University of Bern

Faculty of Business, Economics and Social Sciences

Institute of Political Science

Jointly Addressing the Three Red Waves: Poverty, Inequality, and Climate Change

Inaugural dissertation

submitted by Valon Hasanaj

in fulfillment of the requirements for the degree of Doctor rerum socialium at the Faculty of Business, Economics and Social Sciences of the University of Bern

Submitted by:

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Switzerland, 2022

The faculty accepted this thesis on the 15th of December 2022 at the request of the reviewers Prof. Dr. Isabelle Stadelmann Steffen (University of Bern) and Prof. Dr. Vally Koubi (ETH Zürich) as dissertation, without wishing to comment on the views expressed therin.

Die Fakultät hat diese Arbeit am 15. Dezember 2022 au Antrag der Gutachter Prof. Dr. Isabelle Stadelmann Steffen (University of Bern) and Prof. Dr. Vally Koubi (ETH Zürich) als Dissertation angenommen, ohne damit zu den darin ausgesprochenen Auffassungen Stellung nehmen zu wollen.

Summary

Poverty, inequality, and climate change –which, I refer to as '*the three red waves*'– are the defining issues of our time (Stern, 2009; World Bank, 2021a). They are all interconnected and their trends have clearly deteriorated in recent years. Firstly, the twenty-five-year trend of constantly declining global extreme poverty was interrupted in 2020, and currently, around 10 percent of the world's population lives in unbearable conditions (World Bank, 2020). Secondly, economic inequality continues to increase at unprecedented levels, with the richest 10 percent earning 52 percent of the world's share of total income and possessing 76 percent of the total wealth (Chancel et al., 2022). Thirdly, climate change poses a persistent and existential threat, with the temperatures on Earth reaching record highs in recent decades, and exposing more than six billion people to moderate or severe ecological hazards (Stern, 2007, p.vi). Apparently, these issues are serious and persistent, and current government policy responses will determine the scale of future repercussions for human civilization and our planet.

This dissertation primarily focuses on contemporary welfare states and environmental states, as uniquely positioned domains to jointly address '*the three red waves*'. Looking through the lens of these *policy areas*, and later expanding on their *policy instruments* and *policy actors*, in this research work I propose a three-fold contribution. In terms of policy areas, I developed a novel and systematic theoretical framework to explain global contemporary welfare state policy variations and directions. Building on a formal three-stage process, the framework includes the most pressing social, economic, and environmental risks of the twenty-first century, and it is empirically validated by advanced empirical methods, using a uniquely assembled dataset for one-hundred-fifty countries. Following these findings, I later present a refined theoretical and empirical understanding of the eco-welfare state –a concept aimed at exploring and promoting synergies between welfare states and environmental states. Moreover, considering that these policy areas can only be successful in tackling 'the three red waves' if crucial policy instruments are implemented and responsible policy actors take effective measures, I offer two other findings: I present a novel approach for predicting the pathways that lead to the highest public support for a policy instrument, and then provide insights into the variations in government leaders' responses to a specific crisis.

Acknowledgments

To Switzerland: Thank you for your hospitality and generosity! In 1999, I was warmly hosted here as a refugee. Twenty years later, I could not have thought of a better comeback.

To my supervisor, Prof. Dr. Isabelle Stadelmann-Steffen: I am eternally thankful for this opportunity. Your continuous academic and professional support, as well as immeasurable kindness, patience, and enthusiasm, meant the world to me. I could not have imagined a better supervisor for my Ph.D. study.

To my co-supervisor, Prof. Dr. Vally Koubi: Thank you very much for agreeing to co-supervise this dissertation. Your time and effort are highly appreciated!

To my sisters, Blerta and Tringa: Thank you for being the brightest stars in my life throughout these years.

To my mum, Shqipe: Thank you for fighting against all odds and dreaming of a better future for us. I promise that the best is yet to come!

To my dad (Lekë) in heaven: During the darkest hours of the Kosovo war, I mostly remember you teaching me the alphabet and multiplication table. I have aspired for a very long time to one day transform those letters and numbers into academic excellence. *This Ph.D. dissertation is dedicated to you! <3*

Table of Contents

List of Figures

List of Tables

Chapter 1

1. Introduction

The world is facing major challenges and crises that are putting many nations' resilience to the test, both directly and indirectly. Rising energy prices, food insecurity, large-scale war and instability, challenges to the rules-based international system, escalating social unrest, pandemic, rising extreme poverty and inequality, and climate change are just a few of the issues that nearly every country has encountered in recent years (Kroenig and Cimmino, 2020; World Bank, 2020; World Food Programme, 2022; United Nations, 2022). Some of these challenges are short-term and may need less commitment, while others are long-term, persistent, and interconnected, hence, require comprehensive and effective responses. This dissertation is mostly concerned with the latter point.

First, I argue that global poverty, inequality, and climate change are the most pressing and interconnected problems, with unsettling upside trends in recent years (Section 1.1). ***Second***, I contend that these issues may be most effectively jointly addressed by expanding and integrating two policy areas: welfare state policy and environmental state policy (Section 1.2). In this regard, I provide three contributions from the perspectives of policy areas, policy instruments, and policy actors. In terms of policy, I propose and validate a global, yet comparative, contemporary welfare state conceptual framework that includes crucial old and new features related to poverty, inequality, and climate change. Building on these results, I then refined and validated the eco-welfare concept— which is a unique approach that explores and develops synergies as well as identifies trade-offs between welfare state and environmental state policy areas. Furthermore, given that each policy area has numerous policy instruments that are of vital importance and need public support for implementation, I later propose in this

dissertation an approach that predicts the pathways that lead to the highest public support for any policy instrument. As a final point, in times of distress, policy actors, and specifically country leaders, play a significant role in controlling and resolving certain crises. In this manner, I provide new knowledge about how male and female leaders' responses differ in how they handle crises, taking into consideration the diverse political systems in which they operate. ***Third***, I briefly summarize each essay's outline and research design (Section 1.3).

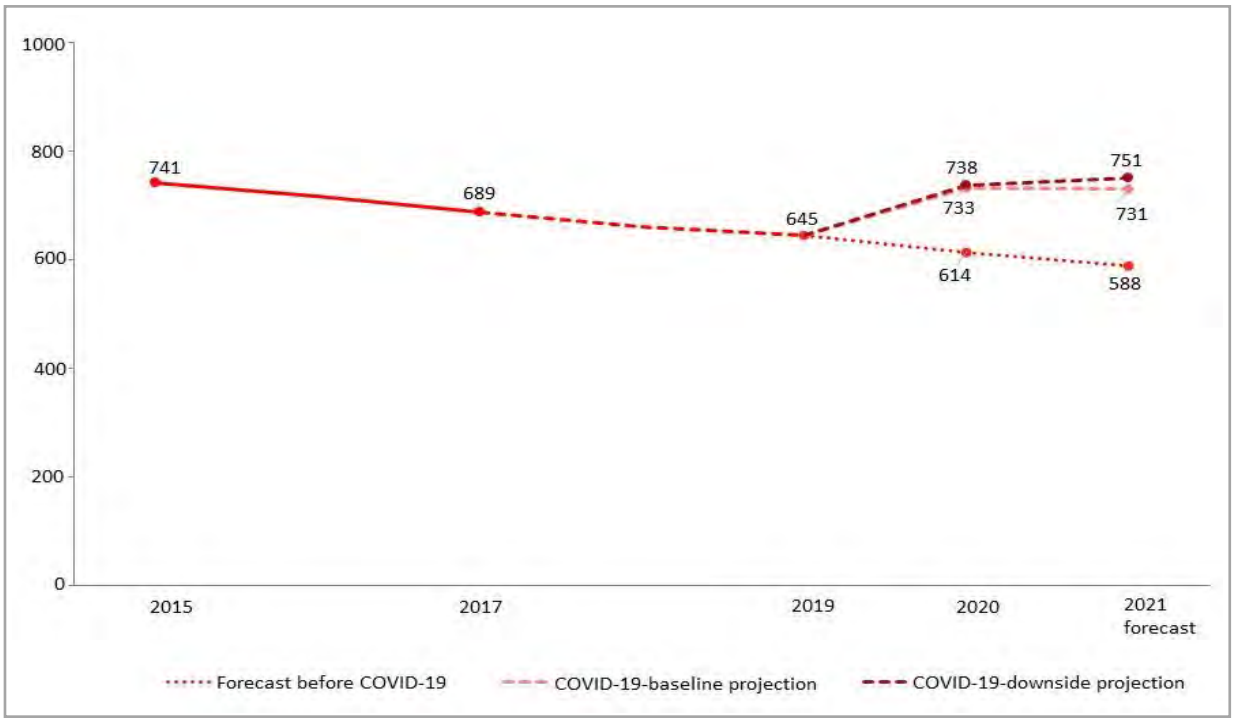
1.1 Problem: The Three Red Waves

The world has achieved incredible levels of progress and development in the previous five decades, with "unmatched human flourishing," "tripled global living standards," and "rapidly declining poverty" (Kroenig and Cimmino, 2020). However, such outcomes should not be taken for granted and indeed have not come without costs. Rather, they are accompanied by: (1) unexpected economic shocks that disrupt poverty downtrends, particularly extreme poverty; (2) unprecedented levels of inequality, notably income and wealth inequalities; and (3) climate change threats, specifically a record-high increase in the average global temperature. Poverty, inequality, and climate change are the most pressing issues confronting the world today (Stern, 2009; World Bank, 2021a), and our responses to them will determine the future of civilization and our planet. In my dissertation, I refer to these issues as ***"the three red waves" (Figures 1.1, 1.2, and 1.3),*** and suggest that they must be addressed jointly and simultaneously, and that failure on one entails failure on all.

First, **the poverty rate** has been consistently dropping for over 25 years. This decline, which started in the late 1990s, was halted in 2020, raising concerns about the reappearance of this existential threat (World Bank, 2020) (Figure 1.1). Coronavirus, growing inflation, and the Ukraine crisis are only a few of the factors that have led to the erasure of many of the preceding decades' achievements (ibid). With 100 million people falling into extreme poverty in less than two years, it is more important than ever to continue establishing more effective and resilient welfare systems (United Nations, 2021). According to a recent estimate, the ongoing crisis will have repercussions far beyond 2030 (World Bank, 2020). Therefore, the objective of reducing global extreme poverty to less than 3 percent becomes less attainable unless substantial and swift policy changes are implemented (ibid). In this manner, the World Food Programme (WFP)

reveals other astounding statistics. This Programme estimates that in 2022, over 828 million people will be food insecure, with 50 million of them experiencing emergency levels of hunger (World Food Programme, 2022). According to them, climate change, natural catastrophes, inequality, food loss, and COVID-19 are among the primary causes of these high levels of hunger (ibid), providing compelling evidence that poverty, inequality, and climate change are interconnected issues that must be addressed jointly.

Figure 1.1. Number of people living below $1.90 a day (million)



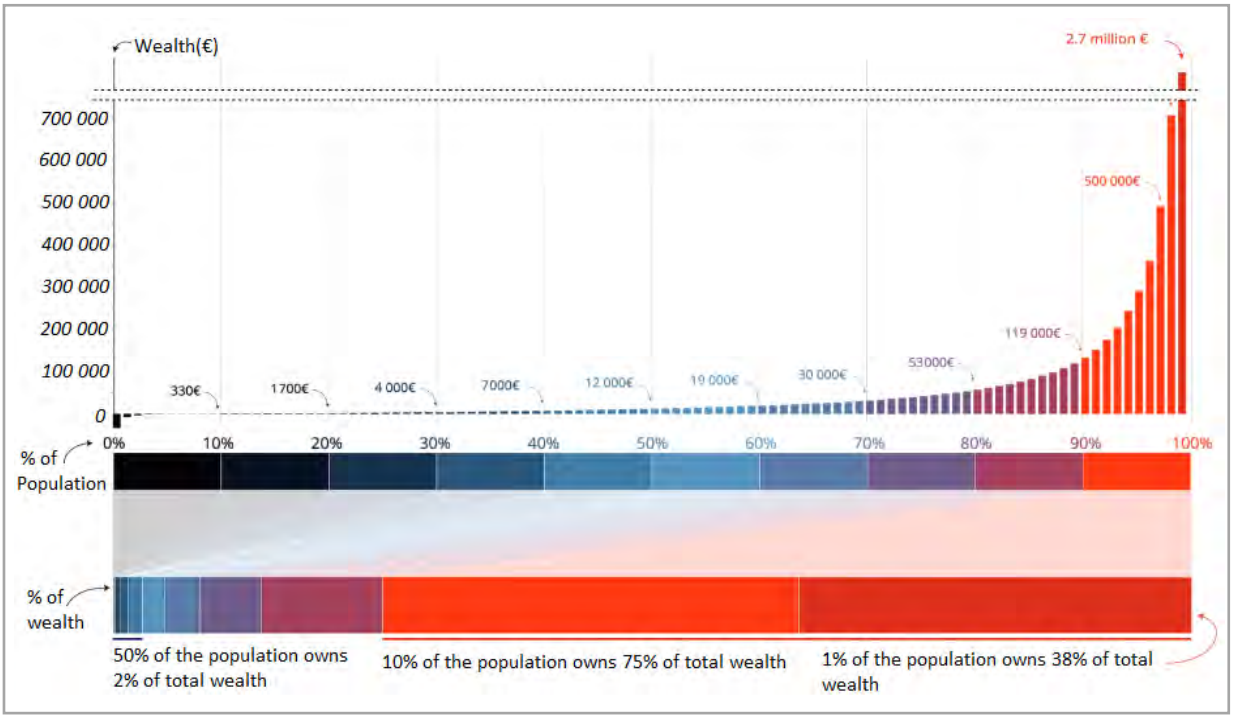
Source: United Nations, Sustainable Development Goals Report 2021.

