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Empirical Essays in Economic Policy: On Labour Markets, Social Mobility and Trade

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Bern, June 2021 *Preetha Kalambaden*

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Preface

This thesis is a collection of three empirical essays in economic policy. All essays are independent and contribute to various fields of economic policy decision-making, which have gained importance in recent years. The first one analyses the introduction of a family-friendly policy and its impact on maternal labour market participation. To combat skills shortages, promoting female participation in the labour market has become one of the most important measures. The second essay tackles the question of whether individuals have equal opportunities in society. In major advanced economies, increasing inequality raises questions about equality of opportunity. And the third essay deals with multinational firms and their allocation of labour worldwide. All chapters share the same motivation, namely the importance of the policy framework in shaping decisions on an individual, family, and firm level. They also show the importance of access to large-scale data and the application of appropriate econometric models. Both are fundamental elements to better understand complex channels and mechanisms, which are crucial determinants for designing the right policies.

The first chapter analyses the labour market impact of a childcare reform in the city of Bern within a quasi-experimental setting. Using data from individual-level tax records, I study the effects of the introduction of the childcare voucher system in 2014 on maternal labour market outcomes in a difference-in-difference and event-study framework. My results show that easier access to subsidised childcare increases maternal employment and labour earnings, especially for those mothers in low-income households and those having only one child. I address the ultimate question of net benefits of this childcare reform in the second part. Within a back-on-an-envelop cost-benefit analysis, I show that one additional franc spent on childcare subsidies increases maternal earnings by more than one franc. This chapter shows that it is crucial how policies are designed. More target-oriented policies might create large incentives to increase labour market participation of vulnerable people. Childcare subsidies, finally, pays out from a welfare perspective, es-

pecially in the long run.

Chapter 2, co-authored with Isabel Z. Martìnez, sheds light on different dimensions of intergenerational mobility. Prior work has shown that intergenerational mobility in Switzerland is high compared to other countries. Our study, however, emphasises that intergenerational mobility has multiple dimensions and looking at only one outcome does not fully capture (in)equality of opportunity. We find that while mobility in income is very high, it is lower in wealth and considerably lower in education and occupation status. Individual's education and occupation choices are, therefore, more driven by family background. Furthermore, there is significant heterogeneity among subgroups by gender and migratory background. Each dimension implies a different conclusion on equality of opportunity in Switzerland, holding large variation among different groups of individuals.

In Chapter 3, co-authored with Daniel Steffen, we study the effect of outward foreign direct investment on domestic employment using firm-level data. Switzerland is a relatively small country with a high relative outward FDI stock. We aim to answer whether firms that engage in outward FDI increase or decrease home employment due to foreign activities. Economic theory suggests that there are negative (displacement effect) as well as positive effects (output effect) in place of offshoring on domestic labour demand. Using firm-level data and an instrumental variable approach, we find no evidence of the negative displacement effect but a positive and significant output effect of FDI to all countries, especially to high-income countries. On the other hand, we find a significant and negative displacement effect that outweighs the positive output effect for FDI to lower middle-income countries. Overall, outward FDI does not endanger the total number of domestic jobs in Switzerland, which is highly dependent on foreign relations. Foreign economic policy is, therefore, essential for individual firms in shaping their investment decisions abroad, which in the end has an impact on domestic labour.

Chapter 1

Access to Subsidised Childcare and Parental Employment

Evidence from a Quasi-Experiment

1.1 Introduction

Female labour participation has increased in high-income countries, and the gender gap in schooling and earnings has mostly been reduced over the last decades (Olivetti and Petrongolo, 2017). However, children still strongly determine employment patterns of women. The literature on *child penalty* shows, for example, that female earnings drop by 30 % in the year after the birth of the first child in Denmark and by 80 % in Germany, and this drop does not recover even after 5 to 10 years[1] (Kleven et al., 2019b). Governments try to improve gender equity by introducing family-friendly policies that enable parents to combine career and family, especially for mothers.

The direct democracy system in Switzerland allows people to present a constitutional popular vote if they like to introduce amendments to the federal constitution. An initiative committee handed in such a popular vote to change the childcare system in the city of Bern, which aimed to improve work

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[1]Maternal earnings do not reach earning levels compared to the pre-child periods.

and family. The popular vote was approved in May 2011, and the childcare reform was finally introduced in 2014. The reform intended to introduce a childcare voucher system, which simplified access to subsidised childcare for parents and increased the number of childcare spaces in Bern. First of all, subsidies were directly paid to eligible parents and not to the childcare facility. Second, the reform was aimed to increase competition among childcare providers by removing restrictions on access to the subsidised childcare market. And third, access to subsidies was now only restricted to parents if both were employed or in education.

Given that only individuals living in the city of Bern had access to the new voucher system, I exploit the introduction of the voucher system within a quasi-experimental setting. Using neighbouring municipalities as control units, I estimate the effect of the policy reform on maternal employment in a difference-in-differences framework and event study model. Identification builds on the assumption that labour market outcomes of mothers with young children in the city of Bern would have evolved the same as in the control municipalities absent the childcare policy change. I differentiate between three different periods, a pre-treatment period (2006-2010), an anticipation period between the year of the vote and the year of the policy change (2011-2013) and the policy period after the childcare reform had been implemented (2014-2017). I use this distinction of the time periods and estimate different effects depending on the state of the political process. Any effects on maternal labour market outcomes, which occurred between the year of the vote and the year of the policy change are called *Anticipation Effect (ANT)*, while all effects which realised after the policy had been introduced are captured by the *Policy Effect (POL)*

My empirical analysis draws on individual-level tax data from the canton of Bern from 2002-2017, which covers the universe of taxpayers in the canton. It contains information on earnings (labour and self-employment), place of residence and some demographic characteristics. The data allow to extract information about the number and age of children and to identify both parents' earnings separately. Information about the childcare arrangement parents have chosen are missing; therefore, I estimate the *intention-to-treat effect (ITT)* of the voucher system on maternal employment and labour earnings.

I find that the introduction of the voucher system increased maternal employment by four percentage points. The effect already kicked-in in the year of the vote and continuously increased till two years after the policy change– there is a positive anticipation and policy effect. Results on labour earnings show a positive policy effect–mothers increased labour earnings after the policy has been introduced in 2014, but there are no effects before 2014. The

estimates for labour earnings, however, are not robust in all specifications.

Looking at heterogeneity in income, especially low-income households responded heavily to the childcare reform, while there are no significant effects among high-income households. Furthermore, heterogeneous effects arise dependent on the number of children. Those mothers having only one child react earlier and more strongly to the childcare policy change than mothers with two and more children. This is in line with the literature on labour market attachment of mothers–having more children is associated with lower maternal labour market attachment (Angrist and Evans, 1998).

To rule out that any location-specific shocks drive the estimated effects, I provide some robustness checks. To do so, I take parents with school-age children which are not eligible for childcare but live in the city, where the policy change occurred, as an additional control unit. This allows me to show that my results are robust and not driven by any other Bern-specific shocks unrelated to the childcare reform.

I address the ultimate question of net benefits of this childcare reform in the second part of the paper. Based on the estimated causal effects, I show the net benefits within a back-of-an-envelope cost-benefit analysis. By comparing net present values of costs (additional spending on subsidies) and benefits (discounted maternal labour earning), my simple calculation shows that one additional franc invested in subsidies for childcare generates 1.13 CHF maternal labour earnings. This estimate, however, might be at the lower range since it does not take into account the long-term benefits of increased female labour force participation.

A sizeable literature analyses the effect of childcare policies on parental labour market outcomes. In the most common setting, childcare policy reforms induce exogenous variation between and within regions. The effect will then be usually estimated in a difference-in-differences design with region-time-specific treatment variable, region and time fixed effects and controls. Early studies look at the childcare reform which induced major expansion of subsidised childcare in the province of Quebec, Canada (Baker et al., 2008; Lefebvre and Merrigan, 2008; Lefebvre et al., 2009) and Germany (Huebener et al., 2019; Müller and Wrohlich, 2020). They find all large positive effects of increased childcare spaces and lower prices on maternal participation rates. Very recent literature does not find any effects of the expansion of childcare on the gender wage gap over the last 60 years in Austria (Kleven et al., 2020). They argue that the null effect is driven by crowding out of informal childcare and the persistence of social norms related to maternal care.

Empirical evidence for Scandinavian countries finds relatively small or no effects (Havnes and Mogstad, 2011) of childcare expansion on maternal labour market participation (Simonsen, 2010). They argue that public child-

care crowds out informal arrangements (Viitanen, 2011). In light of the already high employment rates of Scandinavian mothers, these results are not surprising.

Other studies look at childcare reforms introducing publicly subsidised pre-school kindergarten and therefore targeting older children. The effects of childcare policies for 3-4 year-old children on parental labour market outcomes are positive but rather small in magnitude. Such childcare policies had been introduced in Germany in 1996 (Bauernschuster and Schlotter, 2015), in Argentina (Berlinski and Galiani, 2007), the US Cascio (2009); Fitzpatrick (2010), Sweden (Lundin et al., 2008), Spain (Nollenberger and Rodríguez-Planas, 2015), UK (Brewer et al., 2016) and Italy (Carta and Rizzica, 2018).

The literature for Switzerland on childcare and parental labour market outcomes is rather scarce. The rapid and heterogenous expansion in childcare over the last 20 years in Switzerland provides a promising setting to evaluate parental labour market effects. Studies find an increase in hours worked of mothers with young kids due to the expansion of childcare in Switzerland Ravazzini (2018); Felfe et al. (2016). There are, however, no effects on inactive mothers. These results are in contrast to very recent studies which have access to individual-level tax data (Ramsden, 2016; Krapf et al., 2020). Availability of childcare has significantly increased maternal employment but has no effects on maternal earnings. Childcare increases maternal labour market attachment, i.e. mothers are more likely to stay in the labour market if there is childcare available in the same municipality they live.

My paper contributes to the existing literature on childcare and parental labour market outcomes on several ways. It makes four main contributions. First, access to subsidised childcare promotes maternal employment but not necessarily maternal earnings. These results are explained by the fact that mothers in low-income households with low wages respond to childcare subsidies, what has no effect on average maternal earnings. Second, I try to isolate one specific policy change which occurred within a small geographical unit and a short period of time. Additional to this, the policy change in my quasi-experimental setting was approved by a popular vote. This setting allows me to causally identify the effect of childcare subsidies even in the very short run. Furthermore, I can rule out any endogeneity problems, which are common issues in prior work. Third, most of the studies so far (except for some Scandinavian countries) use household survey data or census data, which typically are repeated cross-sections and do not include the whole population. In contrast to them, I have access to register-based individual-level tax data for the full population of the canton of Bern. Thus, I can follow each individual paying taxes in the canton of Bern during a specific period (covering many years in the pre-treatment period) what allows me to tackle

common issues with the difference-in-differences method and to run multiple robustness tests. Fourth, within a simple back-of-an-envelope calculation, I quantify the net benefit of the childcare reform. I calculate the amount of subsidies a given household receives and relate this to the present value of benefits of maternal employment. To the best of my knowledge, no study following a quasi-experimental approach has analysed the net benefits of a childcare reform.

The remainder of the paper is organised as follows: Section 1.2 gives an overview of the childcare system in Switzerland and the policy reform I analyse. The data and my empirical design are explained in Section 1.3 and Section 1.4 shows the results. In Section 1.5, I run some robustness checks. I discuss some main limitations of my paper in Section 1.6 and Section 1.7 concludes.

1.2 Institutional Setting

Childcare Provision

In Switzerland, childcare is provided by public or private childcare facilities and is managed at a municipality level. There are large differences in childcare coverage at a regional level, where the French-speaking cantons and urban areas report higher coverage rates compared to German-speaking rural areas. However, there is in general large regional disparity on a municipality level. Most of the cost of childcare is carried by the parents. Access to subsidies for childcare is dependent on parents' income and wealth and is coordinated at a municipality level. The costs for subsidies usually are carried by the municipality and the canton.

The federal government had launched a national program (Impulsprogram) in 2003, considering reconciliation of work and family life. Over the time period of 2003-2019 around 300 Mio. Swiss Francs were invested in building up and expanding childcare facilities (Bundesamt für Sozialversicherungen , BSV).[2] The overall goal of the national program is to facilitate access to childcare and encourage labour force participation of second earners. Within this national program, the federal government also supports pilot projects from municipalities or cantons introducing a childcare voucher system. Under the voucher scheme subsidiaries are directly transferred to eligible parents and not to the childcare facility, as it is the case under the subsidy scheme. This change to financing the subject instead of the ob-

[2]Data on all projects supported within this program are available from the Swiss Federal Social Insurance Office: `https://www.bsv.admin.ch/bsv/de/home/finanzhilfen/kinderbetreuung/finanzhilfen-schaffung-betreuungsplaetze.html`

ject simplifies access to subsidised childcare for parents since they directly receive subsidies as a voucher, which they could redeem at any facility participating at the voucher system.[3] Furthermore, the overall goal is to remove restrictions within the childcare market which encourages competition among childcare facilities and to increase childcare spaces.

Childcare Voucher System in Bern

The city authority of Bern decided to introduce such a voucher system as a pilot project.[4] This change in the childcare system had first to be approved and was put to vote on 15. May 2011. The electorate of the city of Bern voted in favour of the introduction of the childcare voucher system.[5] The voucher system was finally introduced on 1. January 2014 as a pilot project, which was considered to be implemented on a cantonal level. The main changes between the old subsidy and the new voucher system in Bern are listed in table 1.1.

First of all, competition among childcare facilities was limited in the city of Bern under the subsidy scheme. Only publicly financed childcare facilities and those facilities with a contractual agreement with the municipalities were allowed to offer subsidies childcare. In 2010, 25 out of 61 privately financed childcare facilities in Bern were allowed to offer childcare spaces at subsidised rates (Stadt Bern, 2011).[6] The switch to the voucher system, allowed any childcare facility with an operating permit to participate and to offer subsidised rates.[7] This system change encouraged competition in the childcare market and led to an increase in childcare spaces. Between 2013 and 2015, the number of childcare facilities increased by 9 % from 88 to 95, and the number of childcare spaces increased by 35 % (Ecoplan, 2016). Second, the number of subsidised childcare slots was severely rationed under the subsidy system. Childcare facilities and municipalities had contractually agreed on the number of subsidised spaces in each year. Excess demand for a subsidised space in a childcare facility could then not be covered. The municipality at-

[3]The majority of the childcare facilities participate at an existing voucher system. 83 out of 96 childcare facility were participating at the voucher system in the city of Bern as of September 2019 (Stadt Bern, 2020).

[4]Other municipalities in Switzerland already introduced a childcare voucher system in earlier years: Lucerne in April 2009, Horw in August and Hochdorf in September 2009.

[5]The introduction of the voucher system was a counter-proposal of the city council to the popular initiative "Familienfreundliches Bern: Für Kindertagesstätten ohne Wartelisten (Kita-Initiative)". The popular initiative and the counter-proposal came to a vote on 15. May 2011. The introduction of the voucher system was accepted, while the initiative itself was rejected through the popular vote.

[6]In 2010, 15 childcare facilities in Bern were publicly financed.

[7]A few company-owned day-care centres do not participate at the voucher system.

Table 1.1: Compare Childcare System Before and After Reform

	Subsidy Scheme	**Voucher Scheme**
Competition among childcare facilities	childcare market divided between facilities offering subsidies childcare and those without subsidies	Competition among all childcare facilities
Rationing on subsidies	Number of subsidised spaces limited	Vouchers not rationed, all eligible parents receive a voucher
Eligibility	- Income and wealth - Family size - Social reasons / equality of opportunity	- Income and wealth - Family size - Social reasons /equality of opportunity - Employment/Education

Notes: This table shows the main difference between the childcare system under the subsidy scheme, which was in place before 2014, and the voucher scheme. The table is based on the information from Ecoplan (2016)

tempted not to exceed the budget, which was already fixed at the beginning of each year.[8] The third main differences between the childcare system with subsidy and voucher scheme are the eligibility criteria. The main criteria for subsidies are earnings of both parents from labour or self employment, wealth and family size. Additional to these, parents have to report employment levels or whether they are in education under the voucher system. Only if employment or education workload of parents exceed 100%, they are eligible for a childcare voucher and entitled days are fixed to the amount exceeding 100%. If workload of both parents together is, for example, 160%, they receive a voucher for 60% (three days).

The amount of subsidies parents receive depends on their level of eligible income, which is calculated by summing up earnings of both parents (from labour and self employment), 5% of net wealth (total wealth minus debt) and subtracting a deduction for family size.[9] The maximum amount of subsidies

[8]The city authority of Bern has removed the limitation on the number of subsidies already in 2013. They guaranteed to pay excess demand for subsidies from their budget, without cantonal cost-sharing already from 2013 on, one year before the voucher system was finally introduced.

[9]Family size deductions is dependent on number of children. For the year 2017 the deduction was: 11'400 CHF for one child, 23'840 CHF for two children, 35'200 CHF for

in the year 2017 was 150 CHF per day for young children under the age of 12 months and 100 CHF per day if they were older.[10] Parents with eligible income below 42'970 CHF were paid the full amount of subsidies which linearly decreased till 160'280 CHF. The percentage of total childcare costs covered through subsidies (subsidy rate) dependent on total income (earnings plus 5 percent of net wealth) is shown in figure 1.A.7.
62% of all married households in the city of Bern in the year 2017 with children aged 0 to 4 were eligible for a childcare voucher. 26% of those with access to a voucher had eligible income less than 45'480 CHF and were therefore allowed to receive the full amount of subsidies.

1.3 Data and Empirical Strategy

1.3.1 Data and Summary Statistics

I have access to confidential individual-level tax data of the canton of Bern for the years 2002-2017. The canton of Bern has 1 million inhabitants in urban and rural areas and where approximately 10 % of the population is French-speaking.[11] Because of this regional diversity and a large population of about one-eight of the total population in Switzerland, the data does very well represent Switzerland as a whole. The data include all individuals filing a tax declaration in the canton of Bern, i.e. having declared the canton of Bern as the place of main residence as of December 31 in each year and are aged 18 or older.[12] The tax data cover information on earnings (from labour and self-employment), total taxable income, wealth, number of child deductions and some demographic characteristics such as age and civil status.

In general, children aged 0 to 4 are eligible for external childcare. To get data about the number and age of children, I extract the information from the change in child deductions in the tax declaration of the mother or father. A tax entity refers either to an individual or a married couple. Not married individuals might file child deductions interchangeably, which might add some noise in specifying my sample. I therefore only include individuals, who were married at some point in time, to identify all parents with young children in my data correctly. I might therefore look at couples with young

three children and 45'480 CHF for four children.

[10]There are fixed costs, which are not covered through subsidies and which parents have to pay out-of-pocket.

[11]The official language for the majority of the municipalities in the canton of Bern is German.

[12]Individuals younger than 18, which earn a considerable amount of money are also obliged to pay taxes. However, there are only a few entries.

children, which were married at some point between 2002-2017 and for the period of time, where both paid their taxes in the canton of Bern. The year of birth of a child is defined as the year in which the number of child deductions declared by both parents together changed. Even though married couples only file one tax declaration, the data allows identifying income earned by each individual.

In total, I observe 165'617 couples in the canton of Bern, which were married at some point in time during my sample period. I restrict my sample to individuals aged 18-65 and exclude all individuals having positive income from self-employment and those having negative labour income. I further drop all same-sex couples and restrict my sample to those individuals, who never got divorced during my sample period. Parents might declare child deductions for children up to 15 and also for children in education till the age of 25. Since my information on number and age of children are extracted from information on child deductions, I end up with a lot of newly born children at a maternal age of around 50. This might be explained by changes in the deductions for children, because of a break year between high school and university. Therefore, I drop all couples, where mothers were older than 45 at the birth of first and second child respectively older than 50 at the birth of third or more children. I further restrict my sample to individuals living at least six consecutive years in the canton of Bern. I am finally left with 107'141 couples with kids living in the canton of Bern. My baseline sample contains only couples having children aged 0 to 4 living in the core zone of the agglomeration Bern over a time horizon from 2006-2017. (16'284 couples).

Summary statistics for all dependent and independent variables from my baseline sample are shown in table 1.2. The sample contains in total 67'763 couple-year observations with around 5'800 observations for each year.

The childcare reform was introduced in the city of Bern in 2014. To evaluate the effect of the childcare reform on labour market outcomes of parents living in the city of Bern, I need to compare those with outcomes of parents not living in the city of Bern but in a suitable control area. The control area should have similar observable characteristics but should not be eligible for the childcare reform. I define the municipalities belonging to the primary core zone (Agglomerationskerngemeinde (Hauptkern)) of the agglomeration commuting zone of Bern (nr. 351) defined by the Swiss Federal Statistical Office as the control area.[13] The classification of a core zone

[13]The Swiss Federal Statistical Office (FSO) has defined urban regions as "Switzerland's area with an urban character". See `https://www.bfs.admin.ch/bfsstatic/dam/assets/349557/master` for further information.

Table 1.2: Summary Statistics: Baseline Sample

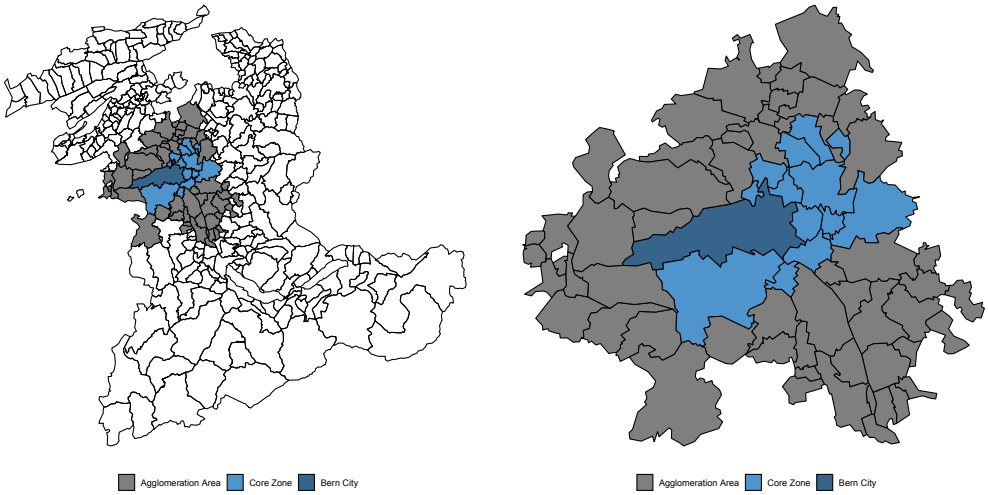
	Bern City		Core Zone	
	Pre	Post	Pre	Post
Earnings Mother (in 1000 CHF)	28.50	36.10	24.96	30.83
	(29.57)	(33.27)	(26.95)	(30.84)
Earnings Father (in 1000 CHF)	74.78	82.25	87.12	88.72
	(58.03)	(55.98)	(61.49)	(55.96)
Employment Mother	0.743	0.793	0.752	0.784
	(0.437)	(0.405)	(0.432)	(0.411)
Employment Father	0.910	0.936	0.942	0.943
	(0.286)	(0.245)	(0.233)	(0.232)
Share of Maternal Income	0.275	0.298	0.228	0.258
	(0.248)	(0.237)	(0.225)	(0.227)
Number of Children	1.583	1.659	1.633	1.680
	(0.868)	(0.902)	(0.889)	(0.906)
Age Mother	36.81	37.27	37.33	37.51
	(8.206)	(7.663)	(8.814)	(8.123)
Age Father	40.03	40.47	40.47	40.71
	(8.679)	(8.349)	(9.082)	(8.567)
Observations	23116	11399	27290	13502

Note: This table shows summary statistics (mean and respective standard errors in brackets) for parents with 0-4 year-old children included in my baseline sample. Core zone refers to all municipalities belonging to the core zone of the agglomeration region Bern, excluding the city of Bern. Pre refers to the pre-treatment period (2006-2013) and post shows the averages in the post-treatment period (2014-2017). Labour income of mothers and fathers are expressed in 2019 Swiss Francs.

of a agglomeration region is done according to some variables related to population density, number of inhabitants and jobs as well as overnight stays. It also takes into account commuting flows. An agglomeration core zone is defined to be homogeneous in its architectural structures, building together the urban and commercial centre.

In line with this definition, I take all municipalities belonging to the core zone of the agglomeration region Bern as treatment and control group, where the city of Bern is the treatment and 13 surrounding municipalities are defined as control group. These municipalities belonging to the control group are: Bolligen, Bremgarten bei Bern, Köniz, Muri bei Bern, Stettlen, Vechigen, Zollikofen, Ittigen, Ostermundigen, Bäriswil, Moosseedorf, Urtenen-Schönbühl, Kehrsatz.

Figure 1.1: Map: Geographical Units of Treatment and Control Groups



Notes: The graph on the left shows the canton of Bern with the agglomeration region Bern (bfsnr. 351) (in grey). The right graph shows the agglomeration region Bern with its core zone (in blue) and the city of Bern (in dark blue). I take the city of Bern as treatment unit and all other municipalities belonging to the primary core zone as control unit (blue). Spatial definition by the Swiss Federal Statistical Office (FSO).

1.3.2 Difference-in-differences Model

I estimate the effect of the introduction of the childcare voucher system in 2014 on maternal labour outcomes in my basic empirical specification. The Bernese population voted in the year 2011 in favour of this policy change. I distinguish between two different effects, which I want to capture separately. The first one refers to an *anticipation effect*, which already occurs after the vote took place in 2011. The second effect, called *policy effect*, realizes in the period after the childcare reform has been implemented.

This differentiation between the two effects is important. We might expect that individuals already adjust their labour market outcomes as soon as the policy change has been announced. If it comes to employment let's

think of individuals which were employed in 2011 and become parents in the year of the vote. They might already calculate in 2011, if – dependent on their income and wealth – they become eligible for childcare vouchers in 2013 (the year, the policy change was initially announced). The only additional pre request is that both parents remain employed or in education. This additional requirement gives an incentives not to quit the job and stay in the labour market between 2011-2013, what results into positive anticipation effects. Additional to that, single policy measures had already been introduced between 2011 and 2013 – before the whole policy package was implemented in 2014 – creating additional anticipation effects.[14]

ANT is equal to one for the years $2011 \leq t < 2014$ and zero otherwise and the policy effect POL being one for years $t \geq 2014$. The estimation equation looks as follows:

$$y_{ist} = \lambda_s + \delta_t + \beta_1(ANT \times TR) + \beta_2(POL \times TR) + \beta_x X_{ist} + \epsilon_{ist} \quad (1.1)$$

Where y_{ist} is the outcome variable for parent i living in municipality s in the year t. The outcome variable y_{ist} in our study is either log of yearly labour income or a dummy for being employed — i.e. employment takes value one if an individual has positive labour income and is zero otherwise. TR is equal to one for parents living in the treatment group (city of Bern) and zero otherwise. The coefficients of interest are β_1 and β_2. β_1 captures the anticipation effect, which occurs between the vote and the implementation of the policy. β_2 captures all effects on labour market outcomes resulting from the implementation of the childcare voucher system. Time fixed effects δ_t are included to absorb variations which affect outcomes of all individuals, such as business cycle movements. And municipality fixed effect λ_s take into account difference in mean outcomes across geographical units. I further control for some demographic characteristics such as parent's age to filter out life cycle effects and for number of children to capture the effect of family size on labour market outcomes. Finally, I add the age of the youngest child into the matrix of covariates, since earnings of both parents might differently be affected dependent on child's age, especially in the year of the birth of a child. Either because 80% of labour earnings are normally paid during maternity leave and mothers take additional (unpaid) leave in the year of the birth, or child allowance might change labour earnings in the year of the birth of (both) parents. Because I only observe whether individuals have (young) children eligible for external childcare but do not have information about childcare arrangements, the estimates capture the *intention-to-treat*

[14]The quota on the number of subsidised childcare spaces and the budget cap on subsidies have already been abolished in 2013.

effect. We might assume that the model is very conservative in estimating the causal effect of the childcare reform.

The policy was introduced on a municipality - year level. Robust standard errors are therefore reported — clustered on municipality and year levels. This means that I allow for some correlation of labour market outcomes of parents cross-sectional within the same municipality and over time.

1.3.3 Event Study Model

The main identification assumption in my approach is that the outcomes would have evolved the same way in the treatment and the control units absent the reform. I test the plausibility of this assumption by looking at how labour outcomes have evolved in both groups before the vote on the childcare reform took place. I generalize equation 1.1 in an event study model, which looks as following:

$$y_{ist} = \lambda_s + \delta_t + \sum_{t=2006}^{2017} \beta_t I[year = t] \times TR + \beta_x X_{ist} + \epsilon_{ist} \qquad (1.2)$$

where the year 2010 $t = 2010$ is treated as reference period and is standardized to zero and is therefore excluded from my regressions. The coefficients of interest are the dummies β_t for the years $t = 2006 - 2009$. To fulfil the main identification assumption, the event study dummies in the pre-reform (-vote) period must equal zero.

I address changes in treatment or control group due to moving between municipalities by assigning individuals to the municipalities of residence in the year of the vote, 2011. This issue might arise if people move to the city of Bern from the surrounding municipality after the vote has taken place to benefit from the policy change. The control unit would not be a valid counterfactual anymore, and I might overestimate the anticipation (ANT) and policy effects (POL), due to moving into treatment.

Unobserved factors, which correlate with the timing of the childcare reform but are not related to the policy and simultaneously affect the treatment and control unit differently, might bias my estimates. To partially address this issue, I include municipality linear time trends in my estimation equations within the vector of covariates X_{its}. I further account for this threat in the robustness checks (section 1.5.1) by expanding the control group with an additional dimension (age of the youngest child), and rule out that location-specific effects might drive the results.

Another concern relates to the Stable Unit Treatment Value Assumption (SUTVA), which arise if there might be some spillover effects between treatment and control units, which might at the end bias my estimates. In my

context the SUTVA might be an issue if parents living in the control municipalities work in the city of Bern and send their children to the childcare facility located in the city. In general, the policy change has induced an increase in the total number of childcare spaces available in the city of Bern and has simplified access to subsidies. Subsidies were only paid to parents with the main place of residence in the city of Bern. Hence, parents not living in the city of Bern could benefit from increased number of childcare spaces but could not get access to vouchers. This fact implies a positive effect of the childcare policy change spilling over to surrounding municipalities included in my control group which at the end leads to an underestimation of my betas. I, therefore, argue that my estimates are rather conservative in estimating the effect of the childcare reform.

1.4 Results

1.4.1 Baseline Estimates

Table 1.4 shows the point estimates from my baseline difference-in-differences model, specified in equation 1.1. My results show that the childcare reform significantly affected both maternal labour market outcomes—employment and labour income.

In terms of employment, the difference-in-difference estimates indicate an increase in maternal employment in the anticipation phase by 3 percentage points and by 6 percentage points in the policy phase (see column 1 in Table 1.4). Both effects are statistically significant at the 0.1% -level and point estimates only slightly change if we include controls – mother's age, number of children and age of the youngest child – into the estimation strategy (see column 2). Even after including municipality time trends, which usually capture a lot of variation in the data, point estimates remain significant and show an anticipation effect of 2 percentage points, respectively, a policy effect of 4 percentage points (see column 3 in Table 1.4).

The childcare reform also had positive effects on maternal labour income. An increase in labour income might result either through changes in the hours worked (intensive margin of labour supply) or an increase in hourly wages. Unfortunately, I cannot disentangle the labour supply or wage effects, as we observe neither of these two variables. Mothers reacted to acceptance of the vote in 2011 by increasing their labour income by 4 percentage points – positive anticipation effect – (see column 4 in Table 1.4). The final implementation of the childcare reform in 2014 increased maternal labour income by 7 percentage points. In contrast to the anticipation effect for employment,

point estimate for labour income lose significant as soon as I include additional controls into the empirical specification (see column 5 in Table 1.4). The policy effect of 6 percentage points still remains significant. Including municipality time trends, however, removes a lot a variation in the data, such that both effects lose significance (see column 6 in Table 1.4).

Table 1.4: Effect of Childcare Reform on Maternal Labour Market Outcomes

	Employment			Income		
	(1)	(2)	(3)	(4)	(5)	(6)
ANT	0.03***	0.03***	0.02**	0.04**	0.02	0.02
	(0.00)	(0.00)	(0.01)	(0.01)	(0.01)	(0.02)
POL	0.06***	0.05***	0.04***	0.07***	0.06***	0.06
	(0.00)	(0.00)	(0.01)	(0.01)	(0.01)	(0.03)
Observations	72839	72839	72839	55916	55916	55916
R-squared	0.007	0.035	0.036	0.024	0.085	0.086
Number of Clusters	168	168	168	168	168	168
Controls		✓	✓		✓	✓
MNC Time Trend			✓			✓

Notes: This table shows the coefficients of the baseline difference-in-differences model for employment (columns (1)-(3)) and labour income (log) (columns (4)-(6)) according to my model (equation1.1). I control for mother's age, number of children and age of the youngest child in columns (2),(3), (5) and (6), linear time trend on municipality level are added in columns (3) and (6). Robust standard errors clustered on municipality-year level are shown in parentheses. All estimations include time and municipality fixed effects. The sample includes all couples with children aged 0-4 in the city of Bern (treatment unit) and other municipalities (control unit) within the core zone of the agglomeration area Bern over the period 2006-2017. Significance levels are shown as: *p< 0.05, **p< 0.01, ***p< 0.001.

Figure 1.2 plots the event study coefficients and the corresponding 95% confidence intervals. All event study coefficients in the pre-reform period $2006 - 2010$ are not significantly different from zero, it, therefore, provides evidence that maternal employment and labour income had evolved the same in the treatment and control groups before the vote in 2011. Our control group is a valid counterfactual for our treatment group for both labour market outcomes and any deviation in the post-(vote)reform period is attributed to the change in the childcare policy.

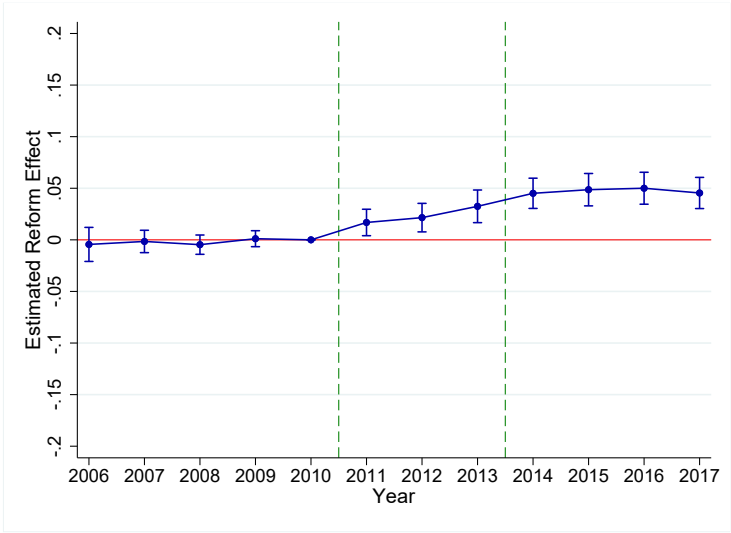
As already indicated by the positive anticipation effect ANT within our difference-in-difference model, we now clearly see that the anticipation effect

for maternal employment already kicked in in the year of the vote, 2011 (see Figure 1.2a). The event study coefficient is (already) for the year 2011 significantly different from zero and increases for later years. The policy effect flattens 2 years after the childcare reform has been introduced.

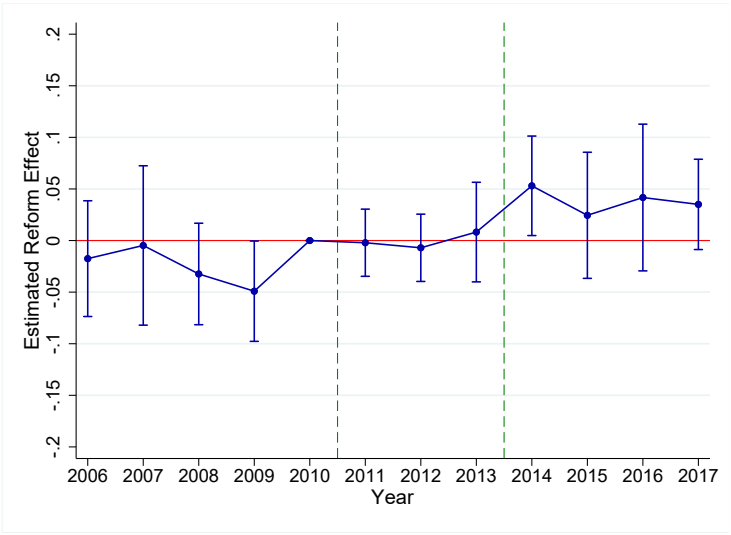
For labour income, most of the event study coefficients are not significantly different from zero (see Figure 1.2b). In line with our baseline difference-in-difference model estimates, our estimates move up into positive territory in the post-vote(reform) period, but remain insignificant.

