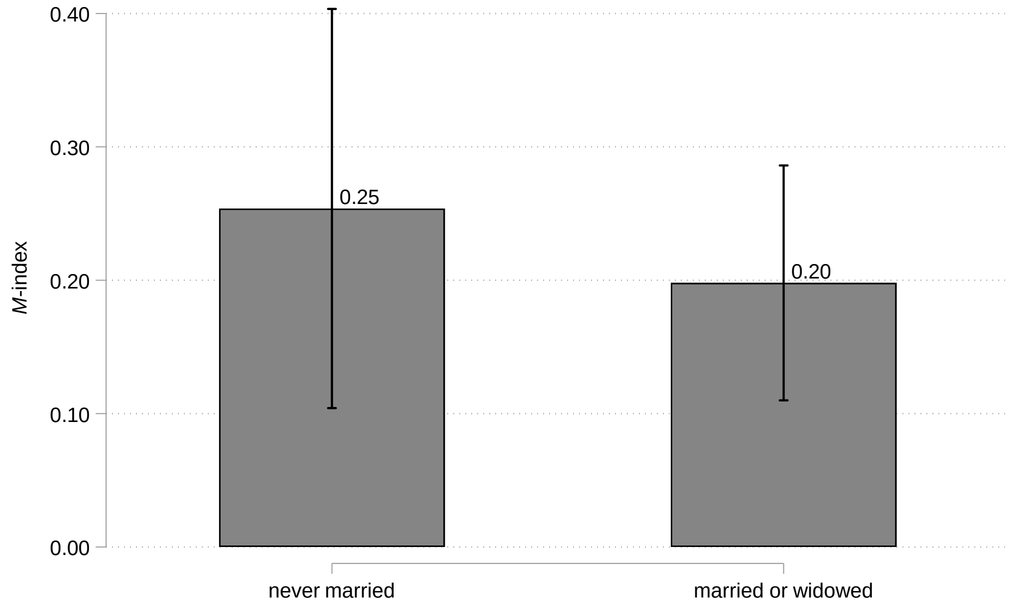
Note: compare **Figure 2-15**, p. 69.



Note: kernel density estimates; kernel: epanechnikov, bandwidths: 1.5 (marriage), 3.5 (death)

Figure A-8. Data Lucerne: Distributions of age at first marriage and death

Source: author, sample based on death registers and marriage registers.



$\chi^2(1) = 0.41$, $p = 0.521$, $N = 287$

Note: Spikes indicate 95% confidence intervals

Figure A-9. Data Lucerne: *M*-index by marital status at death

Note: Not sampled randomly from whole canton, test statistics for indicative purpose only; confidence intervals based on bootstrapped standard errors; 1000 replications. Source: author, sample based on death registers, age at death > 32 (see text for details).

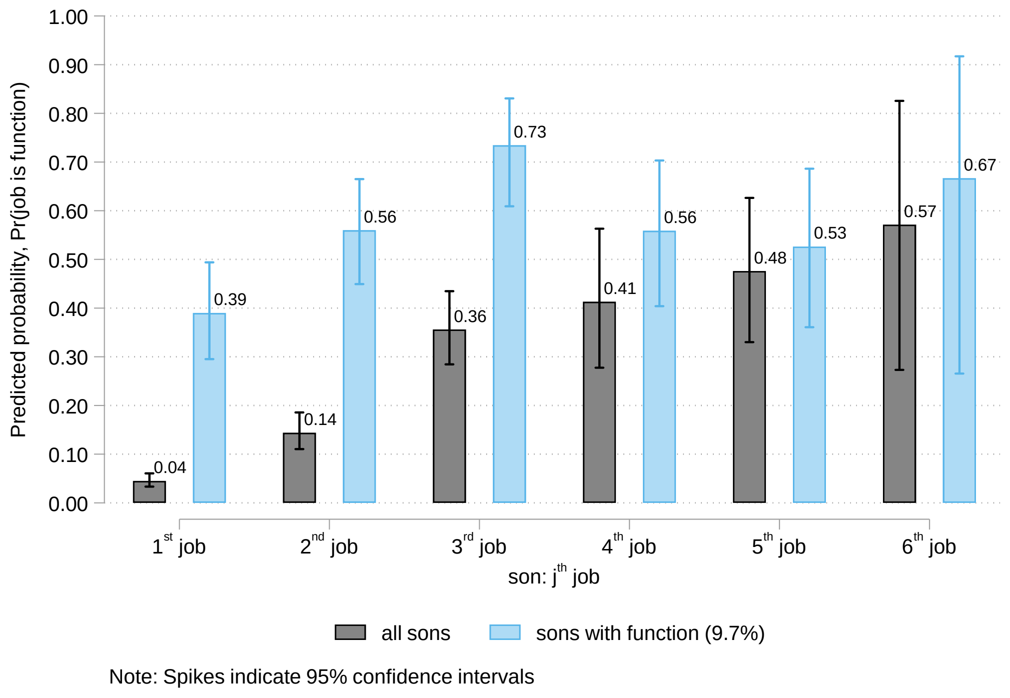


Figure A-10. Data Glarus: Son: Predicted probabilities for each job being a function

Note: Confidence intervals based on robust standard errors (clustered by register page). Source: author.

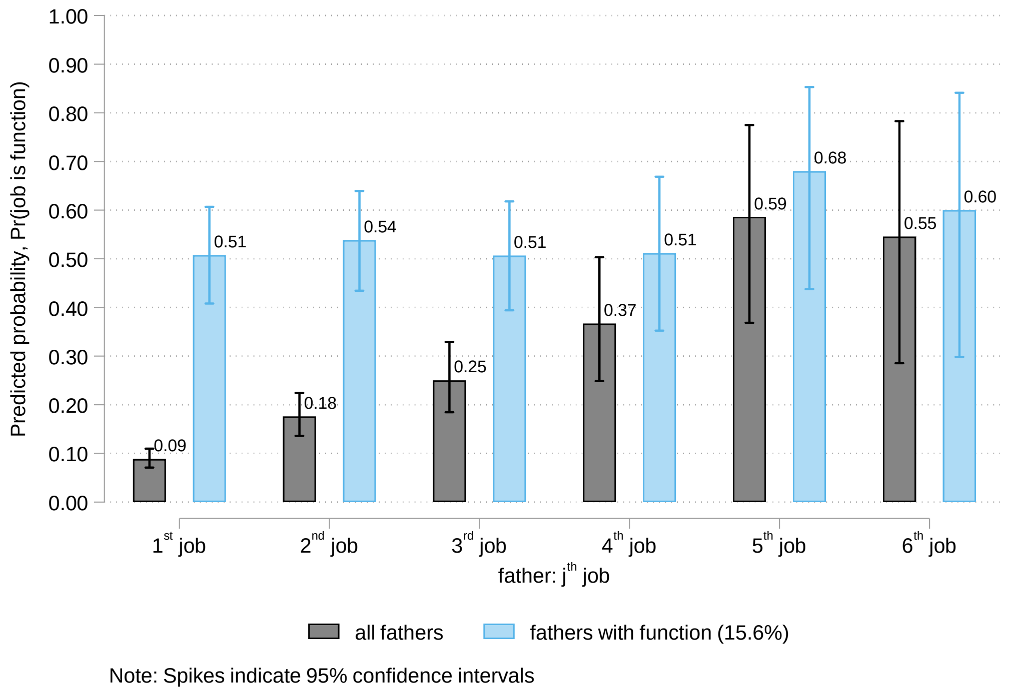


Figure A-11. Data Glarus: Father: Predicted probabilities for each job being a function

Note: Confidence intervals based on robust standard errors (clustered by register page); one father with 19 jobs has been excluded from analysis. Source: author.

Figure A-12. Map of the regions of the canton of Lucerne

Note: Regions equal official districts (Bundesamt für Statistik 2013) with few exceptions: Emmen has been attributed to Luzern-Land and not to Hochdorf, and the parishes in the rather flat Wiggertal have been attributed to Sursee and not to the otherwise mountainous Willisau. Regions collapsed from parishes (see **Figure 3-3**, p. 91 for further notes on parishes). Source: author, borders based on Bundesamt für Statistik (2013).

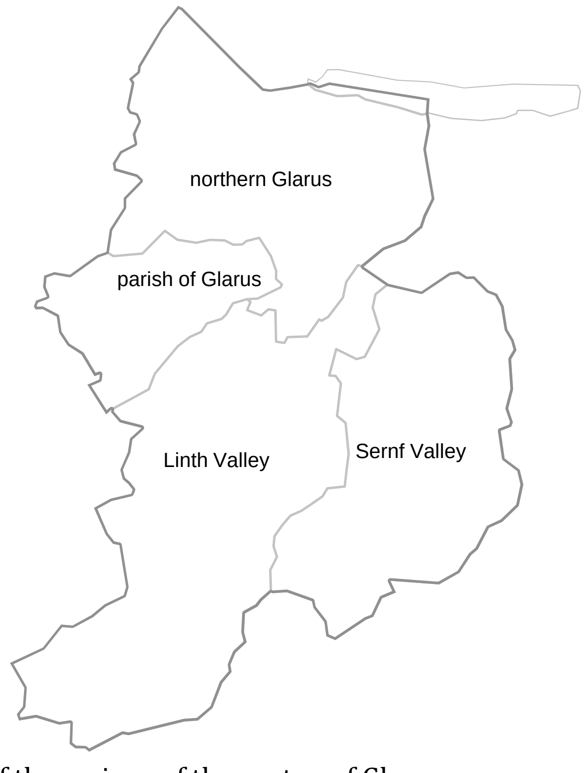


Figure A-13. Map of the regions of the canton of Glarus

Note: Regions collapsed from parishes (see **Figure 3-4**, p. 92 for further notes on parishes). Source: author, borders based on Bundesamt für Statistik (2013).

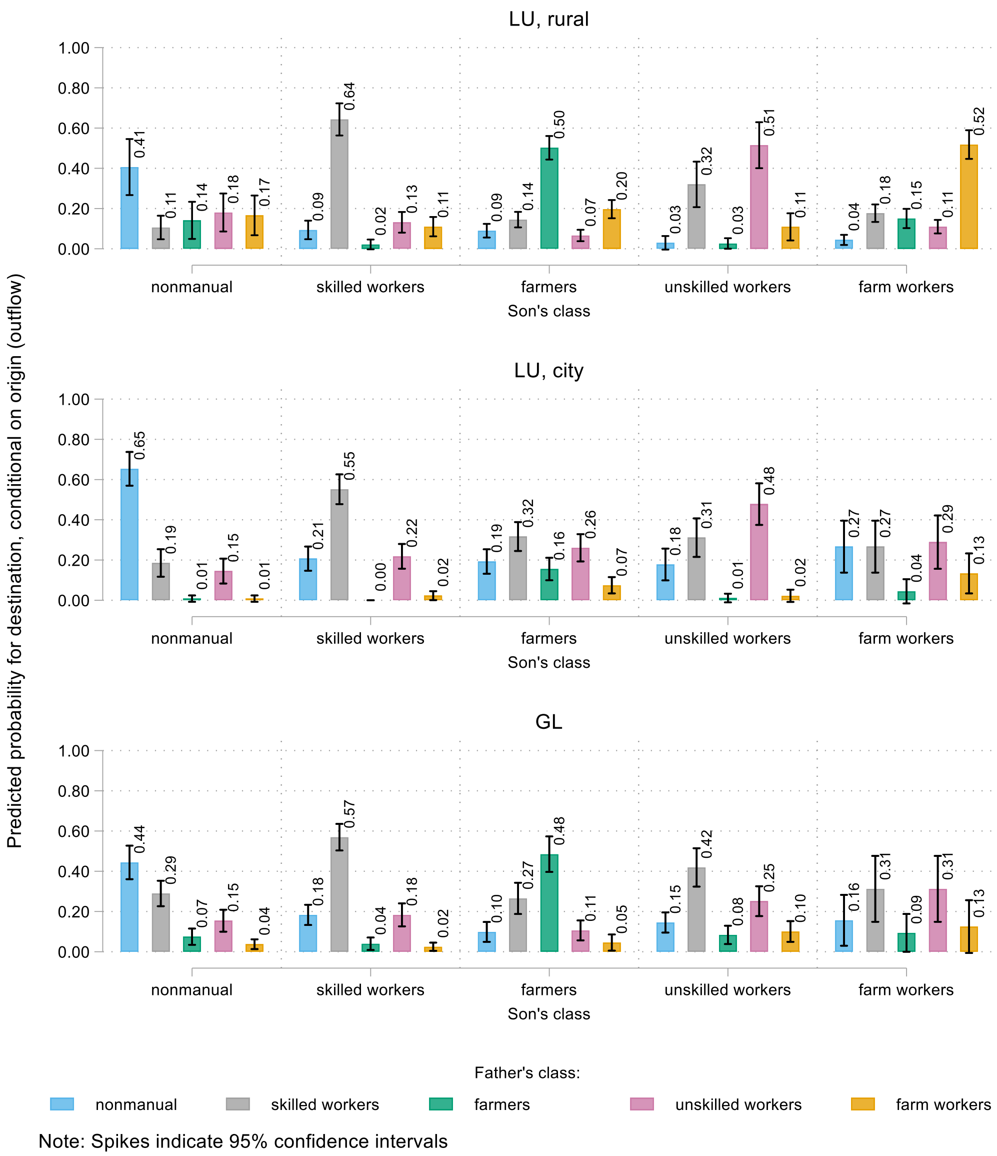


Figure A-14. Probabilities of classes of destination, conditional on class of origin, for rural Lucerne, the city of Lucerne, and Glarus