Second, the debate about the best way to structure 21st-century society revolves around the issue of **inequality** –which is both widespread and critical (Chancel et al., 2022) (Figure 1.2). In this vein, many questions are raised about the fairness of the economic distribution of income and growth, the sufficiency of social safety nets, and the rates of racial, gender, and international inequalities (ibid). In essence, neither ideal levels of inequality nor the social policies or institutions necessary to achieve them have been agreed upon or scientifically validated. Nonetheless, the current degree of global economic inequality paints a grim picture that warrants extensive scientific research and attention in pursuit of better understanding and addressing this challenge.

According to the Purchasing Power Parity (PPP) measure of the income distribution, the bottom half of the world's population earns 8.5 percent of the total global income,

whereas the top 10 percent earn 52 percent, and the top 1 percent earn 19 percent (Chancel, et al., 2022). When examing distributions of wealth, we see that the bottom half of the population possesses only 2 percent of the total global wealth, whereas the top 10 percent possess 76 percent, and the top 1 percent around 38 percent (ibid). It is abundantly clear that there is a massive disparity between the rich and the poor throughout the world, and the wealth gap seems to be far worse (Figure 1.2). These high levels of income and wealth inequality around the world are also visible in their separate components: inequalities between countries or regions as well as inequalities within countries. Therefore, inequality is present independent of geographic location or level of economic development (ibid). It is possible that differences in income and wealth may not inform us very much about other significant socioeconomic problems, such as gender or environmental inequality. New data suggests, however, that the disparities that exist within these two dimensions reveal a picture that is very similar to economic inequality (e.g., Gregory 2012; Ota, 2017). In terms of gender, women only make up 34.7 percent of the global total income, while men make up 65.2 percent. In terms of environmental inequality, studies show that economic differences are closely linked to ecological differences and carbon footprint. Only 12 percent of emissions come from the poorest 50 percent of emitters, while nearly half of all emissions come from the top 10 percent (Chancel, et al., 2022).

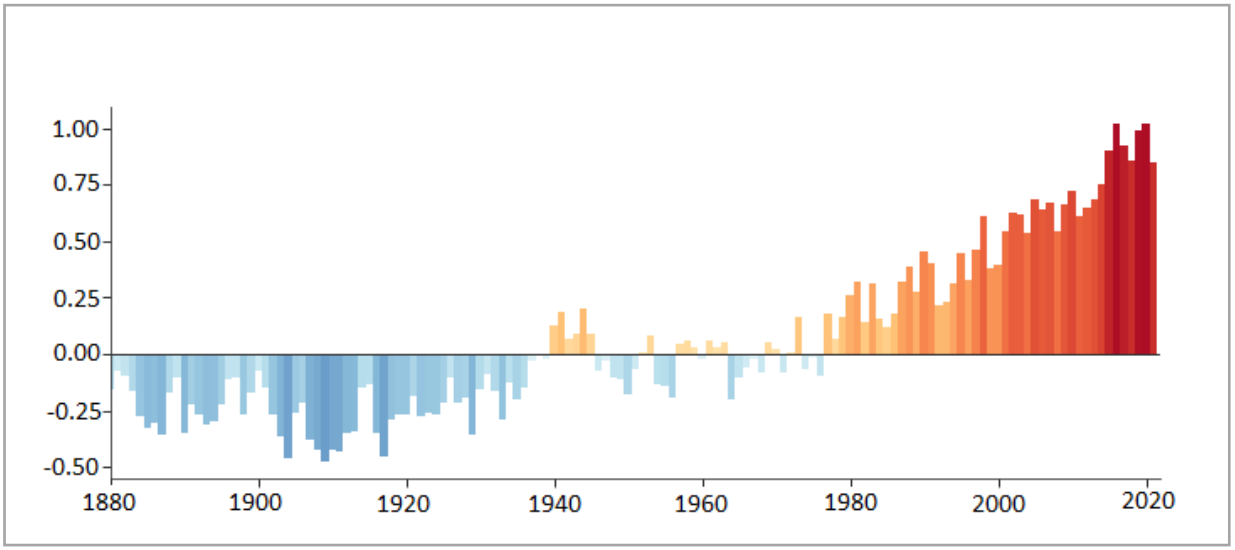
Figure 1.2. Wealth Inequality in the World



Source: World Inequality Report 2022, World Inequality Lab.

Third, **climate change** "is a serious global threat, and it demands an urgent global response" (Stern, 2007, p.vi). There is a substantial amount of scientific evidence and consensus on this serious issue, which highlights the urgency for swift and decisive responses to avert the worst of its repercussions. David Attenborough, a world-famous naturalist, told the Security Council in 2021 that "climate change is the biggest threat to security that modern humans have ever faced" (United Nations, 2021b, p.1). Climate change is also seen as a "crisis multiplier." As a result of it, "wildfires, cyclones, floods, and droughts are now the new normal," and the collapse of what gives us basic security, such as "food production, access to fresh water, habitable ambient temperature, and ocean food chains," is now a real possibility (ibid, p.1-2). These warnings are well-corroborated by the Institute for Economics and Peace's (2020) book "Ecological Threat Register," which suggests that about 1.2 billion people are at risk of being displaced because of climate change, and 6.4 billion are at risk of medium or high ecological hazards (p.4).

Figure 1.3. Global Temperature Anomaly (°C compared to the 1951 - 1980 average)



Source: NASA Earth Observatory 2022.

Since the Industrial Revolution, the Earth's temperature has been increasing over the years, specifically 1.1° Celsius since 1880 (NASA: Earth Observatory, 2022). Since 1880, when the Industrial Revolution began, the Earth's temperature has gone up by 1.1°C. (NASA: Earth Observatory, 2022). However, as shown in Figure 1.3, since 1975, global warming has accelerated by about 0.15 to 0.25 degrees Celsius every decade (ibid, p.1). In response to this crisis, 196 countries signed The Paris Agreement at COP 21, in December 2015. This Agreement is the first legally binding agreement that brings the

whole world together to work toward a shared objective, which is rather ambitious and requires massive transformations in society and the economy. This deal, which went into effect in November 2016, aims to keep global warming to no more than 2 degrees Celsius, and preferably 1.5 degrees, compared to levels before the Industrial Revolution (ibid).

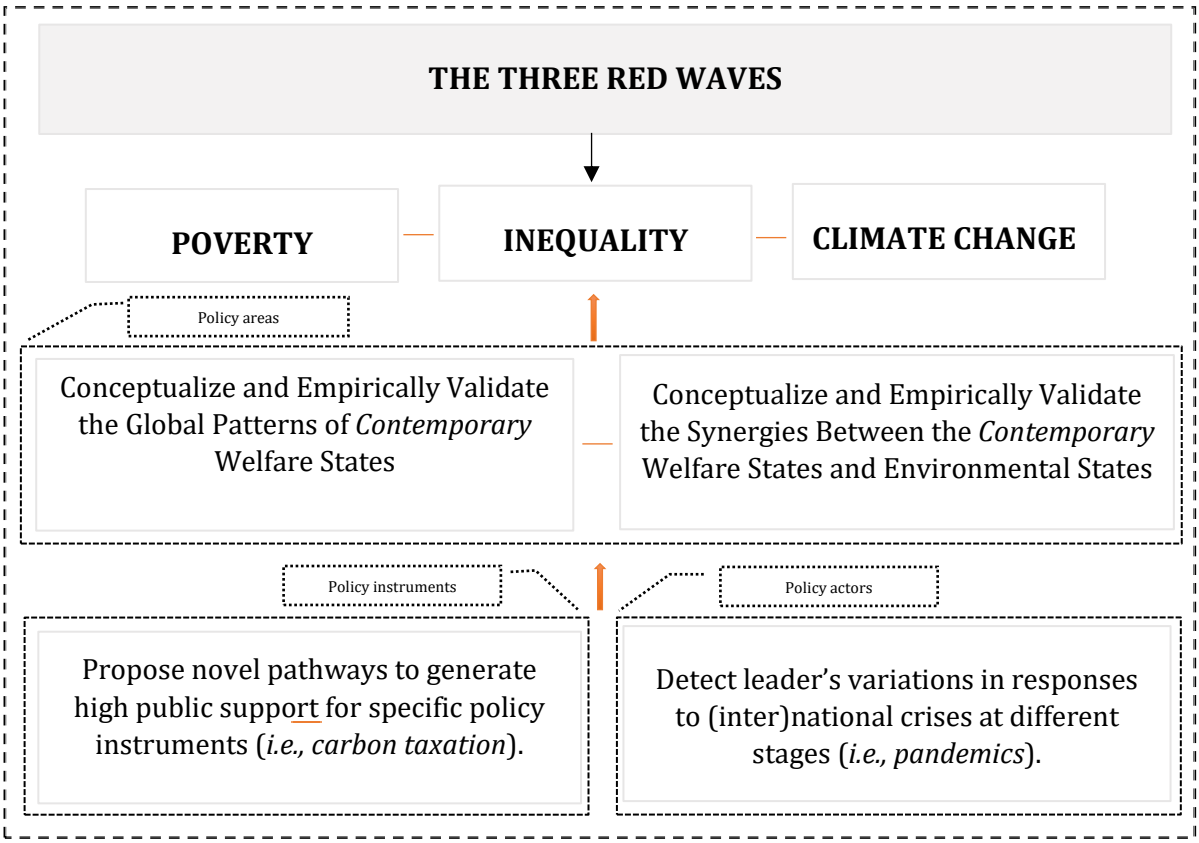
1.2 Contribution and relevance

The interdependence of poverty, inequality, and climate change is evident (Gough, 2013a, 2015, 2016; Rao, et al., 2017; Hallegatte et al., 2018; Lankes et al., 2022), necessitating comprehensive and long-term government responses. Apparently, for these responses to be effective, three conditions need to be met. First, it is essential for various *policy areas* to collaborate and come up with solutions that are all-encompassing. Second, a variety of innovative, bold, and well-designed *policy instruments* is required to equip certain policy areas with crucial contemporary tools to address 'the three red waves'. Third, capable and effective *policy actors* are needed to successfully implement these policies and address these challenges. This dissertation, as illustrated in Figure 4 'Conceptual Overview of the Thesis', proposes three major contributions which directly target each of the conditions above.

Firstly, I argue that the welfare state and environmental state are two of the most important and primary policy areas for addressing "the three red waves" worldwide. As indicated in the subsection below, the welfare state is a legacy system that predates the environmental state by decades (Gough, 2015); hence, it is larger in terms of the risks and needs it addresses, the policy instruments it employs, and the funding it has at its disposal. For these reasons, I began my thesis by developing and validating a novel global yet comparative conceptual framework that detects the variations and the direction of welfare states across the world. For the first time, this proposed framework includes the most important old and new social risks and policies (Taylor-Gooby, 2004; Bonoli and Natali, 2012; Morel et al., 2012; Häusermann, 2012), and it is validated using a unique database for one-hundred-fifty countries. As I lay this foundation, the next step is to explore pathways that bring welfare states and environmental states together. The newly emerging literature has proposed the concept of 'eco-welfare state' as a viable path forward (Koch and Fritz, 2014; Sabato et al., 2021; Mandelli, 2021). Therefore, in the next step of my research, I propose a refined and empirically validated conceptualization of the

eco-welfare state, by exploring concrete synergies and cooperation pathways between the welfare state and environmental state policy areas. ***Secondly***, because welfare states and environmental states across the world are always changing, new policy instruments in these areas keep being introduced. In many countries, people can vote on these kinds of policy instruments, and they are often strongly contested (Harrison, 2010; Williams III, 2016; Rhodes et al., 2017; Lachapelle and Kiss, 2019; Levi, 2021; Dermont and Stadelmann-Steffen, 2020). In this part of research, I address this issue by proposing a new theoretically and empirically supported approach for determining out the pathways for a specific policy instrument to garner the highest support from the public. ***Thirdly***, since these policies are implemented by certain policy actors, there is a need for more information about how policymakers deal with challenging contemporary problems. So, this piece of research looks for differences in how leaders respond to crisis, paying special attention to the leaders' genders and the different types of institutions in which they govern.

Figure 1.4. Conceptual Overview of the Thesis



1.2.1 Policy Areas: Welfare State and Environmental State

Welfare state and environmental state are particularly well-positioned policy domains that possess the necessary tools and objectives to jointly address poverty, inequality, and climate change. The former is defined as a "distinctive form of governmentality: a specific mode of constituting the economy, assuring social security, and guaranteeing social provision" (Garland, 2014, p. 330). The latter is characterized as "a state that possesses a significant set of institutions and practices dedicated to the management and societal-environmental interactions" (Duit et al., 2016; Gough, 2015, p.3). *While these two domains' policy inputs and outputs may be comprehensive, their projected policy outcomes are rather specific: poverty reduction, inequality reduction, and climate change mitigation.*

Welfare states and environmental states are driven by a great deal of similar factors like industrialization (changing economic, demographic, and social structures), interests (collective actors, political parties, class movements), institutions (states, political systems, constitutions), ideas (culture, ideology, policy learning), and international superstate influences (war, global governance, globalization, policy transfers) (Gough, 2015, p.2). These features undoubtedly continue to evolve in many countries and regions and as a result, welfare states and environmental states evolve as well. While these changes occur in the two policy domains, the current research falls short in at least two aspects, which are addressed in this section of the dissertation. ***The first major shortcoming:*** there is still an unclear understanding of the contemporary global welfare state variations and directions. For example, how can we conceptualize these changes on a global scale, how do we know the course of these changes, and which sets of social risks and policies are prioritized? ***The second major shortcoming:*** while both, welfare state and environmental state policies evolve, the literature has only recently begun to explore and promote pathways for cooperation. For example, there is still a fundamental theoretical need to better conceptualize the synergies/interlinkages between these two areas, and offer empirical insights into the emergence of such patterns in any country or region.