To summarize my baseline results, the introduction of the childcare voucher system had a significant positive impact on maternal employment rates in the anticipation as well as in the policy phase. This implies, that some mothers managed to react shortly after the popular vote had been accepted and adjusted their employment already in the very short run. Based on the literature on child penalty, approximately 10 percent of women quit their jobs at birth of first child (Kleven et al., 2019a). In our setting, mothers in the city of Bern, were less likely to quit their jobs – let's say due to childbirth – compared to those mothers living in the surrounding municipalities. We will see blow, that our effects are driven by those mothers with first child, and that therefore the new upcoming childcare policy regime had prevented new mothers to quit their jobs. The initial positive effects of the childcare reform on maternal labour earnings are not robust and diminish if municipality time trends are included in the specification.

Figure 1.2: Effect of Childcare Reform on Maternal Labour Market Outcomes



(a) Employment



(b) Labour Income

Notes: The graphs show the estimated effects and corresponding 95% confidence intervals of the introduction of the childcare voucher system on employment (left) and log income (right) according to the event study model (equation 1.2). I control for mother's age, number of children and age of the youngest child. Furthermore, time and municipality fixed effects are included in the estimations. Robust standard errors are clustered on municipality-year level. The sample includes all couples with children aged 0-4 in the city of Bern (treatment unit) and other municipalities (control unit) within the core zone of the agglomeration area Bern over the period 2006-2017.

1.4.2 Heterogeneity

To further assess the effect of the childcare policy change on maternal labour market outcomes, it is crucial to know who and by how much reacted to the (upcoming) childcare reform. The childcare policy reform increased number of (subsidised) childcare spaces and facilitated access to subsidies for eligible parents. Given that eligibility is linked to total household income, I might expect different effects along household income levels. Furthermore, some mothers managed to react in the very short run to the upcoming policy change. It is interesting to assess, whether ability to react in the short run is linked to different level of labour market attachments.

Household Income. Given that eligibility for subsidies is linked to income (and wealth) of both parents, I expect the effect of the childcare reform on labour market outcomes to be larger for mothers in low(er)-income household. I group households into income quintiles dependent on total taxable income of each household. Ranking into quintiles is done in each year and for each municipality. The coefficients of the difference-in-differences model (equation 1.1) are then estimated for each quintile.

The estimates of the anticipation effect (ANT) and the policy effect (POL) of the difference-in-differences estimation for each income quintile are plotted in Figure 1.3. The effects ANT and POL are more pronounced and statistically different from zero for low(er)-income households in the first and second quintile of the income distribution compared to those in the fourth and fifth quintile. The childcare reform did not have any effects on labour market behaviour of high-income households. In line with my results from the baseline difference-in-difference estimation the policy effect POL is larger in size in each income quintile compared to the anticipation effect ANT.

If we look at employment (see Figure 1.3a), the strongest effect of the childcare reform on maternal employment is perceived by households in the second quintile, they took advantage of the childcare reform and increased their employment by a sizeable amount of 15 percentage points. Even though, one might expect that low-income households to benefit the most from access to subsidized childcare and that the employment effect to be the strongest in the first quintile, they might have limited choice concerning labour market participation. Either because both parents contribute to total household budget and maternal labour income is essential independent of childcare policies. Or because of limited access to the labour market due to low education.

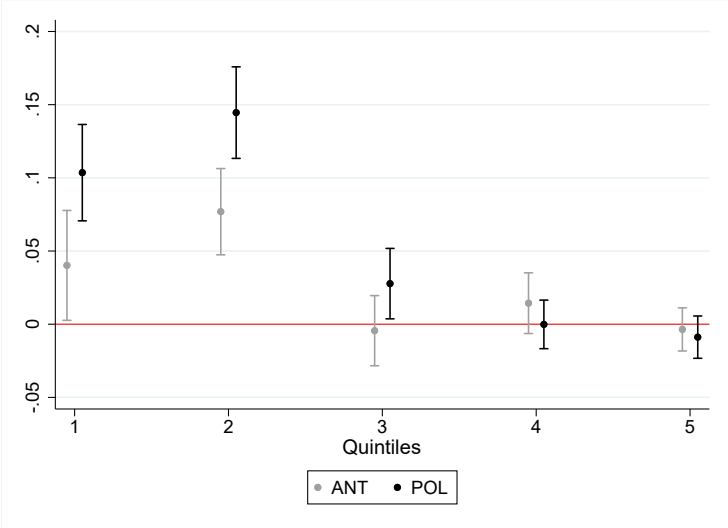
Turning to labour income (see Figure 1.3b), both effects (ANT and POL) on maternal labour income decrease with increasing income quintile. This pattern is in line with the general expectations: those household, which

benefit the most from the policy also react the most.

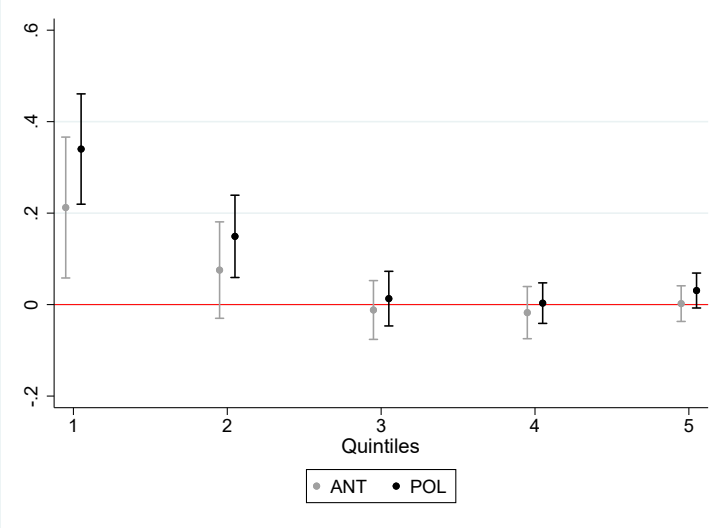
In a next step, I run the event study model for different income groups. This allows me to track the differences between income groups in each year and to test the parallel-trend assumption in the pre-treatment period. Due to graphical reasons, I group mothers into two (and not five as before) income groups; below and above median household taxable income. Grouping into income groups is defined in each year and municipality. I run the event study model for each income group and the event study coefficients and the corresponding 95% confidence intervals are plotted in Figure 1.4. The coefficients show that the childcare reform encourage labour market participation of mothers belonging to below-median income households, while mothers in above median income households do not react at all to the policy change. The effects are sizeable: the childcare policy reform increased maternal employment rates of below-median income households by 10 percentage points.

Turning to the parallel-trend assumption in the pre-treatment period, not all event study coefficients are different from zero if looking at labour earnings. Low(er)-income household experienced a larger drop in maternal labour earnings in the years 2008 and 2009 in the city of Bern compared to the surrounding municipality. This drop in these years might be explained by the occurrence of the great recession by which the city of Bern was hit harder than smaller municipalities. Jobs in the city of Bern were more affected from the great recession than jobs in the surrounding areas. Furthermore, mothers in low-income household, which most likely have low-paid jobs were more affected compared to mothers in high-income households, having high-paid jobs. Another explanation is that, individuals with high-paid jobs are more likely to commute from the surrounding area to the city, what explains the same evolution of labour earnings between control and treatment units in above-median income households during the great recession. Compared to that, the event study coefficients for employment of mothers in both income groups are not significantly different from zero, i.e. employment evolve the same in the treatment and the control unit. Employment rates were not hit more severely in the city of Bern during the great recession. One explanation is the broad expansion of short-time work compensation what guaranteed income payments of 80% without loosing the job. This might justify the similar evolution in the employment rates of mothers in the city of Bern and the surrounding municipalities during the great recession.

Figure 1.3: Heterogeneity: Labour Market Effects Along Taxable Income Distribution



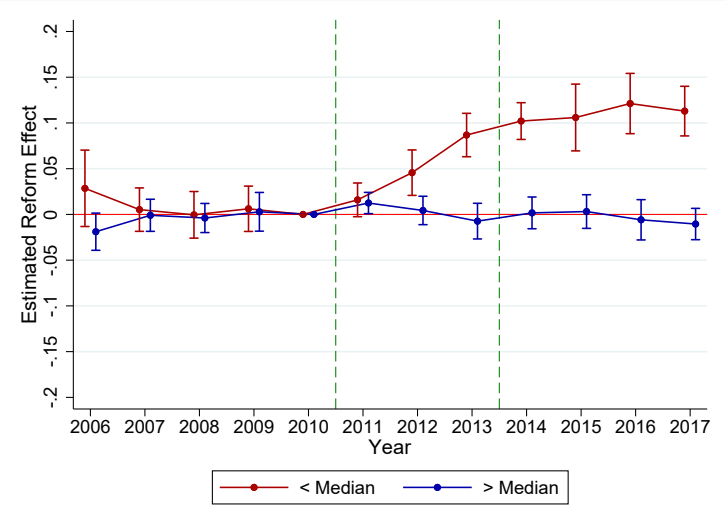
(a) Employment



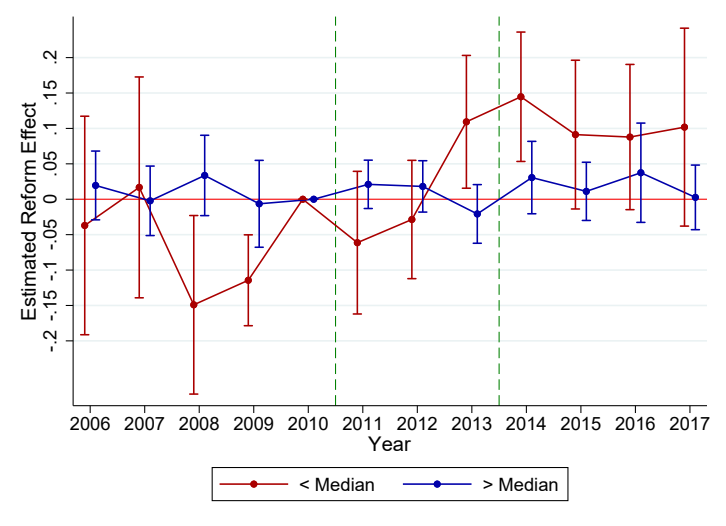
(b) Labour Income

Notes: These graphs show the effect of the childcare policy reform on maternal labour income (left graph) and employment (right graph). They show the estimated coefficients ANT (in grey) and POL (black) of the difference-in-differences model (equation 1.1) for each income quintile. Grouping into quintiles are done according to total household taxable income of married couples in each year and municipality. All estimations include controls, municipality and year fixed effects. The sample includes all couples having kids aged 0-4 in the city of Bern (treatment unit) and other municipalities (control unit) within the core zone of the agglomeration area Bern over the period 2006-2017.

Figure 1.4: Heterogeneity: Labour Market Effects Across Household Taxable Income



(a) Employment



(b) Labour Income

Notes: The graphs show the estimated effects and corresponding 95% confidence intervals of the introduction of the childcare voucher system on maternal employment (left) and log income (right) according to the event study model (equation 1.2). I control for mother's age, number of children and age of the youngest child. Furthermore, time and municipality fixed effects are included in the estimations. Robust standard errors are clustered on municipality-year level. The sample includes all couples with children aged 0-4 in the city of Bern (treatment unit) and other municipalities (control unit) within the core zone of the agglomeration area Bern over the period 2006-2017. The sample is grouped according to total taxable household income into below (red) and above (blue) the median in each year and municipality.

Number of Children. Another dimension I look at is the number of children. One might expect labour market attachment to depend on number of children, i.e. having more children is associated with lower maternal labour market attachment (Angrist and Evans, 1998).

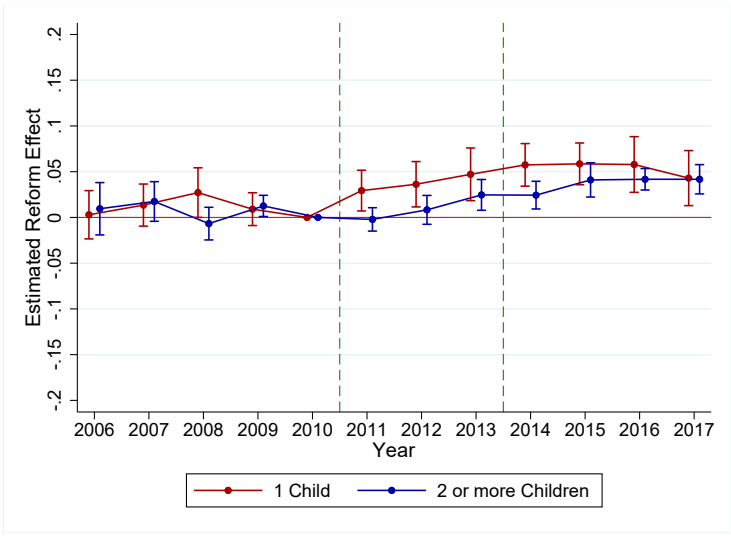
To exploit this variation in labour market attachment, I split my sample into two groups. The first one includes all mothers having one child and the second group contains mothers having two or more children. In line with the approach in the previous section, I run the event study model for both sub-samples and the coefficients are plotted in Figure 1.5.

The parallel-trend assumption in the pre-treatment period is again fulfilled for employment and labour earnings. Turning to employment, the anticipation effect (ANT) is clearly driven by mothers with only one child. These mothers are probably still in the labour market at birth of first child and decide whether to quit the job or stay employed. Since eligibility criteria for a childcare voucher has changed, they are more likely to stick to the current employment. This allows them to make use of the voucher as soon the new policy has been implemented.[15] Mothers with two or more children do not adapt their labour market participation before the policy was implemented. The positive effects of the childcare reform on their employment rates realize just right after the policy has been implemented. The effects on labour earnings are less pronounced than for employment. The event study coefficients move into positive territory in the post-reform period for mothers with only one child, indicating some positive policy effects. However, they are not significantly different from zero throughout all post-treatment years.

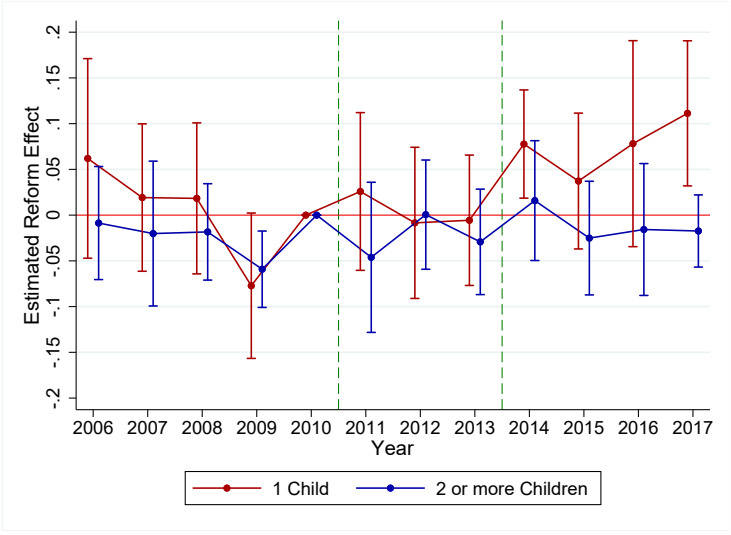
Overall the effect of the policy change on employment and labour income is more pronounced for mothers with only one child than to those having more children. One explanation is their tighter labour market attachment and their possibility to adjust in the short run.

[15]The voucher system was first planned to be implemented on 01.01.2013. The city of Bern defined the regulations for the childcare system in the aftermath of the vote. A non-partisan committee then launched the referendum "Gleich lange Spiesse für stadtische udn private Kindertagesstätten", what finally led to a delay in the implementation of the childcare voucher system of one year.

Figure 1.5: Heterogeneity: Labour Market Effects Across Number of Children



(a) Employment



(b) Labour Income

Notes: The graphs show the estimated effects and corresponding 95% confidence intervals of the introduction of the childcare voucher system on maternal employment (left) and log income (right) according to the event study model (equation 1.2). I control for mother's age and age of the youngest child. Furthermore, time and municipality fixed effects are included in the estimations. Robust standard errors are clustered on municipality-year level. The sample includes all couples with children aged 0-4 in the city of Bern (treatment unit) and other municipalities (control unit) within the core zone of the agglomeration area Bern over the period 2006-2017. The sample is grouped according to number of children into mothers having one child (red) and 2 or more children (blue).

1.5 Robustness Checks

1.5.1 Triple Difference Estimation

One limitation of the estimation so far is that any Bern-specific shock, which coincides with the year of the policy change, but is unrelated to childcare reform might bias my estimates. Such confounding factors might be other reforms, which happened during the same time period as the childcare reform, or location-specific shocks on demand or prices. In order to address this issue and to rule out that other confounding factors drive my results, I include individuals, which are not affected by the policy but living in the city of Bern as an additional unit in my control group. Most of the children older than 6 go either to kindergarten or to school and are not be affected by this policy change. I take the age of the youngest child as an additional dimension and run a triple difference estimation. My control group now also contains parents with older children (aged 6 and older) living in the core zone of the agglomeration region Bern, which includes the city of Bern.

In doing so, I exploit variation along three dimensions in my triple difference estimation: difference among time before and after the policy was introduced, between parents living in treatment and control municipalities and between parents with young (age 0-4) and older (age 6 and older) children. Since I need 2 additional years in order to capture all children with age 6 and older compared to my baseline estimation, my time period shrinks to 2008-2017.
The estimation equation takes the following form:

$$y_{iast} = \lambda_{as} + \delta_{at} + \gamma_{st} + \beta_3(ANT \times TR \times AGE) + \beta_4(POL \times TR \times AGE) + \beta_x X_{iast} + \epsilon_{iast} \quad (1.3)$$

Where a now indicates the age-group of the youngest child of each parent i living in municipality s. AGE is a dummy equal to one, if the child is between 0 and 4 years old and zero otherwise (child is 6 or older). Further, I include interaction terms between age group of the child and municipality λ_{as}, age group and time δ_{at}, and municipality and time γ_{st}. The interaction terms capture differences in labour outcome variables between parents with old and young children across municipalities λ_{as} or across time δ_{at} and differences over time in each municipality γ_{st}. Here the main coefficients of interest are β_3 and β_4. Control variables are the same as in the baseline estimation, these are parent's age and number of children.

To check the main identification assumption that the treatment and control group follow the same pre-treatment trend, I modify my difference-in-

differences model to a event study model, similar to what is done in the baseline estimation.

$$y_{iast} = \lambda_{as} + \delta_{at} + \gamma_{st} + \sum_{t=2006}^{2017} \beta_t (I[year = t] \times TR \times AGE) + \beta_x X_{iast} + \epsilon_{iast} \tag{1.4}$$

Table 1.5: Robustness Check: Effect of Childcare Reform on Maternal Employment and Labour Income

	Employment		Income	
	(1)	(2)	(3)	(4)
ANT	0.04***	0.04***	0.06**	0.06***
	(0.00)	(0.00)	(0.02)	(0.02)
POL	0.06***	0.06***	0.08***	0.09***
	(0.00)	(0.00)	(0.02)	(0.02)
Observations	152789	152789	121608	121608
R-squared	0.006	0.024	0.020	0.047
Number of Clusters	280	280	280	280
Controls		✓		✓

Notes: This table shows the coefficients of the triple differences model for employment (columns (1)-(2)) and labour income (log) (columns (3)-(4)) according to my model (equation 1.3). I control for mother's age and number of children in columns (2) and (4). Robust standard errors clustered on municipality-year level are shown in parentheses. All estimations include time, municipality and age fixed effects. The sample includes all couples with children aged 0-4 in the city of Bern (treatment group) and other municipalities (control group) of the core zone of the agglomeration area Bern over the period 2008-2017. I include all parents with children aged 6 and older in the core zone as an additional control unit. Significance levels are shown as: *p< 0.05, **p< 0.01, ***p< 0.001.

My results in Table 1.5 suggest that the change in the childcare system in the city of Bern increased maternal employment by 6 percentage points. The effects of the policy reform on labour earnings is 9 %. Both point estimates remain significant after including controls in the regression. If I compare those coefficients to the baseline difference-in-difference estimations, both effects (anticipation and policy effect) are larger in size and the effect on labour earnings remain significant in all specifications. Those positive effects

found in my baseline estimation are, therefore, robust and not are not driven by any location-specific shocks.

Looking at the point estimates and the corresponding 95% confidence interval of the event study model plotted in Figure 1.A.6, I conclude that the parallel trend assumption is fulfilled and that the control group is a valid counterfactual in the triple difference estimation.

1.6 Discussion

1.6.1 Welfare Analysis

One important question is whether highly subsidised childcare does finally improve welfare. Assessing the impact of a policy change, however, has multiple dimension. I discuss the direct welfare effects with a standard cost-benefit analysis and discuss some welfare implications through long term adjustments in outcomes.

Cost-Benefit-Analysis. A standard cost-benefit analysis compares the present values of costs with the present value of gross benefits (Fredriksson et al., 2012). Based on this concept, I define present value of costs of the childcare reform as the additional costs born by the government due to larger amount of the budget spent on childcare subsidies. Gross benefits are specified as labour earnings generated through additional labour market participation of mothers. Within a very simple back-of-an-envelope calculation, I subtract additional costs born by the government from the gross benefits due to higher maternal labour market participation and calculate net benefits of the policy change. All calculations are done on an annual basis for one specific year, 2017.

The present value of costs are direct governmental spendings for subsidies to the parents for the year 2017. I can calculate the subsidy rate of each (married) household for this specific year 2017, dependent on their income and wealth declared in their tax declaration in the year 2016 and their family size in 2017. This subsidy rate indicates the share of childcare costs, which are covered through subsidies (see Figure 1.A.7).[16] The maximum amount of subsidies was 150 CHF per day in the year 2017 if a child was younger than 18 months and 100 CHF for children older than 18 months. With

[16]The subsidy rate is calculated by the level of eligible income, where eligible income is a sum of parental income plus 5% of parental wealth minus a deduction dependent on family size. The subsidy rate is then a linearly interpolating between the maximum (160'280 CHF) and minimum level (42'970 CHF) of eligible income.

this information, I calculate the total amount of subsidies each household receive. To do so, I assume that each household send their children 2.5 days (according to the average occupancy rate) per week for 48 weeks[17] a year to childcare.

The present value of gross benefits of the reform are increased labour earnings in the year 2017 due to higher employment and prevented future wage losses. One year employment interruption, in general, has implications for future labour income. The literature has estimated that wage loss for a 1-year interruption is around 12% in all future labour market years, i.e. being one year out of the labour market reduces my potential earnings by 12% for all remaining years in the labour force (Adda et al., 2017). The underlying assumption is that women work till the age of 64. I calculate the present value of benefits of participating in the labour market in the year 2017 for all mothers in my baseline sample. This is done by adding up labour earnings in the year 2017 and discounted avoided earning losses (in the future) due to not being out of the labour force in the year 2017: $GrossBenefits = w + \sum_{t=0}^{64-age} \frac{0.12*w}{(1+r)^t}$, where w is maternal wage and r is the discount rate.[18]

So far, I have calculated the present value of gross benefits and the present value of costs for all mothers in my sample for the year 2017. The question now is, which mothers actually reacted to the policy change by increasing employment and would otherwise have remained unemployed in the year 2017 absent the reform. Put it differently, what are the additional costs, benefits, and finally, net benefits of this childcare reform. So, picking the right mothers is crucial in this cost-benefit analysis, and I do it based on my results in the previous sections. My results in the baseline estimations in section 1.4.1 and 1.4.2, show that the childcare policy reform increased maternal employment. So, the important implications are that the childcare reform *causally* increased maternal employment and we calculate net benefits only for those mothers, which were affected by the childcare reform. Absent the childcare reform, those mothers would take care of their children by themselves and, therefore, would have left the labour market. The results indicate that maternal employment increased by 5 percentage points in the policy period (see Table 1.4) and by 8 percentage points for the below-median income sample (see column 3 in Table 1.A.8). For the specific year 2017, the effect is roughly 10 percentage points (see event study coefficient for the year

[17]The maximum number of days for which subsidies are paid was fixed to 240 days per year in 2017 (Kanton Bern, 2017)

[18]I take a discount rate of 5 percent, according to the standard literature (Davis and von Wachter, 2011)

2017 in Figure 1.4a). Overall, there are no effects for high income households.

I, therefore, select those 10 percent of mothers from the below-median income household sample. Picking the 10 percent of mothers in the below-median income household sample depends on the amount of subsidies they receive. I assume that those mothers, which receive the largest amount of subsidies have the highest incentive to return to or remain in the labour market. To do so, I rank all mothers in the below-median income household sample according to the level of subsidies they would receive dependent on total income and wealth of both parents and pick the first decile with the highest amount of subsidies. Only for those selected mothers, I then calculate the net present value of benefits by subtracting costs from the present value of benefits. The cost-benefit analysis is, therefore, only done for those 10 percent of mothers belonging to below-median income households, which stayed in the labour market due to the childcare reform. They would have have left the labour market, absent the reform.

The present value of costs and gross benefits of the introduction of the voucher system is shown in Figure 1.A.8, where gross benefits (in blue) and costs (in red) are shown according to household eligible income (see y-axis). Costs exceed gross benefits if households with very low eligible send their children to childcare and receive subsidies. This might be explained by the fact that mothers in low-income households earn itself lower wages. In this case, present value of benefits is lower than the present value of costs, what finally generate negative net benefits. On average over all mothers selected within the 10% in the below-median income households, the present value of benefits (19600 CHF) exceed costs (17592 CHF) for the year 2017 by approx. 2000 CHF. Relating net present value of benefits to costs for this specific year yields a rate of return of 1.13 CHF, i.e. one additional franc invested for subsidies generates 1.13 CHF maternal labour earnings.

Long Term Outcomes. Higher maternal labour market participation has some further implications, which can not be captures by a simple cost-benefits analysis. First, gender diversity has been recognized to boost firm productivity and increase GDP (Zhang, 2020). Furthermore there are significant non-market production effects, if women are more likely to work in paid employment. This implies that they do less household work and the non-market production could move into market production. Finally, effects on child development has not taken into account. Subsidies for childcare allows families to earn higher income what might move children out of poverty. Children of families, which remain in poverty are more likely to get low education, being unemployed and commit a crime. High quality childcare can also have a direct effect on mental and physical health for children from dis-

advantaged background providing them better nutrition and human services. These long-term effects, however, are very difficult to identify and to estimate. By discussing such effects, I conclude that my cost-benefit analysis is very likely to underestimate the net benefits of access to subsidised childcare.

1.7 Conclusion

In this paper, I analyse the effect of the introduction of the childcare voucher system in the city of Bern on maternal employment and labour earnings. The policy change simplified access to subsidised childcare and linked eligibility for subsidies to parental employment rates. Using individual-level administrative data, I exploit variation in the childcare policy over time and municipalities within a difference-in-differences and event-study framework. My results show that the childcare reform significantly increased maternal employment by 4 percentage points. Positive effects on maternal labour market outcomes are especially driven by mothers in low and lower-middle income households (+8 percentage points), while mothers in high-income households did not react at all to the childcare policy reform. Furthermore, those mothers with only one child respond more strongly and in the short run to access to subsidies than mothers with two and more children. One explanation is the decreasing labour market attachment of mothers with increasing number of children.

The provision of subsidised childcare is an effective tool to increase maternal labour market participation, especially of those mothers in households at the lower tail of the income distribution. It is crucial how subsidies are designed. If subsidies are more target-oriented, it can create large incentives to adapt labour market outcomes already in the short run. In our case, (future) mothers already know in the year of the vote that eligibility for and provision of subsidies will change in the upcoming years and being employed or in education to become a new pre-request for subsidies. This already created incentives to stay in the labour market after the electorate voted in favour of this policy reform. Individuals are forward-looking, take all information into account and adapt their outcomes, since they benefit from acting before the treatment occurs. The cost-benefit analysis shows that access to subsidies pays out from a welfare perspective. One franc spend for subsidies creates 1.13 francs maternal labour earnings of low-income households. Providing childcare subsidies is an effective tool with redistributive character, generating larger welfare effects in the long run.

1.A Additional Tables and Figures

1.A.1 Tables

Table 1.A.6: Summary Statistics: Triple Difference Estimation

	Bern City		Core Zone	
	Pre	Post	Pre	Post
Earnings Mother (in 1000 CHF)	30.70	36.49	27.07	31.73
	(30.73)	(34.72)	(27.81)	(31.48)
Earnings Father (in 1000 CHF)	80.59	85.78	96.01	98.08
	(68.67)	(63.36)	(93.55)	(187.3)
Employment Mother	0.777	0.797	0.788	0.806
	(0.416)	(0.402)	(0.408)	(0.395)
Employment Father	0.915	0.918	0.947	0.941
	(0.278)	(0.274)	(0.224)	(0.235)
Share of Maternal Income	0.288	0.305	0.235	0.258
	(0.255)	(0.248)	(0.226)	(0.227)
Number of Children	1.682	1.655	1.727	1.673
	(0.856)	(0.917)	(0.856)	(0.917)
Age Mother	40.93	42.22	41.88	42.92
	(8.435)	(8.621)	(8.506)	(8.683)
Age Father	43.97	45.37	44.76	45.86
	(8.698)	(8.873)	(8.595)	(8.747)
Observations	40252	26599	53222	35597

Note: This table shows summary statistics for parents included in my triple difference estimation: Parents with 0-4 year-old children and with 6-year old and older kids. Pre refers to the pre-treatment period (2008-2013) and post shows the averages in the post-treatment period (2014-2017). Labour income of mothers and fathers are expressed in 2019 Swiss Francs.

Table 1.A.8: Robustness Check: Heterogeneous Labour Market Effects Across Income Groups

	< Median						> Median					
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
ANT	0.05***	0.04***	0.03	0.07	0.07	0.05	0.01*	0.01	0.01	0.01	-0.00	0.03
	(0.01)	(0.01)	(0.02)	(0.04)	(0.04)	(0.06)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.02)
POL	0.11***	0.10***	0.08**	0.17***	0.16***	0.13	0.01	0.00	0.01	0.02	0.01	0.06*
	(0.01)	(0.01)	(0.02)	(0.03)	(0.03)	(0.09)	(0.00)	(0.00)	(0.01)	(0.01)	(0.01)	(0.03)
Observations	29360	29360	29360	18915	18915	18915	43479	43479	43479	37001	37001	37001
R-squared	0.017	0.038	0.039	0.021	0.045	0.046	0.010	0.026	0.026	0.028	0.065	0.066
Number of Clusters	168	168	168	168	168	168	168	168	168	168	168	168
Controls		✓	✓		✓	✓		✓	✓		✓	✓
MNC Time Trend			✓			✓			✓			✓

Note: This table shows the coefficients of the difference-in-differences model for households with different household taxable income level (lower-median income level (1)-(6)) higher-median income level (7)-(12). Outcome variable are maternal employment (columns (1)-(3), (7)-(9)) and labour income (log) (columns (4)-(6), (10)-(12)) according to my model (equation 1.1). I control for mother's age and age of the youngest child in columns (2),(3),(5), (6), (8),(9),(11),(12), linear time trend on municipality level are added in columns (3),(6), (9) and (12). Robust standard errors clustered on municipality-year level are shown in parentheses. All estimations include time and municipality fixed effects. The sample includes all couples with children aged 0-4 in the city of Bern (treatment unit) and other municipalities (control unit) within the core zone of the agglomeration area Bern over the period 2006-2017. Significance levels are shown as: *p< 0.05, **p< 0.01, ***p< 0.001.

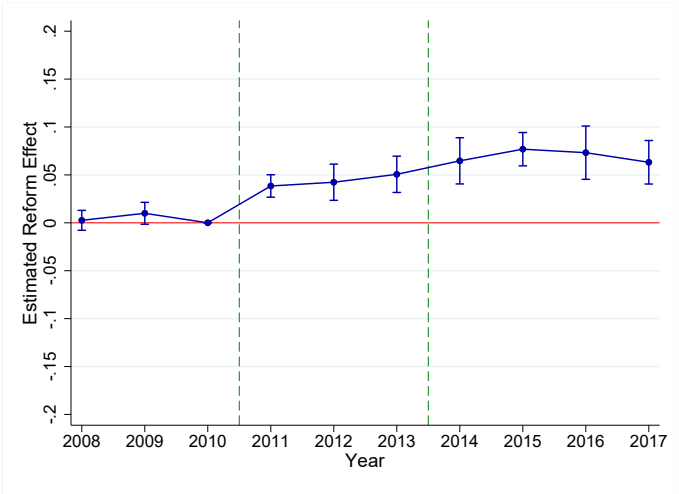
Table 1.A.9: Robustness Check: Heterogeneous Labour Market Effects Across Number of Children

	1 Child						2 and more Children					
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
ANT	0.04***	0.03***	0.03**	0.03	0.00	0.04	-0.01	-0.01	-0.01	0.01	-0.01	0.00
	(0.01)	(0.01)	(0.01)	(0.02)	(0.02)	(0.04)	(0.01)	(0.01)	(0.01)	(0.03)	(0.03)	(0.04)
POL	0.05***	0.04***	0.05**	0.09**	0.07**	0.14*	0.03***	0.02**	0.02	-0.00	-0.02	0.01
	(0.01)	(0.01)	(0.02)	(0.03)	(0.02)	(0.06)	(0.01)	(0.01)	(0.02)	(0.02)	(0.02)	(0.05)
Observations	25700	25700	25700	21036	21036	21036	25706	25706	25706	20374	20374	20374
R-squared	0.010	0.040	0.041	0.024	0.105	0.106	0.010	0.030	0.031	0.039	0.095	0.097
Number of Clusters	168	168	168	168	168	168	168	168	168	168	168	168
Controls		✓	✓		✓	✓		✓	✓		✓	✓
MNC Time Trend			✓			✓			✓			✓

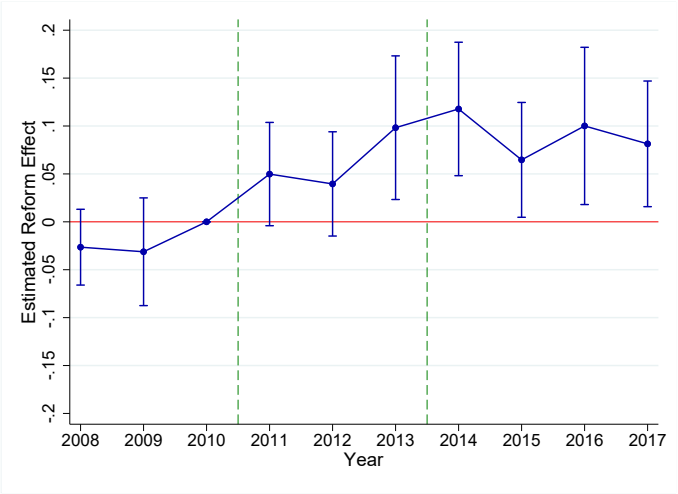
Note: This table shows the coefficients of the difference-in-differences model for households with different numbers of children (one child columns (1)-(6)) and two and more children columns (7)-(12). Outcome variable are maternal employment (columns (1)-(3), (7)-(9)) and labour income (log) (columns (4)-(6), (10)-(12)) according to my model (equation 1.1). I control for mother's age and age of the youngest child in columns (2),(3),(5), (6), (8),(9),(11),(12), linear time trend on municipality level are added in columns (3),(6), (9) and (12). Robust standard errors clustered on municipality-year level are shown in parentheses. All estimations include time and municipality fixed effects. The sample includes all couples with children aged 0-4 in the city of Bern (treatment unit) and other municipalities (control unit) within the core zone of the agglomeration area Bern over the period 2006-2017. Significance levels are shown as: *p< 0.05, **p< 0.01, ***p< 0.001.