Notes and source: see **Figure 3-18.**

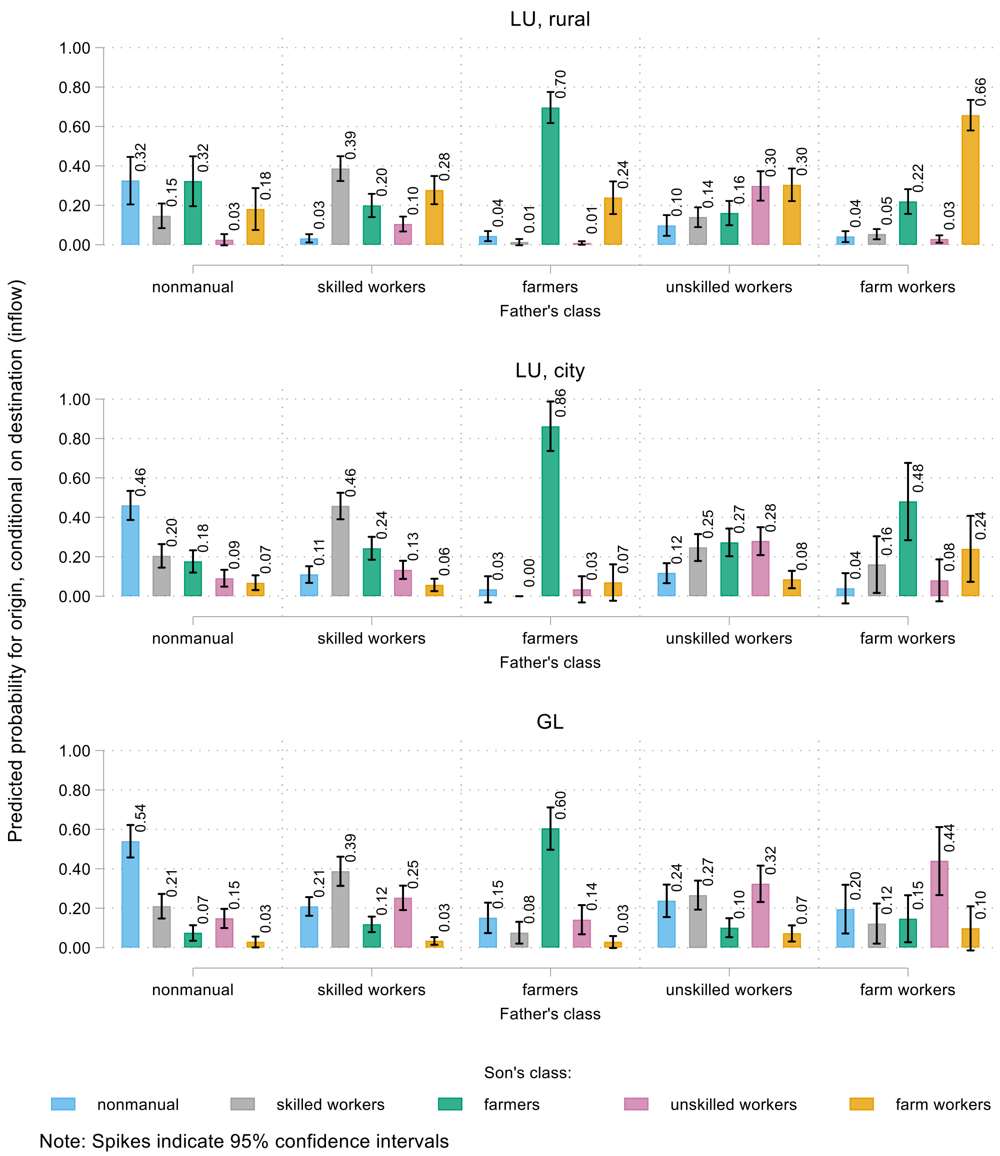


Figure A-15. Probabilities of classes of origin, conditional on class of destination, for rural Lucerne, the city of Lucerne, and Glarus

Notes and source: see **Figure 3-18**.

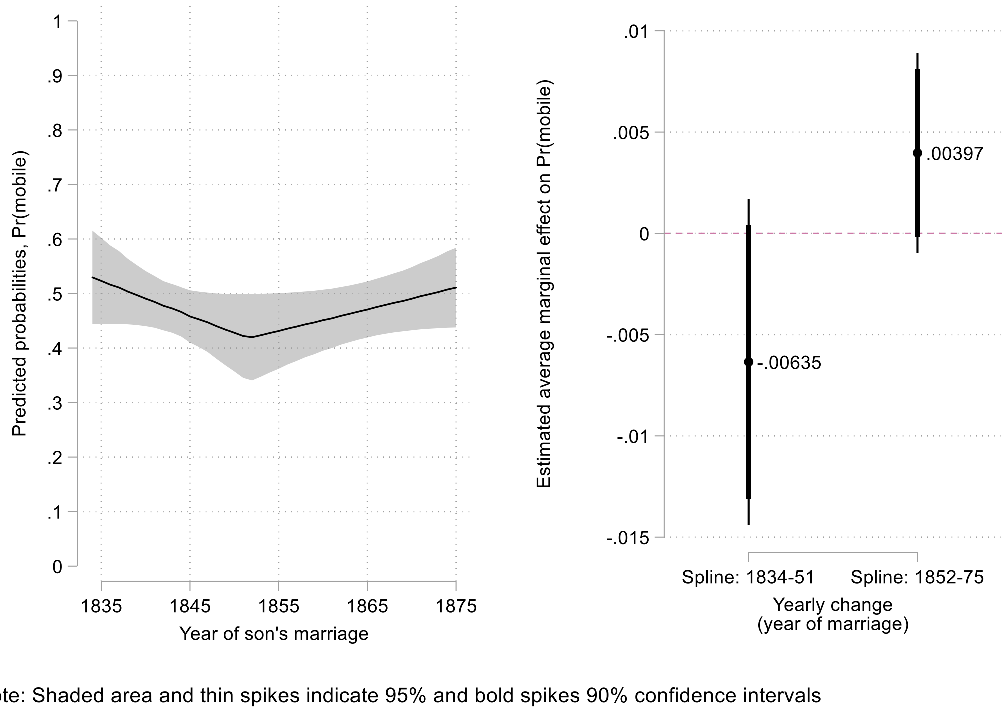


Figure A-16. Observed mobility in rural Lucerne by year of marriage

Note: Predictions and average marginal effects based on the corresponding logistic regression model in **Table B-6** (Appendix B, p. 285).

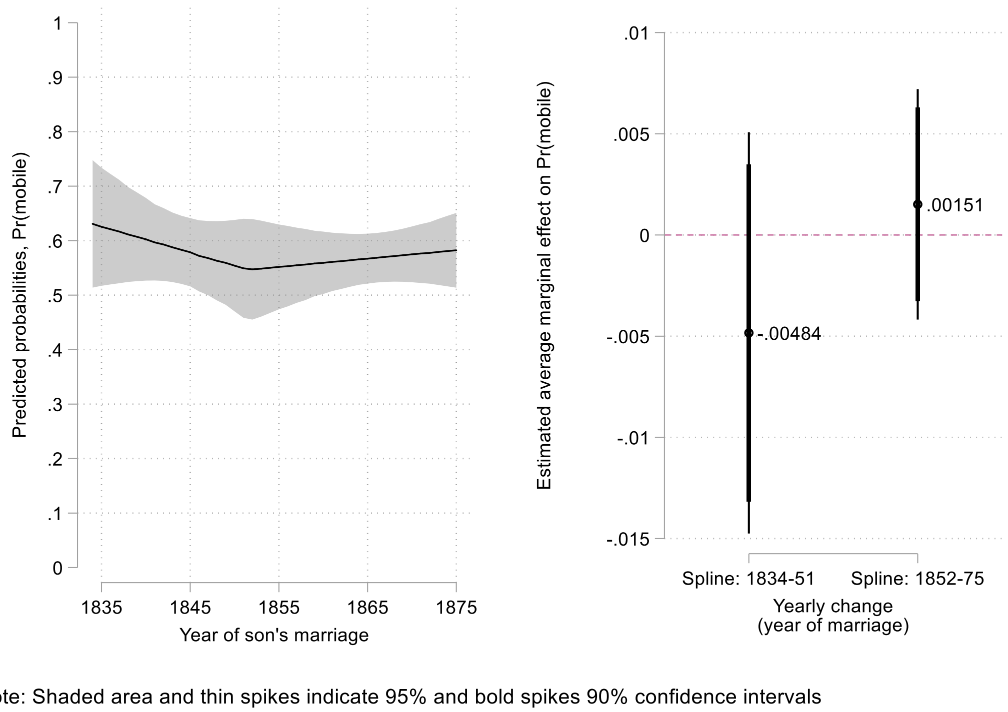
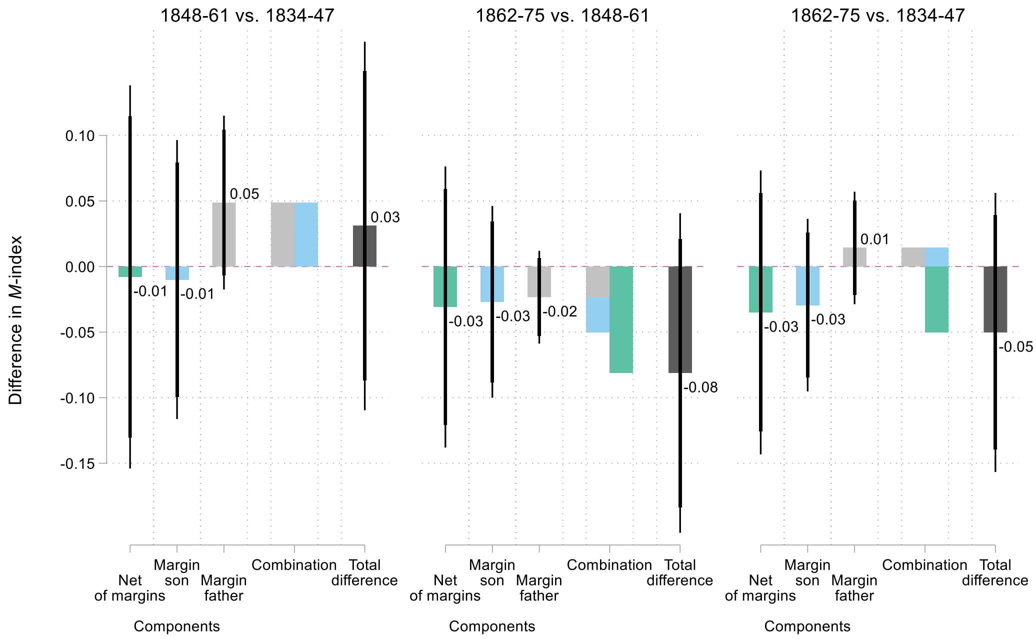


Figure A-17. Observed mobility in the city of Lucerne by year of marriage

Note: Predictions based on average marginal effects on the corresponding logistic regression model in **Table B-6** (Appendix B, p. 285).



Note: Bold and thin spikes indicate 90% and 95% confidence intervals

Figure A-18. City of Lucerne: Decomposed differences in the *M*-index by son's marriage cohort

Note: Confidence intervals based on bootstrapped standard errors; 1,000 replications based on 1,106 observations in 647 clusters. Source: author, based on data from the marriage registers of Lucerne.