Regarding the first major shortcoming, I initially focus on the welfare state policy domain, which is a much more comprehensive area than the environmental state and 'predates' it by a generation, and in some ways, a century (Gough, 2015). The social risks and demands of the twenty-first century have resulted in significant changes and restructurings in welfare states (Mares and Carnes, 2009; Hall, 2015; Shahidi, 2015). Two waves of welfare state research delve further into the characteristics of such

transformations. The first wave relates to the 'era of austerity,' which is characterized by significant cutbacks in social benefits, tightening of eligibility requirements, and significant adjustments in conventional social programs, i.e., social assistance and insurance (Pierson, 2001). Welfare scholars have investigated these policy shifts and national variations in detail for years, concentrating on common hazards such as income and job loss, i.e., unemployment, illness or disability, and retirement benefits (Häusermann, 2012). The second wave of research is associated with the emergence of new social risks and demands, which led to a substantial expansion of new welfare state policy tools and intervention areas, including social investment and activation programs (Taylor-Gooby, 2004; Bonoli and Natali, 2012; Morel et al., 2012). These instruments are designed to address rising challenges to social welfare, such as atypical work, unemployment, unequal labor market participation, inequality, and climate change (Häusermann, 2012; Diamond and Chwalisz, 2015; Gough, 2013a).

These changes demonstrate unambiguously that welfare states are not "frozen landscapes," but rather a patchwork of old and new policies and institutions (Hemerijck, 2012, p. 12). However, considering the broad range of risks and demands that contemporary welfare states are supposed to confront, there is surprisingly little evidence on global welfare state direction patterns and variations. In this vein, a prominent study provides crucial insights into potential approaches for examining such directions and variations. Esping-Andersen (1990), using a sample of developed countries, finds that welfare states throughout the world are neither "extremely divergent" nor "universal," but rather follow "systematically divergent" paths. Simply stated, global welfare state patterns belong to specific peer groups. In his seminal work "The Three Worlds of Capitalism," Esping-Andersen (1990) finds that welfare state regimes may be categorized according to regime type, notably unveiling the "Liberal, Corporatist, and Social Democratic" regimes. Over the years, other academics replicated this work, resulting in extensive discussion and empirical study (e.g., Rudra, 2007; Sharkh and Gough, 2010; Gough, 2013b; Kühner, 2015; Mkandawire, 2016), yet major shortcomings in this area of literature are still evident.

Existing and prevalent welfare typologies imply that only industrialized nations have welfare states (Esping-Andersen, 1990), whilst others classify emerging nations as "Insecurity Regimes" or "Informal Security Regimes" (Wood and Gough, 2006). In this vein, several other studies have highlighted similar concerns about the exclusion of

mostly non-OECD countries in the existing welfare regimes or frameworks (Midgley, 1995; Kpessa and Béland, 2013, p. 326; Plagerson et al., 2019; Jawad, 2019). Another major flaw of these frameworks is that they focus mostly on old social hazards and policies, such as social assistance and social security programs aimed to address the prevalence of disease, unemployment, old age, occupational injury, and income loss. However, they do not adequately account for the newly emerged social risks in recent years, particularly those associated with the new knowledge economy (post-industrialization), economic and gender inequalities, and climate change, for which several policy instruments pertaining to social investment and activation policies have already been implemented (Armingeon and Bonoli, 2006; Gough, 2010; Vandenbroucke, 2012; Kowalewska, 2017).

Given that the existing literature largely excludes developing countries or regions, barely incorporates new social risks and policies into their frameworks, and uses simple empirical methods to validate proposed regimes, one can conclude that a comprehensive and robust global picture of contemporary welfare state patterns is missing. Though, it would be very important for researchers and policymakers to map and understand the different ways institutions are set up in the global welfare state landscape (Kpessa and Béland, 2013). In response to the acknowledged shortcomings in welfare state policy, and more especially welfare state regimes, I propose a conceptual framework –that is both global and comparative– for identifying the global directions and variations of contemporary welfare states. This is the first attempt in the literature to define and measure welfare state concepts using a three-stage process that includes *conceptualization, operationalization, and measurement* (DeCarlo, 2018).

In the *conceptualization stage*, I propose and define contemporary welfare state concepts clearly and concisely, taking into account both old and new social risks and policies, and relying on five key dimensions such as the concentration on specific risks, the configuration of welfare provision, the most commonly used instruments, the relationship between the welfare state and the market, and the types of measures. Two possible welfare state patterns have been identified and conceptualized in this stage. The first concept, the Reactive Welfare State, is a pattern that shows a stronger tendency for welfare state policy design to stress traditional social hazards and needs, provide welfare aid and protection during market failures, promote decommodification, and use responsive measures. The second concept, the Proactive Welfare State, reveals a pattern

where welfare state policies are more likely to respond to new social risks and needs, provide more services, encourage productivity and commodification, and use preventive measures. Then, I move on to the *operationalization stage*, where I detect the key elements of each concept. Here, I propose adding key policies that deal with old social risks and needs, such as social assistance, social insurance, healthcare, housing and amenities, public order and safety, and worker protection. In addition, I also suggest another set of important elements that tackles the new social risks and needs, such as education and training, gender development, child development, the new knowledge economy, climate policy, employment activation, and family policy. Based on these elements, I could then identify the indicators that best represent them, and which are necessary for the completion of the next stage. In the *measurement stage*, I attempt to ensure the validity of these concepts via accurate measurement. For the first time, I assembled a unique dataset for nineteen indicators and one-hundred-fifty countries–which make up more than ninety percent of the world's population and gross domestic product. I employed sophisticated model-based cluster analysis and conducted rigorous robustness checks to reconfirm that global contemporary welfare states follow systematically divergent patterns and also validate the existence of the newly conceptualized welfare regimes. These results, for the first time, unveil clear global contemporary welfare state directions and variations.

Regarding the second major shortcoming, building on the research strategy and results from the section above, this area of research needs to expand on a better understanding of the nature of the interaction of the welfare state with the environmental state. In recent years, the environmental state has also developed various policy instruments in response to ecological concerns such as "climate change, deforestation, and the deterioration of soil, water, and air" (Koch and Fritz, 2014, p. 679). The emergence of numerous new policies and areas of intervention in both policy domains has raised high academic interest in discussing new concepts for a "distinct network of environmental and welfare policy governance" (ibid). Notably, Ian Gough's influential research on the decarbonization of social services, welfare state typologies and their potential to fulfill 21st-century demands, and the necessity to combine welfare and environmental state objectives has set the way for a dynamic discussion in this respect (Gough and Therborn, 2010; Gough, 2010, 2011a, 2011b, 2013b; Gough and Meadowcroft, 2011; Bailey, 2015). Existing research finds several parallels between the welfare state and the environmental state, often connecting their past, present, and future (Meadowcroft, 2005; Dryzek, 2011; Gough, 2011b, 2015,

2016). While the timeframes and causes for their emergence differ, there are signs of convergence between these two policy domains today. Meadowcroft (2005) established analogies between these two realms and laid the framework for future research into potential links. First, it is suggested that both environmental states and welfare states reflect the expansion of state programs, activities, and expenditures into "new sectors of social life". Second, both include government responses to market failures and volunteerism. Third, the two domains are subject to "major economic and political constraints," which alter traditional patterns of economic cooperation (ibid). Although there is substantial evidence showing there are significant links between the welfare state and environmental state policies and objectives, this does not mean that the whole pathway between these two sectors is devoid of tension.

Trade-offs suggest that environmental and welfare policies and objectives may collide or compete. According to Dryzek (2011), competition between these two policy areas is imminent, despite the fact that some governments have not yet allocated enough resources to environmental programs. He contends that global control of climate change concerns will have an impact on other policy sectors, notably welfare state programs. Furthermore, policy goals may become incompatible. Climate change mitigation and adoption policies, for example, produce new demands for government expenditure that is likely to conflict with social spending (Gough, 2016, p. 40).

S*ynergies*, however, suggest that the policies and goals of environmental states and welfare states may complement one another and find common ground, and this is precisely what this stage of research is all concerned about. Environmental states, from an institutional standpoint, are built on top of welfare states. As a result, it reinforces the case that welfare regimes may affect environmental policies and even influence governments to establish integrated *eco-social programs* (Gough, 2016). In this relatively new area of research, the recent literature discusses various paths that policy formulation might take concerning the interaction between welfare and environmental policies. In this study, I am specifically interested in "eco-social integration"– which is a policy-making path that aims to establish and realize interrelated goals (Sabato et al., 2021; Mandelli, 2021). This path or pattern is conceptualized as an eco-social policy, referring to "public policies designed to pursue *explicitly* (output-based) and *interconnectedly* (policy integration) both ecological and social policy goals" (Mandelli, 2021, p.1). In other words, the eco-social policy takes into account the effects of social policies while also addressing

the environmental consequences of welfare state programs that may promote harmful production or consumption (Koch and Fritz, 2014; McGann and Murphy, 2021). Furthermore, the eco-social policy envisions a welfare state that is rooted in ecosystems and respects ecological constraints (Hirvilammi and Koch, 2020; McGann and Murphy, 2021).

In this dissertation, I argue that the literature on the eco-welfare state (or eco-social policy) is in its infancy, and needs two fundamental theoretical and empirical contributions, which might help pave the way for further research on this area. Notably, the literature still lacks a comprehensive theoretical explanation of the concept of an eco-welfare state, and the shift towards or the existence of this pattern has not been validated by any rigorous empirical method. In response, I undertook two major research steps. *First and foremost*, this study aims to refine the concept of an eco-welfare state and its rationale. This is achieved by using a more structured research approach. It begins by looking extensively into the broader relationships between environmental and welfare states. The study then delves more into the processes that lead to synergy, as well as potential trade-offs between these two realms. Following this, a number of significant environmental state and welfare state regimes are reviewed in an attempt to better understand their rationale and how they may provide light on the development of the eco-welfare state. Finally, a thorough examination of the current eco-welfare state and synonymous concepts was conducted. As a result, this research assembles for the first time the most important theoretical information necessary to understand the concept of the eco-welfare state. *Second*, this is one of the first empirical studies to verify the existence of and the transition to an eco-welfare state pattern. These findings reveal the presence of an eco-welfare state regime in a group of industrialized nations and hint at the prospective development of new eco-welfare state patterns in other nations. The findings are based on advanced empirical techniques, such as model-based cluster analysis, and for the first time encompass a sample of both developed and developing countries.

1.2.2 Policy Instruments: Carbon Tax Policy Support

"Policy instruments are the linkages between policy formulation and implementation" (Ali, 2013, p.99). Such links are often challenging to establish. Whereas new policy

instruments get introduced constantly, public support is crucial for their implementation, especially if citizens have the right to vote on them. Essentially, some policy instruments might be targetting vital welfare state or environmental state issues, i.e., climate change, and still be perceived as controversial or polarising by the public. Therefore, for academics and policymakers, it is of great importance to better understand how to predict the pathways that generate the highest public support for a policy instrument, and this is the main focus of this study.

Literature classifies policy instruments into four major categories: command and control instruments, market-based instruments, informational/educational instruments, and voluntary agreements (Bengtsson, 2020, p.7). In this analysis, we chose to focus on a market-based instrument, namely carbon tax policy support. In recent decades, carbon pricing has dominated climate change-related political debates, and as an instrument has resulted to be more successful than emissions trading systems (ETSs) (Green, 2021). Although ecological economists see carbon taxes as "a key instrument [...] to achieve future de-carbonization targets" (EAERE, 2019, p.1), the lack of public acceptance has proved to be a major barrier to their implementation (Harrison, 2010; Williams III, 2016; Rhodes et al., 2017; Lachapelle and Kiss, 2019; Levi, 2021; Dermont and Stadelmann-Steffen, 2020). Implementing climate policy instruments typically requires public support, either and most obviously because citizens can vote on them in certain contexts (Stadelmann-Steffen and Dermont, 2018; Stademann-Steffen and Thalmann, 2021; Carattini et al., 2019), or because politicians who need to win elections are unlikely to implement unpopular instruments (Harrison, 2012, Lachapelle and Kiss, 2019). Public opinion is crucial in shaping support for public policy, particularly climate policy, according to existing studies (Agnone, 2007; McCright et al., 2013; Goldberg et al., 2020; Stadelmann-Steffen and Eder, 2020). Several individual-level characteristics that influence climate policy support are identified in this area. Climate change beliefs, risk perceptions, sociodemographics, sociopsychological factors, and political affiliation are among the most influential (O'Connor et al., 1999; Smith and Leiserowitz, 2013; Elgin, 2014; Lee et al., 2015; Drews and Bergh, 2016; Knight, 2016; Crawley et al., 2020; Bumann, 2021). While public opinion research has often shown a positive correlation between beliefs about climate change and policy support, it has become clear that the presence of such beliefs is not necessarily sufficient to justify policy support. This is the starting point for our study, in which we investigate the connection between climate

change beliefs and policy support by merging climate-related risk perceptions and policy-solution-related risk perceptions.