1.A.2 Figures

Figure 1.A.6: Robustness Check: Effect of Childcare Reform on Maternal Income and Employment



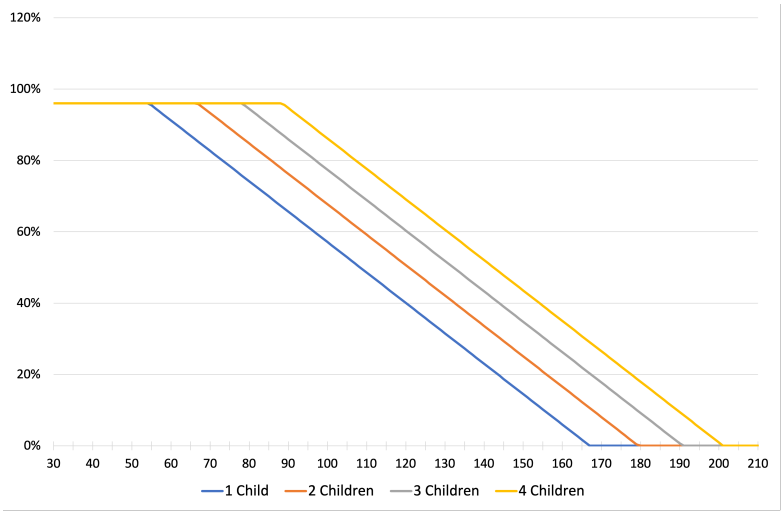
(a) Employment



(b) Labour Income

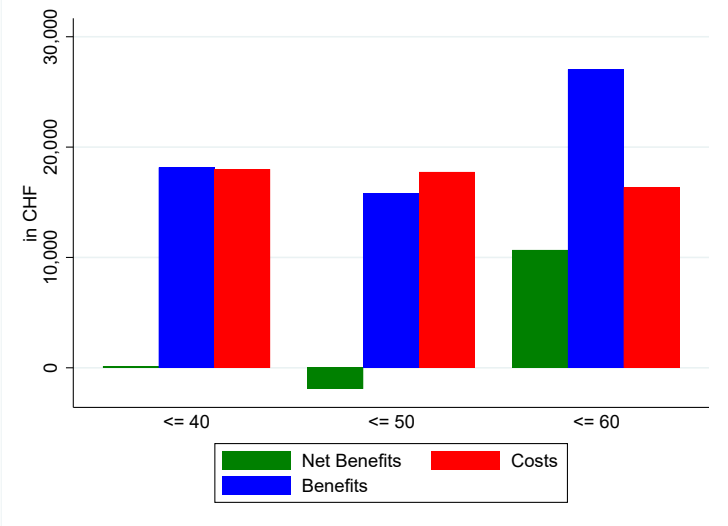
Notes: The graphs show the estimated effects and corresponding 95% confidence intervals of the introduction of the childcare voucher system on employment (left) and log income (right) according to the event study model (equation 1.4). I control for mother's age and number of children. Furthermore, time, municipality and age fixed effects are included in the estimations. Robust standard errors are clustered on municipality-year level. The sample includes all couples with children aged 0-4 in the city of Bern (treatment group) and other municipalities (control group) within the core zone of the agglomeration area Bern over the period 2008-2017. I include all parents with children aged 6 and older in the core zone as an additional control unit.

Figure 1.A.7: Subisidy Rate Along Total Income Distribution, Year 2017.



Note: This graph shows the subsidy rate dependent on total income (in 1000 CHF). Total income of each household is calculated by adding up earnings (from labour and selfemployment) of both parents and 5% of net wealth (total wealth minus depth). The subsidy rate for each household is calculated by total income minus a deduction for household size.

Figure 1.A.8: Welfare Analysis: Cost-benefits Calculation



Notes: This figure shows benefits, costs and net benefits of the introduction of the childcare voucher system grouped according to household eligible income (in 1000 CHF) for the year 2017. Costs include total amount of subsidies households receive in a given year. Benefits is calculated by adding up yearly labour earnings and net present value of avoided earnings losses. The sample include 10 percent of married households with children aged 0 to 4 in the city of Bern, which received the highest amount of childcare subsidies.

Chapter 2

Intergenerational Mobility Along Multiple Dimensions

joint with **Isabel Z. Martìnez**

2.1 Introduction

Studies on intergenerational mobility aim at understanding how strong the relationship is between the socioeconomic status of parents and children (Becker and Tomes, 1979, 1986; Solon, 1999; Black and Devereux, 2011; Chetty et al., 2014b, 2019). The strength of this relationship is typically seen as an indicator of (in)equality of opportunity. In practice, most studies focus on a specific outcome, such as earnings or education, to measure intergenerational mobility. It is, however, not a priori clear which measure of intergenerational mobility one should use, nor whether one single outcome fully captures the transmission of economic status. Mobility may be particularly high in one dimension but low in another. One should, therefore, be cautious in drawing conclusions about a society's overall rate of intergenerational mobility based on only one single measure. Transmission mechanisms may be different for different outcomes and for different groups, and they may have evolved differently over time.

To address these issues, we study intergenerational mobility in Switzerland for the 1967–1982 birth cohorts using longitudinal data linked from several administrative registers, which covers the universe of Swiss residents. We shed light on intergenerational mobility along four dimensions: income,

Acknowledgements: We thank all the participants of the Brown Bag seminar (University of Bern).

wealth, education, and occupation. To understand differences in social mobility in different outcomes and put them into context, we present comparable measures of relative mobility and absolute upward mobility. In a second step, we look at the rate of mobility among subgroups by gender and migratory background.

We find that labor income mobility is particularly high in Switzerland when compared to other countries. In a rank-rank regression specification we measure the rank-rank slope (RRS) (Chetty et al., 2019), a 10 percentile increase in parent rank is associated with an increase of 1.38 percentiles in a child's rank on average. In comparison, this rate amounts to 1.82 percentiles in Sweden (Heidrich, 2017), 2.5 percentiles in Italy (Acciari et al., 2019), and 3.41 percentiles in the U.S. (Chetty et al., 2019).[1] For wealth, we find a somewhat lower, but still high mobility, with a RRS of 2.66. For comparison, Adermon et al. (2018a) estimate a RRS of 3 for early cohorts in their sample, which increases to 3.9 for the later generation. Note however, that our wealth mobility estimate likely constitutes a lower bound of the RRS—i.e., true wealth mobility may be somewhat lower in Switzerland—due to the way we measure wealth (see Section 2.4 for details). To fully compare mobility across different socioeconomic outcomes, we turn to the concept of absolute mobility, as proposed by Chetty et al. (2019). This measure calculates the expected rank of children from families at any given percentile of the parent distribution. More specifically, we focus on absolute upward mobility (AUM): the expected rank of children whose parents are at the 25th percentile of the distribution (i.e., the median of the bottom half of the distribution). Such a measure is not only better suited for comparisons of population subgroups (Asher et al., 2021). Based on a new approach by Novosad et al. (2020), this measure can also be calculated for education, a categorial variable for which ranks are typically not well-defined.

Our findings again suggest that overall, AUM in Switzerland is very high for earnings but low for education and occupation mobility. A child growing up in a family at the 25th percentile of the parent earnings distribution can expect to reach the median on average. This is considerably higher than findings for the U.S., where white children with parents at $p = 25$ reach an income rank of 45 on average. Black children even only reach rank 33. For wealth, we find an AUM at $p = 25$ of 41. Due to the way the wealth data is structured, we take this as an upper bound of wealth mobility (see Section 2.4 for details). In the case of education, absolute

[1]Note that the income definition differs slightly across studies. While we only consider earnings from employment, self-employment, as well as unemployment and disability benefits, Chetty et al. (2019), and Acciari et al. (2019) use total pre-tax income, including capital incomes

upward mobility is low. A child whose parents are at the 25th percentile of the latent parent education distribution, can expect to reach a percentile between 29 and 41. Similarly, the AUM for occupational status (measured by the International Socio-Economic Index of Occupational Status, ISEI, (Ganzeboom et al., 1992)) is 36.

Turning to different subgroups, we find important differences in social mobility rates (measured by AUM) depending on the outcome used. For income, we find considerable differences between sons and daughters, with an expected rank of 64 and 36, respectively. Similarly, we find that daughters experience much lower educational mobility than sons. In occupational status, however, daughters reach slightly higher ranks than sons. Differences between second-generation immigrants (children with at least one foreign-born parent) and natives are largest for occupation status, where the former with a parent at $p = 25$ can expect to reach rank 40 on average, compared to 36 for natives. Children of foreign-born parents also have somewhat higher AUM in education, but lower AUM in wealth than natives. In contrast, we find hardly any difference in expected income ranks between the two groups.

We take these results as evidence in favor of our hypothesis that mobility measures based on a single outcome do likely capture the full picture of intergenerational mobility in a country, and one should be careful when drawing conclusions about equality of opportunity within and across countries.

The main contribution of this paper is that we analyze intergenerational mobility for a broad range of outcomes, rather than focusing on only one dimension. We mainly relate to seminal papers and apply it to all four dimensions of intergenerational mobility: income, wealth, education and occupation. To the best of our knowledge, no prior work has studied all four dimensions of mobility together and has provided comparable measures across all outcome variables.

More broadly, our paper contributes to different strands of the literature on intergenerational mobility. First, it contributes to the literature on intergenerational *income mobility*. In economics, many studies have focused on income as proxy for socioeconomic status (see Solon, 1999; Black and Devereux, 2011; Jäntti and Jenkins, 2015, for an overview of the literature). The seminal work by Chetty et al.; Chetty et al. (2014a; 2014b) has used fine-grained individual-level register data, to uncover trends in income mobility within the U.S. (Chetty and Hendren, 2018) and for different population groups (Chetty et al., 2019). The authors find that intergenerational mobility in the U.S. is low by international standards, but there are large differences across regions and between blacks and whites. (Acciari et al., 2019) find similar results of low mobility rates for Italy. Most closely related to our work is the recent paper by Chuard and Grassi (2020). Using the same longitu-

dinal earnings register data, they study intergenerational income mobility in Switzerland and within different Swiss regions. Our results on income mobility are, therefore, almost identical to theirs and confirm that Switzerland has high intergenerational income mobility. [2]

Second, we are also the first to study intergenerational *wealth mobility* in the Swiss context. In general, evidence on the intergenerational transmission of wealth is scarce due to limited access to wealth data, since only a few countries (including Switzerland) levy taxes on wealth. Based on register data, Bourdieu et al.; Garbinti and Savignac (2019; 2020) present evidence for France, Boserup et al. (2018) for Denmark and Adermon et al. (2018b) for Sweden. Studies for the US, based on survey data, find rather high parent-child wealth elasticity i.e. low intergenerational wealth mobility (Charles and Hurst, 2003).

Third, this is the first study on *education mobility* in Switzerland providing relative measures of intergenerational mobility. Previous work study intergenerational education mobility in Switzerland by analyzing transition probabilities along limited number of educational categories for the overall population and for subgroups (Bauer and Riphahn, 2007). This method, however, face some major limitations since it does not account for the unequal distribution across categories. Furthermore, it does not correct for changes in the underlying education distribution. To come up with comparable measures across all four dimensions and to cope with the limitations in previous work, we apply a novel rank-based approach developed by Novosad et al. (2020) and Asher et al. (2021), we are the first applying the new method in the Swiss context. More broadly, our study relates to previous work on education mobility. Because data availability on linked parent-child income or wealth has typically been limited, especially in developing countries, many studies have focused on education to measure intergenerational mobility and equality of opportunity (e.g., Black et al. (2005) for Norway; Wantchekon et al. (2015) for Benin; Card et al. (2018) and Derenoncourt (2019) for the U.S.; Alesina et al. (2021) for African countries; see Black and Devereux (2011) and Asher et al. (2021) for an overview).

Finally, we are the first to study *occupation mobility* in Switzerland based on longitudinal register data covering the entire population. Existing studies typically faced considerable data limitations, as they were based on surveys, asking participants to recall their father's occupation when they were young, and in most cases excluded the mother (examples include Falcon, 2012; Falcon and Joye, 2015; Jann and Combet, 2012). Also, these studies typically use

[2] We slightly deviate from some definitions in Chuard and Grassi (2020), e.g., as we use parental income (thereby following Chetty et al., 2014b,a) instead of father's income only.

a limited number of occupational categories and analyze, similar to education mobility, transition probabilities along these categories. Instead, we focus on measuring the persistence of socioeconomic *rank* across generations. Building on the literature on intergenerational transmission of occupation status, which has a long tradition in the sociology literature (Blau and Duncan, 1967; Hauser et al., 1975; Rosenfeld, 1978; Ganzeboom et al., 1991; Ermisch and Francesconi, 2004; Mazumder and Acosta, 2015), we will rely on work which has put large effort in creating indices aiming at capturing socioeconomic status attributed to a given occupation on a continuous scale, in particular Ganzeboom et al.; Ganzeboom and Treiman (1991; 2010). Using this index allows us to estimate relative measures for occupation mobility, what has not been done so far for Switzerland.

The remainder of this article is organized as follows. In Section 2.2, we provide some theoretical background on intergenerational mobility. Sections 2.3 and 2.4 present the mobility measures we use and the data, respectively. We present the results in Section 2.5. Section 2.6 concludes.

2.2 Theoretical Background

We base our empirical analysis on the theoretical model of the transmission of earnings, assets, and consumption from parents to descendants by Becker and Tomes (1986). Parents are assumed to maximize the welfare of children (an extension of Becker and Tomes, 1979, where parents maximize their offspring's income). Each family has its own cultural and genetic "infrastructure", which Becker and Tomes call endowment or vector of endowments. Endowment entails genetics and ability, as well as a family's culture, e.g., emphasis on childhood learning. Endowments are transmitted by a stochastic linear or Markov equation, and it is assumed that parents cannot invest in their children's endowment. But parents must decide how to allocate their total bequest to children between i) human capital investments and ii) assets they pass on to their children. Parent's expenditures are then determined on the one hand by the abilities of children (which are assumed to be observed by the parents), and on the other hand by parental incomes, wealth, preferences, and fertility. In addition, certain exogenous factors such as public expenditures on education influence the optimal level of parental investment in their children. Since earnings are practically the sole income for most persons, parents influence the economic welfare of their children primarily by influencing their potential earnings. Hence the main channel for the rise and fall of families goes through investments in human capital.

The Becker and Tomes (1986) model leads to several predictions about the correlation of these different factors across generations. In addition, sociological theories also presume a direct link between occupational status of parents and their children.

1. Parental and child *education* are correlated through endowments, which include preferences or a taste for education. But more importantly, because higher ability raises the marginal effect of family investments in the production of human capital, parents of high-ability children will invest more in their offspring's human capital according to the model, reinforcing differences in child ability.[3].
   A counter-thesis, brought forward by Behrman et al. (1982) is that parents try to compensate for lower ability of their children by investing more in them. Using data from Ethiopia, Fan and Porter (2020) find support for such a negative correlation between endowment and parental investments.

2. *Occupation* is not considered by Becker and Tomes (1986). However, especially in sociology there is a long tradition in studying intergenerational mobility in social status based on occupational mobility (Blau and Duncan, 1967; Hauser et al., 1975; Rosenfeld, 1978; Ganzeboom et al., 1991; Ermisch and Francesconi, 2004; Long and Ferrie, 2013; Mazumder and Acosta, 2015). Results indicate, that there is non-negligible correlation in occupation between parents and children. In addition, occupation may have an effect on earnings beyond the differences in educational attainment. Therefore, we include occupation in our list of outcomes which serve as indicators of socioeconomic well-being.

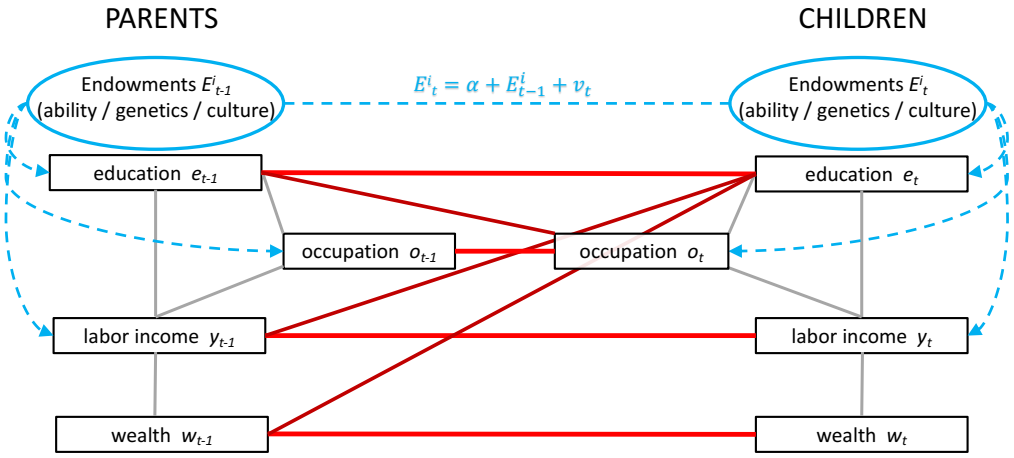
3. Parental and child *income* are correlated through the inheritability of endowments. In the presence of credit constraints, there is even a direct link between parental and child earnings, as in that case the amount of parental investment—which has a positive impact on child productivity and earnings—depends directly on their earnings (Becker and Tomes, 1986, p.S12, eq. (14)). Other channels of a direct effect would be through parent's social capital, where contacts raise children's opportunities (Atkinson, 1983; Coleman, 1988), or when parents receive utility directly from the human capital of their offspring. Presumably,

[3]In addition, richer families "also have better than average endowments, which raises the wealth-maximizing investment in human capital by richer families above that by poorer families" (Becker and Tomes, 1986, p.S15)

these latter channels are more important in richer families (Becker and Tomes, 1986, p.S14).

4. *Wealth* has a direct link from parents to children, as parents can choose to bequest some of their assets to their children. In addition, parental wealth influences parental investments in children's education. According to Becker and Tomes (1986), most bequests to children are found in a relatively small number of richer families, and the ratio of assets to human capital of children increases in parents' wealth.

Figure 2.1: Graphical Model Representation of Intergenerational Mobility



Notes: This figure shows a graphical representation of intergenerational mobility. Dashed arrows in light blue show effects from unobservable background factors, namely ability, genetics, family environment and the like. Solid gray lines indicate how education and occupational choices affect income and wealth within each generation. Solid red lines show effects running from parents to children.

Figure 2.1 shows a graphical model representation of the complex relationships between education, occupation, income, and wealth within and between generations. Our interest lies in the links between parental and child outcomes (red lines). We focus on earnings, which is also the income variable we can measure in our data. The endowments are unobservable background factors (shown as dashed arrows in light blue) such as ability, genetics, and the family environment, which are correlated across generations. Within each generation, education and occupation are correlated, affecting earnings, which in turn affect wealth (solid gray lines). For simplicity, we assume that parental wealth is a function of their earnings, thus abstracting from, e.g.,

grand-parental wealth,[4] or the effect a particular occupation may have on wealth accumulation.

2.3 Measuring Intergenerational Mobility

The graphical representation in Figure 2.1 visualizes the different correlations and nested models within a system of equations. Note, however, that estimating the entire system of equations shown in Figure 2.1 is not feasible, as the system suffers from omitted variable bias since endowments are not observable.

Hence, rather than isolating the causal effect of a single parental characteristic, we will only measure the correlation between parental characteristics and child outcomes. We do so by using a set of mobility measures, which we present below. Each measure has its advantages and shortcomings, hence using different measures allows us to obtain a comprehensive picture of intergenerational mobility. It further allows us to compare our results to existing estimates for Switzerland and other countries.

As indicated by the red lines in the graph, our analysis is not limited to measuring the direct correlation between the same parental and child variable, but also includes cross-correlations, such as, e.g., from parental wealth to children's education. These cross-correlations across several dimensions are an important extension of prior work.

In what follows, we will now denote child outcomes as Y_i and parental outcomes as X_i (instead of Y_{t-1}). While the measures we present below are typically calculated for income, we aim for measures that can be computed for any outcome of interest as well as for cross-correlations of different outcomes.

2.3.1 Intergenerational Elasticity (IGE)

The most straight-forward approach to intergenerational mobility is a direct comparison of parental and child outcomes, such as the amount of income, wealth, or years of schooling. Following the influential contribution by Solon (1992), the economic literature has long been concerned with the estimation of the intergenerational elasticity of income (IGE) (see Solon, 1999; Corak, 2006; Black and Devereux, 2011, for an overview of the literature). This elasticity, which has long been the "industry standard" (Mitnik and Grusky,

[4] In Becker and Tomes (1986), "constraints on financing investments in children introduce a negative relation between the earnings of grandparents and grandchildren" (p.S13). Unfortunately, we do not observe grand-parents in our data.

2020), is obtained by regressing child log earnings on parental log earnings:

$$\log Y_i = \alpha + \beta \log X_i + \varepsilon \tag{2.1}$$

The parameter β measures the intergenerational elasticity of income, which can be expressed as

$$IGE = \beta = \rho_{XY} \frac{SD(logY_i)}{SD(logX_i)}, \tag{2.2}$$

where ρ_{XY} denotes the correlation in parent's and children's log earnings and $SD()$ denotes the standard deviation. The IGE measures the difference in outcomes between children of high versus low income parents (Chetty et al., 2014a). It also represents the fraction of economic advantage that is on average passed on to the next generation (Corak, 2006). The intercept α reflects changes in average income from one generation to another, e.g., due to economic growth.

Despite it's popularity, the IGE has at least four shortcomings. First, it depends on the distribution and the standard errors in the parental and child incomes (Black and Devereux, 2011). All else equal, the elasticity is higher if the variance of log earnings in children's generation increase.

Second, as shown in the paper by Chetty et al. (2014a), the estimates from this log-log specification yields very unstable estimates, because the relationship between children's and parent's log income is not linear. This problem seems to have become particularly prevalent in studies that are based on full-population register data, which covers the tails and allows to identify significant non-linearities in the relationship between parental and child income. While the regression to the mean model assumes that the data-generating process is linear, in studies with administrative data the relationship can typically be described as an elongated S (Corak, 2020). Fitting a linear OLS model through the data, leads to biased parameter estimates.

Third, the log-log specification is not applicable in cases where the outcome variable contains zeros. This is particularly problematic when studying intergenerational wealth mobility, as large fractions at the bottom have zero or negative wealth. But also with income, some individuals—typically women—may have zero income, even when measured over several years (Mitnik and Grusky, 2020; Chetty et al., 2014a). Mitnik and Grusky (2020) show that by simply dropping the zeros generates serious selection biases. They conclude that even available approaches to address this problem are "unattractive due to a combination of methodological and pragmatic reasons." (p.50). Conclusions may be misleading, especially in cross-country comparisons, when studying historical trends, or when comparing intergenerational mobility across groups.

Finally, for categorical variables, like highest attained education levels, the log-log specification has no meaningful interpretation at all.

2.3.2 Rank-Based Mobility Measures

For the aforementioned reasons, we turn to rank-based mobility measures. These are becoming the new standard in the literature, following the work by Chetty et al.; Chetty et al. (2014a; 2014b) and the availability of large administrative datasets covering the entire population. In addition, rank-based measures can also be computed for categorial variables, such that we can obtain comparable measures of educational mobility.

Rank-Rank Slope (RRS)

Let P_i denote parent's and R_i child percentile rank, respectively, whereby ranks are computed separately within the child and parent generation. The regression of child rank R_i on parent rank P_i yields the rank-rank-slope (RRS):

$$R_i = \alpha + \beta P_i + \varepsilon \tag{2.3}$$

$$RRS = \beta = \rho_{PR} \tag{2.4}$$

A comparison of equations (2.2) and (2.4) shows how the IGE and the RRS differ, as the latter is independent of the level of inequality in the parent's and child distribution. As inequality in the child distribution increases, so will the IGE—but not the RRS.

Absolute Mobility

The RRS and the IGE are both relative measures, i.e., they are silent about the direction of mobility. High mobility may arise not because children from poor families reach the top, but because rich children have worse outcomes than their parents. Following Chetty et al. (2014a) and building on the RRS estimations, we therefore measure expected mobility at parent rank p to understand the direction of mobility:

$$\hat{R} = \hat{\alpha} + \hat{\beta} p \tag{2.5}$$

where $\hat{\alpha}$ and $\hat{\beta}$ are obtained from the regression of child rank R_i on parent rank P_i described above.

Absolute mobility measures where children can expect to end up in adult life, given that they grew up at a particular percentile p. A popular value

is $p = 25$, which Chetty et al. (2014a) coined as absolute upward mobility (AUM). It measures the expected average rank of a child whose parents are at the median of the bottom half of the parent distribution.

2.3.3 A Note on Measurement of Educational Mobility

The methods above are not directly applicable to categorial variables, especially if they have only few categories and individuals are not evenly distributed over these categories. For our purpose of obtaining comparable mobility measures for different outcomes, this causes some challenges for the measurement of education mobility, as education is measured in a limited number of ordered categories, rather than as a continuous variable such as income or wealth. For instance, 48.5% of fathers of children born in Switzerland 1967–1977 had 'vocational education and training' as highest level of education.

Studies of educational mobility have instead focused on estimators like the correlation coefficient between parents' and children's highest education level.[5] But this correlation does not control for changes in inequality and growth, which in the context of education has lead to an overall increase in educational attainment in younger generations.

To come up with comparable estimates of intergenerational social mobility across our four different outcomes, we use a novel approach – *bottom half mobility* – developed in Novosad et al. (2020) and Asher et al. (2021). Their method allows for a rank-based estimation of the expected rank of a child born to parents in the bottom half to the education distribution and has therefore similar interpretation as absolute upward mobility. It, however, does not provide estimates of rank-rank correlations.

Their estimate of absolute upward mobility is based on the latent ranks of the education distribution contained in coarse education bins. Using education ranks holds the relative size of the group constant over time. Novosad et al. (2020) treat the problem as interval data problem, where the latent education rank is only observed within a set of pre-defined bins. Individuals who are close to the margin of obtaining the next discrete level of education are those with high latent ranks within each bin. Their method applies to

[5] An alternative would be to measure education in years of formal schooling. To account for differences in the variance of years of schooling between children and parents and across cohorts, one can normalize the variable by dividing it by its cohort specific standard deviation(Checchi et al., 2013). In our data, however, we do not observe years of schooling but only the highest degree obtained. Simply assuming the average duration of degree completion for every individual would introduce large measurement error and mask underlying variation in years of schooling, which is why we focus on obtained degrees.

many contexts of interval-censored conditioning variables, as long as the outcome of interest—in our case: child education, as in Asher et al. (2021)—is at least weakly increasing in the latent parental education rank.[6] In other words their underlying assumption of *weak monotonicity* requires that, in our case, children have on average at least the same or higher education levels as their parents have, within each parental education bin. Novosad et al. (2020) develop a numerical optimization framework, which allows to apply a flexible set of structural assumptions. The Stata program *bound_mobility*[7] provided by Asher et al. (2021) then allows us to compute measures of absolute mobility at any rank p.

2.4 Data and Sample Definition

We use two different (albeit similar) datasets for our empirical analyses. Both combine a series of register data and survey data and are matched through the individual social security numbers. 2.B provides a more detailed description of the two datasets.

2.4.1 Matched SSER-Census-Survey Data

The first dataset merges the Swiss population censuses 1990 (VZ90), 2000 (VZ00), and the register-based 2012 census (STATPOP) with social security earnings records (SSER), which track the entire labor market history of the population, covering the period 1981–2017. In addition, this data is complemented by the Structural Survey (SS) for the years 2010–2018.

Our sample is based on the entire population living in Switzerland in 2012, identified in that year's register-based population census (STATPOP). Linkages between children and parents are provided through STATPOP. These linkages are provided if they are recorded in the municipality population register INFOSTAR, introduced in 2005. INFOSTAR reports child-parent linkages if both have Swiss citizenship as of 2005 or later. Furthermore, linkages are also recorded for individuals with foreign citizenship if they registered any changes in the civil status (marriage, birth, death etc.) after 1990. Changes in the civil status which occurred abroad are less likely to be recorded in INFOSTAR, especially for foreign nationals.

[6] The assumption is weak monotonicity, so the outcome may also be weakly decreasing in education bins, as in Novosad et al. (2020), who study mortality rates by education bin over time.

[7] `https://github.com/devdatalab/paper-anr-mobility-india/blob/master/mobility_programs.do`

In total, we obtain 3,78 million mother-child pairs (46% of the whole 2012 STATPOP population) and 3,09 million father-child pairs (40%), and linkages between both parents and children for 38% of the whole 2012 population. Due to the data structure, with reference year 2012 and limitations in parent-child linkage in INFOSTAR, we are more likely to be able to link younger children and those who have Swiss-born parents. Appendix Figure 2.A.1 gives an overview of the linked populations over time.

The SSER contain each individual's entire earnings history from employment and self-employment, as well as unemployment spells, benefits from unemployment and disability insurance, and financial compensations for maternity leave, military service. Because almost everybody generates a social security entry at some point in their life, our matched data covers 99.5% of the male and 96.6% of the female permanent resident population, respectively, aged 20–60 in 2012 (see Appendix Figure 2.B.3). In 1981, our base-sample of matched STATPOP 2012-SSER individuals, still represent 62% of the permanent resident population aged 20–60 in that year.

The information on individual's residential, education, and marital status history is obtained combining information from the 1990, 2000 and 2012 population censuses. The 1990 (VZ90) and 2000 (VZ00) censuses do not contain social security numbers and were matched with the 2010 census using probabilistic methods based on sex, day of birth, marital status, nationality, religion, place of residence and other variables.[8]

Finally, we link data from the annual Structural Survey (Strukturerhebung, SE, in German) to our matched register-census data via the social security number. This survey is a component of the otherwise register-based Population Census since 2010. It samples at least 200,000 individuals aged 15 and older each year and provides information on households, families, housing, employment, mobility, education, language, and religion. With a total of 9 waves of survey data, we are able to merge information from the survey for 28 % of our 2012 base-sample.

An important limitation of our matched SSER-Census-Survey dataset is that it does not contain information on wealth. As shown in Figure 2.1, wealth is not only of interest because it can be directly transmitted from parents to children, but also because parental wealth likely influences educational attainment. Variables on wealth were provided through access to the WiSiER datapool, explained next.

[8]This probabilistic matching relies on the "Swiss National Cohort" project, see Spoerri et al. (2010) and 2.B for details.

2.4.2 WiSiER: Data on Economic Well-Being of the Population

The second dataset we use is WiSiER,[9] a novel dataset recently made available by the Federal Social Insurance Office. This is a matched dataset that contains several register datasets, including (among others) (i) each year of the register-based Population Census (STATPOP, 2010–2016), (ii) social security data earnings records (SSER, 1982–2016), (iii) the structural survey (SS, 2010–2016), and—most importantly—(iv) harmonized individual income and wealth tax data from 9 cantons[10] for the years 2011–2015. Since wealth taxes are levied at cantonal level only, cantonal tax records differ somewhat in definitions and structure and have been hence cleaned and harmonized (Wanner, 2019). We use this cleaned dataset to study intergenerational wealth mobility.

All datasets contained in WiSiER were linked by the Federal Statistical Office based on individual's social security number. As in our matched SSER-Census-Survey data described above, linkage of parents and children is possible through information contained in STATPOP. Unfortunately, we were not allowed to link the 1990 and 2000 census from the "Swiss National Cohort" project to this database for legal reasons. Therefore, information on residential, education, and marital status history is not as precise as in our matched SSER-Census-Survey data.

Note that the base sample is slightly different to that in our matched SSER-Census-Survey data, as WiSiER contains the entire resident population for the years 2010–2016, and not only in 2012. With 3.84 million pairs, the number of matched parent-child links is therefore larger in this data.

The wealth measure has two important drawbacks. First, it is only available for individuals who filed a tax return in one of the 9 cantons contained in the dataset between 2011–2015. These cantons contain 53% of Switzerland's taxpayers in 2015 according to federal income tax statistics. However, parents and children both need to reside in one of these 9 cantons for them to be in our sample of linked parents and children. Therefore, we can measure wealth for only 660'150 linked pairs of parents and children. Second, and more importantly, we can measure wealth for both, parents and children, only over the years 2011–2015 rather than over the life-cycle. Hence we are

[9] WiSiER stands for Wirtschaftliche Situation von Personen im Erwerbs- und im Rentenalter: `https://www.bsv.admin.ch/bsv/de/home/publikationen-und-service/forschung/forschungsbereiche/WiSiER.html`.

[10] Access to cantonal tax data was only allowed upon cantonal confirmation. Overall tax data of 11 cantons are covered in the WiSiER datapool, we got access to tax data of 9 cantons. The cantons included are: AG, BE, BL, BS, GE, LU, NE, SG, VS.

not able to measure parental wealth when the children were growing up but instead have to take parental wealth ranks when children are grown up as proxy for parental wealth at childhood as we explain below.

2.4.3 Sample Definition

Our sample definition is based on data availability such that we are able to construct all outcome variables for the same cohorts. We are only able to take into account those individuals (children) which are present in the 2012 register based census (STATPOP). Parent-child linkages, where parents emigrated or died before 2005 are not considered in our sample. The baseline sample consists of all individuals (i) who were present in the 2012 register based census as a permanent resident in Switzerland, (ii) were born between 1967-1982 (iii) and for whom we are able to link both parents (mother and father) through STATPOP.

2.4.4 Variable Definitions

Income. The SSER contain earnings history of all individuals and is therefore the main source for our outcome variable income. We define income as *total earnings* including income from employment and self employment, as well as unemployment, disability, and maternity leave benefits, and compensation for military service (which is still mandatory for all Swiss males). We therefore use a very encompassing definition of labor income, including replacement of such income through the different mandatory insurances in place. We take total earnings on an annual base and do not adjust for hours worked, as these are not reported in the SSER data. All income variables are deflated by the 2019 Consumer Price Index and are therefore expressed in 2019 Swiss francs[11].

Child Income. We follow the literature and measure child's income in their early thirties (Chetty et al., 2014a). To reduce measurement error, income is the mean over the three years at age 32–34. We discuss the sensitivity of our results to using different years for mean child income in the results section. For children, we do not consider family income but their individual earnings. We keep observations with zero average earnings. Child's rank is then defined relative to all other children in our linked sample who are in the same birth cohort.

Parental Income. Parental income is defined as the sum of mother's and

[11]CPI data is available here: `https://www.bfs.admin.ch/bfs/en/home/statistics/prices/surveys/lik.html`

father's income independent of their marital status. In light of the increasing female labor force participation in recent decades, maternal income has gained importance in reflecting total economic resources of parents. Parental income, however, is only available for those children where information on both parents is available. Prior to 1997, non-employed married women were exempt form annual contributions towards the OASI, if their spouses were employed and therefore contributed to the OASI for both. That is why many mothers have missing entries in our SSER database, especially during the years children were growing up. We impute zero values for those mothers which were missing in specific years, as they were clearly not active in the labor market (see chapter 2.B.1 for details).

We follow Chetty et al. (2014a), and take mean parental income over the six years the child is aged 15–20. Hence we consider the parental earnings distribution of children who grow up together (in the sense that they belong to the same birth cohort). The idea is to hold the conditions under which children grow up fixed. We only take into account those parents (sum of mother's and father's income), which have non-zero (positive) mean income over this period.

Wealth. We measure wealth as *net worth*, defined as all private wealth subject to taxation, which includes financial assets, real estate, cars, and valuables such as art or jewellery. All wealth variables are deflated by the 2019 Consumer Price Index and are therefore expressed in 2019 Swiss Francs. In contrast to our income data, we observe individual's wealth only for a short period of time, for the years 2011–2015. We are therefore not able to measure wealth at a specific age of the child.

Child Wealth We average net wealth over the years 2011–2015. This means that we observe wealth for children of the earliest cohorts in their mid forties and for latest cohorts in their early thirties. However, we rank children within their own cohort. Since intra-generational mobility is lower in wealth than in income, we assume that wealth ranks should not change much over this period.

Wealth of married couples is recorded as family wealth and it is not possible to identify each individual's wealth, as married individuals in Switzerland are taxed jointly and recorded as one tax unit. For child wealth, we therefore split wealth equally among married couples before computing wealth ranks. Since the largest wealth component is real estate wealth, which normally belongs to both both spouses and which certainly both spouses will enjoy equally while married, splitting wealth equally seems reasonable.