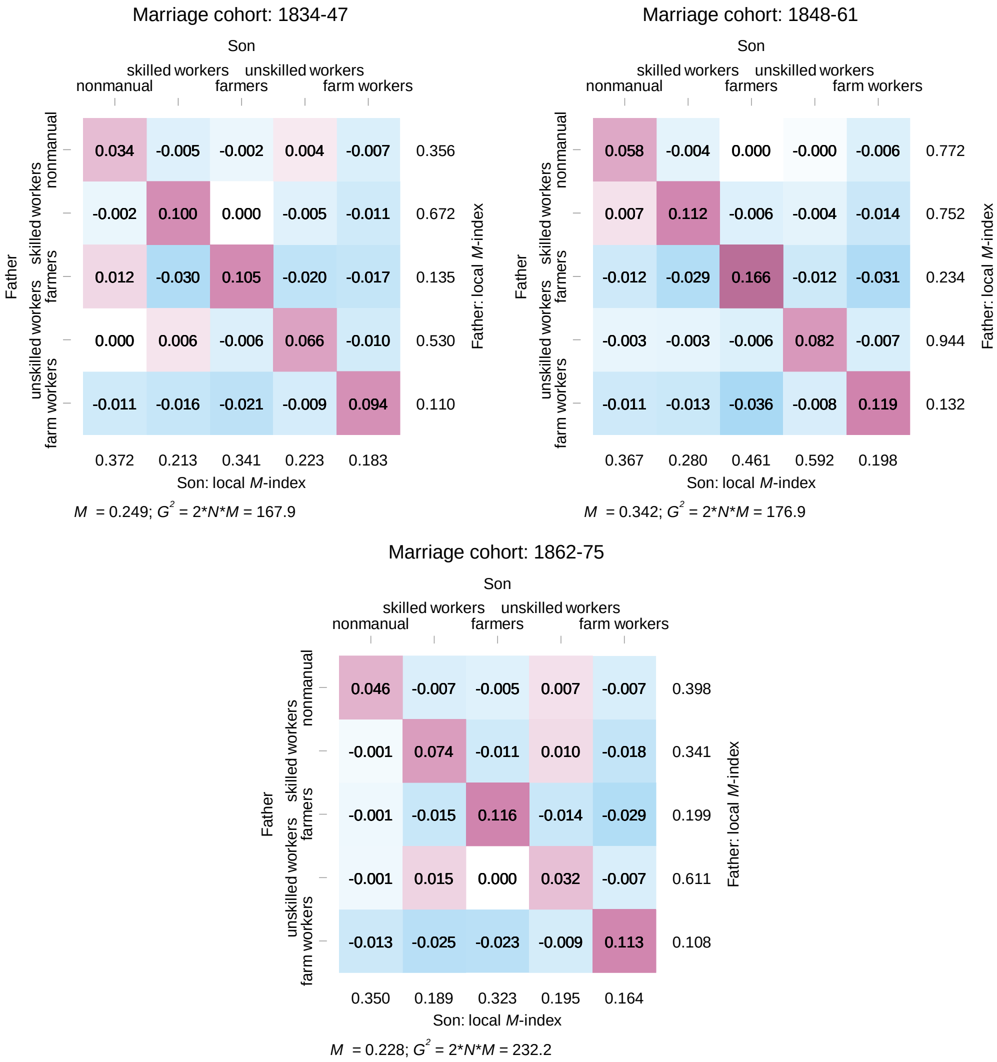


Figure A-19. Rural Lucerne: mobility patterns by marriage cohorts

Note: Cell contributions to the *M*-index. Source: author, based on data from the marriage registers of Lucerne.

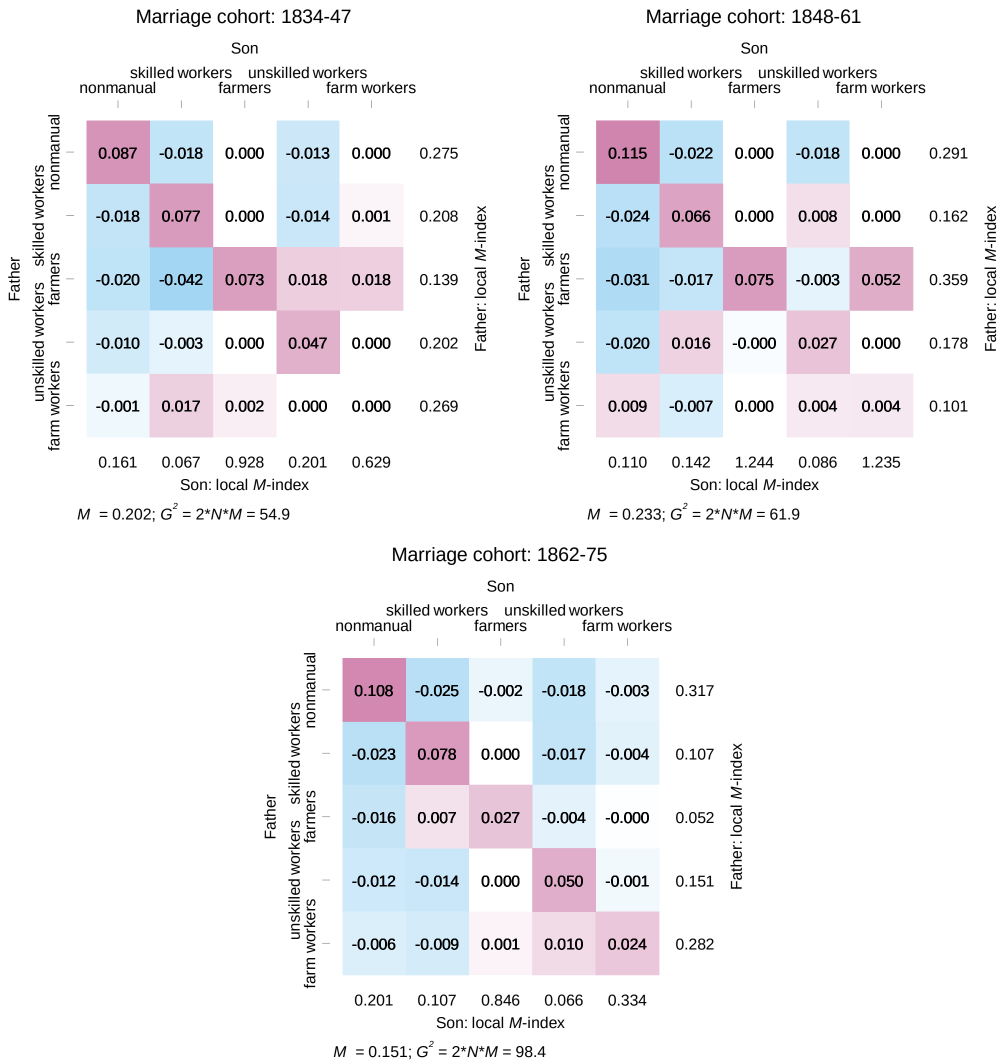


Figure A-20. City of Lucerne: mobility patterns by marriage cohorts

Note: Cell contributions to the *M*-index. Source: author, based on data from the marriage registers of Lucerne.

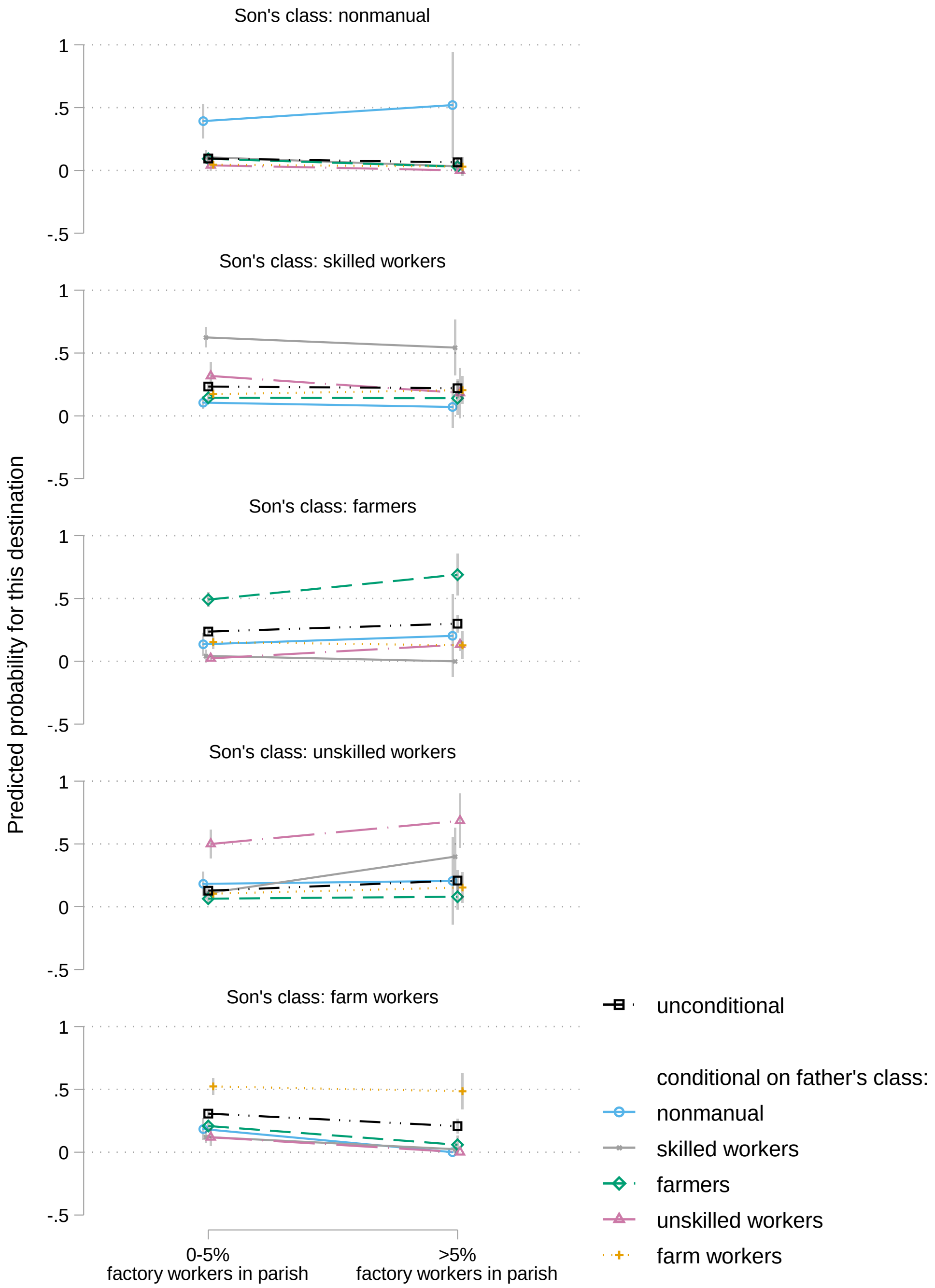


Figure A-21. Rural Lucerne: Effects of the proportion of factory workers on class conditional on class of origin

Note: Spikes indicate 95% confidence intervals based on cluster robust standard errors; predictions based on a multinomial logistic regression model; regressing son's class on father's class, indicator for >5% factory workers in parish, controls (time and indicators for regions), and the two-way interactions between origin and the other variables; 1,106 observations in 647 clusters. Source: author, based on the marriage registers of Lucerne.