Specifically, we study the following question: "*How climate policy support may be influenced by interactive mechanisms related to beliefs and risk perceptions*?". We examine the mechanisms that link climate change beliefs, risk perceptions, and policy support using survey data from the United States and Switzerland and employing the random forest technique. The results of this study contribute directly to the literature on public opinion and (climate) policy support, and they might be replicated successfully for policy instruments other than environmental state policies. *First*, we show that climate change-related *beliefs and risk perceptions* are significant predictors of support for carbon tax policies, surpassing socio-demographic indicators. These results imply to policymakers and advocates that these two factors have a significant influence on generating support for climate policies. *Second*, there are disparities between the United States and Switzerland in terms of the most important predictors in the random forest analysis. The observed difference in predictor values between the two nations illustrates that each one of them has a unique set of beliefs and risk perceptions that have a substantial impact on the level of carbon tax policy support. Nonetheless, we also observed several commonalities. Importantly, risk perceptions associated with both the problem and the proposed solution are crucial indications of policy support in both countries. *Third*, it has been often emphasized in the public debate that economic concerns, generally referred to as costs in the context of climate change mitigation, are essential. In general, our results suggest that these arguments might be countered by emphasizing the problem rather than the risks associated with the proposed solution.

1.2.3 Policy Actors: Variations in Leaders' Responses in Times of Crisis

"Policy is made, shaped, and operationalized by a large number of individuals often referred to as policy actors" (Maddison and Denniss, 2009, p.102). Considering that this thesis is mostly concerned with policy areas and instruments aimed at jointly addressing major ongoing global issues, it is also greatly important to understand how certain policy actors –notably country leaders– are responding to a specific contemporary crisis. The ability of most world leaders to properly handle global issues including climate change, coronavirus, security, food, inequality, energy, and financial crises has been tested in

recent years (United Nations, 2015; Rogers, 2010; Intergovernmental Panel on Climate Change, 2022, IMF, 2021; Gopinath, 2020, WHO Coronavirus Dashboard, 2022, UNDP, 2020; UNIDO, 2020). In each crisis, it seems that some nations emerge stronger or weaker, with some hardly feeling the repercussions and others suffering significant short- and long-term consequences and losses. The available research offers several explanations for these national variances, and the most frequent ones are socioeconomic development, geographical location, political system type, or leadership style in times of crisis (Sorci et al., 2020).

In this vein, since the beginning of the coronavirus pandemic in 2020, the leadership differentiation factor gained particularly higher attention. The wide disparities in government responses and performance indicators throughout this crisis have underlined the argument that leadership differentiation might be an important factor. Particularly, according to numerous media reports and subsequent academic studies, leaders' gender may be an explanation for (in)effectiveness in controlling and curing coronavirus crises. Specifically, it is argued that governments headed by women outperformed governments led by men in terms of crisis control (Garikipati and Kambhampati, 2020; Harder, M., and Harder, C., 2020; Sergent and Stajkovic, 2020; Coscieme et al., 2020). These recent findings and studies benefit from and add to a half-century of research on gender differences in leadership effectiveness (Megargee, 1969), followed by major special issues in *The American Psychologist* (Chin, 2010), *The Leadership Quarterly* (Eagly and Heilman, 2016), and *Education Sciences* (O'Connor, 2018).

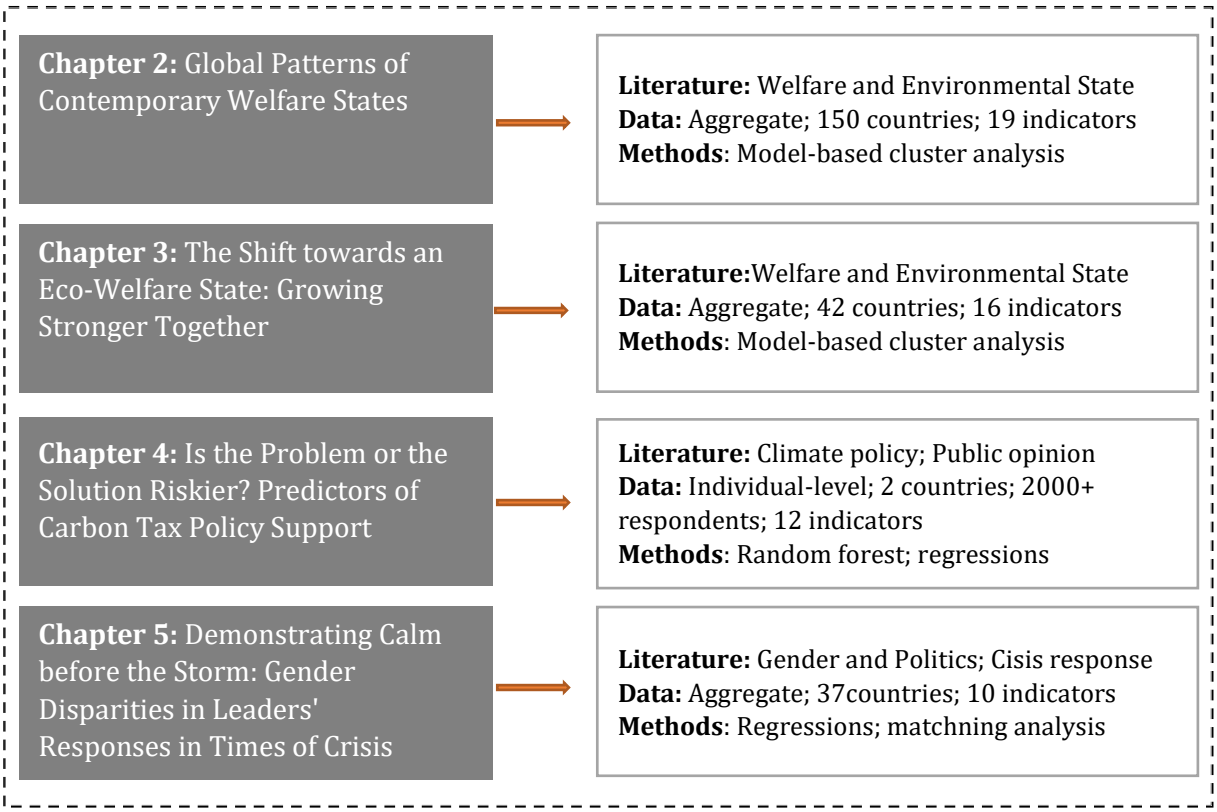
In this piece of research, however, we aim at shifting the research focus to another important factor. Whereas the existing recent studies offer us substantial insights into leaders' gender and *effectiveness* in controlling crises, there is now a need to raise the question of whether the leaders' *responses* to a crisis may exhibit a systematic gender pattern. And this is precisely where this part of the dissertation contributes to the above-listed literature. Using the coronavirus crisis as an example, we ask the following question: *Do we detect gender disparities in government leaders' responses to the coronavirus crisis?* We contend that the different political structures within which male and female leaders make decisions and take action must be taken into account to isolate a possible gender effect. Using the Government Response Index during the coronavirus crisis and building on the previously highlighted findings that countries led by women

performed better during times of crisis, we attempt to systematically examine whether female leaders achieved higher positive outcomes by responding with stricter measures in 2020 and 2021– at the beginning and the peak of the crisis. As a result, we utilize a two-step empirical strategy consisting of covariance analysis and matching analysis. Surprisingly, we get results that largely contradict our original hypotheses. We find that nations governed by women used less stringent measures to contain the crisis, and that the gender impact was significant and persistent across both periods. These findings may be explained based on the three major arguments: female leaders are characterized by soft power traits– known as the most essential elements of strong leadership (Salinas and Soni, 2020); higher levels of collaboration and flexibility in times of crisis could have ensured a more compliant population (Gerzema and D'Antonio, 2013); and female-leaders responded to this crisis earlier (Harder, M. and Harder, C., 2020; Sergent and Stajkovic, 2020). Finally, we find no significant differences between female and male leaders in varying political institutions. These findings could help to shape the understanding of the current and future leader's potential responses and outcomes to other crises.

1.3 Plan of the thesis

This thesis is comprised of four essays that are published or are currently under review in various journals focusing on (the intersection of) welfare state and environmental state research (Figure 1.5). The first two essays attempt to jointly address 'the three red waves' by proposing and validating new conceptualizations pertaining to two vital policy areas –the welfare state and the environmental state–, and exploring various lanes for establishing synergies between them. The last two essays include a novel approach for predicting the pathways that result in the highest public support for a specific policy instrument, as well as explore the variations in country leaders' responses in times of crisis based on their gender and institutions.

Figure 1.5. Thesis Overview and Research Design



The first essay in Chapter 2, titled "**Global Patterns of Contemporary Welfare States**," proposes a novel and systematic theoretical framework to uncover and explain the global variations and directions in contemporary welfare state policies. Building on the existing literature on welfare state regimes (i.e., Esping-Andersen, 1990; Rudra, 2007; Sharkh and Gough, 2010), I pursued a rigorous three-step research process that helped to formally conceptualize global contemporary welfare states. First, I develop a three-stage global comparative framework that satisfies the requirements of consistency, inclusivity, and compliance. In other words, I ensure that this framework is relevant to any nation, regardless of its geography or level of development, and that it embodies the most serious socioeconomic and ecological challenges of our time. Second, based on this conceptual framework, I compiled a unique and comprehensive dataset for 150 nations –onboarding many of them for the first time in this set of literature–, and 19 indicators. Thirdly, I use advanced empirical methods, such as model-based clustering, to empirically validate the proposed conceptualization.

The second essay in Chapter 3, "**The Shift to an Eco-Welfare State: Growing Stronger Together,**" provides a refined conceptualization and validation of the concept of an eco-welfare state. While relying heavily on the results and methods of Chapter 2, this article

builds on the most prominent research on eco-welfare states (i.e., Gough and Meadowcroft, 2011; Koch and Fritz, 2014; Zimmerman and Graziano, 2020; Sabato et al., 2021; Mandelli, 2021). Initially, I propose a more detailed and comprehensive definition of the concept of an eco-welfare state. In addition, I explore and explain the major synergies between the welfare state and the environmental state that contribute to the establishment of this sort of regime, as well as the possible trade-offs that can and should be avoided. Finally, using a dataset for forty-two developed and developing countries and two time periods, I empirically validate –using model-based cluster analysis– the transition of some countries towards an eco-welfare state regime, as well as unveil the existence of this regime in specific countries.

The third essay in Chapter 4 titled "**Is the Problem or the Solution Riskier? Predictors of Carbon Tax Policy Support**", proposes a novel pathway for predicting and generating strong public support for specific policy instruments. This essay builds on the literature pertaining to public support and climate policies (i.e., Stadelmann-Steffen and Dermont, 2018; Dermont and Stadelmann-Steffen, 2020; Goldberg et al., 2020; Stademann-Steffen and Thalmann, 2021; Crawley et al., 2020, 2021). I specifically address the claims that, although governments continue to devise and propose various climate policy instruments, implementing them is a major challenge since they often fail to get public support. Using the carbon tax policy as an example, we empirically uncover the strongest indicators and specific patterns that yield the greatest public support for such a policy instrument, using individual-level data for Switzerland and the United States. Regression analysis and random forest technique are successfully employed to conduct the empirical tests.

The fourth essay in Chapter 5 titled "**Demonstrating Calm before the Storm: Gender Disparities in Leaders' Responses in Times of Crisis**", provides new information about how governments react differently in times of crisis depending on the gender of the leader. This essay builds on the literature intersecting leadership, gender and politics, and it pays close attention to some more recent studies (i.e., Garikipati and Kambhampati, 2020; Harder, M., and Harder, C., 2020; Sergent and Stajkovic, 2020; Coscieme et al., 2020). Using the coronavirus crisis as an example, we attempt to assess whether there are differences in how male and female leaders respond to this crisis, while taking into account the different political institutions in which they make decisions and take action.

We assembled a dataset of 37 OECD countries over two time periods and used regression analysis and matching analysis to test three hypotheses.

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Chapter 2

2. Global Patterns of Contemporary Welfare States

This study proposes a novel and systematic theoretical framework to explain global welfare state policy differences. The existing scholarship examined ample welfare state variations, reforms, and transitions; however, it is typically limited to specific countries, regions, policies, or risks. In an endeavour to combine these theoretical and empirical insights, the global contemporary welfare state patterns remain vague. This study aims at bridging this gap in the literature by deploying an orderly and comprehensive three-step procedure. First, I formally design a three-stage global yet comparative conceptual framework that ensures consistency, inclusiveness, and compliance. Second, based on this framework, I assemble a unique comparative dataset for one-hundred-fifty countries, some of which appear for the first time in this literature. Third, I validate the framework using an advanced data reduction method named model-based cluster analysis. The results of this study demonstrate that global contemporary welfare states follow systematically divergent paths, revealing Proactive, Reactive, and Dual patterns.

Keywords: Proactive and Reactive welfare states; conceptualization; operationalization; measurement; model-based cluster analysis.

DOI: https://doi.org/10.1017/S0047279421001033

2.1 Introduction

"Social policy means public management of social risks. Some risks are perennial, some come and go with the flow of history." (Esping-Andersen, 1999, p. 36).