Parental Wealth Since wealth levels highly vary over the life cycle we

rank parents within their own birth cohort, rather than within the birth cohort of their child. Assuming that an individual changes wealth rarely within its own cohort, we take this parental wealth rank as a proxy for the wealth rank when the child was growing up.

Education. Educational attainment is recorded in the 2000 Census and the Structural Surveys 2010–2018, where the highest level attained and current education (if enrolled at the time of the survey) are indicated. We assume that individuals complete their current education at a certain point of time and take this as the highest level of education. For parents, we use information on their highest education as reported in the 2000 Census. Even if later on they may have pursued an additional degree, using the information from the year 2000 should be a better indicator of the education they had when the child was growing up. Since children in the later cohorts were still very young in the 2000 Census, their information on educational attainment comes from the Structural Surveys 2010–2018. This explains the reduced sample size in estimations on education.

Highest education levels are classified in the following five categories: No education (no formal education completed); Compulsory education (typically up to grade nine); Upper secondary education (high school, vocational education and training VET); Higher professional education (further professional education, *Höhere Fachschule HF* in German); Tertiary education (University of Applied Sciences, University).

Creating each percentile out of these 5 categories by ranking individuals across education classification is not feasible. We assume that education is increasing if we move up from category 1. to 5. – i.e. those individuals having upper secondary education have more education than those having compulsory education etc. If we create percentiles with categorical variables we end up having the same percentile for all individuals in each category.

To come up with rank-based education measures, we make use of the novel method by Novosad et al. (2020), which allows to estimate ranks of the latent education distribution within each education bin and allows to estimate absolute mobility measures (see Section 2.3.3 for more details on the method). The main underlying assumption which has to be fulfilled is *monotonicity of the conditional expectation function (CEF)*, i.e., expectation of child education rank is weakly increasing in the parents latent education rank – having a more advantaged parent in terms of education cannot make the child worse off.

Figure 2.A.2 graphically shows, that the main assumption of weak mono-

tonicity is fulfilled in our data.[12] Children have higher expected education ranks with increasing latent parents education ranks. We create education percentiles for children and parents ranked within each child's cohort, analogously to the way we measure income.

Occupation. The Census 2000 and the Structural Surveys 2010–2018 report individual's occupation classified according to the International Standard Classification of Occupations (ISCO) codes.[13]

ISCO-08 classifies occupation as a categorical variable. To obtain a continuous occupation status variable, we match the ISCO-08 occupations with the International Socio-Economic Index of Occupation Status (ISEI-08), which ranks occupation on a continuous scale between 10 and 89 (Ganzeboom et al., 1992; Ganzeboom and Treiman, 1996). It was constructed with data on ISCO-classified occupations, education, and personal income from the 2002–2007 issues of the International Social Survey Program (ISSP), covering almost 200,000 individuals in 16 countries. To calculate ISEI values, the indirect effect of education on income via occupation was maximized, while the direct effect from education was minimized, controlling for age. The idea is to measures the attributes of an occupation which convert a person's education into a person's income. An iterative algorithm was then used to calculate the status values (Ganzeboom et al., 1992, p.10). Since ISEI was developed using ISCO occupations, it can easily mapped to our data. Table 2.A.1 reports occupations with the highest and lowest ISEI scores.

For parents, we use occupation related information from the 2000 Census. For children, information on occupation is taken from the Structural Surveys 2010–2018, as in the 2000 census many children, especially the younger cohorts, were very young.

2.4.5 Summary Statistics

Tables 2.1 and 2.A.3 report summary statistics of all outcome variables and some other characteristics of our core sample with children in the 1967–1982 cohort. Our baseline sample consists of 667'047 individuals (children) for whom we are able to match both parent's income entries. Mean child's income at age 32–34 is 64'040 CHF, and 94% of all children were employed at this age. Income is defined as yearly earnings (earnings out of labor and self

[12]There are only a handful of parents, were highest education level of both of the parent is "No Education". They are included in the first percentile of the parental latent education rank.

[13]We harmonize the ISCO-88 codes in the Census 2000 into ISCO-08 using the correspondence tables made available by Internationl Labour Organization (ILO).

employment; unemployment, disability and maternity leave benefits). Unfortunately, we do not have information on hours worked for which we would like to adjust for. Due to lower labor force participation and wide spread part-time employment of women in Switzerland there is large differences of income between women and men in the parent as well as in the child generation (see Tables 2.2 and 2.A.3). Almost one fourth of all children completed or were enrolled in tertiary education. Since education and occupation related variables for children are obtained through the Structural Surveys 2010–2018, number of observations drop sharply to one third of our baseline sample. Almost all children are Swiss nationals in 2012, this high coverage rate in our sample and therefore low coverage of children with foreign citizen is due to the fact, that parents of foreign nationals are more likely to live abroad and are, therefore, not covered in Swiss data sources. To study intergenerational mobility, information of both – parents and children – are necessary in the data. Furthermore, the municipality-level population register INFOSTAR only covers parent-child linkages, if both had Swiss nationality as of 2005. This implies, that there is limited coverage of parent-child linkages among foreign nationals – especially if children are born before 2005 – in our data source STATPOP (see section 2.4.1 for further details). Parents income and wealth variables are reported on a household level (mother's and father's variables are summed up). 34% of parents, which were married at child's age 15, are single earner household i.e. only one parent fully contribute to household income. In our sample most of the single earner households have (full-time) working fathers and stay-at-home mums, which generate zero-income, especially when children were growing up. On average, fathers' contribution to total household income is 83% if children are between 15-20 years old. 14% of children have at least one parent with tertiary education. Parents, which emigrated or died between 2005-2012 are not present in the 2012 register-based census (STATPOP). For those parents, we are not able to observe variables on civil status and country of birth and that is why number of observations of both variables shrink slightly.[14]

20% of all children in our sample have at least one foreign-born parent – i.e. are second-generation immigrants. If we compare all outcome variables between children with different migratory background, we hardly find any differences between native (none of the parent is foreign-born) and second-generation immigrant children (see Table 2.A.4). The most common country of birth of foreign-born parents – the most common countries, from which parents emigrated from – are Italy, Germany, France, Austria and Turkey

[14]Country of birth is also reported in the Census 2000, that is why we have more observations on country of birth than on civil status.

(see Table 2.A.2).

Our wealth variables are extracted from the WiSiER datapool, in which we have access to tax data of 9 cantons. Due to this limitation, we only observe parent–child links for 314'905 individuals. See Table 2.A.5 for summary statistics of our wealth variables and the characteristics in our WiSiER datapool.

Table 2.1: Summary Statistics

	(1) **Mean**	(2) **SD**	(3) **P10**	(4) **P90**	(5) **N**
Child Characteristics					
Income (in 1000)	64.04	51.42	5.66	111.46	667047
Employed (%)	93.97	23.80	100.00	100.00	667047
Net Worth (in 1000)	118.11	1162.13	-43.13	276.44	314905
Tertiary Education (%)	24.42	42.96	0.00	100.00	196594
ISEI	54.03	19.66	25.20	77.19	175817
Female (%)	48.95	49.99	0.00	100.00	667047
Swiss (%)	99.57	6.54	100.00	100.00	667047
Married (%)	45.73	49.82	0.00	100.00	667047
Have Kids (%)	40.84	49.15	0.00	100.00	667047
Parents Characteristics					
Income (in 1000)	126.00	118.14	56.56	198.55	667047
Single Earner HH (%)	34.08	47.40	0.00	100.00	645716
Net Worth (in 1000)	1041.72	6906.34	14.47	1949.70	315778
Tertiary Education (%)	14.30	35.01	0.00	100.00	549243
ISEI	46.93	19.52	24.07	75.25	408261
Married (%)	93.88	23.97	100.00	100.00	534878
Foreign-born (%)	20.61	40.45	0.00	100.00	659194

Notes: Income of child is defined as average income over the age 32–34. Employed reflects the share of children employed during that age. We consider someone as employed, if they have positive earnings out of labor or self employment. Tertiary education is defined as having a degree from a(n) (Applied) University. Swiss shows the share of Swiss citizens as reported in the register-based census STATPOP 2012. For children, civil status and having kids themselves is defined at age 32–34. For both, children and parents, net worth is a the mean over the years 2011–2015. For parents, income is defined as average income of both parents combined over the years when the child was 15–20. The dummy variable on tertiary education equals one if at least one parent has tertiary education. The Index of Socio-Economic Occupation Status (ISEI) of parents is the highest ISEI between mother and father. Parents are defined as married if father and mother were married at child age 15. Foreign-born is a dummy that equals one if at least one of the parent is foreign-born. All monetary variables are expressed in 2019 Swiss Francs.

Table 2.2: Summary Statistics: Across Child Gender

	(1) **Mean**	(2) **SD**	(3) **P10**	(4) **P90**	(5) **N**
Daughter Characteristics					
Income (in 1000)	45.43	35.82	0.37	90.48	326515
Employed (%)	90.77	28.95	100.00	100.00	326515
Net Worth (in 1000)	122.85	1525.29	-42.79	280.39	151598
Tertiary Education (%)	21.82	41.30	0.00	100.00	100024
Index of Occ. Status	53.88	18.94	26.64	76.65	83339
Swiss (%)	99.69	5.52	100.00	100.00	326515
Married (%)	52.04	49.96	0.00	100.00	326515
Have Kids (%)	49.22	49.99	0.00	100.00	326515
Son Characteristics					
Income (in 1000)	81.88	57.44	32.76	124.48	340532
Employed (%)	97.72	14.93	100.00	100.00	340532
Net Worth (in 1000)	113.70	666.71	-43.45	273.27	163307
Tertiary Education (%)	27.08	44.44	0.00	100.00	96477
Index of Occ. Status	54.17	20.29	24.93	78.76	92478
Swiss (%)	99.45	7.38	100.00	100.00	340532
Married (%)	39.67	48.92	0.00	100.00	340532
Have Kids (%)	32.81	46.95	0.00	100.00	340532

Notes: Income is defined as average income over the age 32–34. Employed reflects the share of children employed during that age. We consider someone as employed, if they have positive earnings out of labor or self employment. Tertiary education is defined as having a degree from a(n) (Applied) University. Swiss shows the share of Swiss citizens as reported in the register-based census STATPOP 2012. Net worth is a the mean over the years 2011–2015. Civil status and having kids themselves is defined at age 32–34. All monetary variables are expressed in 2019 Swiss Francs.

2.5 Results

In this section we first present our main results of intergenerational mobility for each outcome. We then combine all main results and provide comparable measures along four dimensions of intergenerational mobility in Section 2.5.2.

2.5.1 Rates of Intergenerational Mobility by Outcome

Income Mobility

Figure 2.1 shows the relationship between parental and child income rank. The binned scatter plot shows the mean income percentile rank of children R_i at ages 32–34 (y-axis), for any given percentile rank of their parents P_i (x-axis). We show the conditional expectation of a child's rank given its parents' rank separately for sons and daughters. The relationship between parental and child's income is almost perfectly linear, and OLS estimates are very precise. Intergenerational mobility is slightly higher for sons (RRS=0.12) than daughters (RRS=0.16). The total RRS for all children over the 1967–1982 cohorts is 0.14 (Column 1 in Table 2.1).

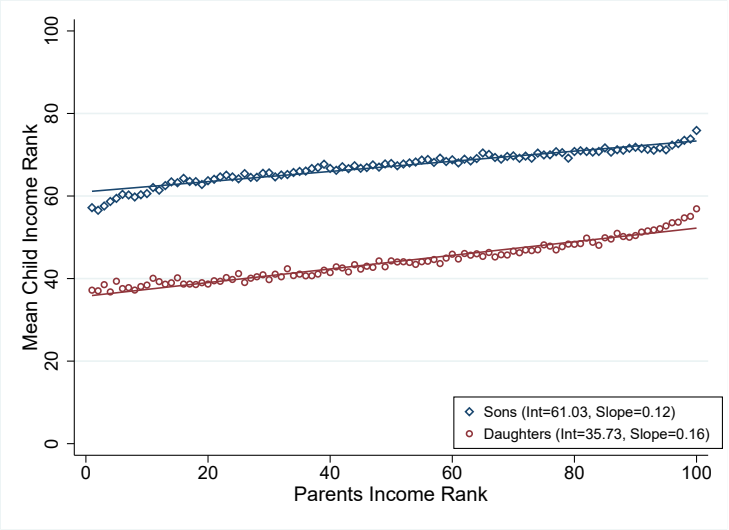
In absolute terms, however, conditional expectations for sons are considerably higher compared to daughters along the whole parental income distribution. This difference in intercepts is mainly explained by the higher labor force participation of men than women, and the high incidence of female part time work in Switzerland. As female labor force participation is highly dependent on having children, we show the binned scatter plot for those children in our sample which have no children themselves in Figure 2.A.3.[15] Gender-differences in mean child income ranks diminishes largely if looking at only individuals without children, but still exists. Unfortunately, we cannot correct for hours worked, as income is simply recorded as annual earnings, and we lack information on hours worked.

Our income mobility measure is robust to attenuation and life cycle biases (Solon, 1992; Chetty et al., 2014a; Chuard and Grassi, 2020). The RRS of 0.14 does not change if we vary the number years used to compute child's or parents' income (see Figure 2.A.7). Furthermore, the RRS remains stable if we measure child's income at later than age 32–34. This implies that individual's lifetime income is already defined in their early thirties, and relative incomes within the cohort hardly change anymore as individuals age.

Comparing our results with the existing literature, our RRS of 0.14 is even slightly lower than the RRS estimated in Chuard and Grassi (2020), who

[15] 60% of all children in our sample have kids themselves, therefore, 40% have no children.

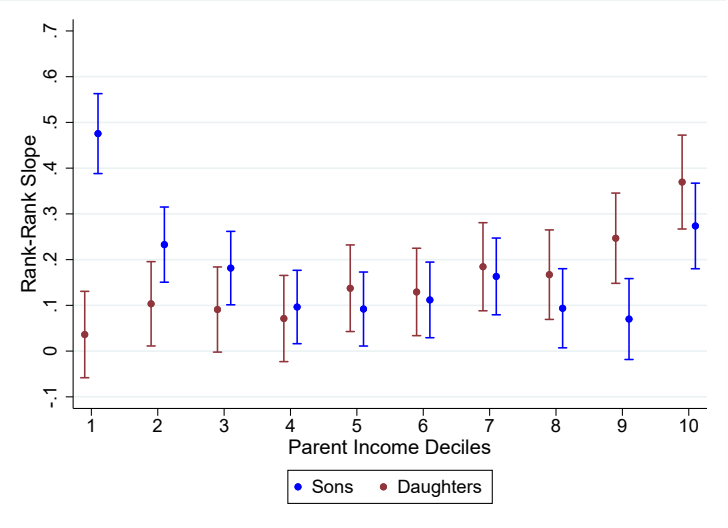
Figure 2.1: Intergenerational Income Mobility



Notes: This binned scatter plot shows the mean income percentile rank of children at ages 32–34 (y-axis), for any given percentile rank of their parents (x-axis). Parental income is the sum of maternal and paternal income, averaged over the years the child was age 15–20. Parents are therefore ranked relative to all other parents with children in the same birth cohort, while children are ranked relative to *all* other children in their own birth cohort (irrespective of their gender). The sample contains all children in the birth cohorts 1967–1982 for which we could link both parents ($N = 667,047$). Estimates from OLS regressions on the binned data are reported separately for sons (blue diamonds) and daughters (red circles). A higher rank-rank slope (RRS) implies lower intergenerational mobility.

report an estimate of 0.15. The difference is explained by different parental income definitions. While Chuard and Grassi (2020) consider father's income only, we include mother's and father's income. Our RRS estimates is 0.147 if we take only father's income and is, therefore, consistent with their estimate. In line to the results in Chuard and Grassi (2020), child income rank is slightly higher correlated with fathers income than with parental income as a whole. If we look at the relationship between child and maternal income, there is no correlation between maternal income and child income, especially for sons (see Figure 2.A.4). Independent of maternal income, sons reach on average rank 66. We even see that sons, with stay-at-home mothers who did not participate at the labor market (34% of all children), earn on average higher income in adulthood than children of mothers who worked. This incidence is, however, mostly explained by the fact, that mothers chose their (level of) labor market participation dependent on father's income. Mothers with low-income spouses are more likely to work full-time in order to compensate

Figure 2.2: RRS Along Parental Income Deciles



Notes: This figure shows the RRS estimates and their respective 95% confidence intervals for different parental income deciles and by child's gender. A higher RRS implies lower intergenerational mobility. The sample contains all children in the birth cohorts 1967–1982 for which we could link both parents ($N = 667,047$). See notes in Figure 2.1 and text for details.

and reach a certain family-income level (see Figure 2.A.5a). Those mothers with high-income spouses are more likely to end up as housewives and not participate in the labor market (see Figure 2.A.5b). The relationship between paternal and child income is positive for sons and daughters (see Figure 2.A.4). Another difference between our approach and that of Chuard and Grassi (2020) is that there are small differences regarding the age in which child income is measured, affecting the cohorts included.[16]

Even though, the relationship between parental and child income rank seems to be linear overall, there are slight deviations along the parental income distribution—especially at the tails (see again Figure 2.1). To further asses differences in the relationship between parent and child income, we split our baseline sample according to individuals' parental income into deciles and run the RRS-regression for each decile. Our RRS for each decile are then plotted in Figure 2.2. For sons, the intergenerational rank correlation is particularly strong within the bottom decile. If parents move up one percentile, a son can expect to move up 0.44 percentiles. For daughters to parents in

[16] We study cohorts 1967–1982, while Chuard and Grassi (2020) consider cohorts 1967–1984, as they measure child income over the age 30–33.

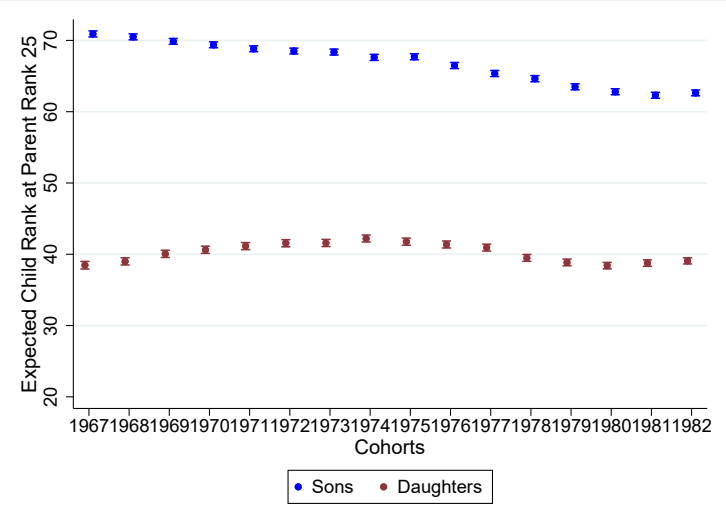
the bottom decile, in contrast, there is no statistically significant correlation between parental and own percentile rank. This implies that boys who have low-income parents will find it harder to climb the distribution in later adult life than girls *in relative terms*—although this is not true in absolute terms as we show below. Moving up the income distribution, however, the RRS for girls keeps rising steadily. Hence the influence of parental rank on child rank rises as parents become richer. Girls in the top decile of the parental income distribution have an RRS of 0.39—more than twice the overall RRS of 0.16 for all girls.

Figure 2.1 shows that the expected rank of sons and daughters given parent income differs substantially between gender, even though they have almost identical RRS. As described in Section 2.3, absolute mobility measures account for such differences in expected outcomes of different population groups. Given that the relationship between child's and parental income rank is almost perfectly linear, our measure of absolute upward mobility (AUM) indicates the expected child's rank, given parent's were at $p = 25$, the median of the bottom half of the income distribution.

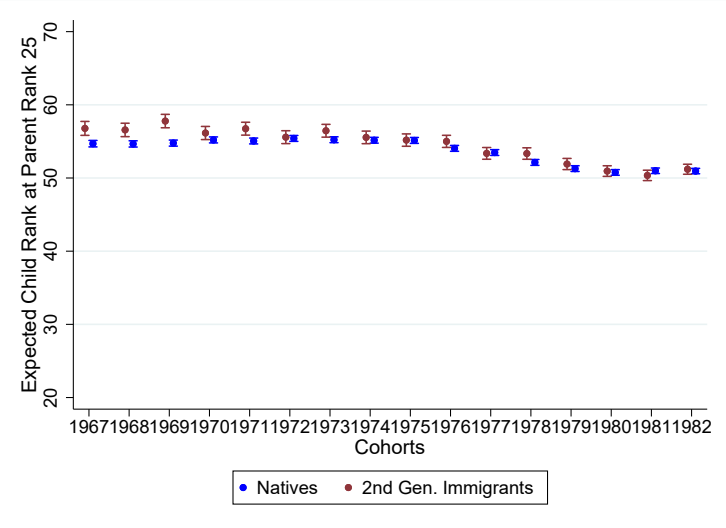
We find an overall AUM of 50 (see Column 1 in Table 2.2), which, however, masks substantial gender differences. Ceteris paribus, girls can expect to reach percentile rank 36, while boys on average reach rank 63, given they both had parents at the 25th percentile. This large difference is mainly explained by differences in labor force participation among men and women. As we measure child income around age 33, many women in our sample are not working full time or withdraw from the labor force completely due to family duties, driving down their total annual earnings. Looking at AUM between natives and individuals with at least one foreign-born parent, we don't see any differences between these subgroups. Expected child rank given parents at $p = 25$ are over time – with very few exceptions – identical between natives and second generation immigrants. Interestingly, Figure 2.3a shows that AUM has decreased over time, especially for males. So far, we don't have any explanation for the decrease in intergenerational income mobility over time.[17]

[17]In fact, we observe this downward trend also in overall income mobility (RRS) (see Figure 2.A.6).

Figure 2.3: Trends in AUM in Income, by Gender and Migratory Background



(a) Gender

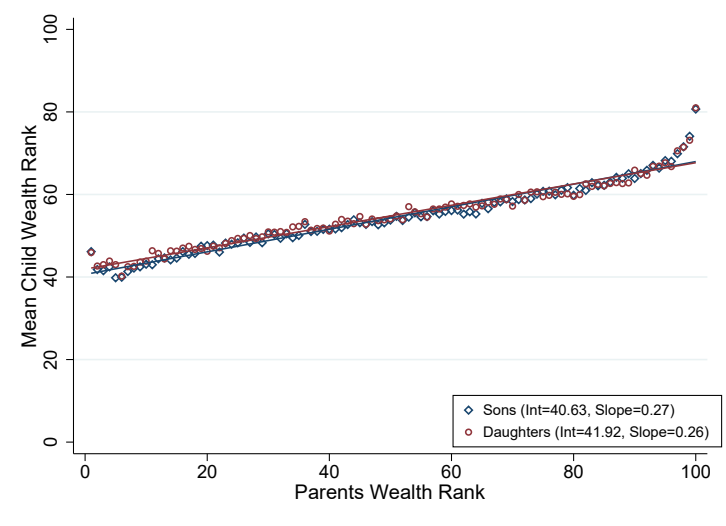


(b) Migratory Background

Notes: These figures show the point estimate of the expected child's rank given parent's income rank 25 (absolute upward mobility measure AUM), and the respective 95% - confidence interval for different cohorts and subgroups. The sample contains all children in the birth cohorts 1967–1982 for which we could link both parents ($N = 667,047$). Child's income rank is the mean at age 32–34. Parental income is the sum of maternal and paternal income, averaged over the years the child was age 15–20. Parents are therefore ranked relative to all other parents with children in the same birth cohort, while children are ranked relative to *all* other children in their own birth cohort (irrespective of their gender). Children are second generation immigrants if at least one of their parent is foreign-born.

Wealth Mobility

Figure 2.4: Intergenerational Wealth Mobility



Notes: This binned scatter plot shows the mean wealth (net worth) percentile rank of children (y-axis), for any given percentile rank of their parents (x-axis). The sample contains all children in the birth cohorts 1967–1982 for which we could link both parents ($N = 314,808$). Child and parents wealth is averaged over the years 2011–2015. Children are ranked relative to other children in their birth cohort, and parents are ranked relative to all other parents within their own birth cohort. The slopes and best-fit lines are estimated using an OLS regression.

The nonparametric binned scatter plot on wealth mobility is shown in Figure 2.4. The associated RRS of 0.27 indicates that an increase in parental wealth rank by 10 percentiles is associated with an increase in child's wealth rank by 2.7 percentiles (see Table 2.1). Wealth mobility is therefore almost 50% lower than income mobility.

It is important to note that our estimates for intergenerational wealth mobility likely constitute an upper bound, (i.e., the true RRS is likely larger). The reasons are: First, we compare child's and parental wealth at very different ages (see Section2.4.4). Children are in their early forties or late thirties, while parents are typically around retirement age during the period available. Comparing children and parents at very different ages might lead to a lower observed correlation due to life-cycle effects. How much the estimated RRS is biased downwards therefore depends on the variation in individuals' *relative* wealth position within their own cohort between their late thirties and early sixties. While we cannot be certain about the size of such a life-cycle bias,

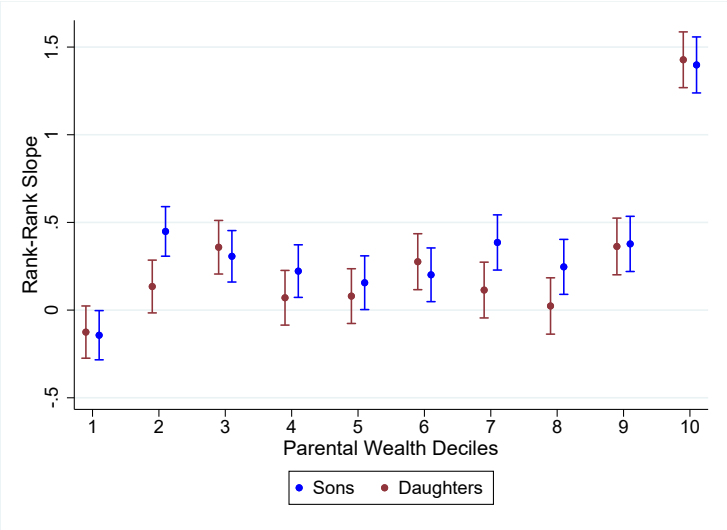
we know that *intra*-generational wealth-rank mobility is lower than mobility in income ranks (Martínez, 2021). Second, since in our linked wealth data parents are still alive, we cannot observe those cases where bequest have already been fully passed on to the next generation. Only to the degree that parents have made inter-vivos gifts (which we unfortunately do not observe) are bequests included in our mobility measure. Assuming that the major part of bequests are transferred after death, we might therefore overestimate wealth mobility (underestimate the RRS). According to Adermon et al. (2018a), bequests and gifts account for up to 50% of the parent-child wealth correlation.

Even though wealth is a function of income, we do hardly see any difference between genders (see Figure 2.4). The main reason is that for married couples, we have to split wealth equally between spouses since wealth is reported together in the tax declaration. 45% of the children in our sample are married, this implies that by construction gender differences in wealth will be small. Another possible reason relates to bequests, which play a crucial role in the process of wealth accumulation over generations. While it may in principle be possible that parents distribute inheritances differently among sons and daughters, we can therefore not observe such differences in our data. Only differences in making inter-vivos gifts would translate into gender differences.

The relationship between parental and child's wealth rank in Figure 2.4 is almost perfectly linear—except for the upper tail of the parental wealth distribution, where the expected child rank increases almost exponentially in parental rank. Again estimating the RRS – the slope parameter from Figure 2.4 –for each decile of the parental wealth distribution, confirms this exponential relationship at the top, as shown in Figure 2.5. While estimates for the RRS lie in the range of 0.0–0.4 for deciles 1–9, it amounts to 1.4 in the top decile. Such an RRS above unity implies a regression away from the mean in the relation between child's and parental wealth and indicates an increase in wealth inequality in the upper tail of the wealth distribution (Becker and Tomes, 1986). This is consistent with observed increases in top wealth inequality (Föllmi and Martínez, 2017).

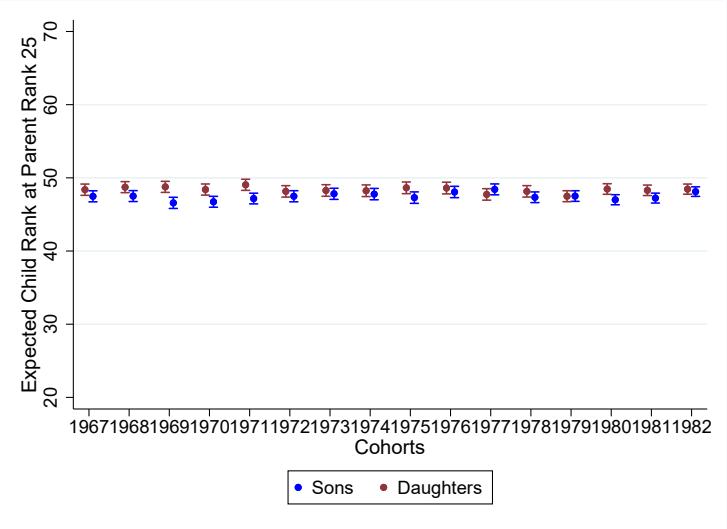
Turning to absolute mobility, measured AUM equals 41 (see Table 2.2). Absolute upward wealth mobility is therefore lower than income mobility. Due to how the data are constructed, there are no significant differences between men and women, (see Figure 2.6a), but we find small and significant differences between natives and second generation immigrants. Natives have slightly higher AUM, especially among younger cohorts (see Figure 2.6b).

Figure 2.5: Rank-rank Slopes across Parental Wealth Deciles

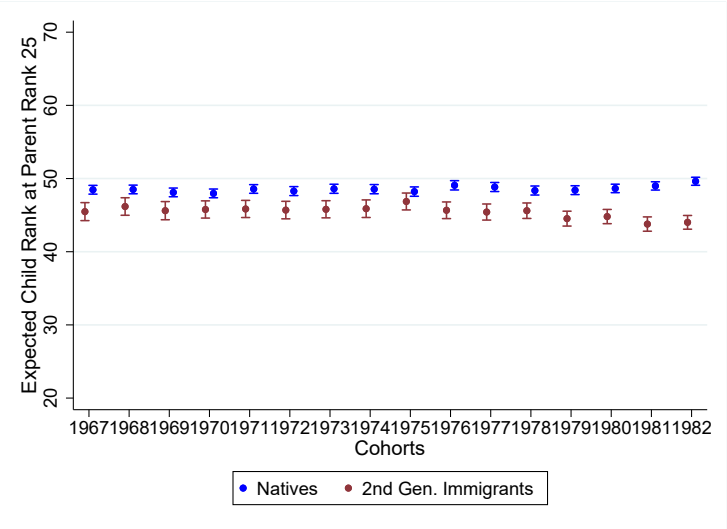


Notes:This figure shows the correlation between child and parental wealth ranks, rank-rank slope (RRS), and the respective 95% - confidence interval for different parental wealth deciles across child's gender. The sample contains all children in the birth cohorts 1967–1982 for which we could link both parents ($N = 314,808$). Child and parental wealth is the mean over the years 2011–2015. Children are ranked relative to other children in their birth cohort, and parents are ranked relative to all other parents in the same birth cohort.

Figure 2.6: Trends in AUM in Wealth, by Gender and Migratory Background



(a) Gender



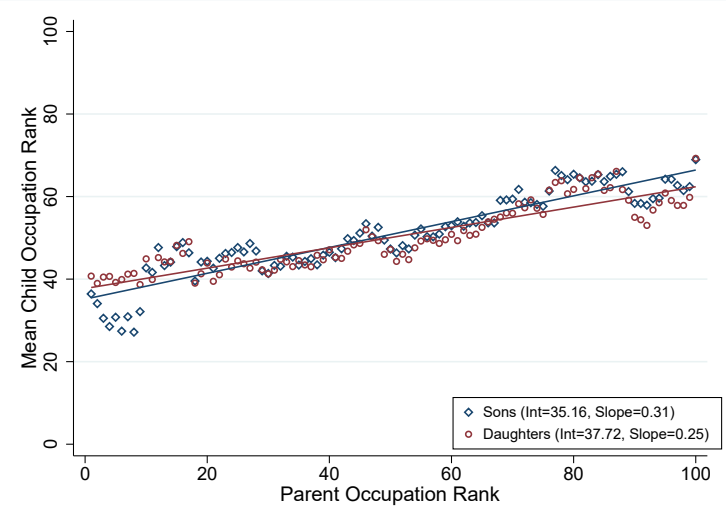
(b) Migratory Background

Notes: These figures show the absolute upward wealth mobility measure AUM (predicted child wealth rank at parents wealth rank 25) and the respective 95% - confidence interval for different cohorts and various sub samples. The sample contains all children in the birth cohorts 1967–1982 for which we could link both parents ($N = 314,808$). Child and parental wealth is the mean over the years 2011–2015. Children are ranked relative to other children in their birth cohort, and parents are ranked relative to all other parents within their own birth cohort. Children are 2nd generation immigrants if at least one of their parent is foreign-born.

Occupation Mobility

To compare occupation status on a continuous scale, we use the Socio-Economic Index of Occupation Status (ISEI), developed by Ganzeboom et al.; Ganzeboom and Treiman (1992; 2010). Each of the 600 ISCO-08 occupation categories, which are provided through our data, is assigned an unique ISEI value. This in turn allows to compute occupation percentiles. The overall correlation between parent and child rank in occupation status is 0.28, hence a 10 pp increase in parental occupation status is associated with an increase in child occupation status by 2.8 percentiles (see Table 2.1).

Figure 2.7: Intergeneratonal Occupation Mobility



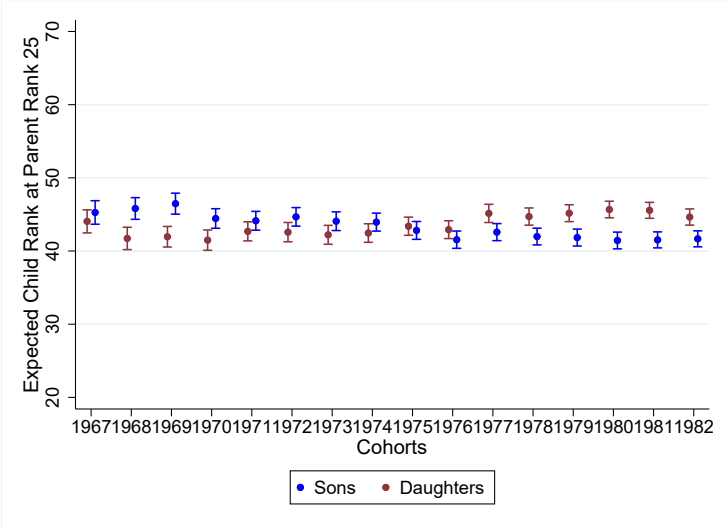
Notes: These figures show the nonparametric binned scatter plot of the relationship between children's and parents' occupation measured with the socio-economic index of occupation status (ISEI). Parents' occupation is defined as the highest occupation of child's mother and father. Parents ISEI is defined as the maximum between mother's and father's ISEI. The sample consists of all children in the 1967-1982 cohort for which we are able to match occupation related information from 2010-2018 Structural Surveys and for which we are able to match their parents' occupation information from the 2000 Census or the 2010-2018 Structural Surveys. ISEI is normalized by its cohort specific standard deviation.

Figure 2.7 shows the binned scatter plot of intergenerational occupation mobility by gender. With an RRS of 0.31 (compared to 0.25 for women), men are more likely to pursue careers with similar occupational status as their parents than women. This might by partly explained by the fact that 27% of parental households were single earner households, and with almost all of the homemakers being women, for a substantial share of children parental occupations status is transmitted only from the father. Presumably, men

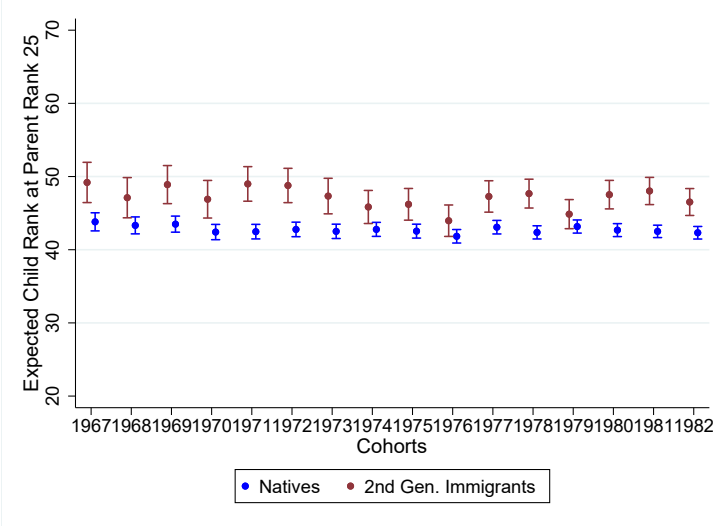
are more likely to pursue similar careers as their fathers than women due to gender stereotypes affecting children's occupation choice.