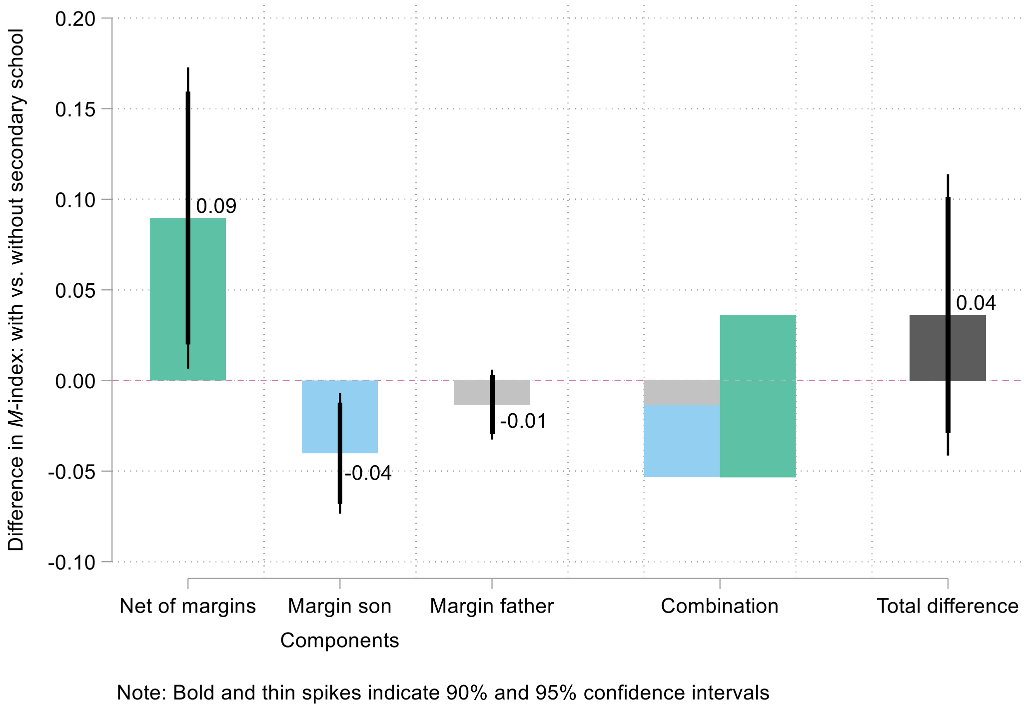


Figure A-22. Glarus: Decomposed differences in the *M*-index between parishes with and without a secondary school

Note and source: See **Figure 3-48.**

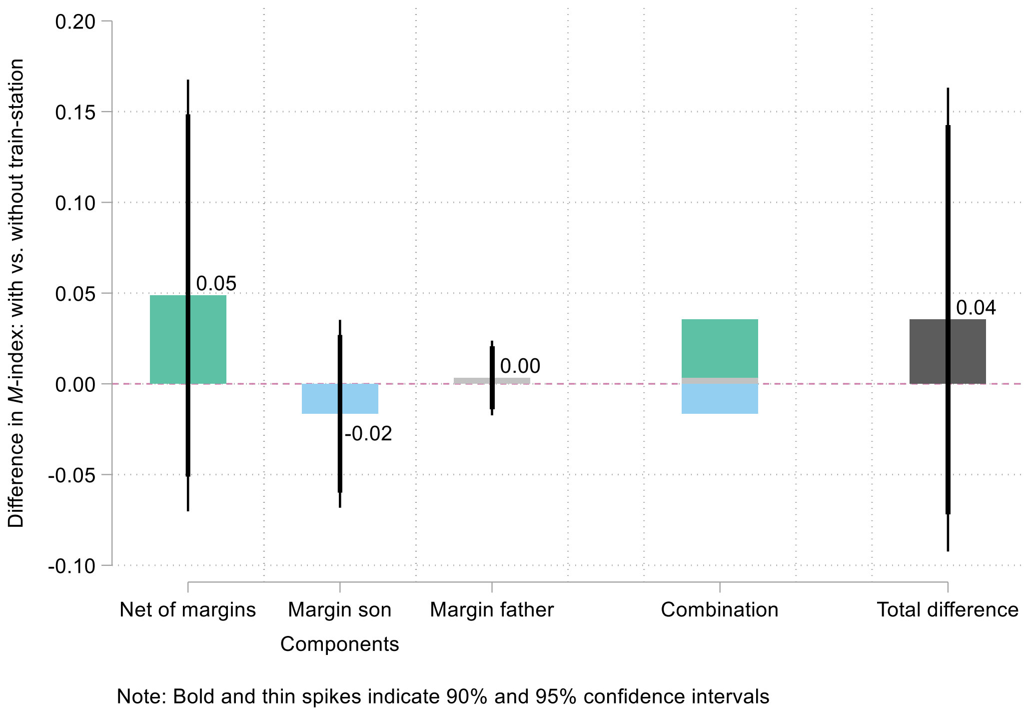


Figure A-23. Glarus: Decomposed differences in the *M*-index between parishes with and without a train station

Note and source: See **Figure 3-48.**

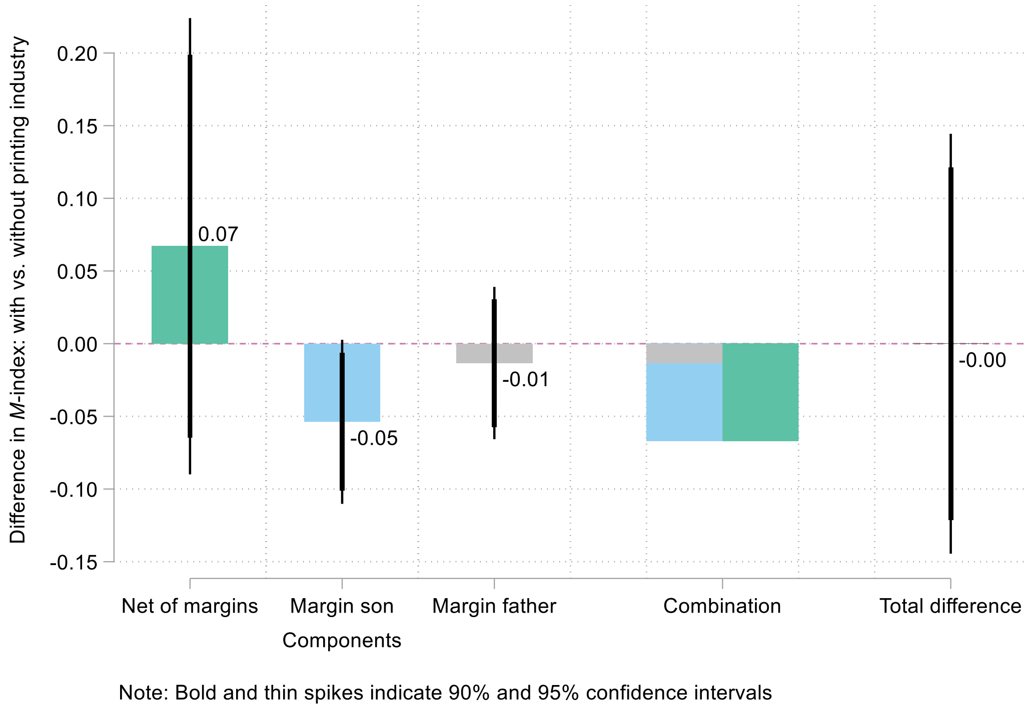


Figure A-24. Glarus: Decomposed differences in the *M*-index between parishes with and without a printing industry

Note: Sernf Valley excluded; confidence intervals based on bootstrapped standard errors; 1,500 replications based on 672 observations in 154 clusters. Source: author, based on data from the genealogy of Glarus.

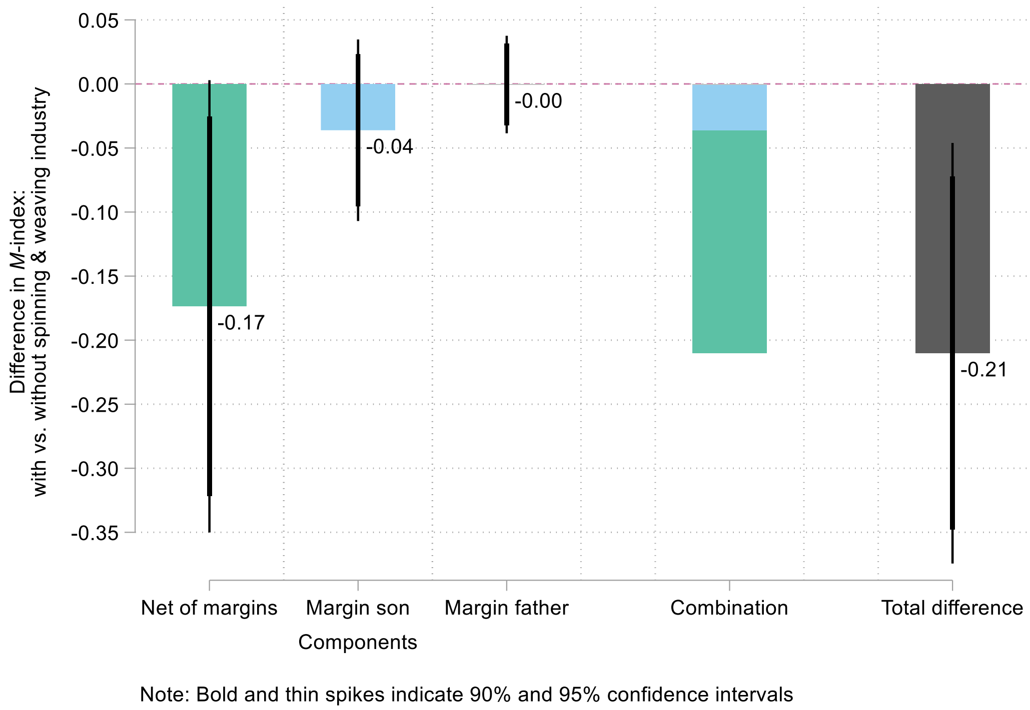


Figure A-25. Glarus: Decomposed differences in the *M*-index between parishes with and without a spinning and weaving industry

Note and source: See **Figure A-24.**

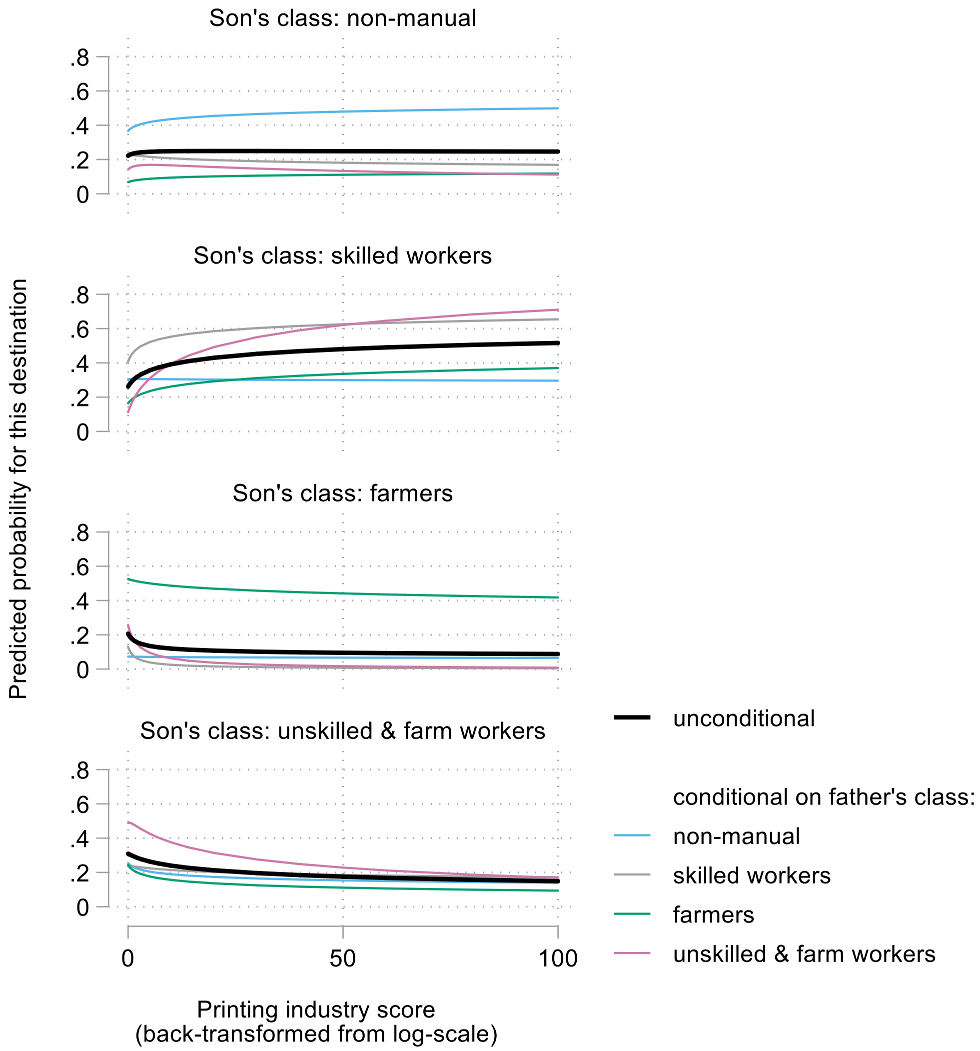


Figure A-26. Glarus: Effects of printing industrialization on class conditional on class of origin

Note: Based on a multinomial logistic regression model; regressing son's class on father's class, logged industry score, controls (time and indicators for the regions), and the two-way interactions between origin and the other variables; 672 observations in 154 clusters (Sernf Valley excluded). Source: author, based on the genealogy of Glarus.