This article proposes a novel theoretical model and validation process that intends to unveil global contemporary welfare state patterns. Scholars argue that the welfare state is a complex and evolving system, with changing goals, functions, and institutions (Hemerijck, 2012). At times, these changes are more profound, dictating the designs and trajectories of welfare states across the globe. In response to 21st-century socio-economic needs and demands, contemporary welfare systems have undergone significant 'restructuring, recalibration, and transformation' (Mares and Carnes, 2009; Hall, 2015; Shahidi, 2015). Notably, two waves of welfare research have examined some of these major shifts. The first wave, the 'era of austerity', refers to changes in welfare state policy – namely, the retrenchments of existing benefits in all key social policy areas (Pierson, 2001). At the center of this era are government initiatives designed to tighten eligibility requirements and decrease benefit amounts, which resulted in sweeping changes to old social policies[1]. Welfare scholars have taken a keen interest in these policy changes and country differences, focusing mostly on common risks such as income and job loss, particularly old age, illness or disability, and unemployment benefits (Häusermann, 2012). The second wave reflects the emergence of new social risks and needs in recent decades, which has led to the expansion of welfare state instruments and areas of intervention, such as social investment and activation programs (Taylor-Gooby, 2004; Bonoli and Natali, 2012; Morel et al., 2012). These welfare policy measures are designed and implemented to address new welfare risks such as atypical employment, (long-term) unemployment, lack of opportunities for labor market participation, gender and income inequality, and climate-change-related risks (Häusermann, 2012; Diamond and Chwalisz, 2015; Gough, 2013a).

Existing research shows consistent findings among scholars that modern welfare states are not 'frozen landscapes', but rather "a patchwork mixes of old and new policies and institutions" (Hemerijck, 2012, p. 12). On the contrary, wide-ranging perspectives on the drivers and the direction patterns of the welfare state change are also evident (Palier,

[1] Old social policies address these risks via income protection, such as regulation of employment or passive transfers (Häusermann, 2012).

2006; Häusermann, 2012). The principal objective of this study is to shed light on global (or 'extensively internationalist', Yeates, 2014) contemporary welfare state patterns and to contribute to a better understanding of the pathways that welfare states may take. When I speak about welfare state patterns, I am focusing on countries' varying instruments and priorities for responding to old and new social risks, rather than the varying degrees at which governments intervene. As I would argue, the latter is closely linked to a country's degree of development, i.e. financial opportunities, and should therefore not be at the core of a global perspective on welfare states. In this study, I depend heavily on and also depart from prior theoretical methods aimed at explaining global welfare state policy differences. Findings in the respective literature suggest that welfare states in developed and developing countries follow 'systematically divergent paths', implying that they are neither 'extremely divergent' nor 'universal' (Esping-Andersen, 1990; Rudra, 2007). In essence, they show that global welfare state patterns belong to certain peer groups.

Most studies on welfare regimes depart from Esping-Andersen's seminal work, "The Three Worlds of Capitalism" (1990). An important finding of this contribution is that "welfare-state variations are not linearly distributed, but clustered by regime types," i.e. 'Liberal, Corporatist, and Social Democratic' (ibid, p. 26). This conceptualization of the welfare state solidified the idea of a 'welfare state regime', which includes traditional social services and transfers, macroeconomic management, and employment (Powell and Barrientos, 2011). Esping-Andersen's (1990) welfare regime paradigm has produced an immense amount of 'empirical work, critical commentary, and theoretical reworking' (i.e., Rudra, 2007; Sharkh and Gough, 2010; Gough, 2013b; Kühner, 2015; Mkandawire, 2016). In so doing, this study contributes to the existing research in three ways. First, theoretically, to my knowledge, this is the first piece of research on the field to develop an extensively internationalist comparative conceptual framework for unveiling the patterns of contemporary welfare states. It is particularly significant since it clarifies the theoretical controversy surrounding the systematic variation of global welfare states and provides a new but comprehensive framework for future research in this area. Second, empirically, this study is important since it brings together 150 countries, a sample size that allowed many countries to be included in this literature for the first time. Moreover, it addresses specifically the existing methodological and variable selection gaps in this

area of research. Third, these findings will inform policymakers and regional and international organizations on the global direction of contemporary welfare states.

Imagining a comprehensive global picture of contemporary welfare state patterns illuminates my motivation and interest to shed some light on this research gap. As a result, this paper sets out to answer the following question:

> *How can we conceptualize, operationalize, and measure the global contemporary welfare state patterns?*

Previous research sets the groundwork for this study based on two assumptions. First, it assumes that the welfare states consistently change, but the patterns on a global scale remain unclear. Second, looking through the lens of divergence, it assumes that welfare states across the world could follow systematically divergent paths. In this vein, I propose and validate a comparative welfare state conceptual framework, taking into account the strengths and weaknesses of current welfare state models.

This study proceeds as follows. In the second part, it reviews the existing literature on welfare regimes and transformations. In the third part, it proposes a formal and comprehensive three-stage comparative conceptual framework. In the fourth and fifth parts, it introduces a uniquely assembled comparative dataset for 150 countries across six continents. This data is utilized to statistically verify the conceptual framework using model-based cluster analysis. In the final part, it summarizes the key results and provides recommendations for future research.

2.2 Previous research: What do we know?

2.2.1 Theoretical review

As stated above, recent comparative welfare policy research has relied heavily on Esping-Andersen's work on welfare state typology, published in 1990. This book, titled "Three Worlds of Welfare Capitalism," sought to provide "reconceptualization and re-theorization of existing inadequate theoretical models of the welfare state" (1990, p. 2). It sparked extensive research on welfare regimes (Powell and Barrientos, 2004; Wood and Gough, 2006; Rudra, 2007; Sharkh and Gough, 2010; Hudson et al., 2014; Gough, 2013b; West and Nikolai, 2013), also known in the literature as the 'welfare modelling business'

(Abrahamson, 1999). This diverse body of research has generated theoretical and conceptual frameworks that have led to numerous welfare typologies.

Nonetheless, distinct frameworks that intend to explore global welfare state patterns cannot ensure a level playing field for welfare state comparison on a global scale (see Wood and Gough, 2006; Sharkh and Gough, 2010). These frameworks imply that the welfare state typologies proposed by Esping-Andersen (1990) are mainly found in developed nations. Whereas developing nations in Sub-Saharan Africa, South Asia, and parts of East Asia are considered welfareless states since they are classified as 'Insecurity Regimes' or 'Informal Security Regimes' (Wood and Gough, 2006). Recent comparative welfare studies, however, highlight the limitations of existing theories for integrating and understanding the development and transformation of social policy in Sub-Saharan Africa, the Middle East, and North Africa (e.g. see Midgley, 1995; Kpessa and Béland, 2013, p. 326; Plagerson et al., 2019; Jawad, 2019). It is thus critical to include these countries in systematic theoretical models that aim to explain welfare state policy variations. According to Kpessa and Béland (2013, p. 326), these models may assist academics and policymakers to map and understand the diverse institutional configurations of the developing countries' welfare state landscape.

Another shortcoming is that the theoretical models aimed at explaining the welfare variations across countries have mostly concentrated on old social risks and policies, although rightly in line with their time-relevance. Such policies include social assistance (non-contributory and regular transfers) and social insurance (insurance schemes), as the two most essential sub-categories of social protection. The objective of these policies is to offer health care and income security, particularly in the events of illness, work injury, invalidity, unemployment, old age, and maternity or loss of main income earner (World Social Protection Report 2017–19). However, numerous new universal social risks and demands have emerged in recent years. The majority of them are concerned with the issues pertaining to the new knowledge economy, income and gender inequality, and climate change. Low or insufficient levels of schooling, reconciliation of family responsibility and paid labor, single parenthood, long-term care dependence of a family member, and climate change-related threats, among other things, are the new social risks and demands (Armingeon and Bonoli, 2006; Gough, 2010; Vandenbroucke, 2012; Kowalewska, 2017). Several new social policy instruments and areas of intervention, including but not limited to social investment and activation policies, are recognized and

examined in contemporary welfare state research (see Morel et al., 2012; Bonoli and Natali, 2012; Eriksen, 2018). However, the existing theoretical frameworks barely include any of the new social policies and risks, leaving critical welfare state developments unexplained.

As a consequence, any effort to piece together the existing literature on welfare typologies falls short in unveiling and explaining the patterns of global contemporary welfare states. For illustration, systematic theoretical approaches are employed to capture commonalities and differences of developed welfare states, i.e. OECD18+ and EA-18 countries (Esping-Andersen, 1990; Powell and Barrientos, 2004; Starke et al., 2008; Danforth, 2014). Other studies attempt to identify region-specific welfare variations, i.e. Powell and Barrientos (2004) and Martínez-Franzoni (2008) on Latin America; Haggard and Kaufman (2008) on Latin America, East Asia, and Eastern Europe; Wood and Gough (2006), Rudra (2007), Sharkh and Gough (2010) on non-OECD nations; Mkandawire (2016) on Africa; and Kuypers (2014) on East Asia. Several welfare regimes emerge from this collection of research. Esping-Andersen's (1990) classification of regimes as 'liberal, corporatist, and social democratic' was subsequently extended to include 'welfare state regimes, informal security regimes, and insecurity regimes' (Wood and Gough, 2006). Rudra (2007) proposes the concepts of 'productive and protective welfare regimes', while Martínez-Franzoni (2008) expands on these concepts by introducing the concept of a 'nonstate familiarist regime'.

2.2.2 Methodological review

Empirical methods aimed at explaining variations in welfare states seem to be fraught with statistical, variable, and country selection issues. As new and advanced quantitative research techniques develop, the results of basic and traditional quantitative approaches are increasingly being questioned (Ahlquist and Breunig, 2012). Powell and Barrientos (2015, p. 263) conduct a review of the welfare regimes literature following Esping-Andersen's (1990) 'Three Worlds of Welfare Capitalism' and classify it into three subgroups, based on their methodological development: data reduction, regression analysis, and qualitative comparative analysis. They find that the most frequently used technique is data reduction, which includes cluster methodologies such as hierarchical cluster analysis and K-means cluster analysis, both of which have been extensively used in the literature on distinct welfare regimes (i.e. Rudra, 2007; Martínez-Franzoni, 2008).

Nonetheless, since I intend to include in this paper different welfare institutions in developed and developing countries, the use of a more 'sophisticated data reduction technique' will be essential for attaining high clustering accuracy (Barrientos, 2015, p. 264). Hence, I use the newly developed advanced mixture model-based clustering technique – which has notable advantages over traditional clustering methods[2]– to validate the comparative conceptual framework (Ahlquist and Breunig, 2012).

Another shortcoming that characterizes current empirical research of welfare regimes is known as the 'variable selection' issue. Yörük et al. (2019) collect, categorize, and statistically evaluate all variables utilized in the literature on welfare regimes. The results of this study revealed three key findings, which my analysis carefully examines and addresses. First, scholars choose variables mostly based on data availability and depend less on theoretical frameworks. Second, welfare policy variables are typically utilized in OECD country studies, while in non-OECD countries with insufficient data, researchers use development outcome variables as proxies. Third, Esping-Andersen variables are rarely utilized in non-OECD research, which weakens reliability and comparability with OECD studies (ibid, p. 1). This trend in the current research could hurt genuine attempts to properly conceptualize, operationalize, and measure welfare state patterns (ibid, p. 1). In light of these limitations, I develop a formal variable selection criterion in this study, which takes into account the representation of all major welfare policies and risks, and combines input, output, and outcome variables, a similar approach to the one adopted by Rudra (2007, p. 386) and Gough (2013a, p. 42) (see the 'Operationalization' section for details).

2.3 The conceptual framework of contemporary welfare states

In this part, I construct a global yet comparative conceptual framework for unveiling the patterns of contemporary welfare states. I take three critical factors into account to ensure a clear and consistent comparative analysis of welfare states across the globe. First, unlike most existing ones, the proposed conceptual framework follows a formal development process and complies with the operationalization and measurement processes (Yörük et al., 2019). Second, the majority of countries, regardless of economic

[2] Please see the 'Method: Model-based cluster analysis' section for details.

level, are welfare states; therefore, this framework adheres to the guiding principles of inclusion and a level playing field. The main criterion for comparing this diverse collection of countries is a functioning government. This implies that formal institutions are in charge of a social welfare system and are accountable for addressing various 'new' and 'old' social risks. Third, it is critical to incorporate contemporary social policies and risks aimed at responding to global demands and needs resulting from the new knowledge economy, gender and income inequalities, and climate change (Armingeon and Bonoli, 2006; Bonoli and Natali, 2012; United Nations, 2015; Stiglitz, 2018). Accordingly, I design and deploy a novel framework, which applies to both "policy mechanisms and outcomes achieved in all welfare states" (Taylor-Gooby, 2004). This framework defines and measures concepts using a three-stage formal process known as conceptualization, operationalization, and measurement (DeCarlo, 2018).

2.3.1 First Stage: Conceptualization

"A concept is the notion or image that we conjure up when we think of some cluster of related observations or ideas" (DeCarlo, 2018, p. 228). Conceptualization, moreover, is a clear and concise definition of a concept (ibid, p. 228). My goal in this stage is to examine the main nuances of contemporary welfare states. I identify five dimensions that are presented chronologically, around which I build the new concepts that assist in unveiling global welfare state patterns (Table 2.1). 'Concentration' emphasizes the presence of both old and new social risks and needs. Countries worldwide may direct their resources toward one category of risks and policies or the other, or in certain cases, they may devote an equal amount of effort to both categories (Esping-Andersen, 2002; Bonoli and Natali, 2012). 'Configuration' emphasizes the differences in the forms of welfare provision. According to the existing research, welfare states that prioritize new social risks and needs provide fewer transfers but more services. Those who concentrate on older social hazards and needs, on the other hand, offer more transfers and fewer services (Häusermann, 2012). The 'Instruments' dimension delves into the main policy areas/instruments that dominate contemporary welfare state policy. Existing research links activation and social investment policies with new social risks and demands, while social security and assistance policies are associated with old social risks and needs (Esping-Andersen, 2002; Morel et al., 2012; Bonoli and Natali, 2012; Hemerijck, 2017). 'Market' stresses the relationship between distinct welfare state policies and the market.