In terms of AUM, children on average reach rank 36 given they grew up to parents in the bottom half of the occupation distribution (see Table 2.2). As shown in Figure 2.7, we find higher AUM for daughters than sons. This is especially true in younger cohorts (see Figure 2.8a). Differences in AUM are also present by migratory background. Children of foreign-born parents have higher upward mobility than those of native parents (see Figure 2.8b and Table 2.2). This difference might be attributed to the fact that immigrants often take up jobs below their true potential, e.g., because of limited language skills or limited recognition of foreign credentials. Another reason might be that immigrants are less informed about the Swiss dual-track education system and push their children to obtain a university degree, especially if they come from a country where vocational education and training does not exist as educational track. Since jobs requiring a tertiary education also tend to have a higher occupational status value, such sorting patterns may be reflected in intergenerational occupation mobility.

Figure 2.8: Trends in AUM in Occupation Status, by Gender and Migratory Background



(a) Gender



(b) Migratory Background

Notes: This figure shows the absolute upward occupation mobility measure AUM (predicted child rank at parents' rank 25) and the respective 95% - confidence interval for different cohorts and for various subsamples. Occupation is measured with the Socio-Economic Index of Occupation Status (ISEI). Parents ISEI is defined as the maximum between mother's and father's ISEI. The sample consists of all children in the 1967–1982 cohort for which we are able to match occupation related information from 2010–2018 Structural Surveys and for which we are able to match their parents' occupation information from the 2000 Census. ISEI is normalized by its cohort specific standard deviation. Children are 2nd generation immigrants if at least one of their parent is foreign-born.

Education Mobility

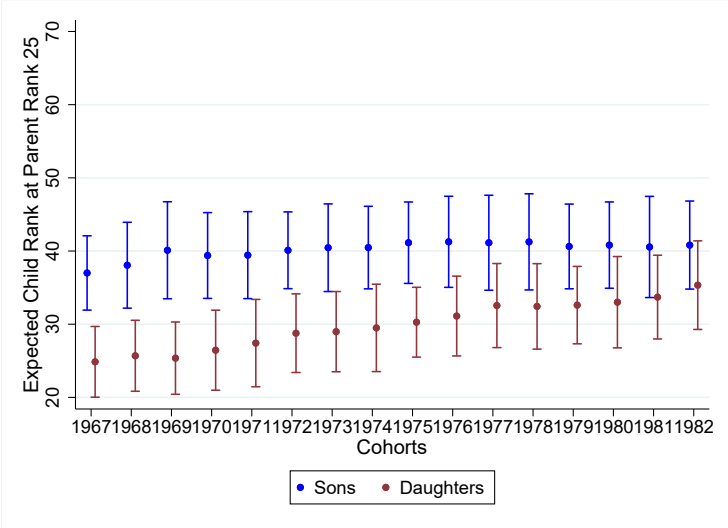
Educational attainment is likely the dimension people care most about when it comes to (in)equality of opportunity. We measure education as the highest attained level of education (including currently ongoing education), classified into five categories. Creating each percentile out of five categories from our data sources is not feasible. In our sample almost 42% of all children report 'vocational education training' as highest education level – the highest level of education most common among individuals in Switzerland.

Facing this challenge of creating education percentiles, we are not able to calculate rank-rank slopes for intergenerational education mobility and come up with a classic binned scatter plot which plots the expected child rank at *each* parental education rank. To obtain a rank-based measure of educational mobility comparable to the other outcomes, we therefore estimate the latent distribution of education within each education bin following Novosad et al. (2020) and Asher et al. (2021) (see Sections 2.3.3 and 2.4.4 for details). Based on their newly developed method, we compute expected rank of a child born to parents at rank $p = 25$. It creates bounded upward mobility measures i.e. creates upper and lower bounds of the upward mobility measure and might, therefore, be compared to point estimates of AUM for previous outcomes.

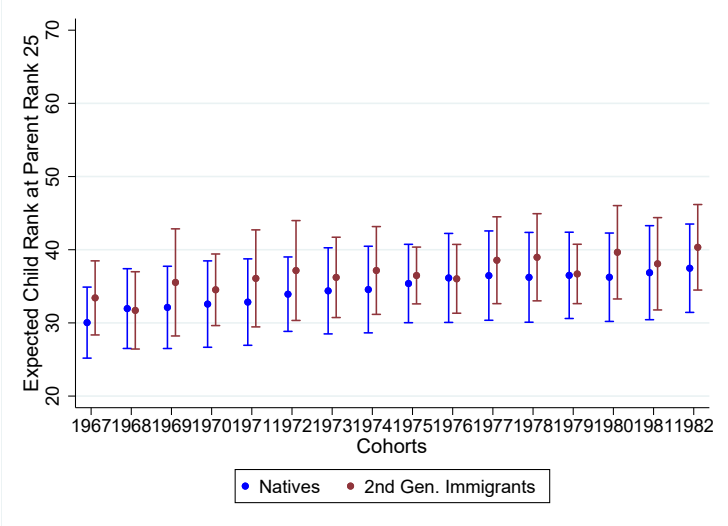
The expected education rank of a child born to parents at rank $p = 25$ is between 29.3 and 41.4 (see Table 2.2). We see significant differences of AUM among gender in the early cohort, where AUM are higher for sons than for daughters. With the increase of female participation in tertiary education over time, these difference diminishes for younger cohorts (see Figure 2.9a). The bounds are overlapping if taking the full sample, indicating no significant differences of education mobility among gender, i.e. AUM for sons (34.2,46.3), for daughters (24.6,36.0).

Differences in AUM in education are small and not significant for natives and second-generation immigrants (Figure 2.9b). Our estimates, however, indicate slightly towards—similar to previous literature (Bauer and Riphahn, 2007)—higher upward education mobility among second-generation immigrants than among native children.

Figure 2.9: Trends in AUM in Education, by Gender and Migratory Background



(a) Gender



(b) Migratory Background

Notes: This figure shows bounded upward mobility in education (predicted child rank given parents' rank $p = 25$) as described in Asher et al. (2021). The latent distribution of a education rank within an education level is constructed based on child education. Parents' education is defined as the highest education of either parent. The sample consists of all children in the 1967–1982 cohorts for which we are able to match i) education related information from 2010–2018 Structural Surveys, and ii) their parents' education information from the 2000 Census or the 2010–2018 Structural Surveys. Children are ranked relative to other children in their birth cohort, parents are ranked relative to all other parents within their child's birth cohort. Children are 2nd generation immigrants if at least one of their parents is foreign-born.

2.5.2 Intergenerational Mobility Across Outcomes

Next, we summarize the results for our four outcomes of interest across different population groups. We begin by commenting on overall intergenerational mobility, the estimated RRS (see Table 2.1). Over the entire population of children in our sample (column 1), intergenerational mobility is highest when measured in terms of earnings. The coefficient is 0.138, implying that a children born to parents who are 10 percentile higher up in the earnings distribution can expect to increase their own rank by only 1.38 percentiles on average. This rate is considerably higher than what is found in the U.S. (3.41, Chetty et al., 2019), Italy (2.5, Acciari et al., 2019), or even Sweden (1.82, Heidrich, 2017), which typically stands out as one of the most egalitarian countries. An important difference between our estimates and those reported for other countries, however, is that we do not observe taxable income but earnings and income from unemployment and disability insurances. Given that capital incomes are more unequally distributed, and that they are likely positively correlated with the intergenerational correlation of wealth, our results have to be seen as a lower bound of the amount of privilege passed on from parents to children. Our results do capture, however, the intergenerational mobility in labor incomes (broadly defined). They can be interpreted as a measure for equality of opportunity in the labor market, which after education is probably the dimension people care most about when it comes to opportunities.

For wealth, we find a RRS almost twice as large as the one for income. Wealth is therefore stickier across generations than income, and in particular earnings. This makes sense since wealth can also be passed on directly from parents to children. For ISEI-based occupation ranks, the RRS is again slightly higher than for wealth, i.e.reporting lowest mobility over all outcome variables.

Comparing relative mobility rates between men and women gives a mixed picture. While daughters have lower mobility in earnings than sons, they experience higher mobility in wealth and occupation (all the gender differences are statistically significant). In contrast, hardly any noteworthy differences emerge between children to foreign-vs. Swiss-born parents, and differences are mostly not statistically significant. Interestingly, for children who only had one parent working while growing up, we see slightly lower relative mobility than in the total population—with the exception of wealth. Having parents 10 percentiles higher up in the occupation index, on average will increase child rank by 2.81 percentiles—or 3.12 percentiles if only one of the parents worked.

Table 2.1: Intergenerational Mobility: Rank-Rank-Slopes (RRS)

	All (1)	Daugthers (2)	Sons (3)	Natives (4)	2nd Gen. Immigrants (5)	Married Parents (6)	Single Parent (7)	Single-Earner HH (8)
Outcome: Income								
Earnings	0.139***	0.162***	0.120***	0.141***	0.133***	0.143***	0.163***	0.141***
	(0.0011)	(0.0015)	(0.0014)	(0.0013)	(0.0025)	(0.0013)	(0.0100)	(0.0025)
Observations	719542	352163	367379	572990	146552	542661	10388	139252
Outcome: Wealth								
Net Worth	0.266***	0.258***	0.273***	0.260***	0.269***	0.260***	0.206***	0.242***
	(0.0018)	(0.0025)	(0.0024)	(0.0020)	(0.0040)	(0.0020)	(0.0059)	(0.0036)
Observations	314808	151543	163265	258906	55902	260144	27206	79523
Outcome: Occupation								
Occupation Status (ISEI)	0.281***	0.247***	0.313***	0.281***	0.265***	0.287***	0.212***	0.311***
	(0.0028)	(0.0039)	(0.0039)	(0.0031)	(0.0067)	(0.0032)	(0.0263)	(0.0053)
Observations	121310	58190	63120	99396	21914	89837	1548	28689

Notes: This table shows the coefficients form the OLS regressions of child's income measure on the parent income measure with the respective standard errors in parenthesis and for various subsamples in each column. Column (1) report coefficients for the core sample, which includes all citizens in Switzerland appearing in the 2012 Census who are (i) born in birth cohorts 1967-1982 (ii) for whom we could identify at least one parent (iii) whose mean parents income (together) is strictly positive during child's age 15-20, and (iv) who paid for Social Security at age 32-34. Column (2) and (3) restrict the sample to females and males. Column (4) uses all children with at least one foreign born parent and column (5) only takes children with native born parents. Columns (6) and (7) limit the sample to children whose parents were single or married in the year of child birth. Column (8) restrict the sample to children from single earner households, where only one parent report strictly positive income. Significance levels are shown as: *p< 0.05, **p< 0.01, ***p< 0.001.

Turning to absolute upward mobility (see Table 2.2), the ranking between the different outcomes remains unchanged, we now are able to compare education mobility with other outcome variables. We find AUM is largest for income, where children born to parents in the bottom half of the distribution can expect to reach rank 50.2 on average. This is again substantially larger than what has been found for the U.S.—where absolute upward mobility ranges from 35.8 in Charlotte to 46.2 in Salt Lake City among the 50 largest commuting zones (Chetty et al., 2014a)—Italy (44, Acciari et al., 2019), and Sweden (43.6, Heidrich, 2017). Chuard and Grassi (2020), who only use father's income, report an AUM of 46 for Switzerland.

Absolute mobility measures allow for better comparison across different population groups as they do not only take into account the slope but also group-specific differences in outcome levels. Table 2.2 reveals the large difference in expected earnings ranks between daughters and sons. While the latter can still expect to reach rank 63.5 if born to parents at $p = 25$, the former on average reach rank 36.1. The difference is largely driven by the extensive use of female part-time work and the lower female labor force participation. Again, differences between natives and second generation immigrants are statistically significant but negligible. Children who grow up with a single parent in the bottom half of the distribution, in contrast, can expect to reach almost 5 ranks less than their counterparts who grew up with married parents. Children growing up in a single-earner household can expect to have the largest upward mobility.

In the case of wealth, gender differences are severely muted as we have to split equally between men and women in the case of married children. With AUM of 38.6, second generation immigrants reach lower ranks than their native counterparts who on average end up at the 42nd percentile of their cohort's wealth distribution. Again, upward mobility is higher if parents are married and live the single-breadwinner model.

Occupational absolute upward mobility is largest for children born to immigrants, who can expect to reach percentile 40.4 (compared to 36.3 for all children) followed by daughters, who reach percentile 37.6 in the distribution of occupation status (ISEI). The higher upward mobility of children with foreign-born parents may be due to the fact that their immigrant parents found themselves in occupations that were below their true potential, if they had to take lower-ranked jobs, e.g., because they were lacking language skills. It may also be that immigrant parents paid particular attention that their children would end up in an occupation with higher status, possibly to counteract stigma against second-generation immigrants, which can often still be quite large in Switzerland—a country where citizenship is still not obtain at birth but has to be applied for later in life.

Estimates for educational mobility show that a child born to parents in the 25th percentile reach on average a rank between 29 and 41. Despite large bounds generated through the estimation method, the estimates report low education mobility compared to other outcome variables. Mobility differ quite a lot across groups, and again daughters and children of single parents have lower expectations to move upward. However, the interval estimation bands around these estimates are quite large, such that it is not possible to conclude whether the estimates are significantly different from each other.

Table 2.2: Intergenerational Mobility: Absolute Upward Mobility at $p = 25$ (AUM)

	All (1)	Daugthers (2)	Sons (3)	Natives (4)	2nd Gen. Immigrants (5)	Married Parents (6)	Single Parent (7)	Single-Earner HH (8)
Outcome: Income								
AUM	53.47	40.10	66.24	53.40	53.77	54.17	48.30	54.39
S.E	0.04	0.06	0.05	0.05	0.10	0.05	0.43	0.08
Observations	719542	352163	367379	572990	146552	542661	10388	139252
Outcome: Wealth								
AUM	47.90	48.36	47.47	48.58	45.34	48.94	43.23	52.17
S.E	0.07	0.10	0.09	0.08	0.14	0.08	0.19	0.15
Observations	314808	151543	163265	258906	55902	260144	27206	79523
Outcome: Occupation								
AUM	43.41	43.89	42.98	42.71	47.03	43.77	41.20	42.03
S.E	0.11	0.15	0.15	0.12	0.27	0.13	1.05	0.20
Observations	121310	58190	63120	99396	21914	89837	1548	28689
Outcome: Education								
Bounded UpMobility	[29.3, 41.4]	[24.6, 36.0]	[34.2, 46.3]	[29.0, 40.8]	[31.1, 42.5]	[30.0, 42.0]	[25.9, 37.1]	[28.9, 39.8]
Observations	175137	89093	86044	139910	35227	145631	19379	41063

Notes: We first regress children's outcome variable (percentiles) on a constant and parental outcome variable (percentiles). Absolute upward mobility is defined as the predicted value from the regression at 25th percentile of the parental outcome variable. Column (1) report coefficients for the core sample, which includes all citizens in Switzerland appearing in the 2012 Census who are (i) born in birth cohorts 1967-1982 (ii) for whom we could identify at least one parent (iii) whose mean parents income (together) is strictly positive during child's age 15-20, and (iv) who paid for Social Security at age 32-34. Column (2) and (3) restrict the sample to females and males. Column (4) uses all children with at least one foreign born parent and column (5) only takes children with native born parents. Columns (6) and (7) limit the sample to children whose parents were single or married in the year of child birth. Column (8) restrict the sample to children from single earner households, where only one parent report strictly positive income.

2.6 Conclusion

We have studied intergenerational mobility in Switzerland covering the cohorts born between 1967 and 1982 along four different outcomes: income, wealth, education, and occupation. We find that income mobility is particularly high in Switzerland: the rank-rank slope is 0.138, such that a child born to parents 10 percentiles higher up in the distribution can ceteris paribus only expect to move up 1.38 ranks. This advantage is less than half than what has been found for the U.S. or Italy. We reach a similar conclusion when looking at absolute upward mobility: children born to parents at the 25th percentile can on average expect to reach the median of the earnings distribution. It may be that we slightly overestimate income mobility compared to other studies, because we do not observe capital incomes in our data. Given that labor income as we measure it (i.e., very broadly defined, including incomes from mandatory social insurances like unemployment and disability benefits) is the most important source of income for most people, we believe the bias to be rather small overall. More importantly, our results capture the intergenerational mobility in labor incomes. They can be interpreted as a measure for equality of opportunity in the labor market, which after education is probably the dimension people care most about when it comes to guaranteeing equal opportunities.

Comparing relative mobility rates between men and women gives a mixed picture. While daughters have lower mobility in earnings and education than sons, they experience higher mobility in wealth and occupation. Due to their extensive use of part-time work and their lower labor-force participation, however, daughters exhibit considerably lower absolute upward mobility than sons: while the latter can expect to reach rank 63.5 despite being born to low-income parents, daughters can expect to reach only rank 36.1.

We can hardly make out any noteworthy differences between children to foreign- vs. Swiss-born parents in terms of relative mobility as measured by the rank-rank slope, absolute upward mobility for children with migratory background is larger in terms of occupation, education, and income (although the latter difference is small) than for natives, but somewhat lower in terms of wealth.

Our study shows large differences in intergenerational mobility dependent on the outcome variable we look at. While mobility in income is very high, it is lower in wealth and considerably lower in education and occupation status. We take this as evidence that one should be careful when drawing conclusions about a country's rate of intergenerational mobility or equality of opportunity. It furthermore suggests that at least in the past the Swiss labor did well in integrating individuals with lower and middle levels

of education. The permeable dual education system based on vocational education and training, with options to specialize further later on during the professional career has been successful in providing the right skill-mix for the Swiss labor market—together with the increasing share of tertiary educated workers. People living in Switzerland are able to reach their financial goals independent of their parental financial resources. Individual's education or occupation choices are, however, more driven by family background.

2.A Additional Tables and Figures

2.A.1 Tables

Table 2.A.1: International International Socio-Economic Index of Occupation Status (ISEI) across ISCO-08 occupation codes. Jobs with lowest and highest ISEI values.

ISCO-08	Job Title	ISEI
6224	Hunters and trappers	10
7516	Tobacco preparers and tobacco products makers	10
9412	Kitchen helpers	10
6114	Mixed crop growers	14
6111	Field crop and vegetable growers	16
9112	Cleaners and helpers in offices, hotels and other	16
9211	Crop farm labourers	16
9214	Garden and horticultural labourers	16
5245	Service station attendants	17
	.	
	.	
	.	
2114	Geologists and geophysicists	80
2611	Lawyers	85
2261	Dentists	86
2612	Judges	88
2211	Generalist medical practitioners	89
2212	Specialist medical practitioners	89

Notes: This table shows the jobs with the highest (upper part) and lowest (lower part) ISEI-2008 values with the respective ISCO 2008 codes and job titles.

Table 2.A.2: Country of Birth of Foreign-Born Parents

Country of Birth	%
Mother	
Germany	20.2
Italy	14.4
France	10.1
Austria	8.1
Turkey	3.5
Spain	3.2
United Kingdom	2.5
Netherlands	2.5
Serbia	1.8
Bosnia and Herzegovina	1.7
Father	
Italy	30.0
Germany	16.6
France	7.5
Austria	5.8
Turkey	3.5
Spain	3.0
Hungary	2.3
Bosnia and Herzegovina	1.8
Czechia	1.8
Serbia	1.7

Notes: This table shows the 10 most common countries of birth of foreign-born parents and the respective shares in %, listed for each parent. The sample consists of all children in the 1967–1982 cohort for which we are able to match both parents and for which we are able to match parental country of birth from STATPOP 2012.

Table 2.A.3: Summary Statistics: Mother and Father Outcome Variables

	(1) **Mean**	(2) **SD**	(3) **P10**	(4) **P90**	(5) **N**
Father Characteristics					
Income (in 1000)	104.72	112.65	42.72	168.50	667047
Employed (%)	98.38	12.61	100.00	100.00	667047
Net Worth (in 1000)	516.37	3883.52	2.02	961.38	315778
Tertiary Education (%)	11.87	32.34	0.00	100.00	577712
Index of Occ. Status	47.34	20.94	17.79	76.24	270804
Swiss (%)	97.27	16.29	100.00	100.00	603981
Foreignborn (%)	12.65	33.24	0.00	100.00	633445
Married (%)	89.21	31.02	0.00	100.00	601342
Single (%)	7.45	26.26	0.00	0.00	601342
Share on total HH Income (%)	83.22	140.20	58.57	100.00	645807
Age	47.26	4.95	41.50	53.50	603981
Mother Characteristics					
Income (in 1000)	21.29	32.83	0.00	52.93	667047
Employed (%)	79.50	40.37	0.00	100.00	667047
Net Worth (in 1000)	525.35	3465.05	2.63	993.54	315778
Tertiary Education (%)	4.06	19.75	0.00	0.00	608444
Index of Occ. Status	41.81	16.37	25.04	68.70	177549
Swiss (%)	99.43	7.55	100.00	100.00	636883
Foreignborn (%)	13.63	34.31	0.00	100.00	648781
Married (%)	90.54	29.27	100.00	100.00	633777
Single (%)	4.14	19.93	0.00	0.00	633777
Share on total HH Income (%)	17.94	35.50	0.00	41.40	645807
Age	44.53	4.47	39.50	50.50	636883

Notes: Income is defined as average income combined over the years when the child was 15–20. We consider someone as employed, if they have positive earnings. Net worth is a the mean over the years 2011–2015. Tertiary education is defined as having a degree from a(n) (Applied) University. Swiss shows the share of Swiss citizens as reported in the register-based census STATPOP 2012. Age of each parent is defined as average over the years when the child was 15–20. All monetary variables are expressed in 2019 Swiss Francs.

Table 2.A.4: Summary Statistics: Migratory Background

	(1) **Mean**	(2) **SD**	(3) **P10**	(4) **P90**	(5) **N**
Natives Characteristics					
Income (in 1000)	63.85	44.34	5.90	110.85	494531
Employed (%)	94.51	22.77	100.00	100.00	494531
Net Worth (in 1000)	118.67	1168.85	-43.31	278.44	302928
Tertiary Education (%)	23.08	42.14	0.00	100.00	145761
Index of Occ. Status	53.55	19.78	25.04	76.98	131192
Female (%)	48.98	49.99	0.00	100.00	494531
Swiss (%)	100.00	0.57	100.00	100.00	494531
Married (%)	46.54	49.88	0.00	100.00	494531
Have Kids (%)	41.38	49.25	0.00	100.00	494531
2nd Generation Immigrants Characteristics					
Income (in 1000)	65.81	51.00	5.91	114.86	128727
Employed (%)	94.09	23.59	100.00	100.00	128727
Net Worth (in 1000)	106.82	992.93	-39.52	215.82	11577
Tertiary Education (%)	29.87	45.77	0.00	100.00	38143
Index of Occ. Status	56.22	19.01	28.48	79.49	33705
Female (%)	48.88	49.99	0.00	100.00	128727
Swiss (%)	98.14	13.51	100.00	100.00	128727
Married (%)	43.43	49.57	0.00	100.00	128727
Have Kids (%)	38.93	48.76	0.00	100.00	128727

Notes: Income is defined as average income over the age 32–34. We consider someone as employed, if they have positive earnings. Net worth is a the mean over the years 2011–2015. Tertiary education is defined as having a degree from a(n) (Applied) University. Swiss shows the share of Swiss citizens as reported in the register-based census STATPOP 2012. All monetary variables are expressed in 2019 Swiss Francs.

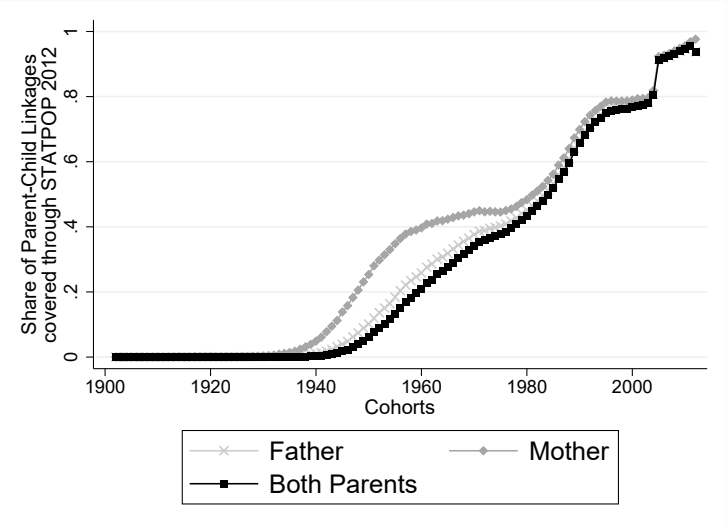
Table 2.A.5: Summary Statistics: Wealth Data

	(1) **Mean**	(2) **SD**	(3) **P10**	(4) **P90**	(5) **N**
Child Characteristics					
Gross Wealth (in 1000)	290.23	1308.68	2.61	615.24	314905
Net Worth (in 1000)	118.11	1162.13	-43.13	276.44	314905
Financial Wealth (in 1000)	114.09	1007.41	0.98	213.10	314905
Real Estate (in 1000)	157.61	346.21	0.00	430.44	314905
Married (%)	60.70	48.84	0.00	100.00	314905
Have Kids (%)	62.56	48.40	0.00	100.00	314905
Parents Characteristics					
Gross Wealth (in 1000)	1454.90	7625.03	76.66	2608.50	314905
Net Worth (in 1000)	1038.74	6879.49	14.62	1947.65	314905
Financial Wealth (in 1000)	721.10	6561.42	21.10	1250.32	314905
Real Estate (in 1000)	645.46	1710.04	0.00	1271.30	314905
Foreignborn (%)	17.26	37.79	0.00	100.00	312986
Married (%)	92.06	27.03	100.00	100.00	293135

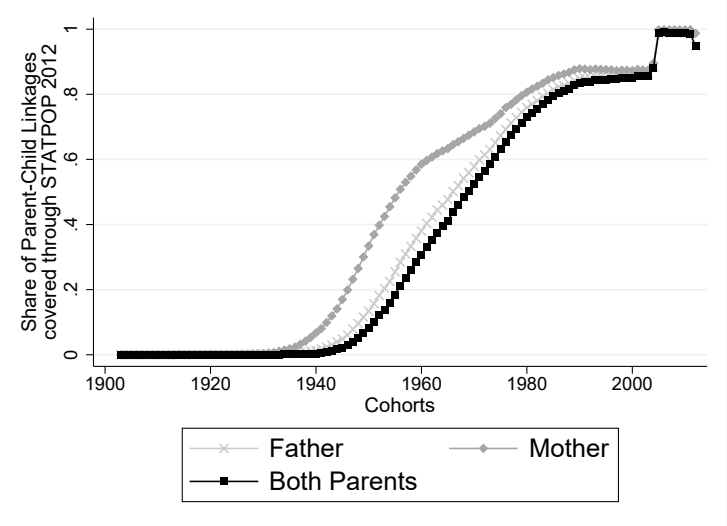
Notes: All wealth variables are averaged over the years 2011–2015. Civil status and having kids themselves is defined over the years 2011–2015. All monetary variables are expressed in 2019 Swiss Francs.

2.A.2 Figures

Figure 2.A.1: Parent-Child Linkages Covered in STATPOP 2012 across Cohorts and Subgroups



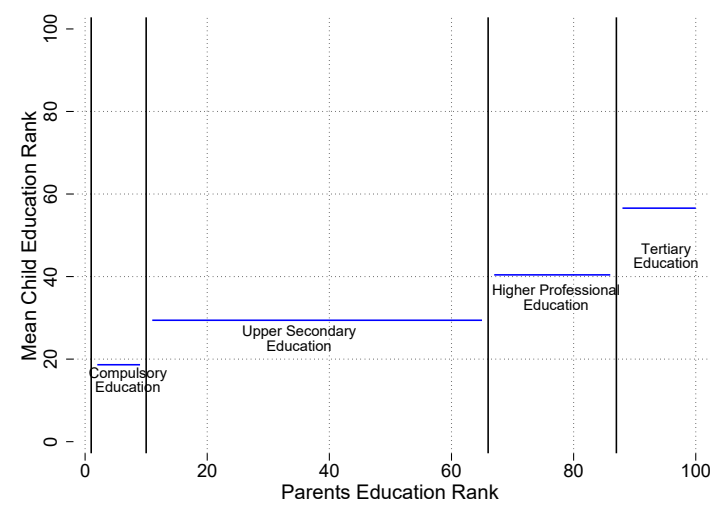
(a) Whole Population



(b) Swiss-Born Individuals

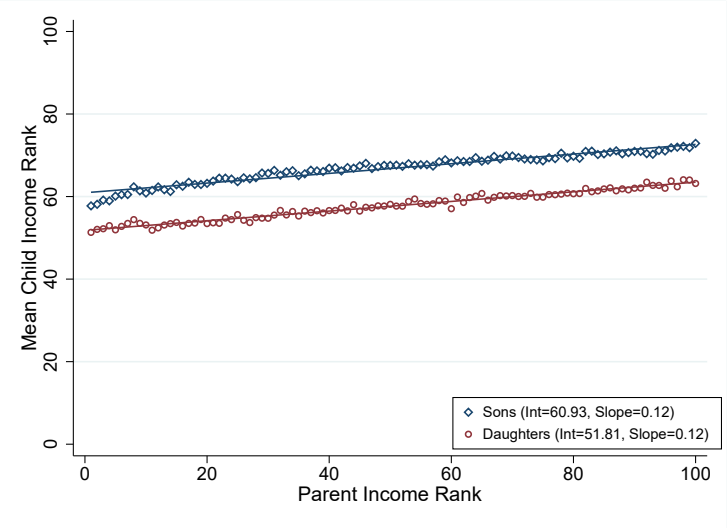
Notes: These figures show the number of linkages between individuals and their parents in STATPOP 2012 as a share of the whole 2012 population. We also look at the sub sample of Swiss-born individuals.

Figure 2.A.2: Mean Child Education Rank in Parent Education Bin



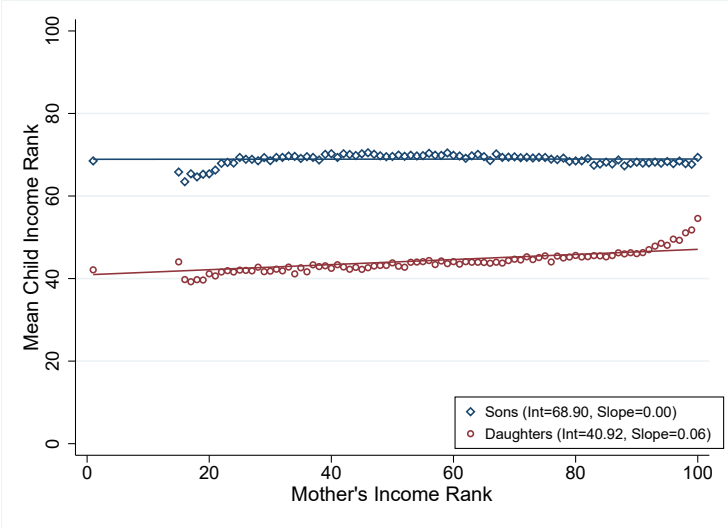
Note: This figure shows mean education rank in each parental education category. The sample consists of all children in the 1967–1982 cohort for which we are able to match education related information from the Structural Surveys 2010-2016 and for which we could match education related information for their parents from Census 2000. Child and parent education is ranked across all cohorts for graphical reasons.

Figure 2.A.3: Intergenerational Income Mobility Heterogeneity: Children without Kids Themselves

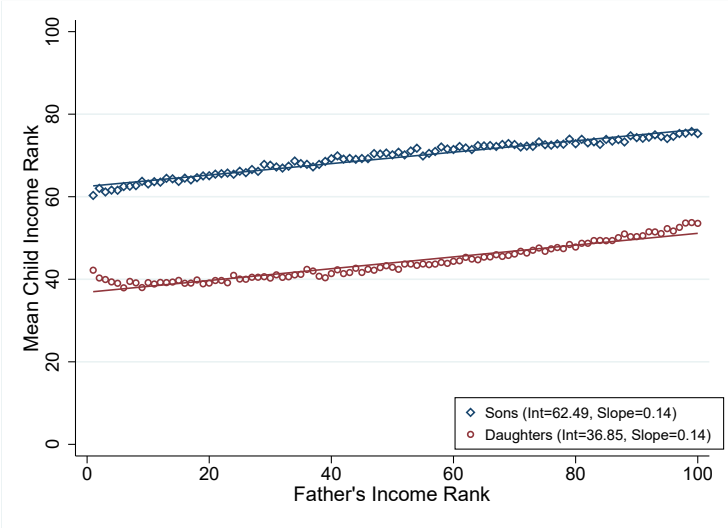


Notes: These figures show the correlation between child's and parent's income percentile (rank-rank slope) and the respective 95% confidence interval for different cohorts and for various subsamples. The sample consists of all children in the 1967–1982 cohort for which we are able to match both parents. Children have no kids during age 32-34. Child's income rank is the mean at age 32–34. Parent's income is the sum of maternal and paternal income averaged over child's age 15–20. Children are ranked relative to other children in their birth cohort, and parents are ranked relative to all other parents with children in the same birth cohort.

Figure 2.A.4: Intergenerational Income Mobility: Each Parent



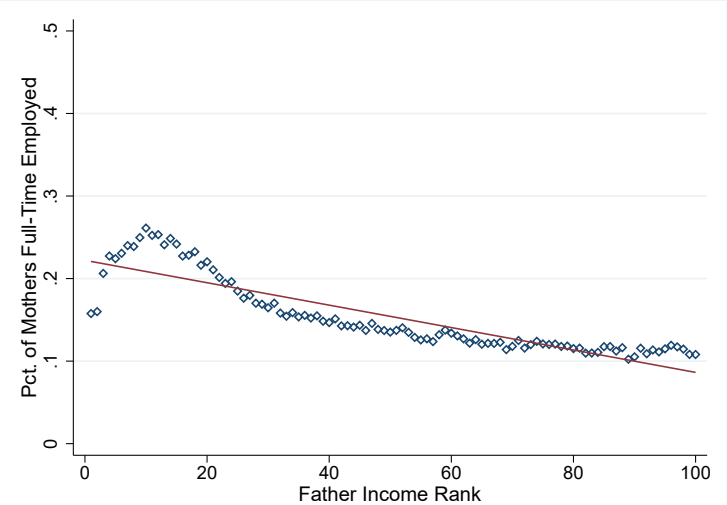
(a) Mother



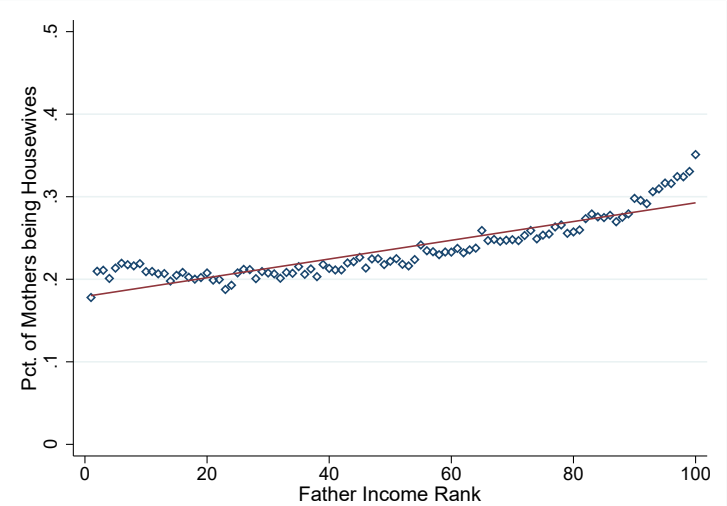
(b) Father

Notes: These figures show the correlation between child's and parent's income percentile (rank-rank slope) and the respective 95% confidence interval for different cohorts and for various subsamples. Children are second generation immigrants if at least one of their parent is foreign born. The sample consists of all children in the 1967–1982 cohort for which we are able to match both parents. Child's income rank is the mean at age 32–34. Parent's income is the sum of maternal and paternal income averaged over child's age 15–20. Children are ranked relative to other children in their birth cohort, and parents are ranked relative to all other parents with children in the same birth cohort.