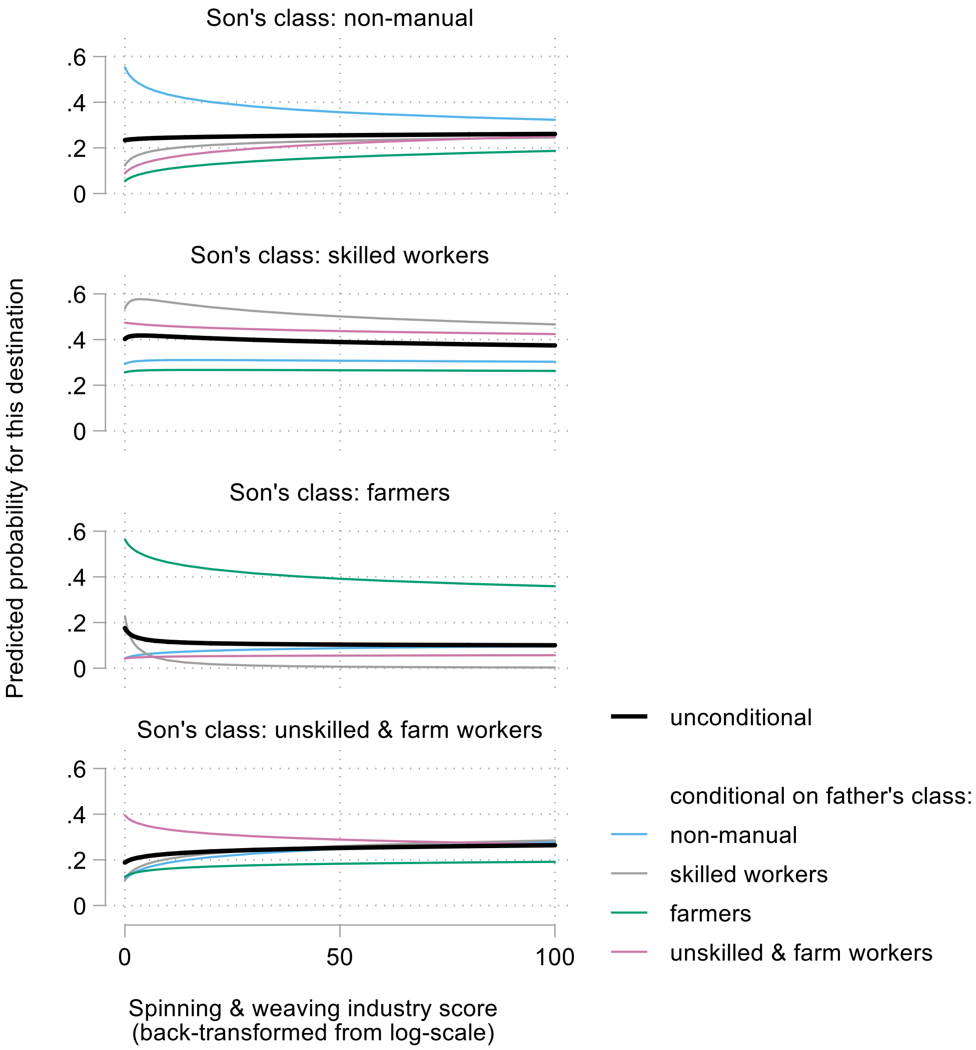


Figure A-27. Glarus: Effects of spinning and weaving industrialization on class conditional on class of origin

Notes and source: see **Figure A-26.**

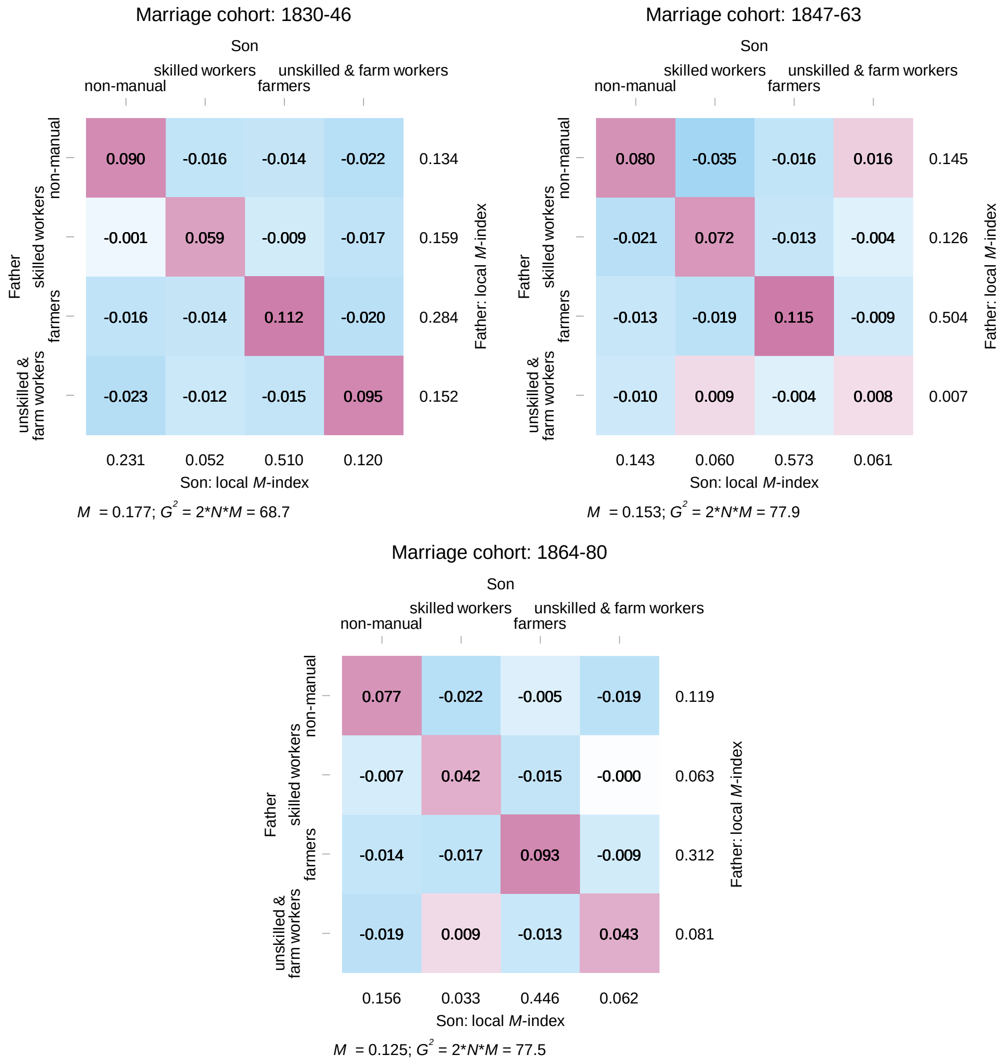


Figure A-28. Glarus: mobility patterns by marriage cohorts

Note: Cell contributions to the *M*-index. Source: author, based on data from the genealogy of Glarus.

Appendix B Additional Tables

Table B-1. List of high prestige functions found in the genealogy of Glarus

Amtsrat	Landweibel
Amtstatthalter	Messner
Appellationsgerichtspräsident	Mitglied der evangel. Synode
Appellationsrichter	Mitglied des Waisenamts
Armengutsverwalter	Nationalrat
Armeninspektor	Neunerrichter (Glarus)
Armenrat	Oberamtmann
Augenscheingerichtspräsident	Oberleutnant
Augenscheinrichter	Oberrichter
Bezirksrichter	Oberstleutnant
Bundesrichter	Officier in Neapol. Diensten
Chorleiter	Organist
Chorrichter	Polizeivorsteher
Dekan (Kirche)	Präsident Armenkommission
Dorfvogt	Präsident der kantonalen Alter- Wittwen- &
Eherichter	Waisen-Kasse
Eidg. Oberst	Präsident der Polizei-Commission
Erziehungsrat	Präsident der Verwaltungskammer
Fähnrich	Präsident des Sanitätsrates
Fallimentspräsident	Ratsherr
Friedensrichter	Ratsherr (evangelischer)
Fünferrichter (Glarus)	Ratssubstitut
Geleitherr	Regierungsrat
Gemeindeammann	Richter
Gemeindepräsident	Ritter der Ehrenlegion
Gemeinderat	Schatzungspräsident
Gemeinderatspräsident	Schatzvogt
General	Schulinspektor
Genossamenvogt	Schulpfleger
Gerichtspräsident	Schultheiss
Grossrat	Schulvogt
Hauptmann	Seckelmeister
Haushaltungskommission	Sigler
Herr	Sigrist
Kapitän-Leutenant	Stadtammann
Kirchenpräsident	Stadtrat
Kirchenrat (kath.)	Ständerat
Kirchenvogt	Standeskommissions-Mitglied
Kirchgemeindepräsident	Steuerkommissionspräsident
Kirchmeier	Sustherr
Kommissionsmitglied	Tagwenvogt
Konsul	Tambour-Major
Korporal	Unteroffizier
Kriegs-Commissär	Verhörrichter
Kriegsrat	Verwalter der kantonal
Kriminalrichter	Feuerassekuranzkasse
Landammann	Vize-Präsident
Landesfähnrich	Vorsänger
Landesstatthalter	Waisenvogt
Landessteuerdelegierter	Zivilgerichtspräsident
Landrat	Zivilrichter
Landseckelmeister	Zugführer
Landshauptmann	

Source: author, based on the genealogy of Glarus.

Table B-2. Son: Occupational status (HISCAM) regressed on position in list of jobs; OLS regression model

	(1)		(2)		(3)	
2nd job	4.878	(4.86)***	1.900	(1.76)	0.544	(0.57)
3rd job	13.51	(8.11)***	5.874	(3.25)**	0.496	(0.32)
4th job	17.75	(6.21)***	2.783	(1.10)	-0.931	(-0.37)
5th job	25.14	(10.57)***	3.919	(1.12)	2.353	(0.86)
6th job	25.51	(6.79)***	6.036	(1.91)	-3.127	(-1.78)
2 jobs			2.031	(1.73)	0.822	(0.80)
3 jobs			4.764	(2.42)*	2.517	(1.65)
4 jobs			12.93	(3.70)***	6.774	(2.56)*
5 jobs			23.52	(9.45)***	10.62	(5.76)***
6 jobs			20.89	(7.81)***	12.78	(6.56)***
high-prestige occ.					26.42	(19.88)***
Constant	56.54	(98.53)***	55.12	(100.68)***	54.78	(101.08)***
Observations	1694		1694		1694	

t statistics in parentheses based on robust standard errors (clustered by 335 register pages, also accounts for clustering within 1,156 individuals)
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table B-3. Father: Occupational status (HISCAM) regressed on position in list of jobs; OLS regression model

	(1)		(2)		(3)	
2nd job	3.571	(3.18)**	0.354	(0.26)	-0.0994	(-0.08)
3rd job	8.347	(4.68)***	-1.292	(-0.69)	-1.731	(-0.95)
4th job	16.75	(5.58)***	3.329	(1.13)	1.822	(0.74)
5th job	21.95	(5.28)***	3.281	(0.96)	-3.100	(-1.07)
6th job	23.65	(3.74)***	1.425	(0.31)	-3.797	(-0.92)
7th job	9.721	(1.07)	-0.400	(-0.07)	5.536	(1.09)
2 jobs			1.239	(0.85)	-0.338	(-0.26)
3 jobs			9.323	(4.54)***	4.577	(3.16)**
4 jobs			10.63	(2.75)**	4.369	(1.75)
5 jobs			19.63	(3.75)***	9.534	(2.71)**
6 jobs			27.91	(9.78)***	17.46	(7.98)***
7 jobs			12.34	(1.24)	7.217	(1.18)
Job is function					27.54	(17.77)***
Constant	55.85	(81.08)***	53.63	(76.96)***	52.81	(79.34)***
Observations	1550		1550		1550	

t statistics in parentheses based on robust standard errors (clustered by 217 register pages, also accounts for clustering within 942 individuals)
Note: the father with 19 jobs has been excluded from analysis
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table B-4. Observed mobility in rural Lucerne, the city of Lucerne, and Glarus; logistic regression model

	mobile individual	
mobile individual		
Area (ref.: LU, rural)		
LU, city	0.402***	(3.49)
GL	0.389***	(3.32)
Constant	-0.0893	(-1.12)
Observations	2459	

z statistics in parentheses based on cluster robust standard errors (1,413 clusters)
$^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$
Source: author, based on data from the marriage register of Lucerne and the genealogy of Glarus.