It emphasizes that some welfare programs seek to encourage productivity and market participation (i.e. activation and social investment), while others aim to shield individuals from market failures (i.e. social security and assistance). The last component, 'Measures', underlines the kinds of measures intended to either prevent social risks from occurring or to respond to an undesirable result (Esping-Andersen, 2002).

Table 2.1. Conceptualization

Dimensions	***I. Reactive Welfare State***	***II. Proactive Welfare State***
1. Concentration	Old social risks and needs	New social risks and needs
2. Configuration	More transfers and fewer services	Fewer transfers and more services
3. Instruments	Social security and assistance	Activation and social investment
4. Market	Encourages protection from the market	Encourages productivity in the market
5. Measures	Responsive	Preventive

Based on the summary of the dimensions, I identify and conceptualize two concepts, Reactive and Proactive Welfare States (Table 2.1). My rationale for naming these concepts differently from the existing ones that circulate in the current literature is appropriate for two reasons. First, the concepts I propose, particularly the second one, include policy areas that go beyond employment-related issues, such as civil rights, climate change, public order, and gender development. As a result, the fundamental definitions of these concepts vary from the existing ones. Second, the usage of the new concepts avoids readers' confusion about whether this study is aligning more with or endorsing one set of existing typologies over the others. In fact, I firmly believe that the most prominent welfare regimes studies bring to this body of literature invaluable and unique insights.

The first concept, Reactive Welfare State, derives from the dimensions listed in the first group (I). In this set, I perceive a higher tendency of welfare policy design to prioritize old social risks and needs, offer welfare provision and protection after the market has failed, encourage de-commodification, and use more responsive measures. On the other hand, the second concept, Proactive Welfare State, reflects on the dimensions presented in the second group (II). Here, I observe a higher tendency of welfare state policy design to respond to new social risks and needs, offer more services, encourage productivity and commodification, and use more preventive measures. I assume that these welfare state concepts are two ideal types, forming a spectrum of welfare states, with actual welfare states falling somewhere in between these two types. However, given the changing nature of welfare state priorities, certain countries may unveil a Dual welfare state pattern. This

may arise as a result of the shift from Proactive to Reactive welfare state priority, or vice versa, or even as a result of particular countries' lack of clear and concise welfare state designs.

The framework then continues to identify the elements of conceptualization based on the concepts and dimensions in Table 2.1. In this case, elements refer to critical policy areas that are present in some form or another in the majority of contemporary welfare states. As discussed previously, traditional welfare policies (i.e., Table 2.2: 1-7) account for the majority of components in the existing frameworks. Nonetheless, contemporary policy areas (i.e., Table 2.2: 8-14) relating to gender and income inequality, new knowledge economy, and climate change, for numerous reasons need further attention in the newly developed theoretical methods. First, policy changes affecting new work/welfare relationships have changed at various levels across the globe (Hall, 1993; Lewis, 2010). From a gender viewpoint, more precisely, the masculinist paradigm of labor and welfare has shifted, indicating a trend toward generalization to women (Lewis, 2010). These modifications to the gender-centered model tackle time constraints and emphasize the need of developing welfare policies that address and value care work, equality of opportunity, and so forth (Lewis, 2010; United Nations, 2015). Second, during the last three decades, socioeconomic developments have influenced the construction of different welfare states. Hall (2015, p. 256) argues that the emergence of revolutionary new technologies, economic and cultural globalization, and significant global shifts toward service-based employment call into question the capacity of traditional welfare programs to address the challenges posed by the new knowledge economy. Third, researchers of welfare policy see climate change as a systemic threat that is "novel, big, global, long-term, persistent, and uncertain" (Stern, 2007, p. 25; Gough, 2010, 2013a). Indeed, climate change-related hazards have numerous consequences for welfare policy. Several of these include precautionary policies on housing, increased insurance costs, and increased health needs in the event of severe climatic disasters (Gough, 2013a). Further, climate migration may exacerbate social integration difficulties and increase demand for housing, employment, education, social protection, services, and health care (ibid, p. 328). Synergies between climate change and social policy are gaining prominence and should be included on the list of elements of conceptualization (Koch and Fritz, 2014). Fourth, in terms of public order and safety, I am more concerned with corruption and property rights enforcement, a policy area influenced by the studies of Lambsdorff (2001) and

Rothstein (2021). The first contends that corruption leads governments to be unable or unwilling to maximize welfare services, while the latter argues that different kinds of malpractice in social program execution have a significant effect on the potential for gaining peoples' support for social policy. Finally, other mentioned policy areas appear often in the welfare states literature (i.e., see Table 2.3 sources for details), with the majority of these indicators fairly accurately also reflecting a country's fiscal policy efforts in terms of social policy (i.e., expenditure variables).

Table 2.2 compiles a list of fourteen policy areas that dominate contemporary welfare state architecture. These policies are neither mutually exclusive nor are they substitutes; rather, they complement one another. Based on the concepts derived from Table 2.1, I propose that contemporary welfare states follow either a Reactive or a Proactive path, or in specific cases a Dual path. The Reactive Welfare State pattern represents welfare designs that prioritize policy areas[3] 2-7, whereas the Proactive Welfare State pattern reflects welfare designs that prioritize policy areas 8-13 (Table 2.2).

Table 2.2. Elements of Conceptualization

Elements: Policy Areas	***Reactive Welfare State***	***Proactive Welfare State***
1. Civil Rights[3]	*Central*	*Central*
2. Social Assistance	*Central*	*Marginal*
3. Social Insurance	*Central*	*Marginal*
4. Healthcare	*Central*	*Marginal*
5. Housing and Amenities	*Central*	*Marginal*
6. Public Order and Safety	*Central*	*Marginal*
7. Labor Protection	*Central*	*Marginal*
8. Education and Training	*Marginal*	*Central*
9. Gender Development	*Marginal*	*Central*
10. Childhood Development	*Marginal*	*Central*
11. Knowledge-Economy	*Marginal*	*Central*
12. Climate Policy	*Marginal*	*Central*
13. Employment Activation	*Marginal*	*Central*
14. Family Policy	*Marginal*	*Central*

Note: The Central and Marginal rankings indicate the degree of priority and use according to certain policies by each regime.

2.3.2 Second Stage: Operationalization

In quantitative research, the operationalization process is concerned with 'how a concept will be measured' (DeCarlo, 2018, p. 236). It includes the identification of indicators that

[3] Civil rights are a prerequisite for the effective execution of other policy areas; therefore, I propose that both regimes place it at the heart of their welfare state policy designs.

represent each concept. In this stage, I do so by identifying at least one indicator for each element of conceptualization (Table 2.3). In the indicator selection process, I closely consult the existing welfare regimes' scholarship and mix input, output, and outcome indicators. Fundamentally, I construct my rationale based on the arguments, experiences, and results deriving from two prominent studies on welfare regimes, Rudra (2007) and Gough (2013b). The term 'input' refers to legislation and expenditure, 'output' refers to the implementation rate of legislation and provision, and 'outcome' refers to the final effect on individuals. Indeed, input, output, and outcome variables are expected to be related. In practice, and according to Rudra and Gough, these connections may vary in different country contexts. As a result, it is critical to consider all three dimensions. The combination of these types of indicators generates substantial explanatory power as it captures the welfare states' efforts and results in several areas, as listed in Table 2.3.

Table 2.3. Indicators of Elements

Indicator Selection	***Policy Area Relation***	**Selected References**	**Type**
	Reactive Welfare State		
Civil liberties	Civil Rights	Wood & Gough 2004	Outcome
Social security policies	Social Insurance	Rudra 2007	Input
Total social protection-expenditures, including health	Social Assistance, Healthcare	Wood & Gough 2006, Rudra 2007	Input
Older persons covered by social protection	Social Protection (Social Assistance and Insurance)	IPCIG 2019	Output
Prevalence of undernourishment	Social Protection (Social Assistance and Insurance)	Wood & Gough 2004	Outcome
Legal health coverage deficit	Healthcare	IPCIG 2019	Output
Child mortality	Healthcare	Conley & Springer 2001	Outcome
Maternal mortality	Healthcare	Molla et al., 2015	Outcome
Corruption	Public Order & Safety	Toukan, 2017	Outcome
Wage and salaried workers	Labor Protection	Kühner et al., 2009	Output
Vulnerable employment	Labor Protection	Weil, 2009	Output
Working poverty	Labor Protection	Halleröd, 2015	Outcome
	Proactive Welfare State		
Civil liberties	Civil Rights	Wood & Gough 2004	Outcome
Education index	Education and Training	Rudra 2007	Output
Education expenditures	Education and Training	Wood & Gough 2006	Input
Tertiary education enrollment	Education and Training	Rudra 2007	Output
Gender development	Gender Development	Stadelmann-Steffen 2008	Outcome
Preprimary school enrollment	Childhood Development	Busemeyer & Seitzl 2018	Output
Individuals using the Internet	Knowledge-Economy	Ojanperä et al., 2019	Output
PM 2.5 Air	Climate Policy	J. Requia et al., 2019	Output
Renewable energy output	Climate Policy	Gough, 2008	Output
Labor force participation rates	Employment Actv., ALMP	O'Connor 1996	Output
Labor underutilization	Employment Actv., ALMP	Hudgins & Gevrek 2015	Output
Youth Unemployment 15-24	Employment Actv., ALMP	Caliendo & Schmidl 2015	Output
Length of maternity leave	Family Policy	O'Connor 1996	Input

Note: This list illustrates the range of indicators that scholars may use in other similar studies. In this paper, I used indicators that generated robust empirical findings.

2.3.3 Third Stage: Measurement

Following conceptualization and operationalization, this stage focuses on ensuring the validity of these concepts via accurate measurement. As a result, the dataset I constructed includes only indicators of elements deriving from Table 2.3. Based on the current literature, data reduction, and more specifically, cluster analysis, is an appropriate quantitative technique for validating the proposed framework (Barrientos, 2015). Cluster analysis groups countries with comparable characteristics and demonstrates feature variations across country groups. Cluster results unveil patterns of contemporary welfare states as I suggested, if they confirm that some countries' welfare designs are prioritizing one group of welfare policies (i.e. Proactive Welfare State policies) over another (i.e. Reactive Welfare State policies), and vice versa. However, if the cluster analysis shows just one cluster, it would imply that the attempts to find welfare state patterns across the world are pointless and that the efforts to tackle the existing new and old social risks are relatively similar in every country. Alternatively, if cluster analysis reveals a much larger number of clusters (e.g. 7-10 clusters), it would imply that global welfare state efforts to address new and old social risks are considerably more diverse than this study suggests.

2.4 Data and empirical approach

2.4.1 Data

I assembled a unique and comparable dataset for the year 2015[4], including nineteen input, output, and outcome variables for 150 countries across six continents (see note 4 and Appendix A for details). The country sample is highly comprehensive and covers the welfare states of more than ninety percent of the world's population. The other omitted information predominantly includes small islands characterized by a substantial lack of data and some extreme country cases, i.e. ruthless dictatorships or countries in massive

[4] The model-based clustering technique does not work when there is missing data. As indicated in the original dataset, a tiny portion of the missing data for 2015 is replaced with data from the closest available years. Alternatively, in extreme cases where data for a single country was unavailable, I utilized R's MICE package, which generates multiple imputations for multivariate data. To verify the robustness of this package, I employed other data imputation options (such as mean or mode) or omitted the observed nations entirely, and I still got the same cluster findings.

ongoing wars. The sources of the selected data include international organizations such as the United Nations, World Bank, World Health Organization, International Labor Organization, and International Institute for Democracy and Electoral Assistance (see Appendix B and C for details). The large sample size, the period it covers, the mix of variables, and the comparability and credibility of data, provide sufficient statistical power to detect global contemporary welfare state patterns.

2.4.2 Method: Model-based cluster analysis

Cluster analysis is an unsupervised learning method used to examine homogenous groups of observations within a multivariate dataset (García-Escudero et al., 2010; Kumar, 2019). In unsupervised learning, hierarchical clustering, partitioning methods, and model-based clustering are the most popular methods. In this study, I used model-based clustering (or Gaussian Mixture Model), a formal and sophisticated method that relies entirely on statistical models and creates the prospects to make formal inferences (Kumar, 2019; Fraley and Raftery, 2002). Recently, model-based cluster analysis has advanced considerably in terms of methods, software, and interpretation of the output (Fraley and Raftery, 2007). It is a 'well-established' tool for clustering multivariate data and is gradually preferred over heuristic methods (Fop and Murphy, 2018; Fraley and Raftery, 2007).

According to Ahlquist and Breunig (2012), the model-based clustering method has four unique advantages over the heuristic clustering methods[5]. Firstly, the partition of data in model-based clustering develops from an estimated statistical model. Secondly, it enables us to choose the clustering method relying on a formal model selection. In this article, I used the Bayesian Information Criterion (BIC) to select the best model. Thirdly, model-based clustering detects the number of clusters in a dataset, unlike the K-means approach, which requires a prior selection, or the hierarchical approach which requires post-subjective selection of the number of clusters. Fourthly, model-based clustering currently has available numerous cluster shapes, unlike the other methods (ibid, p.96). In this analysis, I assume a Gaussian Mixture Model for data X, with D variables and N observations. For G clusters, the likelihood is:

[5] It is also worth mentioning a disadvantage that is discussed by Baudry (2015). The model-based clustering method (MBC-BIC) picks mixtures that are a good fit to the data, which might generate "too many" components when the goal is to identify clusters. In this case, the ILC criterion is preferred.