Figure 2.A.5: Maternal Employment Status Related to Father's Income



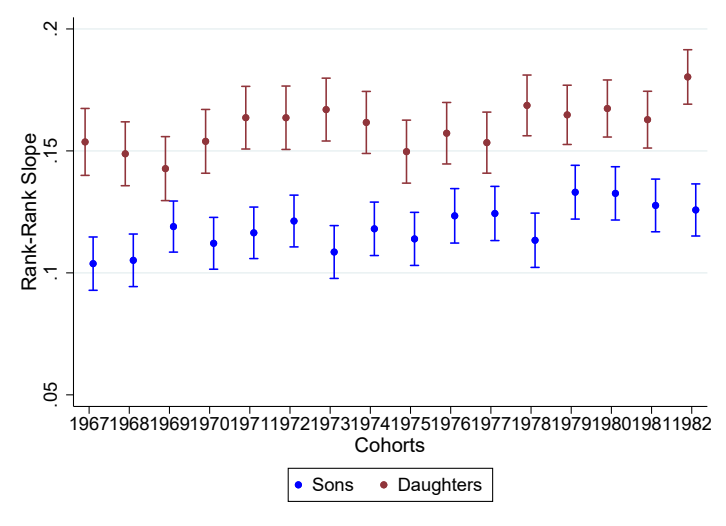
(a) Full-Time Employment



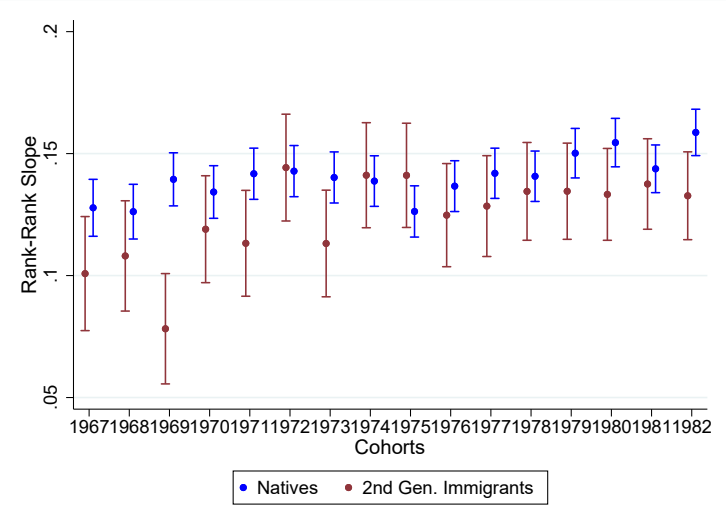
(b) Housewives

Notes: These graph show the percentage of mothers reporting working full-time (a) or being housewives (b) with respect to father's income rank. The sample contains all parents with children in the birth cohorts 1967–1982 for which we could link fathers income through SSER and mothers employment status through Census 2000. Fathers income is averaged over child's age 15–20. Fathers are ranked relative to all other fathers with children in the same birth cohort.

Figure 2.A.6: Heterogeneity: Income Mobility across Cohorts



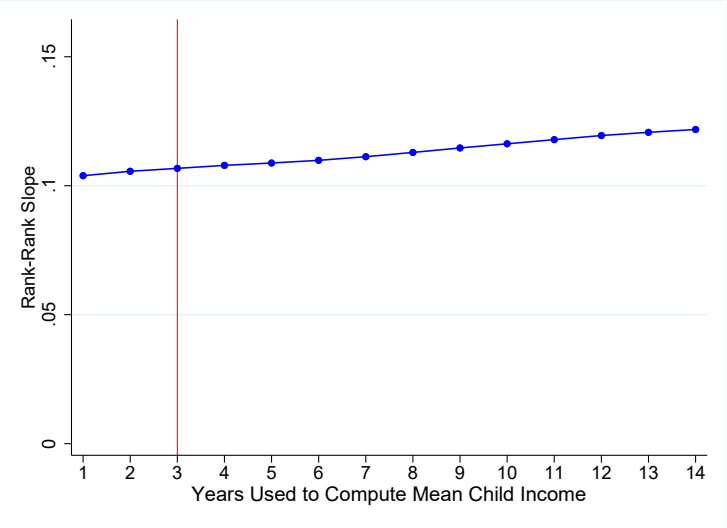
(a) Gender



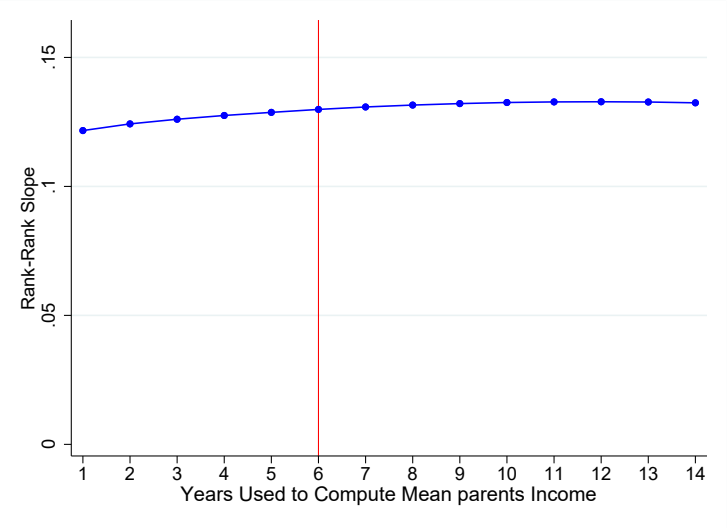
(b) Migration Status

Notes: This figure shows the nonparametric binned scatter plot of the relationship between children's and each parent's percentile income ranks. The sample contains all children in the birth cohorts 1967–1982 for which we could link both parents. Child's income rank is the mean at age 32–34. Parents income is the sum of maternal and paternal income averaged over child's age 15–20. Children are ranked relative to other children in their birth cohort, and parents are ranked relative to all other parents with children in the same birth cohort. The slopes and best-fit lines are estimated using an OLS regression.

Figure 2.A.7: Robustness Income Mobility: Attenuation Bias



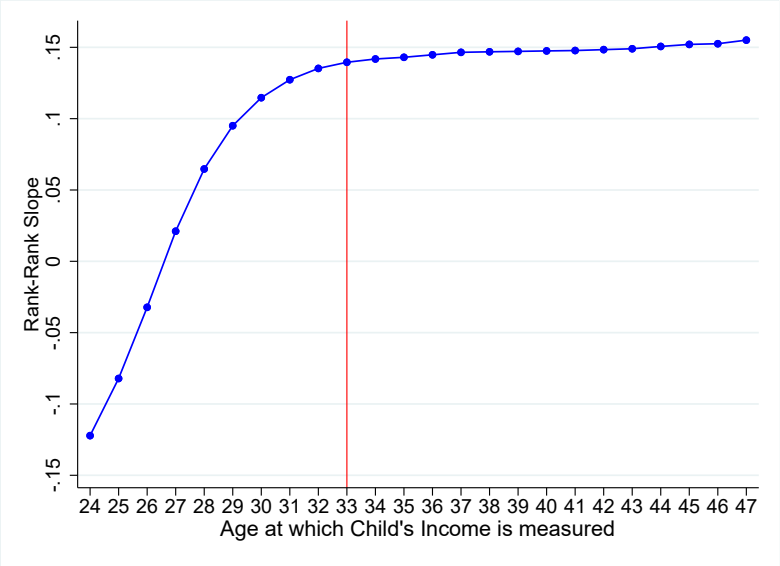
(a) Child Income



(b) Parents Income

Note: These figures test the robustness of the rank-rank slope estimates from table 2.1 by varying the number of years used to compute child's income (Panel a) and parents' income (Panel b). The first point in panel a) corresponds to children in the birth cohorts 1967–1970, for which we measure income at age 33, while parents' income is fixed and averaged over the years the child is aged 15–20. The second point takes averages of child's income at age 33–34. In panel b) the first point corresponds to the average of parents' income when the child is 15 years old, while child's income is the average over the age 32–34.

Figure 2.A.8: Robustness Income Mobility: Life Cycle Bias



Note: This figure tests the robustness of the rank-rank slope (RRS) estimates from table 2.1 by varying the age at which child income is measured. We take averages over three years. The first point refers to the RRS if child income is measured as mean over age 23–25. Parents' income is measured and averaged over the period the child is aged 15–20.

2.B Data Description

We use two different large register data sets in our main empirical analyses. The first combines the Swiss population censuses with social security data earnings records, which track the entire labor market history of the population of Switzerland. In addition, we can merge survey information for a subset of the population (28 %). We refer to this data as matched SSER-Census-Survey data. The second main data set we use is WISIER, a novel data set made available by the Federal Social Insurance Office. This is a matched data set that contains several register data sets including (among others) social security data earnings records, individual income and wealth tax data from 11 cantons, and census and survey data.

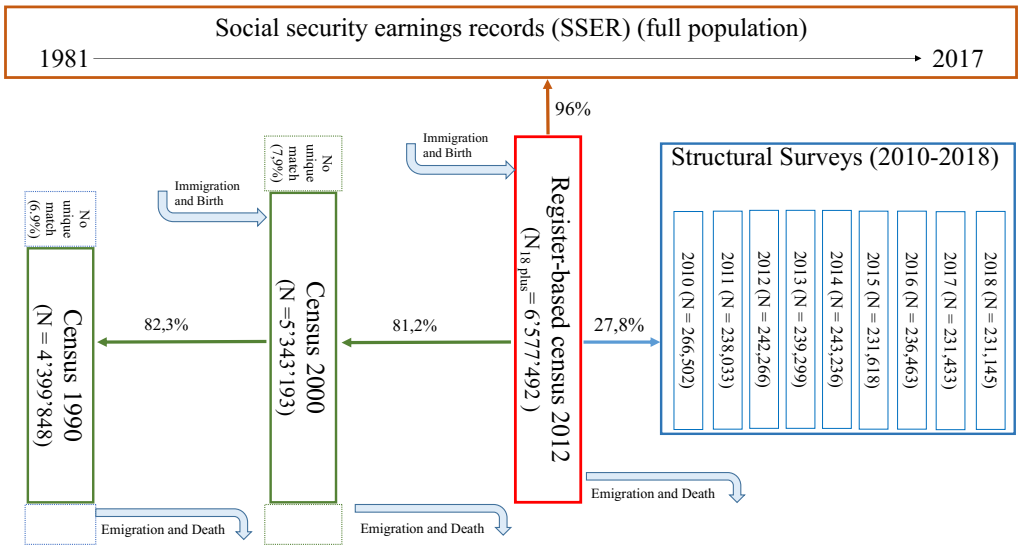
2.B.1 Matched SSER-Census-Survey Data

Figure 2.B.1 illustrates our main data set. Its core is a merge between the register-based population census of Switzerland as of December 2012, and 100 percent of the social security earnings records (SSER) from the Old-Age and Survivors' Insurance (OASI, AHV in German), covering the period 1981–2017. The 2012 register-based census allows us to link parents and children. The SSER contain individual's entire earnings history from employment and self-employment. To obtain information on individual's residential, marital status and education history, we further match data from the population censuses in 1990 and 2000. Finally, we can link the data from the annual Structural Survey (Strukturerhebung in German) to our matched register-census data via the social security number. This survey is a component of the otherwise register-based Population Census available since 2010. It samples at least 200,000 individuals aged 15 and older each year and provides information on households, families, housing, employment, mobility, education, language and religion. We describe each of these data sets in turn.

Register-Based Census 2012 (STATPOP)

We start from the register-based census in 2012, the data set which contains variables on place and year of birth, marital status, nationality etc. and which allows us to link parents and children. Hence the underlying sample is everyone that was living in Switzerland in 2012. In total the census 2012 contains 8.12 million individuals. We drop those, which are registered as non-permanent residents and those aged younger than 18. We are finally left with 6.58 million permanent resident population in Switzerland aged 18 and more. To this data we are able to link the income history from the SSER for

Figure 2.B.1: Illustration of matched SSER-Census-Survey Data.



Note: The data covers the whole permanent-resident population in 2012 in Switzerland aged 18 and more (6.58 million). 96% of these individuals had generated at least one entry in the SSER over the period 1981-2017. We observe 81.2 % of these individuals in the 2000 census and 66,9 % (81,2 % of 82,3%) could be matched to the 1990 census.

96% of the individuals. Furthermore, 81,2% could be matched to the 2000 census and 66,5% to the 1990 census. Further variables of interest, such as education, occupation, religion or language might be matched through the Structural Surveys 2010-2018 for 27,8% of the permanent resident population aged 18 in Switzerland.

The main variable of interest in the register-based census STATPOP 2012 is the linkage between parents and children. This link might be observed in STATPOP for those parent-child pairs if both (parent and child) were living in Switzerland in 2005 or in more recent years.[18] If parents or children died or emigrated before 2005 parent-child linkages are missing in the data. Furthermore, linkages might be missing if parent or child have foreign citizenships, and if in that case the parent never had any changes in the civil register since 1990. One limitation of our data, therefore, is parent-child linkages for individuals with migrant background are not fully captured in our data even though both were living in Switzerland in 2012. Overall we observe 3,78 million (46 % population-share) mother-child and 3,09 million father-child linkages (40%) for the whole 2012 permanent resident population of Switzerland.

Social Security Earnings Records SSER (OASI)

This data set contains everyone who ever generated an entry in the SSER between 1981 and 2017. Because contributing to the old age insurance is mandatory from age 18 onward, almost everybody living in Switzerland generates a record at some point in their life. As Figure 2.B.1 shows, our data set contains 96 % of the permanent population age 18 or older in 2012 (6.58 million of 8.03 million permanent residents in 2012).

Employed and self-employed individuals generate one record per job per year that details the starting and ending month of an employment relationship along with the total earnings over that time period. For example, a person with two different employers and also some self-employment income would generate three records. In cases where individuals have records as self-employed and employees within a year, we categorize them as employees or self-employed according to the job that generates the higher income. Moreover, the data contain individual records for unemployment benefits, disability pensions and income compensation allowances in the event of military service or maternity. Our total income measure includes all of the above income sources (which are also fully subject to income taxation in Switzerland).

[18] Linkages between parents, children or spouses in STATPOP were derived from the centralized civil status register Infostar.

Finally the register also contains records of non-employed individuals (e.g., students). Contributions to the old-age scheme are mandatory from age 20 onward until reaching the statutory retirement age (65 years for men; for women, it was increased from 62 to 63 in 2001 and to 64 in 2005), such that non-working individuals have to make an annual minimum contribution to avoid pension cuts. Prior to 1997, when 10th OASI reform was implemented, non-employed married and widowed women below statutory retirement age of 62 were exempt from annual contributions towards the OASI. We therefor attribute an income of zero to mothers which we identify in the 2012 census but who have no SSER entry at all. More generally, we also attribute labor income of zero to individuals who have no SSER entry in single years.

Although the data cover the near universe of the population of Switzerland, the matched data set has some limitations and caveats, which we discuss below.

Missing records in 1998. The earnings records in the year 1998 are incomplete. About 5 percent of all records are missing. This is illustraed in Figure 2.B.2. The reasons for the missing observations are not entirely clear. According to statisticians of the compensation office, the missing records most likely arise because one of the IT pools, which are responsible for delivering the earnings records of several equalization funds (Ausgleichskassen) to the federal equalization fund collecting the data, had IT problems at the time.[19] As one IT pool handles several equalization funds, entries from several equalization funds have missing records in 1998. The problem is that some cantons are more heavily affected by the missing data problem than others. For example, descriptive analyses suggest that the cantonal equalization funds of the cantons of St. Gallen and Fribourg were strongly affected. The problem with the missing records remained unnoticed at the time because statistics that are based on the earnings records were only published in odd years. Inquiries revealed that it would be impossible to try to recover the missing records as of today, as many affected workers are retired by now and equalization funds discard the data of retired workers.

The missing data in 1998 affect income measurement of cohorts born between 1967 and 1968 (who are aged 30–31 in 1998). Without taking into account that data is missing for this year, we would wrongfully assume

[19]Every employer and self-employed is affiliated with an equalization fund of their choice, which collects contributions on behalf of the federal equalization fund (Zentrale Ausgleichsstelle ZAS, located in Geneva). Contributions of non-working individuals, or unemployment, disability, maternity, and military service compensation recipients are collected by the cantonal equalization funds. The SSER data set contains the id of the equalization fund.

that income of affected individuals was zero for this year. We account for these missing years as follows. We assume that an entry is missing at the individual-job level, if i) there was an entry in 1997 and 1999, but not in 1998, and if at the same time ii) the entry in 1997 and 1999 is with one of the affected compensations funds. For these records we identify as missing, we linearly impute the 1998 values at the job level, i.e., before aggregating the data to individual-year observations. We add the imputed values back to the SSER data and aggregate it to individual-year observations.

Missing records in other years. In a few cases, there are also compensation offices in which the records for a year other than 1998 are likely missing. These are usually smaller compensation offices with a small number of affiliated workers. We identify these cases by looking at detailed time series of year-on-year changes in record entries by compensation office. We assume that a large drop in entries in just one year followed by a large increase in the following year (in otherwise relatively smooth series) indicates missing records. In total, we identified 83 cases of potentially missing data. Many of them happen in 1989, another year that seems particularly affected by missing data.[20] We impute the data as described above in all these cases. Figure 2.B.2 shows the number of raw and corrected entries, along with the number of individuals (after imputation) in each year in our data.

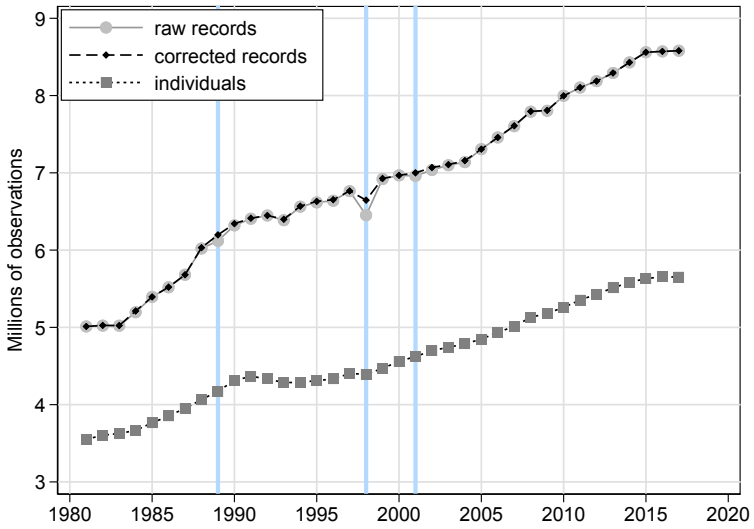
With the imputation, we obtain for each income category as well as for total income an alternative measure which includes imputed incomes from missing years.

Census 1990 and 2000

The register-based census 2012 is based on the information in the municipal registers of residents. It only contains register-based information and, therefore, has no information on some variables of interest normally available in census data such as schooling/education or occupation. Such information are only available for individuals for which we could match the censuses in 1990 or 2000. Those older censuses were conducted through surveys, which were compulsory for all inhabitants living in Switzerland. Another limitation of the register-based census 2012 is that place of birth in Switzerland is recorded as the municipality where birth was registered. Birth registration is normally done in the hospital, where a mother gives birth to a child and,

[20] Our approach differs from the one in Martínez et al. (2021), who identify affected compensation offices and years based on comparisons of cantonal unemployment rates and discard affected individuals altogether.

Figure 2.B.2: Missing records in 1989, 1998, and 2001



therefore, in the municipality in which the hospital is located.[21] This implies, that municipality of birth registered in STATPOP 2012 only covers more urban regions with hospitals and do not reflect the detailed location of early childhood of individuals e.g. the place of residence of mothers giving birth. To overcome this limitation, we add information about municipality of birth from census 1990 and 2000, in which municipality of birth indicates the place of residence of the mother. The census 1990 and 2000 did not contain the social security number as personal identifier, as it is the case in the register-based censuses. Matching between census 1990, 2000 and the register-based census was done using probabilistic methods based on sex, date of birth, marital status, nationality, religion, place of residence and other variables in the "Swiss National Cohort" project (see Spoerri et al. (2010), for a detailed discussion of this data linkage).

We are able to match 81,2 % of the permanent-resident population in Switzerland in 2012 aged 18 and older to the census 2000 and 66,9% to the 1990 census. As shown in figure 2.B.1 our matched dataset does not contain individuals which were present in the 1990/2000 censuses but died or emigrated before 2012. Furthermore, it was not possible to link 7,9% of the individuals appearing in census 2000 to a register-based census entry given that they in principle were still living in Switzerland. They could not

[21] If a mother gives birth at home, the registration is done in the residence-municipality of the mother.

be matched through a unique probabilistic match.

Some characteristics such as marital status or individual's place of residence change over time. We try to reconstruct such information prior to 2012 with individual characteristics provided by the register-based census 2012 and for those available from older census 1990/2000. Nevertheless, we have to make a set of assumptions in order to impute the data points prior to 2012. We discuss how we exploit the various variables provided in the census datasets in order to reconstruct the variables prior to 2012 in section 2.B.2.

Structural Survey 2010–2018 (SS)

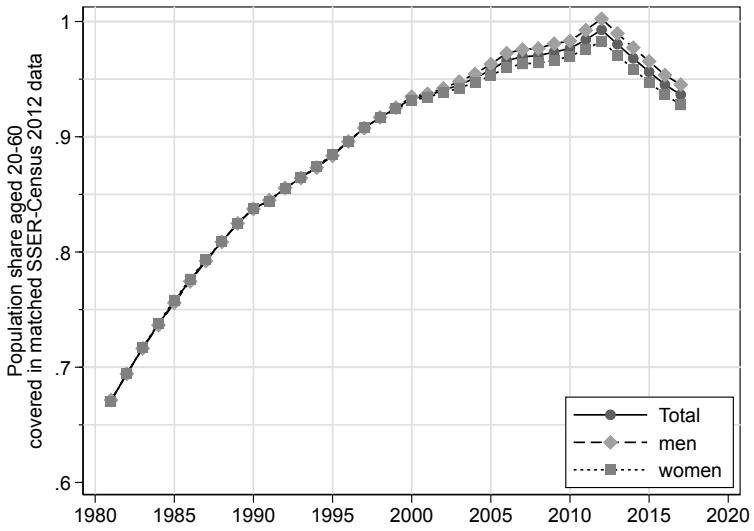
The Structural Survey complements the Population Census STAPOP, which is otherwise purely register based since 2010. Each year, the sample surveys at least 200,000 people aged 15 and older living in a private household. The survey provides information on population, households, families, housing, employment, mobility, education, language and religion. As with the register-based census, the reference date is December 31.

2.B.2 The Matched SSER-Census-Survey Data

Population coverage

Figure 2.B.3 shows the share of 20–60 year old individuals relative to the resident population in that age range in the matched SSER-Census 2012 data. In 2012, the year in which the register-based Census is drawn, our matched data covers 99.5% of the male and 96.6% of the female permanent resident population. We observe the labor market history of everyone who i) lived in Switzerland on December 31, 2012 (the date when the register-based Census 2012 was drawn), and who ii) generated at least one SSER entry between 1981 and 2017. People may have entries in the SSER data in some years but not in others—which does not mean that they were not present, but simply that they were not in the labor force. To account for the fact that individuals have gaps in labor market histories, we build a balanced panel, making the following assumptions: i) People who are present in the 2012 Census lived in Switzerland the entire time between their last SSER entry and 2012. This includes, for example, people who have retired or who have left the labor market lo look after small children. ii) For gaps in labor market histories we assume that people were still living in Switzerland. iii) We assume that people lived in Switzerland prior to their first entry in the SSER data if they were born in Switzerland. For foreign-born individuals, we assume they have been present since their declared arrival date.

Figure 2.B.3: Population share covered in matched SSER-Census 2012 sample (age 20–60)



Note: This figure shows the share of individuals aged 20–60 in our matched SSER-Census 2012 relative to the total resident population in that age group. We observe the the labor market history for everyone who i) lived in Switzerland on December 31, 2012 (the date when the register-based Census 2012 was drawn), and ii) who appeared at least once in the SSER data between 1981 and 2012. Coverage of the total resident population declines as one moves away from year 2012, due to deaths and migration.

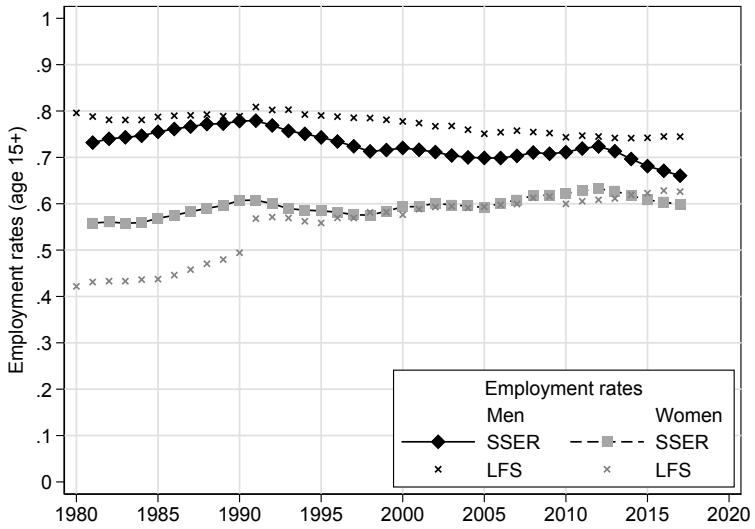
Figure 2.B.4 shows official employment rates of the population aged 15 and above along with employment rates for men and women (age 15–75) according to our matched data. While for men the levels differ slightly, we match the general trend for both groups very well (note the break in official series in 1991, which affects the level of female employment rates).

Variables of Interest

We construct several variables of particular interest from our matched data set.

Place of residence. To assign places of residence to individuals, in a first step, we use information from different variables available in the different censuses. The 2012 census (STATPOP) contains a variable indicating an individual's 2012 place of residence, as well as the municipality in the 5 years before 2012 – i.e., from 2007 to 2011. Additionally, STATPOP contains a

Figure 2.B.4: Employment rates

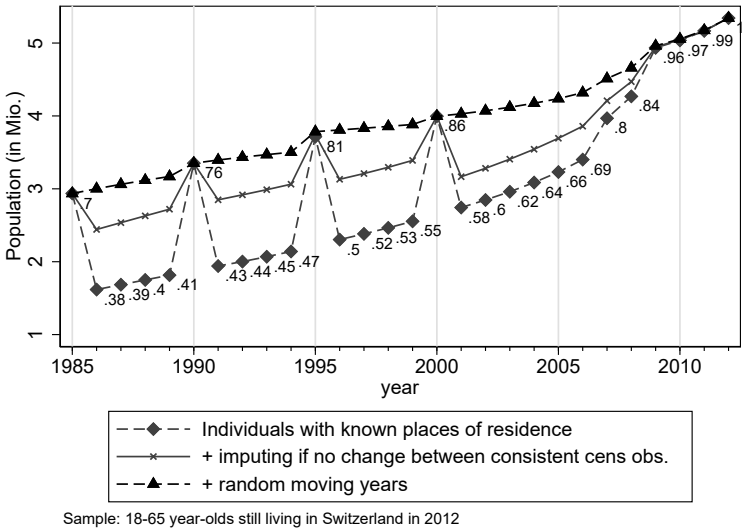


variable on the year in which an individual moved into her 2012 place of residence. When available, This information can be used to assign places of residence in the years before 2007, if an individual was living more than 5 years in the same place – the 5 years before being already assigned thanks to the previous variable - as the one in 2012. The 2000, as well as the 1990 censuses contain variables indicating an individual's place of residence in the years 2000 and 1990 respectively, as well as the place of residence 5 years before the censuses' years, i.e. in 1985 and in 1995. The places of residence assigned using the variables described above over the years 1985-2012 are considered as being known; in other words, they are not derived from assumptions. In a second step, for the years for which no place of residence could be assigned - i.e., in which we do not have variables allowing to assign known places of residence - and when that is possible, we impute the information through 2 different steps which are based on assumptions. We describe the 2 imputation steps, as well as the assumption made below.

Imputation step 1 – between censuses:
If an individual has the same address between two consecutive known information extracted from the censuses (e.g., 1985 and 1990) and if the information is missing between those two censuses, we make the assumptions that the individual did not move and we impute the information for the years in-between.

Imputation step 2 – random moving year:

Figure 2.B.5: Place of Residence Imputation

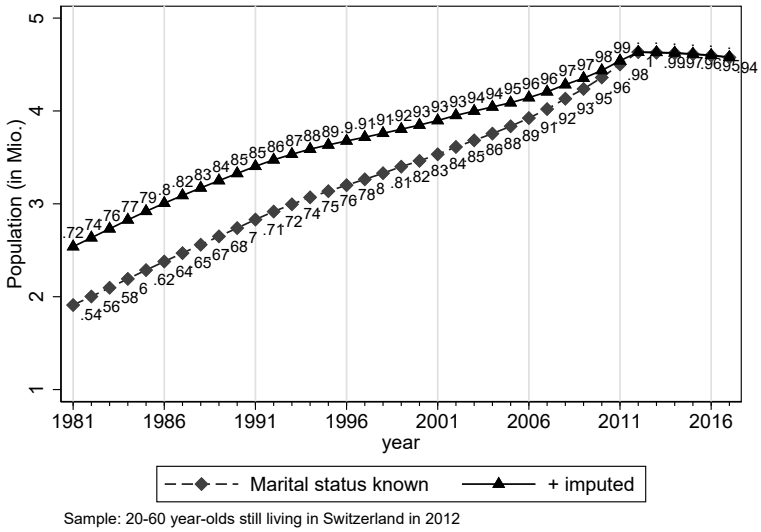


Note: This figure shows the number of individuals (and share on total population) of individuals aged 18–65 for which we know the place of residence based on our imputation. In line (1) we have individuals for which we know the place of residence based on the information available in from census 1990, 2000 and 2012. We know municipality of residence for 100% of the population in 2012, this share decreases the more one moves away from 2012. Line (2) shows the number of individuals for which we could impute place of residence if there are no changes in municipality of residence in two consecutive censuses. Line (3) includes imputation step 2 were we assign random moving years between the years for which information are available through censuses.

In a next step, if the data shows that an individual moved between two years and if the information is missing between those years, we assign randomly the year in which the individual moved and thus can fill the gap between those years, using the same strategy as in the 1st imputation step.

Marital status. Information about martial status of individuals are provided by Statpop 2012, which records the marital status and the date of the change in martial status (e.g. date of marriage or data of divorce). We create the history of individual marital status from 1981-2017 based on the following assumptions. First, we impute back based on the variables provided in STATPOP (see line "Marital status known" in figure 2.B.6). Second, everyone is single before getting married: married individuals in 2012 are single before date of marriage. Third, divorced or widowed people in 2012 are married before divorce/death date. Since we have no information about length

Figure 2.B.6: Martial Status Imputation



Note: This figure shows the number of individuals (and share on total population) of individuals aged 20–60 for which we know the marital status based on our imputation. In line (1) we impute the history of individual's marital status based on the information available in the register-based census 2012. We know the marital status for 100% of the population in 2012, this share decreases the more one moves away from 2012. Line (2) shows the number of individuals for which we could impute marital status based on our underlying assumptions.

of marriage, if a person is divorced/widowed in 2012, we impute back based on assuming i) if people have children: they are married since year of birth of first child ii) if people have no children: they are married since average age of marriage (women: 29, men: 30). Forth, we assume that marital status does not change between 2012 and 2017.

Education. Education level is the key variable to assess education mobility. The register-based census 2012 does not contain any information about education, thus gather information from census 2000 and the structural surveys. They provide the following information:

- Census 2000
  - Highest education level in 2000
  - Current education level in 2000
- Structural Surveys 2010-2018

– Highest completed education level
– Ongoing education level

For older cohorts (year of birth before 1967), we take the information on highest and current education levels from census 2000 and update the education level, if new information on highest or ongoing education levels are available in the structural surveys. We assume, that individuals do finish if they have started an education during census year 2000 or during the years the structural surveys were conducted and we assume, that information in the structural surveys are more accurate than those in the older census. For younger cohorts, we only take education related information available in the structural surveys as long as individuals were at least 30 years old in the year the survey was conducted [22]

We classify highest education level in five categories:

- No education
- Compulsory education
- Upper secondary education (High school, vocational education)
- Tertiary education I (Higher professional education (höhere Fachschule)
- Tertiary education II (University of Applied Science, University)

We are able to link information on education from census 2000 and the structural surveys for 68% of the 2012 permanent-resident population in Switzerland. Education levels might not be constant over time, especially for individuals at younger age, e.g. children in compulsory school in 2000, might have reached higher education levels till 2012. Therefore, it is important to observe highest education levels at older ages. We assume that education is constant after the age of 30. We could match education level at age 30 or older for around 66% of the 30-65 year-old residents in 2012.

2.B.3 WiSiER: Data on Economic Well-Being of the Population

To study wealth mobility we rely on a second dataset, which consist of the register datasets as those described above, with the important addition of

[22] Here we implicitly assume that education level remains constant after the age of 30.

individual tax data containing information on wealth. WiSiER[23] is a novel dataset built in 2019 by the Federal Social Insurance Office (in cooperation with the Federal Statistical Office) and made available only recently for academic research.

It is a large compilation of different administrative datasets, including the structural survey (SS, 2010–2016), the social security earnings records (SSER, 1982–2016), and *each year* of the register-based Population Census (STATPOP, 2010–2016). In addition, WiSiER contains harmonized cantonal tax data from 11 cantons (AG, BE, BL, BS, GE, LU, NE, NW, SG, TI, VS) for the years 2011–2015.[24] The tax data allows to observe wealth and total income rather than just labor income, including capital incomes and pensions, albeit only for the years 2010–2015.

All datasets were linked by the Federal Statistical Office based on individual's social security number. As in our matched SSER-Census-Survey data described above, linkage of parents and children is possible through information contained in STATPOP. Unfortunately, we were not allowed to link the 1990 and 2000 census from the "Swiss National Cohort" project to this database for legal reasons. Therefore, information on residential, education, and marital status history is not as precise as in our matched SSER-Census-Survey data.

[23]WiSiER stands for Wirtschaftliche Situation von Personen im Erwerbs- und im Rentenalter: `https://www.bsv.admin.ch/bsv/de/home/publikationen-und-service/forschung/forschungsbereiche/WiSiER.html`.

[24]The database contains further data for the period 2010–2016 from pension registers, the job placement and payment system, housing and building statistics, social assistance statistics, and migration statistics. We did not apply for these datasets for this project.

Chapter 3

The Effect of Outward Foreign Direct Investments on Home Employment

Evidence using Swiss Firm-Level Data

joint with **Daniel Steffen**

3.1 Introduction

At present, globalization and international economic interdependence are experiencing a political setback. In many countries that were previously known for their economic openness protectionist forces have gained increasing influence. The most striking example of this turning away from globalization is the election of Donald Trump in the USA. The reason for this departure from economic openness is, among others, the fear that domestic jobs will be relocated.

Accordingly, the discussion about the effects of outward FDI on the do-

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mestic job market is reviving and the benefits of investment treaties are doubted. On the one hand, proponents of protectionism often regard outward FDI as a classic zero-sum game: The total number of jobs is fixed and every job that is built up abroad, is a job that is lost at home. This static idea of firms comes closest to the so-called *displacement effect* known in economic theory. Policy makers that support this idea strongly oppose large scale outward FDI in order to ensure home employment and production. However, this static idea of the economy does not correspond to what we observe in reality: FDI are supposed to be crucial to give firms the possibility to remain competitive and guarantee or even create additional domestic jobs in a longer term. Part of this argumentation is related to the *output effect* discussed in economic theory.