Table B-5. Lucerne: Observed mobility and local rootedness in rural Lucerne and the city of Lucerne; logistic regression model

	basic		basic + local	
City of Luzern	0.410***	(3.47)	0.432**	(2.74)
Groom: local			-0.197	(-1.39)
Groom: local # City of Luzern			-0.680*	(-2.36)
Constant	-0.0985	(-1.18)	-0.00386	(-0.03)
Observations	1686		1686	

z statistics in parentheses based on cluster robust standard errors (1,230 clusters)
$^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$
Note: compared to other analyses, the sample is reduced by 14 observations due to missing values for the variable indicating local rootedness. Source: author, based on data from the marriage registers of Lucerne.

Table B-6. Lucerne: Observed mobility by year of marriage; logistic regression model

	whole canton		city of Lucerne		rural Lucerne	
Time:						
Spline: 1834-51	-0.0247	(-1.63)	-0.0199	(-0.95)	-0.0255	(-1.53)
Spline: 1852-75	0.0158+	(1.77)	0.00622	(0.52)	0.0160	(1.57)
Constant	-0.280+	(-1.83)	0.186	(0.95)	-0.331+	(-1.95)
Observations	1700		594		1106	

z statistics in parentheses based on cluster robust standard errors (1,241 clusters)
$^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$
Source: author, based on data from the marriage registers of Lucerne.

Table B-7. Lucerne: Observed mobility by region; logistic regression model

	mobile individual	
Hochdorf	0.252	(0.97)
Luzern-Land	0.452*	(2.05)
Stadt	0.707***	(3.75)
Sursee	0.453*	(2.22)
Willisau	0.160	(0.70)
Constant	-0.395*	(-2.33)
Observations	1700	

z statistics in parentheses based on cluster robust standard errors (1,241 clusters)
$^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$
Source: author, based on data from the marriage registers of Lucerne.

Table B-8. Lucerne: Observed mobility and railway stations in a parish; logistic regression model

	no controls		regions		regions + time		parishes + time	
Railway station in parish	0.350	(1.63)	0.231	(0.96)	0.252	(0.95)	0.139	(0.52)
Regions (ref.: Entlebuch)								
Hochdorf			0.195	(0.71)	0.220	(0.80)		
Luzern-Land			0.492*	(2.00)	0.506*	(1.98)		
Sursee			0.320	(1.29)	0.338	(1.34)		
Willisau			0.0628	(0.25)	0.0799	(0.31)		
Time								
Spline: 1834-51					-0.0284	(-1.73)	-0.0287	(-1.56)
Spline: 1852-75					0.0158	(1.54)	0.0200	(1.58)
Parishes (ref.: Altishofen)								
Buchrain							-0.318	(-0.24)
Buttisholz							-1.193***	(-3.92)
Büron							0.458	(1.49)
Dagmersellen							0.807	(1.79)
Doppleschwand							-0.228	(-0.72)
Emmen							0.543	(1.12)
Entlebuch							-0.125	(-0.30)
Escholzmatt							-0.127	(-0.24)
Ettiswil							0.949**	(3.16)
Grossdietwil							-0.188	(-0.61)
Hergiswil							0.252	(0.84)
Hitzkirch							0.499	(1.02)
Hochdorf							0.560	(1.88)
Hohenrain							1.063***	(3.55)
Inwil							-0.315	(-1.02)
Kleinwangen							0.482	(1.60)
Kriens							0.462	(1.18)
Littau							0.404	(0.92)
Luthern							0.425	(1.33)
Malters							0.732	(1.33)
Marbach							0.937**	(3.09)
Meggen							0.0710	(0.13)
Menzberg							-0.594	(-1.92)
Neuenkirch							0.584*	(2.14)
Nottwil							1.061***	(3.89)
Pfeffikon							0.693*	(2.10)
Reiden							0.161	(0.41)
Rickenbach							1.913***	(3.43)
Ruswil							0.234	(0.77)
Schongau							-0.364	(-1.20)
Schüpfheim							0.271	(0.84)
Sursee							0.432	(1.18)
Triengen							0.235	(0.78)
Ufhusen							0.638*	(2.14)
Weggis							1.073***	(3.49)
Werthenstein							0.0505	(0.08)
Willisau							0.334	(0.86)
Constant	-0.125	(-1.49)	-0.338	(-1.79)	-0.606**	(-2.72)	-0.747*	(-2.23)
Observations	1106		1106		1106		1106	

z statistics in parentheses based on cluster robust standard errors (647 clusters)
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$
Source: author, based on data from the marriage registers of Lucerne.

Table B-9. Lucerne: Observed mobility and proportion of factory workers in a parish; logistic regression model

	no controls		regions		regions + time		parishes + time	
Factory workers in parish: >5%	-0.196	(-0.98)	-0.334*	(-1.96)	-0.418*	(-2.06)	-0.393	(-1.50)
Regions (ref.: Entlebuch)								
Hochdorf			0.140	(0.53)	0.166	(0.62)		
Luzern-Land			0.569**	(2.62)	0.595**	(2.69)		
Sursee			0.332	(1.47)	0.349	(1.55)		
Willisau			0.00399	(0.02)	0.0151	(0.06)		
Time								
Spline: 1834-51					-0.0246	(-1.50)	-0.0248	(-1.34)
Spline: 1852-75					0.0192	(1.81)	0.0224	(1.74)
Parishes (ref.: Altishofen)								
Buchrain							-0.376	(-0.30)
Buttisholz							-1.426***	(-4.96)
Büron							0.220	(0.76)
Dagmersellen							0.660	(1.43)
Doppleschwand							-0.229	(-0.82)
Emmen							0.514	(1.07)
Entlebuch							-0.348	(-0.86)
Escholzmatt							-0.369	(-0.72)
Ettiswil							0.646*	(2.27)
Grossdietwil							-0.425	(-1.47)
Hergiswil							0.0292	(0.10)
Hitzkirch							0.278	(0.58)
Hochdorf							0.338	(1.19)
Hohenrain							0.841**	(2.95)
Inwil							-0.556	(-1.90)
Kleinwangen							0.254	(0.89)
Kriens							0.503	(1.35)
Littau							0.343	(0.84)
Luthern							0.0259	(0.09)
Malters							0.639	(1.14)
Marbach							0.706*	(2.47)
Meggen							-0.171	(-0.33)
Menzberg							-0.755**	(-2.59)
Neuenkirch							0.417	(1.47)
Nottwil							0.914**	(3.19)
Pfeffikon							0.431	(1.39)
Reiden							0.0157	(0.04)
Rickenbach							1.782***	(3.32)
Ruswil							0.000479	(0.00)
Schongau							-0.594*	(-2.07)
Schüpfheim							0.0159	(0.05)
Sursee							0.279	(0.74)
Triengen							0.00952	(0.03)
Ufhusen							0.419	(1.47)
Weggis							0.835**	(2.89)
Werthenstein							-0.170	(-0.29)
Willisau							0.0905	(0.24)
Constant	-0.0762	(-0.90)	-0.283	(-1.58)	-0.559**	(-2.60)	-0.520	(-1.63)
Observations	1101		1101		1101		1101	

z statistics in parentheses based on cluster robust standard errors (647 clusters)
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$
Source: author, based on data from the marriage registers of Lucerne.

Table B-10. Lucerne: Class linkage and local rootedness in rural Lucerne and the city of Lucerne; *M*-index equation from GMM-estimator

	basic		basic + local	
M				
City of Luzern	-0.0958**	(-2.97)	-0.0820*	(-1.99)
Groom: local			0.0938*	(2.24)
City of Luzern # Groom: local			0.157+	(1.71)
Constant	0.244***	(10.19)	0.206***	(5.85)
Observations	1686		1686	

z statistics in parentheses based on cluster robust standard errors (1,230 clusters)

+ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Note: compared to other analyses, the sample is reduced by 14 observations due to missing values for the variable indicating local rootedness; to ensure stable estimation, each cell of the city×local×origin×destination table has been augmented by 0.001. Source: author, based on data from the marriage registers of Lucerne.

Table B-11. Lucerne: Class linkage by marriage cohort; *M*-index equation from GMM estimator

M		
City of Luzern	-0.0482	(-0.86)
Cohort: 1848-61	0.0924	(1.30)
Cohort: 1862-75	-0.0214	(-0.41)
City of Luzern # 1848-61	-0.0615	(-0.63)
City of Luzern # 1862-75	-0.0282	(-0.38)
Constant	0.249***	(7.03)
Observations	1700	

z statistics in parentheses based on cluster robust standard errors (1,241 clusters)

+ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Note: to ensure stable estimation, each cell of the cohort×origin×destination table has been augmented by 0.001. Source: author, based on data from the marriage registers of Lucerne.

Table B-12. Lucerne: Local class linkages by marriage cohort; M-index equation from GMM estimator

	Rural: by origin		Rural: by destination		City: by origin		City: by destination	
M								
Cohorts (ref.: 1834-47)								
1848-61	0.416	(1.13)	-0.00475	(-0.02)	0.0162	(0.12)	-0.0504	(-0.54)
1862-75	0.0425	(0.16)	-0.0222	(-0.08)	0.0426	(0.33)	0.0406	(0.41)
Class of origin (ref.: nonmanual)								
skilled workers	0.317	(1.61)			-0.0664	(-0.61)		
farmers	-0.220	(-1.35)			-0.135	(-1.31)		
unskilled workers	0.174	(0.83)			-0.0735	(-0.68)		
farm workers	-0.245	(-1.56)			-0.00797	(-0.07)		
1848-61 # skilled workers	-0.336	(-0.84)			-0.0628	(-0.46)		
1848-61 # farmers	-0.317	(-0.86)			0.203	(1.14)		
1848-61 # unskilled workers	-0.00201	(-0.00)			-0.0392	(-0.23)		
1848-61 # farm workers	-0.394	(-1.21)			-0.182	(-1.13)		
1862-75 # skilled workers	-0.373	(-1.27)			-0.143	(-1.03)		
1862-75 # farmers	0.0214	(0.08)			-0.130	(-0.98)		
1862-75 # unskilled workers	0.0387	(0.10)			-0.0929	(-0.63)		
1862-75 # farm workers	-0.0450	(-0.18)			-0.0264	(-0.13)		
Class of destination (ref.: nonmanual)								
skilled workers			-0.159	(-1.01)			-0.0937	(-1.17)
farmers			-0.0313	(-0.19)			0.762***	(5.50)
unskilled workers			-0.149	(-0.88)			0.0395	(0.35)
farm workers			-0.189	(-1.31)			0.457*	(2.55)
1848-61 # skilled workers			0.0715	(0.26)			0.125	(1.12)
1848-61 # farmers			0.125	(0.49)			0.364	(1.45)
1848-61 # unskilled workers			0.373	(1.17)			-0.0636	(-0.48)
1848-61 # farm workers			0.0195	(0.08)			0.659**	(2.59)
1862-75 # skilled workers			-0.00176	(-0.01)			-0.00108	(-0.01)
1862-75 # farmers			0.00428	(0.02)			-0.121	(-0.53)
1862-75 # unskilled workers			-0.00582	(-0.02)			-0.175	(-1.39)
1862-75 # farm workers			0.00335	(0.01)			-0.324	(-1.14)
Constant	0.356*	(2.28)	0.372*	(2.54)	0.274**	(2.88)	0.161^{+}	(1.96)
Observations	1106		1106		594		594	

z statistics in parentheses based on cluster robust standard errors (1,241 clusters)

$^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Note: to ensure stable estimation, each cell of the cohort×origin×destination table has been augmented by 0.001. Source: author, based on data from the marriage registers of Lucerne.

Table B-13. Lucerne: Class linkage and railway stations in a parish; *M*-index equation from GMM estimator

	no controls		regions		cohorts		regions + cohorts	
M								
Railway station in parish	-0.0207	(-0.44)	-0.0340	(-0.61)	-0.0322	(-0.59)	-0.0755	(-1.14)
Regions (ref.: Entlebuch)								
Hochdorf			-0.0167	(-0.18)			-0.00687	(-0.08)
Luzern-Land			-0.0707	(-0.83)			-0.0889	(-1.06)
Sursee			-0.0658	(-0.79)			-0.0602	(-0.68)
Willisau			-0.118	(-1.37)			-0.150	(-1.76)
Cohorts (ref.: 1834-47)								
1848-61					0.108	(1.47)	0.130*	(1.99)
1862-75					-0.00858	(-0.15)	0.0457	(0.96)
Constant	0.251***	(10.24)	0.328***	(4.44)	0.249***	(7.03)	0.306***	(3.56)
Observations	1106		1106		1106		1106	

z statistics in parentheses based on cluster robust standard errors (647 clusters)
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$
Note: to ensure stable estimation, each cell of the rail×region×cohort×origin×destination table has been augmented by 0.001. Source: author, based on data from the marriage registers of Lucerne.