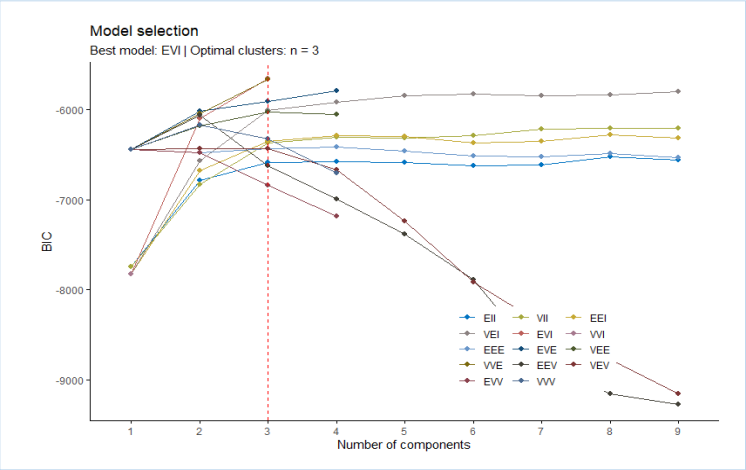
$$\prod_{i=1}^{N}\sum_{k=1}^{G} \mathrm{T}\kappa\emptyset k(\boldsymbol{x}i \mid uk, \boldsymbol{\Sigma}k),$$

where Tκ represents the probability that an observation belongs to cluster k, $\emptyset k$ is the normal probability distribution centered at uk with variance-covariance matrix $\sum k$ (Fraley et al., 1999; Evans et al., 2015, p. 67). In this approach, "clustering is formulated in a modeling framework, and the data generating process is represented through a finite mixture of probability distributions" (Fop and Murphy, 2018, p. 2). This study uses multivariate data, and I conduct model-based clustering analysis via GMMs in R (R Core Team, 2017), using *mclust* package. The data is standardized since the ranges of the variables vary significantly. Using the model-based clustering method, I was able to attain an optimal number of clusters and a smooth interpretation of the results.

2.5 Validation of the conceptual framework

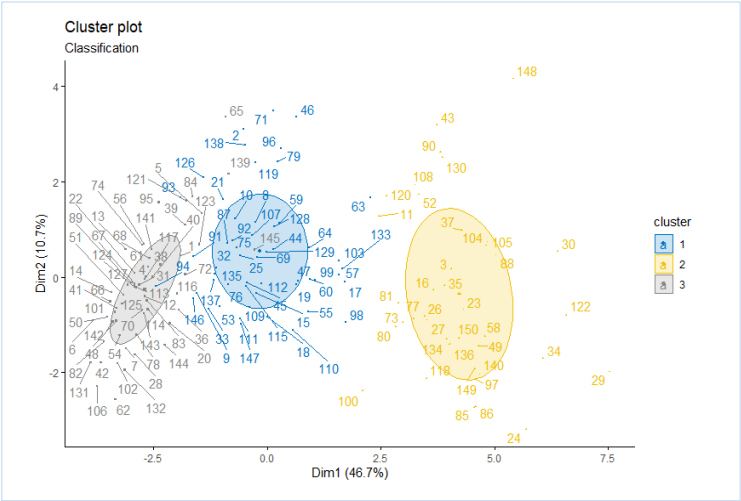
In Figures 2.1 and 2.2, as well as Tables 2.4.1, 2.4.2, and 2.4.3, I show model-based cluster findings. I converted the data to percentiles to facilitate a smooth comparison between countries and variable averages. The values of all variables are computed in ascending order from 0 to 100. The higher the percentile rating, the stronger the corresponding indicators are in a country/cluster, and vice versa. First, I determine the number of clusters identified by the data reduction technique. Second, I evaluate the features of each cluster and compare the findings to the conceptual framework developed in this study. Third, I use a suitable robustness technique to assess the confidence of the chosen model (see Appendix D for details). The model-based cluster analysis reveals three clusters, demonstrating the presence of different patterns of welfare states throughout the world (see Figure 2.1). The highest BIC score indicates the strongest evidence in favour of the optimal model. The cluster findings show three groupings made up of 53, 39, and 58 countries, respectively (see Figure 2.2). Analyzing variable or country averages may provide micro information about how a variable compares to a country group, or how one country compares to a set of variables. However, in this study, I am primarily concerned with extracting information from a macro perspective. Do the cluster findings, in particular, validate the new conceptual framework that this study proposes? If that is the case, what does the global picture of contemporary welfare state patterns tell us?

Figure 2.1. Model Selection



Note: Figure 1 shows the selection of the best model using the Bayesian Information Criterion (BIC).

Figure 2.2. Cluster Plot



Note: Figure 2 figure shows the three cluster plots. Cluster one (center) represents the group of countries with the Dual Welfare States, cluster two (right) represents the group with the Proactive Welfare States, and cluster three (left) represents the group with Reactive Welfare States.

2.5.1 Model-Based Cluster Analysis Results

In Cluster 1, the indicators capturing the Reactive and Proactive Welfare State concepts have almost identical cluster averages (46th and 45th percentiles, respectively) (see Table 2.4.1). This finding reveals a hybrid pattern or a 'Dual Welfare State', which means that, from a macro viewpoint, this group of countries puts equal efforts in both Proactive and Reactive welfare programs and risks. However, from a micro perspective, the results show that several countries have individual average welfare state patterns that lean toward Reactive (i.e., Algeria, Egypt, and South Africa), Proactive (i.e., Bhutan, Ghana, and Peru), or Dual (i.e., Dominican Republic, Malaysia, and the Kyrgyz Republic) welfare state patterns.

Cluster 2 has the lowest welfare state performance of the three clusters (19th and 32nd percentiles, respectively) (see Table 2.4.2). Nonetheless, the results indicate that the welfare state structure of this set of countries is characterized as a Proactive Welfare State pattern. Cluster analysis reveals that the average of the variables representing the Proactive Welfare State dimension is considerably higher in nearly all countries than the indicators representing the Reactive Welfare State. As a result, in accordance with the proposed conceptual framework, I refer to this group of countries as the Proactive Welfare States, since they devote a relatively greater amount of attention to the policies and risks upon which this regime is built. A thorough causal analysis is necessary to elucidate why this group of emerging countries with low-level welfare states adheres to the Proactive pattern. However, the current literature provides some indications. According to Kuitto (2016), the main components of the Proactive Welfare State, social investment and activation policies, are less costly than compensatory programs such as social protection policies; hence, they are more affordable and attractive for poorer countries (Kuitto, 2016). Furthermore, new welfare policies are simpler to modify than conventional ones since they do not have substantial 'path-dependent' consequences (ibid, p.5). Finally, the impact of international organizations in bringing Proactive Welfare State ideas to the top of the social policy agenda may be another explanation.

Cluster 3 has the strongest welfare state performance of the three clusters (72nd and 65th percentiles, respectively) (see Table: 2.4.3). As I am interested in the primary directions and strategies of the welfare state rather than on the level, cluster averages show that this group of countries has especially high values for Reactive Welfare State policies and risks. Such a finding is also mirrored in nearly all country-level averages. This cluster mostly consists of nations that feature often in the current literature on welfare regimes yet are classified as having distinct welfare regimes (e.g., Norway, Sweden, United States, United Kingdom, and Germany). The clustering of this group in the current study is most likely due to path dependence and the fact that the majority of these nations have well-established social safety systems built over decades. In this regard, it is worth noting that cluster analysis may still assist in identifying differences within this cluster that correlate to traditional typologies. To illustrate, if we compare Sweden (Social-Democratic), Germany (Corporatist), and the United Kingdom (Liberal) using Esping-Andersen's (1990) traditional (Reactive) welfare state instruments, their national average still shows this difference through percentiles, 84th, 81st, and 77th, respectively.

Table 2.4.1. Cluster Analysis Results

CLUSTER 1																							
REACTIVE WELFARE STATE											PROACTIVE WELFARE STATE												
Country	TotSocProt	SocSecPoli	CivilLib	Undernourish	ChildMortR	MaternalMortR	OldPensCov	HealthCovDf	WorkPov	**Average**	EducExp	EducIndex	PreprtSchEn	GenDIndex	InternetUsage	TertiaryEd	MaternityLe	RenEnergyOut	LaborForcePR	CivilLib	LUnderutility	**Average**
Algeria	50	57	25	61	38	32	50	52	85	**50**	52	42	61	13	38	50	37	11	3	25	14	**32**
Azerbaijan	48	57	11	100	36	63	60	9	93	**53**	14	56	20	44	81	38	71	23	46	11	63	**43**
Bahamas, The	32	43	91	34	71	40	62	100	100	**64**	39	60	27	98	83	27	27	0	89	91	26	**51**
Bahrain	23	13	1	61	73	71	43	100	84	**52**	22	60	42	35	97	56	6	0	53	1	93	**42**
Belize	29	21	77	45	51	58	50	28	65	**47**	87	52	38	58	42	38	37	62	60	77	30	**53**
Bhutan	15	2	27	44	31	31	6	56	67	**31**	91	15	17	21	40	19	89	97	42	27	92	**50**
Bolivia	57	43	53	18	28	26	74	38	54	**43**	83	45	52	29	34	52	27	52	71	53	91	**53**
Botswana	43	13	62	12	27	34	74	22	33	**36**	98	41	17	64	37	42	13	10	85	62	9	**44**
Brunei Darussalam	11	13	4	69	61	65	61	100	100	**54**	37	53	50	81	72	45	3	11	19	4	37	**37**
Cabo Verde	45	57	88	29	42	50	64	44	61	**53**	68	29	50	39	44	37	6	42	40	88	16	**42**
China	38	57	7	40	61	59	74	65	70	**52**	5	39	62	45	50	56	37	46	74	7	78	**45**
Colombia	66	57	50	49	50	43	45	54	67	**53**	32	44	54	83	54	67	71	81	61	50	59	**60**
Dominican Republic	41	43	59	33	33	38	19	30	69	**40**	12	40	34	86	53	64	13	32	47	59	29	**42**
Ecuador	48	57	41	46	52	43	46	24	62	**46**	42	46	52	59	48	57	13	69	35	41	72	**48**
Egypt, Arab Rep.	59	43	5	59	39	54	40	40	75	**46**	51	34	25	12	38	48	68	24	7	5	13	**29**
El Salvador	61	21	56	36	52	46	26	24	73	**44**	33	32	48	56	30	41	60	72	30	56	79	**49**
Georgia	58	43	70	48	58	54	67	28	64	**54**	3	81	43	64	47	58	93	84	58	70	18	**56**
Ghana	34	13	67	51	21	20	38	46	58	**39**	82	30	98	22	27	28	13	67	81	67	40	**50**
Guatemala	26	21	42	24	34	40	14	34	59	**32**	23	25	36	42	32	36	13	74	19	42	96	**40**
Guyana	49	21	57	44	32	24	74	26	66	**44**	23	34	77	40	34	21	27	0	17	57	18	**32**
Honduras	26	43	48	25	43	34	47	18	30	**35**	86	21	33	62	31	36	13	60	38	48	47	**43**
India	15	43	33	23	26	29	32	19	24	**27**	27	28	11	8	17	40	89	37	11	33	81	**34**
Indonesia	4	13	55	42	36	35	21	41	50	**33**	32	35	46	30	24	44	27	30	45	55	50	**38**
Jamaica	28	21	80	41	48	39	37	23	77	**44**	76	49	71	68	42	40	3	28	48	80	17	**47**
Jordan	51	21	28	30	45	45	44	47	79	**43**	46	54	23	13	60	50	9	13	0	28	14	**28**
Kuwait	60	13	24	100	67	97	36	100	81	**64**	28	35	48	75	74	46	9	0	58	24	89	**44**
Kyrgyz Republic	52	57	34	48	41	41	74	50	69	**52**	67	61	23	50	32	61	71	87	28	34	42	**51**
Lebanon	7	13	37	32	69	71	0	38	80	**39**	11	37	59	20	77	52	9	17	5	37	37	**33**
Malaysia	21	2	26	69	73	51	28	100	100	**52**	60	57	83	62	72	55	6	28	30	26	88	**51**
Mauritius	54	21	64	54	54	47	74	100	84	**61**	59	59	93	50	50	51	13	45	15	64	63	**51**
Mexico	63	43	49	62	53	52	34	52	68	**53**	71	44	52	44	56	44	13	38	24	49	61	**45**
Moldova	78	57	44	44	49	65	55	48	95	**59**	84	56	66	89	67	54	71	21	1	44	58	**56**
Mongolia	66	57	66	27	44	50	74	49	87	**58**	45	66	100	97	25	81	68	19	23	66	67	**60**
Morocco	42	57	31	66	38	36	41	37	72	**47**	73	26	42	7	56	42	37	36	6	31	20	**34**
Myanmar	2	2	21	33	22	28	70	60	56	**33**	0	13	20	42	23	28	37	73	89	21	100	**41**
Namibia	44	43	68	9	25	22	72	31	48	**40**	97	32	19	87	28	33	13	93	15	68	1	**44**
Nicaragua	39	21	28	21	44	30	31	18	50	**31**	44	30	41	39	21	32	13	66	33	28	41	**35**
Oman	22	2	12	56	60	69	32	66	89	**45**	55	54	44	38	77	53	1	0	64	12	72	**43**
Panama	54	43	68	38	46	38	40	40	73	**49**	19	48	38	88	51	60	37	79	50	68	70	**55**
Paraguay	40	21	52	31	40	33	30	26	74	**38**	62	38	30	61	49	47	71	98	68	52	56	**57**
Peru	36	43	60	39	48	42	27	43	61	**44**	29	49	74	38	41	83	27	68	77	60	87	**57**
Philippines	9	21	58	26	34	36	41	50	52	**36**	6	42	90	82	35	48	6	47	28	58	87	**48**
Qatar	30	2	9	100	70	73	26	100	100	**57**	13	51	45	100	97	26	1	0	95	9	98	**49**
Saudi Arabia	20	13	5	56	69	74	54	28	100	**47**	93	70	17	18	68	71	9	9	11	5	46	**38**
South Africa	56	57	56	55	28	32	68	100	54	**56**	83	55	60	69	52	35	70	17	12	56	0	**46**
Sri Lanka	42	13	39	38	63	56	34	100	78	**51**	5	65	80	33	10	34	13	64	9	39	63	**38**
St. Lucia	37	21	91	20	46	48	36	35	51	**43**	58	46	56	76	43	29	27	0	69	91	3	**45**
Tajikistan	74	43	9	9	30	55	68	3	60	**39**	38	42	8	26	20	39	83	93	29	9	20	**37**
Thailand	21	57	8	46	62	66	60	69	95	**54**	46	38	48	83	40	63	27	25	78	8	95	**50**
Trinidad&Tobago	52	43	69	50	35	44	72	39	92	**55**	21	58	65	93	68	23	27	0	49	69	82	**50**
Tunisia	58	57	48	59	55	44	39	48	76	**54**	81	40	34	21	46	46	1	18	5	48	10	**32**
Venezuela, RB	50	43	19	26	40	37	48	100	53	**46**	88	62	57	98	62	87	89	77	43	19	46	**66**
Vietnam	40	57	20	36	42	46	42	42	65	**43**	57	36	66	92	45	43	89	57	92	20	97	**63**
Cluster Average	**40**	**33**	**42**	**44**	**46**	**46**	**47**	**50**	**70**	**46**	**48**	**44**	**48**	**54**	**48**	**46**	**34**	**41**	**41**	**42**	**52**	**45**