Hence, economic theory suggests two important channels through which outward FDI affect home employment: a negative and direct displacement effect channel and a positive and indirect productivity or output effect channel. Opponents of outward FDI focus rather on the displacement effect, while supporters emphasize the output effect and the importance of FDI for firms in order to remain competitive and to survive. Economic theory is not able to predict, whether the gain of domestic jobs due to output effects outweighs the initial loss due to displacement. Therefore, the currently much discussed political question about the effect of outward FDI on home employment boils down to an empirical issue.

The goal of this paper is to empirically examine this effect of outward FDI[1] on *within firm* domestic employment in the context of a small and open economy with a high relative outward FDI stock, i.e. Switzerland. In particular we aim to answer the question whether firms that engage in outward FDI increase or decrease home employment due to foreign activities. This means that we will not consider horizontal and vertical spillover effects on other firms. There is only limited evidence of these spillover effects. However, Tang and Altshuler (2015) find positive spillover effects of outward FDI on domestic suppliers, showing that at least backward linkages appear to affect home employment positively. Furthermore, we do not take into consideration that firms might have to close down their business in the longer run, if they do not have the possibility to conduct outward FDI. Hence, the overall effect on home employment is likely to be more positive than our within firm estimates suggest.

[1]Note that we are interested in operational activities of multinational enterprises (MNE) and not necessarily in financial flows. Therefore, we use foreign employment of MNEs instead of actual financial flows or stocks as measure for foreign activities. It is important to know that FDI as we use it in this paper are operational activities (foreign employment) and not financial flows.

We find no evidence for the existence of a negative displacement channel and clear evidence for a positive output channel, when we are considering only FDI to high-income countries. However, the positive effect of FDI to high-income countries on home employment is rather small. In the case of FDI to lower middle-income countries, the negative displacement effect outweighs the positive output effect and, thus, the cumulative effect on home employment is negative but as well rather moderate. This negative effect is driven by China. Further, we find no evidence for the displacement effect and only partially significant evidence for the output effect of FDI to low-income countries. Again, this potentially positive effect is driven by a single destination country, India. Finally, we are not able to estimate the effect of FDI to upper middle-income countries reliably. Considering all types of FDI, we find that outward FDI have no clear effect on domestic employment for Switzerland, if at all, outward FDI tend to create more domestic jobs within the firm than it relocates.

This paper contributes to the existing literature by analyzing the domestic employment effect of outward FDI for a small economy, Switzerland. Switzerland has one of the highest outward FDI stocks and flows relative to GDP in the world and is thus heavily exposed to the effects of outward FDI. Not surprisingly, some of the largest MNEs such as Nestlé, Roche or Novartis are located in Switzerland. Hence, Switzerland is not only a small economy, but, relative to its size, it engages more strongly in FDI than all other countries examined in the literature so far. Moreover, we construct a novel instrument for foreign employment and our data contains firms from the service and manufacturing sector, while the other studies often focus on the manufacturing sector.[2] We were able to acquire unique administrative firm-level data from the surveys on cross-border capital linkages from the Swiss National Bank (SNB). We construct a novel instrument for the number of employees abroad by using different exogenous predictors of FDI to estimate the potential employment for each firm in each country in a zero-stage. The idea to estimate a firm's location choices using exogenous predictors is related to the idea of di Giovanni and Levchenko (2009), who compute potential trade flows per sector adapting the classic gravity model approach. Using this novel instrument we estimate the displacement and the output effect in two different steps.

We can draw on a broad literature, which addresses the same empirical question. The literature can be roughly categorized into three approaches: *i)*

[2]For instance, Hijzen et al. (2011) focus as well on service and manufacturing sector of France and find a positive effect for horizontal FDI and no effect for vertical FDI. Crinò (2010) considers only the service sector in the US and finds positive employment effects for skilled workers, while less skilled workers might be displaced.

papers that pursue an instrumental variable (IV) strategy, *ii)* papers that use matching estimators to form a counterfactual, and *iii)* a paper that exploits a natural experiment. The first strand of literature using an IV strategy is most closely related to our method. In particular, Wright (2013) is quite closely related to this paper. We adopt the empirical strategy of this paper by estimating the displacement and the output effect in two separate steps. Wright (2013) uses sector-level data on US manufacturers and finds a positive overall effect of FDI on total employment. However, he is as well examining the effect on high- and low-skilled labor separately and finds that the total effect on low-skilled labor employment is negative. Among others, the approaches of Desai et al. (2009) and Harrison and McMillan (2011) are as well related to our strategy. Desai et al. (2009) show that greater foreign employment of US manufacturers is associated with greater domestic employment using firm-level data and applying as well an instrumental variable approach. Harrison and McMillan (2011) find mixed effects. They emphasize that it depends on the type and destination of FDI, whether the overall effect is positive or negative: For firms most likely to perform similar tasks in domestic and foreign affiliate, foreign and domestic employees are substitutes. However, for firms that engage in significantly different tasks at home and abroad, foreign and domestic employments are complements.[3]

The second strand of literature tries to establish a counterfactual for firms that invest abroad for the first time. This strand of literature compares national firms with firms that switch from national to multinational status using matching estimators. Debaere et al. (2010) for example, find that South Korean multinational enterprises (MNE), which invest to countries with a lower income than South Korea face lower employment growth than comparable national firms. On the other hand, the authors find no significant difference in employment growth between firms investing in countries with higher income and comparable national firms. Barba Navaretti et al. (2010) find, however, positive effects on home employment for Italian and French MNE, irrespective whether they invest in low- or high-income countries.

In a third approach, Sethupathy (2013) uses firm-level data and two events in Mexico as a natural experiment to identify the effects of a fall

[3]This list is obviously incomplete and there are other papers that are related to our approach. Many of them focus on the effect on wage or skill intensity. For instance, Hummels et al. (2014) are estimating the effect of offshoring on wages in Denmark using an instrumental variable approach. Another prominent example are Ottaviano et al. (2013) who apply as well an instrumental variable approach and find no negative effect of offshoring on employment level for the US. For a broader overview of offshoring and its effects on wage, skill intensity, investment as well as job loss and creation see Hummels et al. (2018).

in the marginal cost of offshoring to Mexico. He finds no evidence of greater domestic job loss in the US due to offshoring. Finally, Crinò (2009) provides an excellent overview of the empirical literature of labor market effects of outward FDI. He finds that FDI mostly have a weak effect on home employment and concludes that results tend to be very mixed depending on countries and offshoring strategy.

Hence, empirical evidence does not clearly show whether overall effects of outward FDI on home employment are positive or negative. The outcomes vary by context and might even indicate contrary effects dependent on the destination market and types of FDI. Or as Lipsey (2004, p.340) puts it in his review of home-effects of FDI: "The effect may depend on whether the foreign operations' relation to home operations is "horizontal" or "vertical," [...] the extent to which the foreign operations are in goods production or in service activities, are in developed or developing countries, or are in industries with plant-level or firm-level economies of scale." The existing literature focuses so far on big economies, while the effect on small economies is clearly less explored.

3.2 Conceptual Framework

Economic theory distinguishes two types of FDI, vertical and horizontal FDI (see e.g. Markusen and Maskus, 2003), which affect home employment through different channels. These types are based on different motivations for an MNE to open affiliates abroad. While it was debated in the early literature which type of FDI is predominant in the world, there is now a consensus that both types of FDI coexist and are important for MNEs (Davies, 2008). Because these types of FDI affect home employment potentially differently (Lipsey, 2004), it is important to understand these diverse types and the mechanisms behind them.[4]

3.2.1 Vertical Foreign Direct Investments

Helpman (1984) and Helpman and Krugman (1985) describe vertical FDI (VFDI) in early models. The goal of VFDI is to exploit differences in factor prices between countries. This means that a company produces intermediate goods abroad at lower costs and thus geographically relocates part of the production chain. As a result, there are intra-firm imports of low-wage goods, which were formerly produced domestically. Therefore, in this first relocation

[4]See Barba Navaretti et al. (2006) for a very broad overview of MNE activities and different types of FDI as well as their effects.

step, foreign and home production are substitutes and VFDI are supposed to reduce the number of domestic jobs. However, after this immediate potential displacement of domestic labor, the intermediate goods produced in these foreign affiliates are complementary to the production that remained in the home country. Because factor prices are lower abroad, intermediate goods produced in the foreign affiliates are cheaper. Due to these cost savings the MNE will be able to gain market shares and, therefore, to increase production and employment at home *and* abroad. Furthermore, an expansion in production abroad leads as well to higher demand for headquarter services. Accordingly, VFDI have a negative and immediate displacement effect, as well as an opposing positive effect via competitiveness and output on domestic employment. Because differences in factor prices are the crucial motivation for VFDI, these kind of investments flow typically from high-wage countries to low-wage countries.

3.2.2 Horizontal Foreign Direct Investments

In the case of horizontal FDI (HFDI), not only one stage but the entire production process is replicated in an affiliate abroad. I.e. the same products are manufactured in different locations. The motivation behind HFDI is the reduction of transport costs, market seeking, technology sourcing and exploitation of firm scale economies (see e.g. Markusen, 1984, for an early version of HFDI models or Markusen and Venables, 2000). Since in the case of HFDI the same products are manufactured at home and abroad, home and foreign production are substitutes. Outward HFDI thus tend to reduce domestic exports, which reduces the demand for domestic employment (Helpman et al., 2004; Lipsey, 2004). However, HFDI allow more efficient sales in the foreign market leading to a stronger penetration of that market and accordingly, an increase in production abroad. This more complex organization and a further expansion of production due to gains in market shares lead to a higher demand for headquarter services and other complementary products, which are typically provided by the parent company (Helpman and Krugman, 1985). This gain in market share and the following rise in output increases the demand for domestic jobs. Furthermore, technology sourcing might increase home productivity, which leads as well to higher output and employment. So, there is again a negative displacement effect and a positive effect via output. The effect of HFDI on home employment strongly depends on whether a firm has exported much to a country before the foreign investment takes place. If there were only few or no exports in the forefront of the investment, there is little or no home production to be substituted and the displacement effect is negligible or even nonexistent. The more the

firm exported to that country before it opened an affiliate there, the stronger is the displacement effect and it depends on the size of the output effect whether number of jobs increase or decrease at home. Because HFDI are motivated by technology sourcing or market seeking, this kind of FDI typically happens between high-income countries. Thus, according to classic theories both VFDI and HFDI have ambiguous effects on home employment: negative displacement effects as well as positive effects due to an expansion in production.

3.2.3 Trading Tasks

More recently Grossman and Rossi-Hansberg (2008) presented an alternative approach which examines the wage effects of offshoring. Instead of goods, tasks are traded in this new model. Wright (2013) reformulates this model in order to be able to estimate the effect on labor demand instead of wage. He, then, decomposes the effect of offshoring on labor demand in three channels: a direct *displacement effect*, an *output effect* and a *substitution effect*.[5] Wright (2013) differentiates between low- and high-skilled labor and assumes that only low-skilled labor can be outsourced. The displacement effect negatively impacts domestic employment, because if firms move more tasks overseas, it takes less domestic tasks to produce a unit of a good. Thus, domestic labor demand falls. The output effect increases domestic labor demand by generating productivity gains via cost-savings. The substitution effect first reflects the substitution between the high-skill factor and the low-skill factor (factor substitution) and second within the low-skill factor the substitution between domestic tasks and foreign tasks (task substitution). While the factor substitution has a positive effect on domestic low-skill employment (and a negative on high skill home employment), task substitution has a negative effect on low-income employment at home. The displacement and the output effect identified by Wright (2013) are closely related to the effects described in earlier literature discussed above.

Summing up, theory comes up with different channels and opposing effects of FDI on home employment. Two channels seem to be important in all models and for both types of FDI: the direct displacement effect and the indirect output or productivity effect. These two channels have opposing effects on home employment and theory is not able to predict which will be the

[5]We do not discuss the substitution effect, because our data is not detailed enough to estimate this effect. However, the substitution effect is not included in the empirical literature discussed in the introduction (except in Wright, 2013, of course). Wright (2013) does not find a significant impact of this substitution effect on employment and does not focus on this channel.

dominating channel. Hence, the theory does not come to a clear conclusion as to whether outward FDI lead to a loss or gain of jobs in the home country. It is important to keep in mind, that the motivation for FDI is decisive in order to investigate the effects on employment, because HFDI and VFDI do affect employment via different mechanisms. Therefore, these different investment types might have distinct effects on domestic labor demand.

3.3 Empirical Strategy

3.3.1 Baseline Specification

As outlined in the previous section two opposing channels explain the relation between domestic and foreign employment. Following Wright (2013), we estimate these two channels in two separate steps reflected in these estimation equations:

$$\ln Empl_{it}^{D} = \alpha^{D} + \beta_1^{D} \ln Empl_{it-1}^{F} + \beta_2^{D} \ln Y_{it-1} + X_{it}'\beta^{D} + \delta_t^{D} + \gamma_i^{D} + \varepsilon_{it}^{D} \tag{3.1}$$

$$\ln Y_{it} = \alpha^{O} + \beta_1^{O} \ln Empl_{it-1}^{F} + X_{it}'\beta^{O} + \delta_t^{O} + \gamma_i^{O} + \varepsilon_{it}^{O}, \tag{3.2}$$

where Equation (3.1) estimates the displacement effect and Equation (3.2) the output effect. $Empl_{it}^{D}$ is domestic labor of the MNE i and $Empl_{it}^{F}$ is the number of employees working abroad. Y_{it} is output measured in net revenue. We control for a set of additional firm specific variables X_{it} (exports, imports and capital). We have no access to export and import data on firm level, they are constructed on industry level.[6] Further, we include year (δ_t) and firm fixed effects (γ_i).

In the first step, we estimate the displacement effect, which quantifies the direct effect of offshoring, where domestic workers are replaced by foreign workers. Therefore, home employment $Empl_{it}^{D}$ is regressed on lagged foreign workers $Empl_{it-1}^{F}$ (see Equation 3.1). As discussed in Section 3.2, home employment is as well affected by foreign employment via an opposing indirect effect. This indirect channel affects home employment via firm output. In order to isolate the displacement effect in Equation (3.1), we have to cancel this output channel out. As Wright (2013), we are doing this by holding

[6] Firm-fixed effects ensure that time-invariant level differences are absorbed. This means that only the change of exports and imports over time is relevant. Including exports and imports on industry-level is therefore based on the assumption that imports and exports of a MNE develop in the same way as the average of its industry.

output fix, i.e. by controlling for output Y_{it-1}. When output is fixed, foreign and home employment are substitutes and more foreign employment means less employment at home. Consequently, we expect the displacement effect to be negative. Because the labor market is not fully flexible, it takes time until a dismissal or hiring of staff realizes. Therefore, both $Empl_{it}^{F}$ and Y_{it} are lagged by one year.

In a second step, we estimate the output effect. As discussed in Section 3.2, the output effect is an indirect effect which works via cost savings and an increase in production. Therefore, we need to estimate the output effect in two steps. We estimate the effect of outward FDI on total output (see Equation 3.2). Again, we lag $Empl_{it}^{F}$, because it takes time until the opening of a new foreign affiliate affects output. However, a significant effect of foreign employment on output in Equation (3.2) is not sufficient to show that the output channel exists. The output effect channel consists of two parts: The effect of foreign employment on output on the one hand and the effect of output on home employment on the other. With Equation (3.2), only the first part of this channel is established. Hence, in order to fully capture the output effect channel, we need to show as well that the effect of output on home employment in Equation (3.1) is significant (and positive). Accordingly, the indirect effect of outward FDI on home employment is only given if both – the effect of outward FDI on output and the effect of output on home employment – can be substantiated. The overall effect of FDI on domestic employment is finally identified by adding up the coefficients from estimating the displacement and the output effect.

By applying a fixed effects model, we control for time-invariant and firm-specific variation, however, there might exist time-variant firm-specific variables that are not observed. One example for time-variant unobserved variables are technology shocks which are absorbed in the error term but affect domestic and foreign employment. This could cause endogeneity issues, which we face by adopting an instrumental variable strategy.

3.3.2 Instrumental Variable Strategy

We are proposing a novel instrument for firm-level outward FDI. We construct the potential foreign employment for each firm using exogenous FDI predictors. Our approach is similar to the strategy used in Desai et al. (2009) and the gravity based technique often used in the trade literature (see e.g. Santos Silva and Tenreyro, 2006). Desai et al. (2009) construct firm-specific weighted averages of foreign GDP growth as predictor for foreign activity of that firm. The predicted growth rates of foreign activity are then employed to explain changes in domestic activity. The idea behind the instrument is

that FDI locations differ significantly between firms and these locations are exposed to different exogenous developments (in Desai et al., 2009, different GDP growth rates) which affect FDI positions. Part of our argument is very similar: We know that FDI destination countries of Swiss MNEs differ significantly across firms. Given these locations, we can observe exogenous and country-specific shocks, which affect FDI choices of Swiss MNEs. Let us for example assume that one firm's investments are concentrated in Germany, while the other firm's investments are concentrated in the United Kingdom (UK). The firm which is operating in Germany is more exposed to shocks in Germany than the other firm. Hence, a positive shock in Germany is – at least in the short term – supposed to have a bigger positive impact on foreign activities of the firm with mostly German operations. As predictors of these shocks we take inward FDI stock of country c minus Swiss outward FDI stock into the same country c, the exchange rate between the US-Dollar (USD) and country $c's$ currency, as well as other variables described below which have been shown to be important exogenous predictors of FDI flows in the gravity literature (e.g. in Carr et al., 2001; Head et al., 2009; Egger and Pfaffermayr, 2004). We take inward FDI stocks as predictor since Swiss MNEs are highly likely to invest in those countries, where MNEs of other countries invest. The idea behind the exchange rate is the following: If there are two firms, one with affiliates mostly in Germany and the other in the UK and the Euro depreciates, German employees become relatively cheaper and firms which have already affiliates in Germany will expand foreign activities relatively more than firms with affiliates concentrated in the UK.[7]

A challenge is that we observe all the predictors of outward FDI on country level. However, we need firm-specific predictions of foreign employment based on the exogenous predictors named above. We apply the approach of di Giovanni and Levchenko (2009) to overcome this problem. The goal is to predict firm-specific foreign employment in a zero-stage in these three steps:

$$Log\ Empl^{f}_{ict} = \alpha + \beta_{1i} Log\ FDI^{*}_{ct} + X^{'}_{ct}\beta_i + \epsilon_{ict} \tag{3.3}$$

$$\widehat{Log\ Empl}^{f}_{ict} = \hat{\alpha} + \hat{\beta}_{1i} Log\ FDI^{*}_{ct} + X^{'}_{ct}\hat{\beta}_i \tag{3.4}$$

$$\widehat{Empl}^{f}_{it} = \sum_{c=1}^{C} e^{\ \widehat{Log\ Empl}^{f}_{ict}} \tag{3.5}$$

$Log\ Empl^{f}_{ict}$ is the log of foreign employment of firm i in country c and

[7] We take the USD dollar as base currency, because fluctuations in the exchange rate of the Swiss franc are likely to be caused by events that affect the performance of Swiss firms.

year t. FDI^{*}_{ct} is total inward FDI stock of country c subtracted by the outward FDI stock of Switzerland (CH) in country c ($FDI_{ct} - FDI^{CH}_{ct}$). X_{ct} is a set of exogenous predictors of FDI: exchange rate between the USD and foreign country c's currency, population (log), capital-labor ratio, investment and trade costs (log), distance from Switzerland to c (log), dummy variable for existing investment treaties between Switzerland and c and a dummy variable for common language.[8]

The key of the approach is the first step, i.e. estimation Equation (3.3). Following di Giovanni and Levchenko (2009), we regress firm-level foreign employment on country-specific predictors to get firm-specific coefficients β_i, i.e. we run regression Equation (3.3) for each firm i. We get different firm-specific coefficients, because firms might follow different foreign investment strategies. Firm-specific investment strategies might address different host-countries, be more or less sensitive to different predictors and change over time. For example, capital-labor ratio might be more important for some firms than for others, depending on the investment strategy and the production function of the firms. In a second step, we predict potential foreign employment per country, $\widehat{Empl}^{f}_{ict}$, based on exogenous predictors of Equation (3.3). Hence, we keep only the exogenous variation of foreign employment, while the endogenous part in the error term is left out. In a final step, we compute the total potential foreign employment per firm by summing up the exponential of the predicted log of country-specific foreign employment over all countries for each firm (see Equation 3.5).[9] Having predicted potential foreign employment $\widehat{Empl}^{f}_{it}$, we apply a 2SLS strategy to estimate Equations (3.1) and (3.2) using $\widehat{Empl}^{f}_{it}$ as instrument.

Since firms have affiliates and therefore positive numbers of foreign employment only in a few countries, they report a lot of zeros for most other countries. This implies that we have to deal with many zero values which would get lost when taking logs. These zero values contain important information in order to consistently estimate the coefficients in Equation (3.3) and allow us to consider cases were firms open up new plants in a foreign

[8]Note that the exogenous predictors should not affect home employment of a Swiss firm via any other channel than foreign employment. Therefore, it is important to include time fixed effects: These time fixed effects absorb global shocks (e.g. a downturn in global economy) that may affect predictors (e.g. FDI^{*}_{ct}) as well as Swiss firms directly. Further, it is important to keep in mind that we control for import and export such that predictors (e.g. distance between countries or population) only affect home employment of a Swiss-based firm via FDI.

[9]In order to get the absolute total of potential foreign employment, we need to sum the exponential because the PPML estimator returns logarithmized results of potential foreign employment per firm and country.

country. We face this issue by following Santos Silva and Tenreyro (2006) and use the Poisson pseudo-maximum likelihood (PPML) estimator in order to estimate Equation (3.3).

3.4 Data

The main data source on multinational activities of Swiss firms are the surveys on cross-border capital linkages from the SNB which covers basically firms with a FDI balance sheet lager than 10 million Swiss Francs (CHF). Our data include domestic and foreign employment on a country level of Swiss multinational enterprises over the period 1994 to 2016. It also covers data on firm characteristics such as industry classification and ownership as well as extensive information on domestic and foreign capital links of the firms. To get access to firm-level data we were obliged to obtain the consent of the respective firms due to confidentiality issues and the data protection rule of the SNB. We got access to data of 139 firms. Our sample covers around 56 percent of all domestic employees working for Swiss MNEs. Further, data on firm characteristics such as net revenues and property, plants, equipment (called capital) were extracted from Worldscope, Thomson Reuter's Datastream. The remaining missing data on firm characteristics were finally gathered through access to historical annual reports by the Swiss Economics Archive (Schweizerisches Wirtschaftsarchiv). However, we were not able to fill all the missing values for variables on firm characteristics. Exports and imports are obtained from UN Comtrade Database for trade in goods and from the SNB[10] for trade in service. The classification from goods trade data to corresponding industries is done according to the concordance table SITC3 to NACE Revision 1.[11]

We further assemble data on FDI predictors in order to construct our instrumental variable (see Section 3.3.2). We obtain data on distance between Switzerland and a certain destination, population size and information on common language from the CEPII gravity database.[12] Data on investment costs (Global Competitiveness Index, GCI), exchange rates, capital-labor ratio and bilateral trade costs are retrieved from the World Bank database. Data on FDI stocks and information on bilateral investment treaties are gathered from UNCTAD and information on preferential trade arrangements between countries including WTO investment areas are provided by Word

[10]Database can be accessed via `https://data.snb.ch/en`.

[11]The concordance table is available on `https://wits.worldbank.org/product_concordance.html`

[12]Database can be accessed via `cepii.fr`.

Table 3.1: Descriptive Statistics

	Characteristics of Swiss multinationals			
	Minimum	Median	Mean	Maximum
Home Employment	109	1434	4361	53,201
Foreign Employment	9	2390	14,021	275,947
Revenue (in Mio. CHF)	43	2005	7698	95,902
Capital (in Mio. CHF)	17	409	7733	404,094
Countries per firm	1	36	45	124
Employment per Affiliate	1	94	592	56,288

Bank.

We need to drop a number of firms from our sample due to several reasons. First, we drop firms which only report zero observations in foreign employment (34 firms never have a non-missing or non-zero value). Second, we drop Swiss-based subsidiary companies of foreign corporations and consider only corporations headquartered in and directed from Switzerland. Thirdly, we drop firms for which the PPML-estimation does not converge, because we are not able to predict potential foreign employment reliably (8 firms). Finally, we have to drop one or two firms in each estimation, because the instrument (prediction of foreign employment) of these firms is a clear and highly influential outlier.[13]

Our panel is highly unbalanced with hardly any values for the years before 2002. Due to modifications of the methodical concepts in 2014[14] and limited availability of other data used, we are finally left with a sample covering the period 2002 to 2013. The data include firms in manufacturing as well as service (including banks and insurance companies). Table 3.1 shows the summary statistics of the firm characteristics. The size of the MNEs vary considerably in our sample. A few firms operate mainly globally and report high values of foreign employment while others operate mainly domestically.

[13] These one or two outliers cause a drop of the first-stage Kleibergen-Paap F-statistic of our 2SLS prediction to below 1 from a convenient value of clearly more than the critical 10. We indicate for each estimation, how many firms had to be dropped because of outliers. Usually, a small bank with very few employees at home and abroad is dropped, as well as a firm in the energy sector. Fixed effects estimations show that estimates are otherwise not sensible to the inclusion or exclusion of these firms.

[14] Until 2013 staff numbers included both minority and majority participations and were stated in relation to the capital participation of the investor. As of 2014 – in line with international methodology – staff numbers only include majority participations. Further, no longer proportional, but absolute numbers of staff abroad are stated.

I.e. the number of workers employed in Switzerland varies between 109 and 53,201 per firm and the number of workers abroad between 9 and 275,947. The average firm in the dataset has about 4,361 domestic employees and 14,021 employees working abroad. Furthermore, firms in our dataset have an affiliate in at least one country and on average in 45 countries. The affiliate size ranges from 1 employee to a maximum of about 56,000 employees with an average of 592 employees. The median firm has affiliates in 36 different countries with a size of 94 employees.

Table 3.2: Employment by Destination

	2002	2013
Domestic employment	223,482	429,080
Total foreign employment	907,752	1,283,284
Employment in high-income countries	627,047	672,839
Share of foreign empl. in high-income	69%	52%
Employment in upper middle-income countries	71,358	130,305
Share of foreign empl. in upper middle-income	8%	10%
Employment in lower middle-income countries	166,575	368,167
Share of foreign empl. in lower middle-income	18%	29%
Employment in low-income countries	42,773	111,972
Share of foreign empl. in low-income	5%	9%

Note: Grouping into income categories according to World Bank classification in 2002.

Table 3.2 reports total number of domestic employment and employment in foreign countries aggregated over all firms and classified by income-level aggregates. We split employment in foreign affiliates according to the country's income level in high-, upper middle-, lower middle- and low-income. The classification is done according to the World Bank income classification of 2002. While Swiss MNEs located their affiliates mostly in high-income countries in 2002 (69 percent of all foreign employees were engaged in high-income countries), lower middle-income and low-income countries have gained importance as destination market for foreign investments in the last decade. During the wave of globalization especially countries like China and India, which are classified as lower middle-income or low-income countries, became increasingly more attractive for foreign investment. These two countries are the

main driver of the rise in employment in the lower middle-income and low-income country aggregates.[15] In the period observed, foreign employment increased in high-income countries by almost 12 percent, while it more than doubled in lower middle- and low-income countries. These findings are well aligned with global FDI patterns: Almost all FDI in the 1990s took place between high-income countries and tended consequently to be HFDI, but VFDI have become increasingly important in recent decades (Barba Navaretti et al., 2006, p.32). Figure 3.A.1a in Appendix 3.A.2 displays the ten most important destination countries in terms of foreign employment for Switzerland. In 2002 the US and Germany were clearly the most important destination countries followed by other major economies in Europe as the United Kingdom and France. Further behind, large emerging countries like Brazil, Russia and China were following as well as other major European economies as Italy and Spain. Over the last decade major emerging economies such as China, Brazil and India became more important countries for outward FDI. In 2013, China was as important as Germany for Swiss multinationals while the US remained the main destination of FDI in terms of employment in foreign affiliates.

3.5 Results

3.5.1 Benchmark Estimations

Table 3.1 reports the results of estimating Equation (3.1) quantifying the displacement effect. Models in columns (1) to (3) are estimated with the fixed effects estimation approach, while models in columns (4) to (6) show the results of the IV estimation within a 2SLS framework. The results in column (1) show that there is no significant correlation between domestic and foreign employment, when we do only control for firm and year fixed effects. Since we expect a negative displacement and a positive output effect to be at work, which might outweigh each other, this result is not meaningful. Therefore, we control for output to isolate the displacement channel. By doing so, the effect of foreign employment becomes, as expected negative and significant (see columns 2 and 3). An increase of foreign employment of 10 percent would lead to a decrease of domestic within firm employment of 1 percent. This is in line with the theory and the underlying concept of the estimation strategy. We control for capital, exports and imports in order to capture changes in capital intensity and trade-related movements. These

[15] India was classified as low-income country until 2009 and is, therefore, included in our low-income aggregate.

additional controls do not alter the coefficient of interest.

To cope with potential endogeneity issues, we instrument foreign employment as described in Section 3.3. The Kleibergen-Paap F-statistics of the first stage show that our instrument is relevant. Using instrumented foreign employment, the displacement effect disappears completely (columns 5 and 6): The coefficient of interest becomes insignificant and is close to zero. Only output seems to be relevant and is positively associated with domestic employment. However, the coefficient of output loses significance, as soon as we control for capital, exports and imports.

In a second step we estimate the output effect, which represents the indirect productivity effect from offshoring on domestic employment. We have discussed in Section 3.2 that we need two steps to fully substantiate the output effect: The effect of foreign employment on output and, additionally, the effect of output on home employment is expected to be positive. First, we consider the effect of foreign employment on output. In order to do that we estimate Equation (3.2) by using the same instrument as in Equation (3.1) for foreign employment. Results are reported in Table 3.2. We find a highly

Table 3.1: Displacement Effect

Dep. Var.:	Not instrumented			Instrumented		
Log of Home Empl.	(1)	(2)	(3)	(4)	(5)	(6)
Lag For. Empl. (log)	0.01	−0.09***	−0.10***	0.22	0.06	0.04
	(0.05)	(0.03)	(0.03)	(0.21)	(0.27)	(0.29)
Lag Output (log)		0.47***	0.39***		0.35*	0.29
		(0.13)	(0.12)		(0.20)	(0.23)
Capital (log)			0.08			0.08
			(0.07)			(0.09)
Exports (log)			0.09			0.10
			(0.18)			(0.20)
Imports (log)			−0.04			−0.01
			(0.08)			(0.15)
Observations	557	557	557	557	557	557
First stage F-stat.				34.26	19.05	18.21
Firm & Year FE	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Clustered std. err. in parentheses for columns 1–3 and bootstrap std. err. (10,000 iterations) for columns 4–6. Two firms have been removed from this estimation for reasons explained in footnote 13. * p<0.10, ** p<0.05, *** p<0.01.

Table 3.2: Output Effect

Dep. Var.:	Not instrumented		Instrumented	
Log of Output	(1)	(2)	(3)	(4)
Lag For. Empl. (log)	0.24***	0.18***	0.45***	0.38***
	(0.08)	(0.07)	(0.13)	(0.13)
Capital (log)		0.15*		0.12
		(0.08)		(0.08)
Exports (log)		0.34***		0.29**
		(0.12)		(0.11)
Imports (log)		0.01		0.06
		(0.08)		(0.11)
Observations	557	557	557	557
First stage F-stat.			34.26	29.08
Firm & Year FE	Yes	Yes	Yes	Yes

Notes: Clustered std. err. in parentheses for columns 1–2 and bootstrap std. err. (10,000 iterations) for columns 3–4. Two firms have been removed from this estimation for reasons explained in footnote 13. * p<0.10, ** p<0.05, *** p<0.01.

significant and positive association between foreign employment and output. The estimate in column (4) indicates that an increase in foreign employment by 10 percent is associated with a rise in output of 3.8 percent. Hence, the first part of the output effect channel is established: Higher foreign employment is significantly and positively associated with output. Results in Table 3.1 show that the evidence of the second part of the output channel – whether output is positively associated with domestic employment – is less clear. Output is on the one hand positively and significantly correlated with home employment when we are not including capital and trade (column 5). But on the other hand, the IV point estimates of output become marginally smaller if we include all controls and bootstrap standard errors get inflated. Therefore, the IV estimates of the relation between output and domestic employment remain positive but turn insignificant in column (6). Hence, we do not find clear evidence of the second part of the output channel. However, results point toward the existence of the output channel.

Summing up, we find that the negative displacement effect seems to be irrelevant when using the IV approach, while it depends on the model whether we find a positive output effect. Hence, outward FDI do not appear to have an important effect on home employment when considering all types of FDI.

As mentioned, depending on the FDI strategy of a firm different mechanisms might be at work and considering all types of FDI in one estimation might not allow to disentangle these different effects. Further, in 2002, about 69 percent of all Swiss outward FDI flow to other high-income countries and are therefore, mainly HFDI. Even though middle- and low-income countries gain importance over time, high-income countries remain the primary destination of outward FDI of Swiss MNEs. As discussed in Section 3.2, HFDI substitute domestic exports. However, if exports to a certain country were low or zero before firms conduct HFDI in that country, there are not much exports to be substituted and thereby the displacement effect is small or nonexistent. Hence, an explanation why there seems not to exist a clear displacement effect in Switzerland, might be the investment strategy of Swiss firms seeking to open (new) markets. The small domestic market and potentially higher transport costs due to the lack of sea access, may further explain why Swiss MNEs are opening up affiliates overseas primarily in order to gain market access. To further investigate and disentangle the effects of different types of FDI on home employment, we need to distinguish between vertical and horizontal outward FDI. This is done in the following section.

3.5.2 FDI by Destination

The distinction between VFDI and HFDI is crucial in determining the displacement and the output effect. While VFDI are motivated by making use of wage differentials and cost savings, market seeking and technology sourcing are main objectives of HFDI. Therefore, the mechanisms at work are different and effects of the respective type of outward FDI might be different.

A crude measure to differentiate between the types of FDI is by looking at destination countries and classify investments to lower-income countries as VFDI and to high-income countries as HFDI.[16] This distinction by income levels is based on the idea that wages are lower in low-income countries and therefore, they are more attractive for VFDI. Furthermore, purchasing power is relatively low and therefore, are these low-income markets less attractive to sell products. In high-income countries, on the other hand, purchase power is high and the technology closer to the frontier, which is important for market seeking or technology sourcing and therefore HFDI. We incorporate this distinction between VFDI and HFDI by splitting countries to high-, upper resp. lower middle- and low-income countries according to the World Bank classification in the year 2002.

[16]This link between type of FDI and destination country is, for instance, as well done in Harrison and McMillan (2011) and Debaere et al. (2010)

FDI to High-Income Countries

In a first step, we focus on FDI to high-income countries. This means, we run the zero stage (Equations 3.3 to 3.5) as well as estimations of the displacement and output effect considering only foreign employment in high-income countries. Figure 3.A.1 in Appendix 3.A.2 shows the share of employment in the 10 most important high-income destinations. In 2002 the USA was clearly the most important destination followed by Germany and further behind other major European economies as the United Kingdom, France or Italy. The most salient change in 2013 compared to 2002 is that very distant countries like Canada, Japan and Australia seem to become more important destinations. As mentioned above, we expect most of these FDI to be HFDI.

Table 3.3: Displacement Effect for FDI into High-Income Countries

Dep. Var.:	Not instrumented			Instrumented		
Log of Home Empl.	(1)	(2)	(3)	(4)	(5)	(6)
Lag For. Empl. (log)	0.04	−0.05	−0.05	0.15	0.03	0.01
	(0.05)	(0.03)	(0.03)	(0.14)	(0.14)	(0.14)
Lag Output (log)		0.43***	0.36***		0.37***	0.31**
		(0.13)	(0.12)		(0.13)	(0.15)
Capital (log)			0.08			0.08
			(0.07)			(0.08)
Exports (log)			0.10			0.09
			(0.18)			(0.19)
Imports (log)			−0.02			−0.02
			(0.08)			(0.13)
Observations	553	553	553	553	553	553
First stage F-stat.				37.00	25.28	26.00
Firm & Year FE	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Clustered std. err. in parentheses for columns 1–3 and bootstrap std. err. (10,000 iterations) for columns 4–6. Two firms have been removed from this estimation for reasons explained in footnote 13. * p<0.10, ** p<0.05, *** p<0.01.