Table B-14. Lucerne: Class linkage and proportion of factory workers in a parish; *M*-index equation from GMM-estimator

	no controls		regions		cohorts		regions + cohorts	
M								
Factory workers in parish: >5%	0.170**	(2.59)	0.118*	(2.05)	0.193**	(2.59)	0.110	(1.72)
Regions (ref.: Entlebuch)								
Hochdorf			-0.0225	(-0.25)			-0.0196	(-0.22)
Luzern-Land			-0.104	(-1.33)			-0.120	(-1.54)
Sursee			-0.101	(-1.27)			-0.101	(-1.33)
Willisau			-0.124	(-1.46)			-0.162*	(-1.99)
Cohorts (ref.: 1834-47)								
1848-61					0.0889	(1.26)	0.113	(1.86)
1862-75					-0.0409	(-0.71)	0.0241	(0.50)
Constant	0.234***	(9.76)	0.334***	(4.59)	0.249***	(7.03)	0.327***	(4.03)
Observations	1106		1106		1106		1106	

z statistics in parentheses based on cluster robust standard errors (647 clusters)
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$
Note: to ensure stable estimation, each cell of the workers×region×cohort×origin×destination table has been augmented by 0.001. Source: author, based on data from the marriage registers of Lucerne.

Table B-15. Lucerne: Local class linkage and proportion of factory workers in a parish; *M*-index equation from GMM estimator

	By origin		By destination	
M				
Factory workers in parish: >5%	0.545	(1.04)	0.395	(0.73)
Class of origin (ref.: nonmanual)				
skilled workers	-0.0266	(-0.17)		
farmers	-0.406**	(-2.98)		
unskilled workers	0.119	(0.69)		
farm workers	-0.516***	(-4.10)		
Factory workers in parish: >5% # skilled workers	-0.509	(-1.07)		
Factory workers in parish: >5% # farmers	-0.235	(-0.51)		
Factory workers in parish: >5% # unskilled workers	-0.390	(-0.82)		
Factory workers in parish: >5% # farm workers	-0.569	(-0.98)		
Cohorts (ref.: 1834-47)				
1848-61	0.135**	(2.59)	0.112	(1.88)
1862-75	0.0301	(0.72)	0.0308	(0.65)
Regions (ref.: Entlebuch)				
Hochdorf	-0.103	(-1.16)	-0.0360	(-0.40)
Luzern-Land	-0.223*	(-2.26)	-0.113	(-1.41)
Sursee	-0.187*	(-2.40)	-0.118	(-1.57)
Willisau	-0.139	(-1.64)	-0.139	(-1.75)
Class of destination (ref.: nonmanual)				
skilled workers			-0.152	(-1.73)
farmers			-0.0252	(-0.22)
unskilled workers			-0.0627	(-0.52)
farm workers			-0.229*	(-2.26)
Factory workers in parish: >5% # skilled workers			-0.439	(-0.82)
Factory workers in parish: >5% # farmers			-0.180	(-0.30)
Factory workers in parish: >5% # unskilled workers			-0.503	(-0.97)
Factory workers in parish: >5% # farm workers			-0.175	(-0.28)
Constant	0.698***	(5.11)	0.448***	(3.46)
Observations	1106		1106	

z statistics in parentheses based on cluster robust standard errors (647 clusters)

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Note: to ensure stable estimation, each cell of the workers×region×cohort×origin×destination table has been augmented by 0.001. Source: author, based on data from the marriage registers of Lucerne.

Table B-16. Glarus: Observed mobility by year of marriage or region; logistic regression model

	time		regions	
Year of first marriage	0.00906	(1.48)		
Region (ref.: northern Glarus)				
parish of Glarus			-0.777***	(-3.87)
Sernf Valley			0.0773	(0.33)
Linth Valley			0.379*	(1.97)
Constant	-16.68	(-1.47)	0.177	(1.44)
Observations	757		757	

z statistics in parentheses based on cluster robust standard errors (171 clusters)

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Note: for all analyses of observed mobility in the canton of Glarus, the two observations from the parish of Luchsingen have been dropped, because both of them were immobile. Source: author, based on data from the genealogy of Glarus.

Table B-17. Glarus: Observed mobility and secondary schools in a parish; logistic regression model

	no controls	regions	regions + time	parishes	parishes + time
secondary school in parish	-0.132 (-0.80)	0.0451 (0.18)	-0.0938 (-0.37)	-0.249 (-0.79)	-0.530 (-1.62)
Region (ref.: northern Glarus)					
parish of Glarus		-0.813^{**} (-2.76)	-0.731^{*} (-2.52)		
Sernf Valley		0.0844 (0.37)	0.123 (0.56)		
Linth Valley		0.352 (1.42)	0.423^{+} (1.70)		
Year of first marriage			0.0114^{+} (1.78)		0.0137^{*} (2.10)
Parishes (ref.: Betschwanden)					
Bilten				-0.421 (-0.29)	-0.882 (-0.61)
Elm				-0.163 (-0.48)	-0.337 (-0.94)
Ennenda				-0.503 (-1.48)	-0.699^{*} (-1.99)
Glarus				-0.772^{*} (-2.20)	-0.728^{*} (-2.09)
Kerenzen				-0.337 (-0.73)	-0.501 (-1.03)
Matt-Engi				-0.148 (-0.39)	-0.219 (-0.60)
Mitlödi				-0.421 (-0.79)	-0.796 (-1.44)
Mollis				-0.507 (-1.28)	-0.684^{+} (-1.77)
Netstal				-0.165 (-0.51)	-0.330 (-1.00)
Niederurnen				0.360 (0.90)	0.139 (0.34)
Näfels Oberurnen				0.0883 (0.22)	0.0964 (0.24)
Schwanden				0.444 (1.26)	0.457 (1.28)
Constant	0.220^{*} (2.11)	0.168 (1.35)	-20.92^{+} (-1.77)	0.421^{+} (1.69)	-24.90^{*} (-2.06)
Observations	757	757	757	757	757

z statistics in parentheses based on cluster robust standard errors (171 clusters)
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$
Note: for all analyses of observed mobility in the canton of Glarus, the two observations from the parish of Luchsingen have been dropped, because both of them were immobile. Source: author, based on data from the genealogy of Glarus.

Table B-18. Glarus: Observed mobility and railway station in a parish; logistic regression model

	no controls	regions	regions + time	parishes	parishes + time
Railway station in parish	-0.0771 (-0.37)	0.441+ (1.84)	0.303 (1.14)	0.487+ (1.83)	0.342 (1.08)
Region (ref.: northern Glarus)					
parish of Glarus		-0.913*** (-4.20)	-0.890*** (-4.10)		
Sernf Valley		0.164 (0.70)	0.174 (0.77)		
Linth Valley		0.465* (2.36)	0.430* (2.13)		
Year of first marriage			0.00715 (1.07)		0.00619 (0.84)
Parishes (ref.: Betschwanden)					
Bilten				-0.336 (-0.23)	-0.502 (-0.35)
Elm				-0.0786 (-0.24)	-0.115 (-0.35)
Ennenda				-0.419 (-1.30)	-0.464 (-1.44)
Glarus				-1.183*** (-3.77)	-1.175*** (-3.73)
Kerenzen				-0.253 (-0.56)	-0.285 (-0.62)
Matt-Engi				-0.0852 (-0.23)	-0.0852 (-0.23)
Mitlödi				-0.336 (-0.64)	-0.463 (-0.86)
Mollis				-0.646* (-1.98)	-0.648* (-1.98)
Netstal				-0.236 (-0.75)	-0.221 (-0.70)
Niederurnen				0.444 (1.15)	0.385 (0.98)
Näfels Oberurnen				-0.239 (-0.60)	-0.225 (-0.55)
Schwanden				0.290 (1.01)	0.216 (0.70)
Constant	0.169+ (1.85)	0.0907 (0.69)	-13.16 (-1.07)	0.336 (1.49)	-11.12 (-0.82)
Observations	757	757	757	757	757

z statistics in parentheses based on cluster robust standard errors (171 clusters)
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$
Note: for all analyses of observed mobility in the canton of Glarus, the two observations from the parish of Luchsingen have been dropped, because both of them were immobile. Source: author, based on data from the genealogy of Glarus.

Table B-19. Glarus: Observed mobility and printing industry in a parish; logistic regression model

	no controls	regions	regions + time	parishes	parishes + time
mobile individual					
Print industry score, ln(x+1)	-0.0713 (-1.46)	0.0306 (0.41)	0.00499 (0.07)	-0.0990 (-0.43)	-0.195 (-0.88)
Region (ref.: northern Glarus)					
parish of Glarus		-0.797^{***} (-3.94)	-0.806^{***} (-4.09)		
Sernf Valley		0.172 (0.50)	0.149 (0.45)		
Linth Valley		0.406^{+} (1.90)	0.372^{+} (1.70)		
Year of first marriage			0.0105^{+} (1.80)		0.0115^{+} (1.85)
Parishes (ref.: Betschwanden)					
Bilten				-0.336 (-0.23)	-0.644 (-0.45)
Elm				-0.0786 (-0.24)	-0.146 (-0.44)
Ennenda				-0.0361 (-0.04)	0.249 (0.27)
Glarus				-0.566 (-0.62)	-0.326 (-0.37)
Kerenzen				-0.253 (-0.56)	-0.312 (-0.68)
Matt-Engi				-0.0852 (-0.23)	-0.0851 (-0.24)
Mitlödi				0.0770 (0.07)	0.243 (0.21)
Mollis				-0.119 (-0.13)	0.108 (0.13)
Netstal				0.282 (0.31)	0.573 (0.66)
Niederurnen				0.786 (0.89)	1.010 (1.17)
Näfels Oberurnen				0.319 (0.36)	0.551 (0.63)
Schwanden				0.575 (0.79)	0.715 (1.02)
Constant	0.342^{*} (2.29)	0.0827 (0.30)	-19.43^{+} (-1.79)	0.336 (1.49)	-20.91^{+} (-1.81)
Observations	757	757	757	757	757

z statistics in parentheses based on cluster robust standard errors (171 clusters)
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$
Note: for all analyses of observed mobility in the canton of Glarus, the two observations from the parish of Luchsingen have been dropped, because both of them were immobile. Source: author, based on data from the genealogy of Glarus.

Table B-20. Glarus: Observed mobility and spinning and weaving industry in a parish; logistic regression model

	no controls	regions	regions + time	parishes	parishes + time
Spin & weave industry score, ln(x+1)	0.224*** (4.43)	0.187** (2.94)	0.162* (2.46)	0.169* (2.24)	0.123 (1.28)
Region (ref.: northern Glarus)					
parish of Glarus		-0.614** (-2.94)	-0.646** (-3.06)		
Sernf Valley		0.339 (1.44)	0.328 (1.40)		
Linth Valley		0.134 (0.63)	0.162 (0.76)		
Year of first marriage			0.00423 (0.66)		0.00513 (0.65)
Parishes (ref.: Betschwanden)					
Bilten				0.154 (0.11)	-0.119 (-0.08)
Elm				0.411 (1.01)	0.245 (0.51)
Ennenda				-0.187 (-0.53)	-0.289 (-0.79)
Glarus				-0.616+ (-1.86)	-0.758* (-1.99)
Kerenzen				0.110 (0.24)	-0.0167 (-0.03)
Matt-Engi				0.257 (0.67)	0.163 (0.40)
Mitlödi				0.154 (0.27)	-0.0869 (-0.13)
Mollis				-0.193 (-0.58)	-0.315 (-0.84)
Netstal				-0.0119 (-0.04)	-0.0583 (-0.18)
Niederurnen				0.219 (0.51)	0.232 (0.55)
Näfels Oberurnen				0.126 (0.31)	0.0417 (0.10)
Schwanden				0.223 (0.71)	0.180 (0.56)
Constant	-0.273* (-2.07)	-0.173 (-0.96)	-7.995 (-0.67)	-0.154 (-0.46)	-9.508 (-0.66)
Observations	757	757	757	757	757

z statistics in parentheses based on cluster robust standard errors (171 clusters)

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Note: for all analyses of observed mobility in the canton of Glarus, the two observations from the parish of Luchsingen have been dropped, because both of them were immobile. Source: author, based on data from the genealogy of Glarus.

Table B-21. Glarus: Class linkages and secondary school in a parish; *M*-index equation from GMM estimator

	no controls	regions	time	parishes
M				
secondary school in parish	0.0362 (0.91)	0.0807 (1.27)	0.0823+ (1.88)	0.134* (2.00)
Region (ref.: northern Glarus)				
parish of Glarus		-0.0157 (-0.19)		-0.0412 (-0.50)
Sernf Valley		-0.0674 (-1.28)		-0.0404 (-0.66)
Linth Valley		-0.123+ (-1.91)		-0.146* (-2.19)
Year of first marriage (centered)			-0.00384* (-2.19)	-0.00278 (-1.64)
Constant	0.118*** (4.63)	0.147*** (4.42)	0.109*** (4.04)	0.142*** (4.09)
Observations	759	759	759	759

z statistics in parentheses based on cluster robust standard errors (172 clusters)
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$
Source: author, based on data from the genealogy of Glarus.

Table B-22. Glarus: Class linkages and railway stations in a parish; *M*-index equation from GMM estimator

	no controls	regions	time	parishes
M				
Railway station in parish	0.0354 (0.58)	0.0354 (0.58)	0.0761 (1.17)	0.0574 (0.74)
Year of first marriage (centered)			-0.00272 (-1.49)	-0.00194 (-1.11)
Region (ref.: northern Glarus)				
parish of Glarus				0.0281 (0.44)
Sernf Valley				-0.0458 (-0.83)
Linth Valley				-0.0647 (-1.41)
Constant	0.132*** (5.95)	0.132*** (5.95)	0.137*** (6.16)	0.158*** (4.36)
Observations	759	759	759	759

z statistics in parentheses based on cluster robust standard errors (172 clusters)
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$
Source: author, based on data from the genealogy of Glarus.

Table B-23. Glarus: Class linkages and printing industry in a parish; *M*-index equation from GMM estimator

	Including Sernf Valley: no controls	no controls	Excluding Sernf Valley: regions	time	parishes
M					
Print industry score, ln(x+1)	0.0156 (1.34)	0.00702 (0.43)	0.000693 (0.04)	0.00246 (0.14)	-0.00263 (-0.11)
Region (ref.: northern Glarus)					
parish of Glarus			0.0632 (1.02)		0.0718 (1.15)
Linth Valley			-0.0424 (-0.90)		-0.0322 (-0.66)
Year of first marriage (centered)				-0.00163 (-0.98)	-0.00149 (-0.85)
Constant	0.0903** (3.02)	0.121* (2.41)	0.145* (2.03)	0.145* (2.57)	0.161+ (1.92)
Observations	759	672	672	672	672

z statistics in parentheses based on cluster robust standard errors (172 (including Sernf Valley) or 154 (excluding Sernf Valley) clusters)
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$
Source: author, based on data from the genealogy of Glarus.

Table B-24. Glarus: Class linkages and spinning & weaving industry in a parish; *M*-index equation from GMM estimator

	Including Sernf Valley: no controls	no controls	Excluding Sernf Valley: regions	time	parishes
M					
Spin & weave industry score, ln(x+1)	-0.0579*** (-3.99)	-0.0624*** (-3.58)	-0.0469* (-2.54)	-0.0615*** (-3.66)	-0.0511** (-2.64)
Region (ref.: northern Glarus)					
parish of Glarus			0.0177 (0.28)		0.00680 (0.11)
Linth Valley			-0.0110 (-0.21)		-0.00943 (-0.18)
Year of first marriage (centered)				-0.000610 (-0.36)	-0.0000628 (-0.04)
Constant	0.262*** (6.19)	0.289*** (5.62)	0.253*** (4.80)	0.291*** (5.92)	0.267*** (5.01)
Observations	759	672	672	672	672

z statistics in parentheses based on cluster robust standard errors (172 (including Sernf Valley) or 154 (excluding Sernf Valley) clusters)
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$
Source: author, based on data from the genealogy of Glarus.

Table B-25. Glarus: Local class linkages and industries in a parish; *M*-index equation from GMM estimator

	Printing				Spinning & weaving			
	by origin		by destination		by origin		by destination	
M								
Region (ref.: northern Glarus)								
parish of Glarus	0.114*	(1.98)	0.149**	(2.70)	0.0560	(0.91)	0.0967	(1.59)
Linth Valley	-0.0223	(-0.43)	0.0271	(0.50)	-0.00093	(-0.02)	0.0121	(0.25)
Print industry score, ln(x+1)	-0.0137	(-0.42)	0.0147	(0.38)				
Class of origin (ref.: nonmanual)								
skilled workers	-0.0304	(-0.15)			-0.0481	(-0.53)		
farmers	0.0269	(0.23)			0.214	(1.62)		
unskilled & farm workers	0.0523	(0.49)			0.00373	(0.04)		
skilled workers # Print industry	0.0121	(0.20)						
farmers # Print industry	0.103*	(2.50)						
unskilled & farm workers # Print industry	-0.0160	(-0.48)						
Year of first marriage (centered)	-0.00143	(-0.86)	-0.00215	(-1.22)	-0.00025	(-0.16)	-0.000906	(-0.60)
Class of destination (ref.: nonmanual)								
skilled workers			-0.0590	(-0.43)			-0.166*	(-2.12)
farmers			0.286+	(1.65)			0.435*	(2.09)
unskilled & farm workers			0.0229	(0.18)			-0.0559	(-0.58)
skilled workers # Print industry			-0.00717	(-0.18)				
farmers # Print industry			0.0752	(1.18)				
unskilled & farm workers # Print industry			-0.0191	(-0.50)				
Spin & weave industry score, ln(x+1)					-0.0602*	(-2.31)	-0.0571*	(-2.05)
skilled workers # Spin & weave ind.					0.0328	(1.06)		
farmers # Spin & weave ind.					0.0386	(0.68)		
unskilled & farm workers # Spin & weave ind.					0.00230	(0.07)		
skilled workers # Spin & weave ind.							0.0382	(1.34)
farmers # Spin & weave ind.							0.00158	(0.02)
unskilled & farm workers # Spin & weave ind.							0.00685	(0.22)
Constant	0.135	(1.19)	0.0659	(0.47)	0.221**	(2.79)	0.250**	(2.99)
Observations	672		672		672		672	

z statistics in parentheses based on cluster robust standard errors (154 clusters)
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$
Source: author, based on data from the genealogy of Glarus.
Note: Observations from Sernf Valley excluded.

Table B-26. Homogamy: time trends – results from regression models

	(1) Time (linear) and city vs. countryside		(2) Time (splines) and city vs. countryside	
Coefficients constraint to be equal for both directions of explanation				
Main effects				
HISCAM ≤ 60.9	0.649***	(0.0451)	0.757***	(0.0615)
HISCAM > 60.9	0.0736	(0.0975)	0.0979	(0.198)
Interactions with: HISCAM ≤ 60.9				
City of Lucerne	-0.400***	(0.0498)	-0.380***	(0.0663)
Year	0.00385	(0.00282)		
Year before 1865			0.00886**	(0.00320)
Year from 1865			-0.0176	(0.0113)
City of Lucerne # Year	-0.00440	(0.00296)		
City of Lucerne # Year before 1865			-0.00214	(0.00325)
City of Lucerne # Year from 1865			-0.00418	(0.0115)
Interactions with: HISCAM > 60.9				
City of Lucerne	0.541*	(0.238)	0.641*	(0.277)
Year	-0.00492	(0.0112)		
Year before 1865			-0.00315	(0.0136)
Year from 1865			-0.0148	(0.0430)
City of Lucerne # Year	0.00709	(0.0111)		
City of Lucerne # Year before 1865			0.0124	(0.0138)
City of Lucerne # Year from 1865			-0.00780	(0.0446)
Random effects				
Var(HISCAM > 60.9)	0.315	(0.0829)	0.323	(0.0882)
Additional coefficients explaining bride's father's HISCAM				
Year	0.00209	(0.0422)		
Year before 1865			0.0476	(0.0596)
Year from 1865			-0.210	(0.219)
City of Lucerne	-0.446	(0.703)	-0.573	(1.003)
City of Lucerne # Year	-0.0683	(0.0428)		
City of Lucerne # Year before 1865			-0.0615	(0.0600)
City of Lucerne # Year from 1865			-0.00886	(0.219)
Constant	58.12	(0.653)	59.05	(0.979)
Random effects				
Var(Constant)	4.965	(1.201)	4.773	(1.176)
Var(Residual)	109.5	(10.34)	109.3	(10.34)
Additional coefficients explaining groom's father's HISCAM				
Year	0.0600	(0.0457)		
Year before 1865			0.110*	(0.0500)
Year from 1865			-0.170	(0.179)
City of Lucerne	-2.036	(1.577)	-2.365	(1.773)
City of Lucerne # Year	-0.0338	(0.0497)		
City of Lucerne # Year before 1865			-0.0449	(0.0515)
City of Lucerne # Year from 1865			0.0731	(0.187)
Constant	57.98	(0.718)	59.16	(0.797)
Random effects				
Var(Constant)	6.500	(1.567)	6.716	(1.596)
Var(Residual)	80.22	(9.953)	79.65	(10.10)
Observations	1499		1499	

Standard errors in parentheses
$^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table B-27. Homogamy: railway stations and factory workers – results from regression models

	(1) Basic: time, rural only		(2) Basic + railway station		(3) Basic + factory workers	
Coefficients constraint to be equal for both directions of explanation						
Main effects						
HISCAM ≤ 60.9	0.757***	(0.0615)	0.745***	(0.0673)	0.805***	(0.0685)
HISCAM > 60.9	0.109	(0.200)	0.113	(0.218)	0.153	(0.227)
Interactions with: HISCAM ≤ 60.9						
Year before 1865	0.00880**	(0.00318)	0.00838*	(0.00341)	0.0107**	(0.00325)
Year from 1865	-0.0176	(0.0113)	-0.0175	(0.0113)	-0.0149	(0.0109)
Railway station in parish			0.0827	(0.112)		
Factory workers in parish: 2.1-5%					-0.161+	(0.0932)
Factory workers in parish: >5%					-0.265**	(0.0978)
Interactions with: HISCAM > 60.9						
Year before 1865	-0.00258	(0.0137)	-0.00233	(0.0148)	-0.000596	(0.0145)
Year from 1865	-0.0165	(0.0432)	-0.0158	(0.0444)	-0.00969	(0.0415)
Railway station in parish			-0.0359	(0.348)		
Factory workers in parish: 2.1-5%					-0.108	(0.433)
Factory workers in parish: >5%					-0.811	(0.646)
Random effects						
Var(HISCAM > 60.9)	0.340	(0.0952)	0.337	(0.0954)	0.449	(0.151)
Additional coefficients explaining bride's father's HISCAM						
Year before 1865	0.0468	(0.0596)	0.0342	(0.0666)	0.0718	(0.0660)
Year from 1865	-0.211	(0.219)	-0.212	(0.220)	-0.203	(0.223)
Railway station in parish			1.952	(1.776)		
Factory workers in parish: 2.1-5%					-1.921	(1.507)
Factory workers in parish: >5%					-3.060	(1.929)
Constant	59.04	(0.981)	58.70	(1.129)	59.70	(1.162)
Random effects						
Var(Constant)	5.077	(1.226)	4.799	(1.160)	5.145	(1.276)
Var(Residual)	105.7	(11.21)	105.6	(11.23)	105.5	(11.27)
Additional coefficients explaining groom's father's HISCAM						
Year before 1865	0.109*	(0.0499)	0.110*	(0.0521)	0.151**	(0.0536)
Year from 1865	-0.169	(0.180)	-0.175	(0.181)	-0.119	(0.177)
Railway station in parish			0.0311	(1.661)		
Factory workers in parish: 2.1-5%					-3.439**	(1.083)
Factory workers in parish: >5%					-5.966***	(1.553)
Constant	59.15	(0.797)	59.17	(0.875)	60.29	(0.985)
Random effects						
Var(Constant)	6.929	(1.668)	6.998	(1.678)	6.769	(1.539)
Var(Residual)	72.95	(9.130)	72.95	(9.127)	71.73	(9.190)
Observations	1002		1002		1002	

Standard errors in parentheses
+ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Selbständigkeitserklärung

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Simon Seiler   Bern, 19. November 2018