The regression results for the effect of investing to high-income countries and therefore performing HFDI are shown in Tables 3.3 and 3.4. The Kleibergen-Papp F-statistics of the first stage of our estimations are much higher compared to the values in the baseline regressions including all types of FDI and show that our instrument is relevant. Compared to the baseline results in Table 3.1, the magnitude of the displacement effect in the fixed

effects approach is cut in half and is not significant anymore (see columns 2 and 3 in Table 3.3). The results of the IV strategy show a similar pattern as in the baseline regression: Point estimates of foreign employment in Table 3.3 are close to zero and clearly not significant. Hence, we do not find any evidence of the negative displacement channel. On the other hand, foreign employment is positively and significantly associated with output (see Table 3.4) and output is positively and significantly associated with home employment (see Table 3.3). There is significant evidence of the existence of both steps of the output effect. Therefore, outward FDI to high-income countries stimulate domestic employment – even though the effect is rather small. A simple combination of both steps of the output effect as in Wright (2013) gives us the following overall effect: An increase of foreign employment by 10 percent is associated with an increase of home employment of about 0.9 percent (including all controls) to 1.3 percent (excluding capital and trade controls) via the output channel. Since results in this sections show that HFDI do not substitute exports (i.e. there is no displacement effect), one might conclude that the main motivation of outward FDI in Switzerland is opening new markets or technology sourcing.

Table 3.4: Output Effect for FDI into High-Income Countries

Dep. Var.:	Not instrumented		Instrumented	
Log of Output	(1)	(2)	(3)	(4)
Lag For. Empl. (log)	0.24***	0.16**	0.34***	0.28***
	(0.08)	(0.07)	(0.11)	(0.08)
Capital (log)		0.15*		0.12
		(0.07)		(0.08)
Exports (log)		0.32**		0.27**
		(0.12)		(0.12)
Imports (log)		−0.02		0.00
		(0.07)		(0.12)
Observations	553	553	553	553
First stage F-stat.			37.00	35.64
Firm & Year FE	Yes	Yes	Yes	Yes

Notes: Clustered std. err. in parentheses for columns 1–2 and bootstrap std. err. (10,000 iterations) for columns 3–4. Two firms have been removed from this estimation for reasons explained in footnote 13. * p<0.10, ** p<0.05, *** p<0.01.

FDI to Upper Middle-Income Countries

Our instrument is not valid for this category of FDI (see Kleibergen-Papp F-statistics of the first stage in Tables 3.A.1 and 3.A.2 in Appendix 3.A.1). Therefore, we refrain from discussing the results. Nevertheless, the results can be found in Appendix 3.A.1.

Reasons why we fail to reliably estimate the effect in this case, might be that the upper-middle income group is a relatively small group of heterogeneous countries and overall only a relatively small number of Swiss MNE employees is active in these countries. In total, Swiss MNEs in our sample are active in only 23 upper middle-income countries, which makes the upper middle-income economies the smallest category in terms of number of destinations. Figure **??** in Appendix 3.A.2 shows that these are mostly Eastern European or Latin American destinations. Compared to the most important countries of other categories these are relatively small economies. With a share of 8 percent of total foreign employment in 2002 and no country in the top ten destinations for Swiss MNE upper middle-income countries are less important as destination for Swiss MNE than high-income or lower middle-income countries.

FDI to Lower Middle-Income Countries

Lower middle-income countries are with a share of 18 percent in 2002 and 29 percent in 2013 the most important destination for Swiss outward FDI after high-income countries. Figure **??** in Appendix 3.A.2 shows that most important lower middle-income destination countries are big emerging markets outside of Europe as Brazil, Russia or China.

These three large emerging markets also belong to the most important destinations for Switzerland when considering all destinations. Due to the high wage level in Switzerland, lower-middle-income countries might mainly be of interest for VFDI for Swiss MNE. However, some of these countries such as China, Brazil and Russia might be as well interesting for HFDI, because of their market size and increasing purchase power (at least during the period observed).

Tables 3.5 and 3.6 show the results of FDI to lower middle-income countries. In contrast to our findings of overall FDI and FDI to high-income countries, we find evidence of a negative displacement effect in the IV model (columns 5 and 6 in Table 3.5). IV estimates show that an increase of foreign employment in lower middle-income countries by 10 percent is associated with a significant decrease of employment at home by 1.6 percent. Furthermore, there is evidence for the positive output effect: Foreign employment is

Table 3.5: Displacement Effect for FDI into Lower Middle-Income Countries

Dep. Var.:	Not instrumented			Instrumented		
Log of Home Empl.	(1)	(2)	(3)	(4)	(5)	(6)
Lag For. Empl. (log)	−0.08*	−0.11**	−0.11**	−0.11	−0.17*	−0.16*
	(0.04)	(0.05)	(0.05)	(0.08)	(0.09)	(0.09)
Lag Output (log)		0.31***	0.28**		0.35***	0.32**
		(0.09)	(0.10)		(0.12)	(0.14)
Capital (log)			0.01			0.01
			(0.05)			(0.13)
Exports (log)			0.17			0.13
			(0.25)			(0.27)
Imports (log)			−0.07			−0.07
			(0.14)			(0.35)
Observations	386	386	386	386	386	386
First stage F-stat.				27.42	23.17	26.51
Firm & Year FE	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Clustered std. err. in parentheses for columns 1–3 and bootstrap std. err. (10,000 iterations) for columns 4–6. One firm has been removed from this estimation for reasons explained in footnote 13. * p<0.10, ** p<0.05, *** p<0.01.

positively and significantly associated with output (see Table 3.6), while output is positively associated with home employment (see Table 3.5). When we are combining the effects as it is done in Wright (2013), we find that overall an increase in foreign employment in lower middle-income countries by 10 percent is associated with a decrease of home employment by about 1.1 percent. Hence, the negative displacement effect outweighs the positive output effect in this case.

So, while overall FDI and in particular FDI to high-income countries tend to have a positive effect on home employment, FDI to lower middle-income countries seem to decrease home employment in the short-run. Hence, the different mechanics behind HFDI and VFDI actually do affect home employment differently: While the positive output effect dominates for HFDI, the negative output effect is dominating for VFDI to lower middle-income countries.

Table 3.6: Output Effect for FDI into Lower Middle-Income Countries

Dep. Var.:	Not instrumented		Instrumented	
Log of Output	(1)	(2)	(3)	(4)
Lag For. Empl. (log)	0.13**	0.11**	0.16**	0.17**
	(0.05)	(0.05)	(0.08)	(0.07)
Capital (log)		0.13		0.12
		(0.11)		(0.15)
Exports (log)		0.41**		0.44*
		(0.17)		(0.23)
Imports (log)		0.01		0.01
		(0.20)		(0.36)
Observations	386	386	386	386
First stage F-stat.			27.42	30.19
Firm & Year FE	Yes	Yes	Yes	Yes

Notes: Clustered std. err. in parentheses for columns 1-2 and bootstrap std. err. (10,000 iterations) for columns 3–4. One firm has been removed from this estimation for reasons explained in footnote 13. * p<0.10, ** p<0.05, *** p<0.01.

FDI to Low-Income Countries

Ultimately, we look at FDI to low-income countries. Figure **??** in Appendix 3.A.2 shows that almost 40 percent of foreign employees in low-income countries are located in India. Other important low-income destination countries are Zambia, Indonesia or Pakistan. Due to the low purchase power, most of these countries do not seem to be interesting for HFDI.[17] Moreover, low-income countries are generally not at the technological frontier and therefore, technology sourcing is as well unlikely to be the motivation behind FDI to these countries. Wage differentials seem to be the main motivation behind FDI in these countries. Furthermore, countries with unstable political institutions and very low purchase power but rich in natural resources as the Democratic Republic of Congo seem to be attractive destinations because of their natural resources and not because of low wages and cost-savings in production. Hence, it is not likely that production stages from Switzerland will be shifted to countries with very low incomes but rich in natural re-

[17]Countries like India or Indonesia could of course be as well interesting for HFDI because of their market size and rapidly growing middle-class. However, HFDI are overall rather the exception, while VFDI are the prevailing FDI type flowing to these type of countries.

sources. The goal behind FDI to these countries is rather natural resource sourcing than a substitution of Swiss production. Thus, FDI to low-income countries appear to be heterogeneous and it is not clear what the prevailing motivation behind FDI to low-income countries is. Further, it is important to know, that only very few Swiss firms open up relatively large affiliates in these countries. In 2013 only 54 firms of 103 in the data have affiliates in low-income countries, while 100 of 103 firms in the data have affiliates in high-income countries.

Table 3.7: Displacement Effect for FDI into Low-Income Countries

Dep. Var.:	Not instrumented			Instrumented		
Log of Home Empl.	(1)	(2)	(3)	(4)	(5)	(6)
Lag For. Empl. (log)	−0.09	−0.12*	−0.09	0.02	−0.05	0.03
	(0.06)	(0.07)	(0.06)	(0.13)	(0.11)	(0.21)
Lag Output (log)		0.27**	0.21*		0.24**	0.12
		(0.11)	(0.11)		(0.10)	(0.15)
Capital (log)			−0.04			−0.02
			(0.03)			(0.15)
Exports (log)			0.58***			0.73**
			(0.20)			(0.37)
Imports (log)			0.00			0.06
			(0.10)			(0.34)
Observations	250	250	250	250	250	250
First stage F-stat.				88.46	93.86	49.20
Firm & Year FE	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Clustered std. err. in parentheses for columns 1–3 and bootstrap std. err. (10,000 iterations) for columns 4–6. * p<0.10, ** p<0.05, *** p<0.01.

Tables 3.7 and 3.8 present the results of the estimations considering only FDI to low-income countries. The results might be compared to the results found in the benchmark estimations in Table 3.1 and 3.2: The displacement effect disappears completely as soon as we instrument foreign employment. The point estimate is again close to zero and clearly not significant (see Table 3.7). On the other hand, we find a positive association between foreign employment and output for the fixed effects approach and for the IV approach (see Table 3.8). Output tends to be positively associated with domestic employment, although the positive association is not significant when including all control variables (see column 6 in Table 3.7). So, in the case

Table 3.8: Output Effect for FDI into low-income countries

Dep. Var.:	Not instrumented		Instrumented	
Log of Output	(1)	(2)	(3)	(4)
Lag For. Empl. (log)	0.14**	0.16**	0.27*	0.30**
	(0.06)	(0.06)	(0.15)	(0.13)
Capital (log)		0.14		0.16
		(0.13)		(0.23)
Exports (log)		0.76**		0.87*
		(0.37)		(0.51)
Imports (log)		0.10		0.18
		(0.13)		(0.42)
Observations	250	250	250	250
First stage F-stat.			88.46	62.10
Firm & Year FE	Yes	Yes	Yes	Yes

Notes: Clustered std. err. in parentheses for columns 1–2 and bootstrap std. err. (10,000 iterations) for columns 3–4. * p<0.10, ** p<0.05, *** p<0.01.

of FDI to low-income countries we do not find evidence of a negative displacement effect and we find no robust evidence of a positive output effect. Similarly as for the estimation with upper middle-income countries, this lack of significance might be attributed to the limited number of observations, but also to the heterogeneity of countries in our low-income sample. On the one hand the data covers foreign employment in countries with large market size such as India and Indonesia which are interesting for VFDI (and HFDI), on the other hand it also includes countries rich in natural resources (e.g. Democratic Republic of Congo, Zambia, etc.), which are rather interesting for resource sourcing instead of production for MNEs.

3.5.3 Robustness Check

In Section 3.5.2 we have grouped the countries into different income categories according to the World Bank definition from 2002. We have used this classification as a rough measure to classify the FDI into HFDI and VFDI. However, results discussed before could be driven by large destination countries. Therefore, we run a robustness check for each destination category, except for the upper middle-income group, where we were not able to estimate benchmark results reliably with the data at hand. In these robust-

ness checks we exclude dominant countries that might drive the results. In the case of FDI to high-income countries we exclude the USA with a share of almost 30 percent of the foreign employees in high-income countries. In the case of lower-middle income countries we exclude China with a share of 35 percent in 2013 and in the case of low-income countries we drop India with a share of almost 40 percent in 2013.

In a first robustness check we drop the USA as dominant destination in the high-income group. Results in Tables 3.A.3 and 3.A.4 in Appendix 3.A.1 show that the exclusion of the USA does not importantly change the results: We still do not find any evidence of the displacement effect when instrumenting for foreign employment (columns 5 and 6 in Table 3.A.3), but – as in the benchmark results – we find evidence for both steps of the positive output effect.

In a second robustness check we drop China as the dominant destination in the lower middle-income group (see Tables 3.A.5 and 3.A.6 in Appendix 3.A.1). Dropping China alters the results completely. The negative displacement effect disappears: Points estimates are small and insignificant. While there is still significant evidence for the first step of the output effect (Table 3.A.6), there is no evidence for the second step anymore: Point estimates of the second step are cut in half and not significant anymore (Table 3.A.5 columns 5 and 6). So, it appears that the negative overall effect of FDI to lower-middle income countries found in the benchmark estimations is driven by China and disappears completely as soon as China is excluded.

In a third robustness check India as the dominant destination of the low-income group is dropped. Tables 3.A.7 and 3.A.8 in Appendix 3.A.1 show that the results found in the benchmark estimation for low-income countries heavily depend on India: Not only does the instrument lose its relevance (Kleibergen-Papp F-statistics of the first stage are consistently below the value of 5), but we do not find any evidence for the displacement or output effect anymore.

In conclusion, results for lower middle- and low-income destination are driven by single dominant countries and not robust when these countries are dropped. However, the positive effect of FDI to high-income destination is robust when dropping the US as dominant destination.

3.6 Conclusion

Economic theory suggests that there are negative as well as positive effects of offshoring on domestic labor demand. However, theory is not able to predict clearly, whether positive effects are able to offset negative effects. Empirical

work does not come to a clear conclusion either: Results depend on the context of the country observed and on the type and destination of FDI. We use firm-level data containing firms of the manufacturing and the service sector in order to examine the effect of offshoring on home employment in the case of Switzerland, a small economy with relatively high outward FDI stock.

We find that it is crucial to distinguish between different types of FDI. Using fixed effects and an instrumental variable approach we find no evidence of the negative displacement effect, but a positive and significant output effect of FDI to high-income countries (i.e. mainly HFDI). On the other hand we find a significant and negative displacement effect which outweighs the positive output effect in the case of FDI to lower middle-income countries (i.e. mainly VFDI). However, while the positive effect found for FDI to high-income countries is robust, the effect of FDI to lower-middle income countries is driven by China and disappears as soon as China is excluded. Further, it is important to keep in mind that these positive short-run effects of HFDI and negative effects of VFDI are rather moderate. We find no evidence of a negative displacement effect when we are considering the IV results of FDI to all countries and only to low-income countries. For both – FDI to all countries and only to low-income countries – results point toward a positive output and, hence, overall effect. The effect of FDI to low-income countries is, however, driven by India and disappears once India is excluded.

Summing up, Swiss outward FDI stock and flows are tremendous in relative size, but do barely affect total domestic jobs within firms. If so, there seems to be rather a positive effect than a negative. It is important to keep in mind that the goal of this paper is to estimate the overall effect of outward FDI on home employment and that effects might be very different between low- and high-skilled labor (see e.g. Wright, 2013).

A reason why the displacement effect does not seem to exist in Switzerland might be, that Swiss MNEs follow a HFDI strategy and primarily invest in other high-income countries. HFDI seem to stimulate total domestic jobs, although the magnitude of the effect is rather small. So, we are concluding that outward FDI do not endanger the total number of domestic jobs in the case of Switzerland – on the contrary they seem to create jobs, especially if the MNE is investing into another high-income country. Although there is a trend to more outward FDI into upper middle- but more importantly lower middle- and low-income countries, the majority of Swiss outward FDI still flows into other high-income countries.

There are limitations in comparing our results with other existing evidence given the different estimation strategy and underlying data. Our approach is most related to Desai et al. (2009), who find positive effects of

foreign activity of US MNEs on domestic employment. Harrison and McMillan (2011) present evidence of different effects given the destination country and the tasks performed abroad, where investments to low-income countries are associated with lower domestic employment, while they find positive effects of FDI into high-income countries. Wright (2013) finds as well a slightly positive overall effect. However, he examines as well the effect on low skilled labor, where he finds a negative effect. Hijzen et al. (2011) and Debaere et al. (2010) pursue a different empirical approach but find similar effects. Hijzen et al. (2011) find positive effects of HFDI and no effects of VFDI in France, while Debaere et al. (2010) find negative effects of FDI in lower-income countries and positive effects on employment of FDI to higher-income countries for South Korea.

Finally, it is important to stress that our estimation approach and the underlying data do not take into consideration that firms might have to close down their business in the longer run, if they do not have the possibility to engage in outward FDI. Furthermore, we do not consider backward or forward spillovers on other firms.[18] These points indicate that the long-run positive effect of outward FDI on home employment might even be more pronounced than our findings suggest.

[18]E.g. Tang and Altshuler (2015) find positive spillover effects of outward FDI on domestic suppliers.

3.A Additional Tables and Figures

3.A.1 Tables

FDI to Upper Middle-Income Countries

Table 3.A.1: Displacement Effect for FDI into Upper-Middle-Income Countries

Dep. Var.:	Not instrumented			Instrumented		
Log of Home Empl.	(1)	(2)	(3)	(4)	(5)	(6)
Lag For. Empl. (log)	0.01	−0.02	−0.01	0.09	0.07	0.01
	(0.04)	(0.03)	(0.03)	(0.28)	(1.91)	(1.20)
Lag Output (log)		0.36**	0.21*		0.32	0.20
		(0.16)	(0.12)		(1.77)	(0.76)
Capital (log)			0.01			0.01
			(0.06)			(0.21)
Exports (log)			0.66***			0.66
			(0.18)			(1.72)
Imports (log)			0.08			0.08
			(0.09)			(0.46)
Observations	369	369	369	369	369	369
First stage F-stat.				2.80	2.81	2.93
Firm & Year FE	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Clustered std. err. in parentheses for columns 1–3 and bootstrap std. err. (10,000 iterations) for columns 4–6. Five firms have been removed from this estimation for reasons explained in footnote 13. * p<0.10, ** p<0.05, *** p<0.01.

Table 3.A.2: Output Effect for FDI into Upper-Middle-Income Countries

Dep. Var.:	Not instrumented		Instrumented	
Log of Output	(1)	(2)	(3)	(4)
Lag For. Empl. (log)	0.13*	0.07	0.06	−0.02
	(0.07)	(0.05)	(0.48)	(0.45)
Capital (log)		0.17		0.19
		(0.13)		(0.27)
Exports (log)		0.54**		0.54
		(0.22)		(0.41)
Imports (log)		0.11		0.10
		(0.21)		(0.44)
Observations	369	369	369	369
First stage F-stat.			2.80	2.79
Firm & Year FE	Yes	Yes	Yes	Yes

Notes: Clustered std. err. in parentheses for columns 1–2 and bootstrap std. err. (10,000 iterations) for columns 3–4. Five firms have been removed from this estimation for reasons explained in footnote 13. * p<0.10, ** p<0.05, *** p<0.01.

Robustness Checks

Table 3.A.3: Displacement Effect for FDI into High-Income Countries: Drop USA

Dep. Var.:	Not instrumented			Instrumented		
Log of Home Empl.	(1)	(2)	(3)	(4)	(5)	(6)
Lag For. Empl. (log)	0.03	−0.04	−0.04	0.05	−0.04	−0.04
	(0.06)	(0.04)	(0.04)	(0.15)	(0.13)	(0.12)
Lag Output (log)		0.42***	0.34***		0.42***	0.34**
		(0.13)	(0.12)		(0.13)	(0.14)
Capital (log)			0.08			0.08
			(0.07)			(0.09)
Exports (log)			0.11			0.11
			(0.19)			(0.19)
Imports (log)			−0.02			−0.02
			(0.08)			(0.12)
Observations	545	545	545	545	545	545
First stage F-stat.				60.63	33.00	32.34
Firm & Year FE	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Clustered std. err. in parentheses for columns 1–3 and bootstrap std. err. for columns 4–6. Two firms have been removed from this estimation for reasons explained in footnote 13. * p<0.10, ** p<0.05, *** p<0.01.

Table 3.A.4: Output Effect for FDI into High-Income Countries: Drop USA

Dep. Var.:	Not instrumented		Instrumented	
Log of Output	(1)	(2)	(3)	(4)
Lag For. Empl. (log)	0.21***	0.14**	0.21*	0.18**
	(0.08)	(0.06)	(0.13)	(0.09)
Capital (log)		0.16*		0.16*
		(0.08)		(0.09)
Exports (log)		0.33**		0.31**
		(0.13)		(0.14)
Imports (log)		−0.02		−0.01
		(0.08)		(0.13)
Observations	545	545	545	545
First stage F-stat.			60.63	51.44
Firm & Year FE	Yes	Yes	Yes	Yes

Notes: Clustered std. err. in parentheses for columns 1–2 and bootstrap std. err. for columns 3–4. Two firms have been removed from this estimation for reasons explained in footnote 13. * p<0.10, ** p<0.05, *** p<0.01.

Table 3.A.5: Displacement Effect for FDI into Lower-Middle-Income Countries: Drop China

Dep. Var.:	Not instrumented			Instrumented		
Log of Home Empl.	(1)	(2)	(3)	(4)	(5)	(6)
Lag For. Empl. (log)	0.00	−0.03	−0.02	0.08	0.05	0.04
	(0.02)	(0.03)	(0.03)	(0.10)	(0.11)	(0.11)
Lag Output (log)		0.24***	0.21**		0.17	0.14
		(0.09)	(0.10)		(0.12)	(0.15)
Capital (log)			0.01			0.00
			(0.05)			(0.12)
Exports (log)			0.13			0.17
			(0.24)			(0.29)
Imports (log)			−0.03			−0.05
			(0.11)			(0.28)
Observations	370	370	370	370	370	370
First stage F-stat.				18.74	18.68	17.61
Firm & Year FE	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Clustered std. err. in parentheses for columns 1–3 and bootstrap std. err. for columns 4–6. Two firms have been removed from this estimation for reasons explained in footnote 13. * p<0.10, ** p<0.05, *** p<0.01.

Table 3.A.6: Output effect for FDI into Lower-Middle Income Countries: Drop China

Dep. Var.:	Not instrumented		Instrumented	
Log of Output	(1)	(2)	(3)	(4)
Lag For. Empl. (log)	0.13***	0.10**	0.18**	0.14*
	(0.05)	(0.04)	(0.08)	(0.07)
Capital (log)		0.13		0.12
		(0.10)		(0.15)
Exports (log)		0.37**		0.38*
		(0.17)		(0.23)
Imports (log)		−0.01		−0.02
		(0.20)		(0.38)
Observations	370	370	370	370
First stage F-stat.			18.74	18.72
Firm & Year FE	Yes	Yes	Yes	Yes

Notes: Clustered std. err. in parentheses for columns 1–2 and bootstrap std. err. for columns 3–4. Two firms have been removed from this estimation for reasons explained in footnote 13. * p<0.10, ** p<0.05, *** p<0.01.

Table 3.A.7: Displacement Effect for FDI into Low-Income Countries: Drop India

Dep. Var.:	Not instrumented			Instrumented		
Log of Home Empl.	(1)	(2)	(3)	(4)	(5)	(6)
Lag For. Empl. (log)	0.14*	0.12	0.07	0.26	0.09	0.08
	(0.07)	(0.08)	(0.09)	(0.70)	(0.52)	(2.63)
Lag Output (log)		0.22*	0.20		0.23	0.20
		(0.11)	(0.11)		(0.19)	(0.35)
Capital (log)			−0.04			−0.04
			(0.03)			(0.68)
Exports (log)			0.33			0.33
			(0.24)			(3.21)
Imports (log)			−0.04			−0.04
			(0.09)			(0.75)
Observations	156	156	156	156	156	156
First stage F-stat.				4.12	3.82	4.25
Firm & Year FE	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Clustered std. err. in parentheses for columns 1–3 and bootstrap std. err. for columns 4–6. * p<0.10, ** p<0.05, *** p<0.01.

Table 3.A.8: Output Effect for FDI into Low-Income countries: Drop India

Dep. Var.:	Not instrumented		Instrumented	
Log of Output	(1)	(2)	(3)	(4)
Lag For. Empl. (log)	0.12	0.10	0.78	0.73
	(0.11)	(0.12)	(5.05)	(12.47)
Capital (log)		0.10		0.19
		(0.11)		(1.60)
Exports (log)		0.67		0.13
		(0.62)		(11.63)
Imports (log)		0.07		0.24
		(0.26)		(3.75)
Observations	156	156	156	156
First stage F-stat.			4.12	4.13
Firm & Year FE	Yes	Yes	Yes	Yes

Notes: Clustered std. err. in parentheses for columns 1–2 and bootstrap std. err. for columns 3–4. * p<0.10, ** p<0.05, *** p<0.01.

List of Countries and Income Classification

Table 3.A.9: Income Classification

Country Names	2002	2013
Antigua and Barbuda	H	H
Aruba	H	H
Australia	H	H
Austria	H	H
Bahamas	H	H
Bahrain	H	H
Barbados	H	H
Belgium	H	H
Bermuda	H	H
Brunei Darussalam	H	H
Canada	H	H
Cayman Islands	H	H
Cyprus	H	H
Denmark	H	H
Finland	H	H
France	H	H
Germany	H	H
Greece	H	H
Hong Kong, China	H	H
Iceland	H	H
Ireland	H	H
Isle of Man	H	H
Israel	H	H
Italy	H	H
Japan	H	H
Korea, Rep.	H	H
Kuwait	H	H
Luxembourg	H	H
Macao, China	H	H
Malta	H	H
Netherlands	H	H
New Zealand	H	H
Norway	H	H
Portugal	H	H
Qatar	H	H
Singapore	H	H
Slovenia	H	H
Spain	H	H
Sweden	H	H
Taiwan, China	H	H
United Arab Emirates	H	H
United Kingdom	H	H
United States	H	H
Virgin Islands (U.S.)	H	H
Argentina	UM	UM
Belize	UM	UM
Botswana	UM	UM
Chile	UM	H
Costa Rica	UM	UM
Croatia	UM	H
Czech Republic	UM	H
Dominica	UM	UM
Estonia	UM	H
Gabon	UM	UM
Grenada	UM	UM
Hungary	UM	UM
Latvia	UM	H
Lebanon	UM	UM
Libya	UM	UM
Lithuania	UM	H
Malaysia	UM	UM
Mauritius	UM	UM
Mexico	UM	UM
Oman	UM	H
Panama	UM	UM
Poland	UM	H
Saudi Arabia	UM	H
Slovak Republic	UM	H
St. Kitts and Nevis	UM	H
St. Lucia	UM	UM
Trinidad and Tobago	UM	H

Cont. Table 3.A.9: Income Classification

Country Names	2002	2013	Country Names	2002	2013
Uruguay	UM	H	Tunisia	LM	UM
Venezuela	UM	UM	Turkey	LM	UM
Albania	LM	UM	Turkmenistan	LM	UM
Algeria	LM	UM	Ukraine	LM	LM
Armenia	LM	LM	West Bank and Gaza	LM	LM
Belarus	LM	UM	Afghanistan	L	L
Bolivia	LM	LM	Angola	L	UM
Bosnia and Herzegovina	LM	UM	Azerbaijan	L	UM
Brazil	LM	UM	Bangladesh	L	L
Bulgaria	LM	UM	Benin	L	L
China	LM	UM	Burkina Faso	L	L
Colombia	LM	UM	Burundi	L	L
Cuba	LM	UM	Cambodia	L	L
Dominican Republic	LM	UM	Cameroon	L	LM
Ecuador	LM	UM	Central African Republic	L	L
Egypt	LM	LM	Chad	L	L
El Salvador	LM	LM	Congo, DR	L	L
Guatemala	LM	LM	Congo, Rep.	L	LM
Honduras	LM	LM	Côte d'Ivoire	L	LM
Iran	LM	UM	Ethiopia	L	L
Iraq	LM	UM	Georgia	L	LM
Jamaica	LM	UM	Ghana	L	LM
Jordan	LM	UM	Guinea	L	L
Kazakhstan	LM	UM	Haiti	L	L
Macedonia	LM	UM	India	L	LM
Morocco	LM	LM	Indonesia	L	LM
Namibia	LM	UM	Kenya	L	L
Paraguay	LM	LM	Kyrgyz Republic	L	LM
Peru	LM	UM	Lao	L	LM
Philippines	LM	LM	Liberia	L	L
Romania	LM	UM	Madagascar	L	L
Russia	LM	H	Malawi	L	L
South Africa	LM	UM	Mali	L	L
Sri Lanka	LM	LM	Mauritania	L	LM
Syria	LM	LM	Moldova	L	LM
Thailand	LM	UM	Mongolia	L	LM

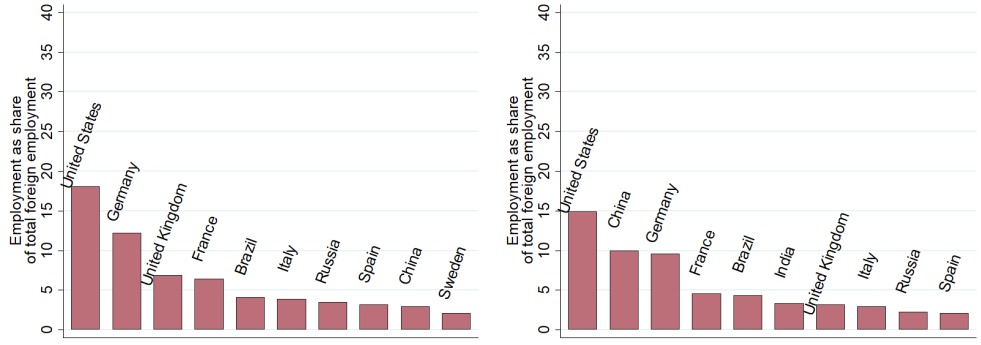
Country Names	2002	2013
Mozambique	L	L
Myanmar	L	L
Nepal	L	L
Nicaragua	L	LM
Niger	L	L
Nigeria	L	LM
Pakistan	L	LM
Papua New Guinea	L	LM
Rwanda	L	L
Senegal	L	LM
Sierra Leone	L	L
Sudan	L	LM
Tajikistan	L	L
Tanzania	L	L
Timor-Leste	L	LM
Togo	L	L
Uganda	L	L
Uzbekistan	L	LM
Vietnam	L	LM
Yemen	L	LM
Zambia	L	LM
Zimbabwe	L	L

Notes:
H: High-income;
UM: Upper-middle income;
LM: Lower-middle income;
L: Low income

3.A.2 Figures

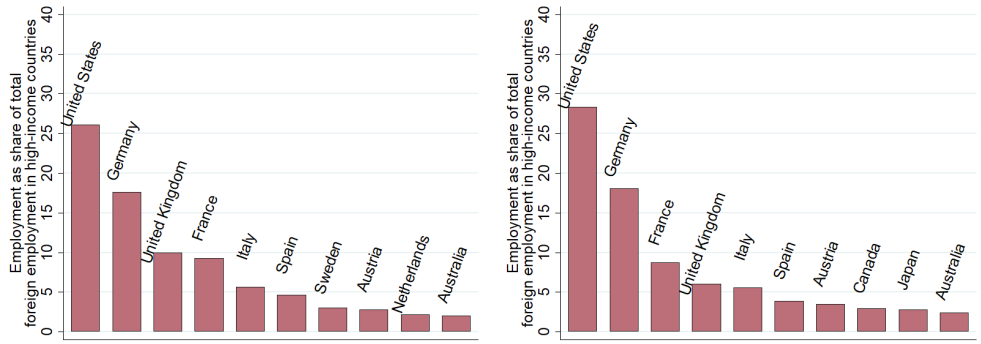
Figure 3.A.1: Share of Total Foreign Employment by Destination

(a) All Destinations



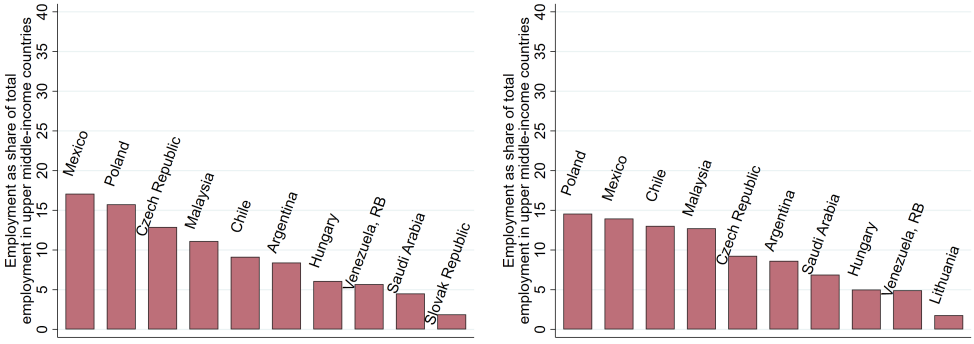
2002 (N=78) 2013 (N=103)

(b) High-Income Countries



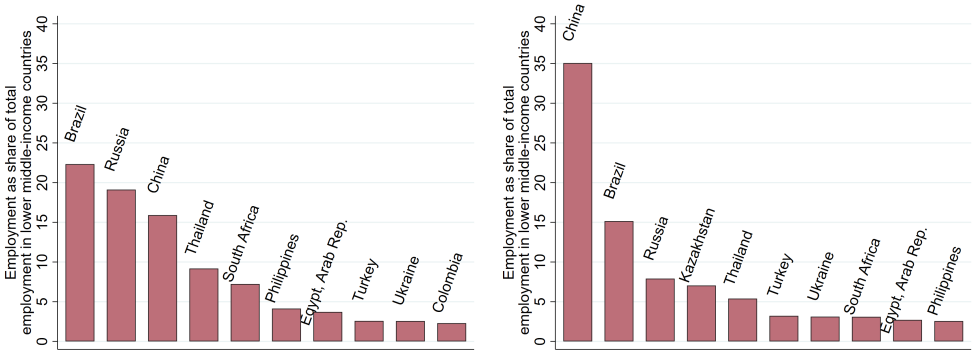
2002 (N=78) 2013 (N=100)

(c) Upper Middle-Income Countries



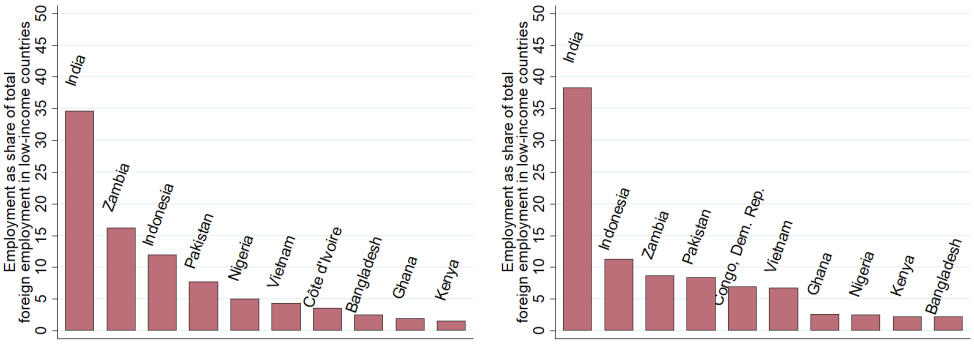
2002 (N=46) 2013 (N=74)

(d) Lower-Middle-Income Countries



2002 (N=45) 2013 (N=73)

(e) Low-Income Countries



2002 (N=32) 2013 (N=54)

Notes: These graphs show the number of foreign employment as share of total foreign employment within each destination. Number of firms in parenthesis.

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Statement of Authorship

Selbständigkeitserklärung

Ich erkläre hiermit, dass ich diese Arbeit selbständig verfasst und keine anderen als die angegebenen Quellen benutzt habe. Alle Koautorenschaften sowie alle Stellen, die wörtlich oder sinngemäss aus Quellen entnommen wurden, habe ich als solche gekennzeichnet. Mir ist bekannt, dass andernfalls der Senat gemäss Artikel 36 Absatz 1 Buchstabe o des Gesetzes vom 5. September 1996 über die Universität zum Entzug des aufgrund dieser Arbeit verliehenen Titels berechtigt ist.

Bern, 30.6.2021

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