Table 2.4.2. Cluster Analysis Results (continued)

CLUSTER 2																							
REACTIVE WELFARE STATE											PROACTIVE WELFARE STATE												
Country	TotSocProt	SocSecPoli	CivilLib	Undernourish	ChildMortR	MaternalMortR	OldPensCov	HealthCovDf	WorkPov	**Average**	EducExp	EducIndex	PreprtSchEn	GenDIndex	InternetUsage	TertiaryEd	MaternityLe	RenEnergyOut	LaborForcePR	CivilLib	LUnderutility	**Average**
Angola	38	21	19	11	8	12	22	1	16	**16**	34	17	32	23	11	14	27	70	34	19	21	**27**
Bangladesh	6	21	26	22	30	28	38	5	30	**23**	3	20	26	18	13	30	60	14	20	26	77	**28**
Benin	25	21	72	35	3	14	18	16	8	**24**	43	16	20	19	9	25	37	22	59	72	69	**36**
Burkina Faso	16	21	65	16	9	16	5	4	11	**18**	49	1	1	15	12	7	37	27	96	65	36	**31**
Burundi	32	21	6	0	15	3	7	32	1	**13**	72	11	12	83	3	9	13	86	97	6	84	**43**
Cambodia	2	1	21	18	32	30	5	29	20	**18**	9	19	15	25	5	24	27	63	91	21	95	**36**
Cameroon	12	21	32	47	7	8	21	7	21	**20**	15	28	30	15	22	31	37	83	75	32	88	**41**
C. African Republic	13	21	23	1	1	1	14	14	2	**10**	2	5	4	1	2	2	37	95	83	23	40	**27**
Chad	5	21	17	6	0	1	2	15	14	**9**	4	2	0	2	1	3	37	0	51	17	72	**17**
Congo, Dem. Rep.	19	21	17	3	4	5	23	16	1	**12**	9	18	1	9	1	11	37	95	56	17	69	**29**
Congo, Rep.	9	21	10	5	22	14	29	22	15	**16**	13	26	11	33	7	23	56	70	54	10	26	**30**
Cote d'Ivoire	7	21	45	15	5	6	13	5	20	**15**	62	11	5	2	39	15	37	40	25	45	27	**28**
Djibouti	46	21	1	17	16	24	20	34	18	**22**	95	3	3	10	9	7	37	0	2	1	19	**17**
Ethiopia	18	2	13	14	17	18	23	12	18	**15**	21	3	25	11	11	12	27	96	95	13	92	**37**
Gambia, The	26	2	11	34	14	4	24	73	42	**25**	15	7	32	5	15	1	89	0	77	11	9	**24**
Guinea	13	43	35	24	7	5	16	2	13	**18**	26	5	13	4	7	21	37	85	94	35	52	**34**
Kenya	11	2	46	12	24	10	33	36	16	**21**	66	27	58	31	15	16	27	89	37	46	23	**39**
Lao PDR	5	21	0	22	14	26	10	17	23	**15**	25	19	29	30	19	32	56	87	87	0	99	**44**
Lesotho	73	1	51	28	5	12	69	22	7	**30**	99	22	28	91	27	15	13	99	39	51	1	**44**
Liberia	19	2	63	4	10	3	64	42	12	**24**	36	12	99	9	33	22	37	0	16	63	94	**38**
Madagascar	1	21	40	3	24	18	8	10	0	**14**	10	22	15	36	3	5	37	71	99	40	89	**39**
Malawi	3	0	62	19	18	7	3	34	3	**16**	79	15	64	32	4	0	3	90	88	62	58	**45**
Mali	31	21	36	55	2	9	4	6	6	**19**	50	1	1	3	8	9	37	60	32	36	33	**25**
Mauritania	30	21	32	42	9	7	17	14	63	**26**	24	9	8	10	14	8	37	34	3	32	39	**20**
Mozambique	28	21	44	10	12	11	25	12	3	**18**	75	9	9	24	16	10	6	88	86	44	76	**40**
Nepal	17	2	47	40	29	23	49	1	41	**28**	30	21	70	27	17	26	3	99	100	47	98	**49**
Niger	17	21	60	30	6	9	11	9	10	**19**	72	0	5	5	0	3	37	12	21	60	93	**28**
Nigeria	1	2	50	38	3	2	13	8	7	**14**	1	17	7	17	35	18	13	42	8	50	90	**27**
Pakistan	0	43	30	14	11	28	3	30	63	**25**	7	10	54	1	12	17	13	53	10	30	75	**26**
Rwanda	46	13	22	7	26	22	9	57	5	**23**	34	13	15	36	19	11	13	72	99	22	99	**39**
Senegal	33	21	70	29	23	20	30	23	14	**29**	89	7	13	23	30	19	37	29	14	70	2	**30**
Sierra Leone	23	2	58	13	1	0	1	1	5	**12**	17	8	7	17	5	1	13	74	32	58	32	**24**
Sudan	10	2	7	16	15	21	8	32	44	**17**	11	4	37	7	29	30	3	78	4	7	12	**20**
Tanzania	44	13	40	8	18	15	6	20	9	**19**	38	14	27	28	21	4	13	55	87	40	83	**37**
Togo	14	21	43	20	12	17	19	12	9	**18**	77	23	14	6	6	20	37	82	91	43	65	**42**
Uganda	8	2	30	5	20	19	12	7	12	**13**	8	24	10	15	18	6	13	91	98	30	77	**35**
Yemen, Rep.	53	2	3	7	20	16	15	36	19	**19**	35	6	1	0	26	17	9	0	7	3	5	**10**
Zambia	35	2	38	2	16	25	16	15	4	**17**	1	33	5	33	23	5	13	91	72	38	36	**32**
Zimbabwe	36	2	14	1	19	13	11	4	22	**14**	7	31	34	28	26	13	37	68	93	14	49	**36**
Cluster Average	**21**	**14**	**33**	**18**	**13**	**13**	**18**	**19**	**17**	**19**	**35**	**14**	**22**	**20**	**15**	**14**	**29**	**59**	**57**	**33**	**56**	**32**

Note: Percentiles were computed using data from 150 countries included in the cluster analysis. The term 'Average' refers to the mean of the indicators of a Reactive and Proactive Welfare State for each country. The 'Cluster Average' for a given regime is calculated by taking the average of all countries in each concept, and the highest percentile determines this group's welfare state pattern (i.e., Table 4.2: Proactive Welfare State, 32nd percentile).

Table 2.4.3. Cluster Analysis Results (continued)

CLUSTER 3																							
REACTIVE WELFARE STATE											PROACTIVE WELFARE STATE												
Country	TotSocProt	SocSecPoli	CivilLib	Undernourish	ChildMortR	MaternalMortR	OldPensCov	HealthCovDf	WorkPov	Average	EducExp	EducIndex	PrepriSchEn	GenDIndex	InternetUsage	TertiaryEd	MaternityLe	RenEnergyOut	LaborForcePR	CivilLib	LUnderutility	Average
Albania	62	57	54	52	65	57	56	26	84	**57**	30	62	71	54	61	79	98	99	13	54	8	**57**
Argentina	69	57	66	65	59	48	65	64	79	**64**	69	77	56	83	65	94	27	49	44	66	38	**61**
Armenia	47	43	38	63	55	63	52	100	71	**59**	16	64	40	59	58	59	83	50	34	38	4	**46**
Australia	81	57	85	100	89	90	54	100	40	**77**	64	99	99	61	88	99	71	34	73	85	60	**76**
Austria	97	57	82	100	91	97	74	71	38	**78**	74	85	91	56	87	91	60	83	70	82	55	**76**
Barbados	60	43	99	65	56	59	51	100	87	**69**	89	69	66	93	80	77	13	0	82	99	24	**63**
Belarus	82	57	15	100	85	97	74	100	84	**77**	64	83	91	96	60	95	71	13	57	15	24	**61**
Belgium	99	57	85	100	87	87	74	70	40	**78**	85	90	97	55	89	85	56	44	38	85	48	**70**
Brazil	79	57	74	100	50	50	58	100	71	**71**	79	47	77	94	58	65	68	81	60	74	39	**67**
Bulgaria	80	57	61	61	69	76	74	54	34	**63**	40	77	66	78	55	83	99	41	46	61	28	**61**
Canada	77	57	87	100	77	87	74	100	32	**77**	65	90	55	70	93	77	56	76	80	87	75	**75**
Chile	69	57	90	67	71	65	59	59	77	**68**	56	74	66	47	81	96	71	61	44	90	30	**65**
Costa Rica	65	43	99	58	65	63	52	100	75	**69**	92	57	59	64	59	66	68	94	36	99	15	**64**
Croatia	87	57	64	100	81	84	48	66	57	**72**	54	73	47	76	69	80	94	80	27	64	11	**61**
Cuba	77	21	3	100	77	52	74	100	89	**66**	99	68	91	37	36	49	71	19	21	3	75	**52**
Cyprus	91	57	75	52	96	87	74	44	46	**69**	85	72	62	73	74	70	71	26	62	75	16	**62**
Czech Republic	84	57	81	100	94	97	74	100	58	**83**	41	91	93	70	79	75	93	31	65	81	85	**73**
Denmark	97	57	97	100	84	90	74	100	48	**83**	96	99	85	64	98	92	71	79	81	97	67	**84**
Estonia	76	57	93	69	94	81	74	58	32	**70**	70	87	74	95	92	84	83	36	70	93	52	**76**
Finland	99	57	79	100	99	100	74	100	49	**84**	90	95	62	86	89	95	87	62	68	79	26	**76**
France	100	57	95	100	84	84	74	73	44	**79**	66	84	95	73	84	73	60	39	54	95	34	**69**
Germany	94	57	87	100	87	90	74	100	36	**81**	54	100	95	52	91	78	37	51	79	87	79	**73**
Greece	95	57	78	100	81	100	57	100	26	**77**	28	82	36	48	64	100	67	50	31	78	6	**54**
Hungary	86	57	52	100	78	69	74	100	46	**73**	53	78	64	72	75	62	88	30	36	52	54	**60**
Iceland	72	57	98	100	100	100	63	100	56	**83**	95	95	87	50	100	86	27	97	97	98	64	**81**
Iran, Islamic Rep.	64	57	13	58	49	63	35	56	88	**54**	17	64	39	14	46	81	95	21	1	13	22	**37**
Ireland	74	57	86	100	91	84	70	100	40	**78**	81	97	87	64	87	87	89	48	48	86	46	**75**
Israel	72	57	46	100	89	93	73	100	27	**73**	74	88	96	58	82	76	37	15	55	46	65	**63**
Italy	98	57	81	100	92	97	74	100	28	**81**	40	72	89	52	57	74	87	58	18	81	12	**58**
Japan	91	57	71	100	95	93	74	100	28	**79**	26	83	70	56	95	74	37	40	72	71	81	**64**
Kazakhstan	34	57	16	100	58	74	62	46	95	**60**	20	75	46	90	71	58	71	26	79	16	68	**56**
Korea, Rep.	55	21	54	100	92	76	58	100	100	**73**	52	86	85	32	93	98	27	16	26	54	57	**57**
Latvia	67	57	89	100	79	67	74	46	29	**67**	50	87	71	98	86	85	60	66	67	89	31	**72**
Lithuania	68	57	73	100	79	79	74	63	26	**69**	100	89	74	97	73	82	71	58	66	73	50	**76**
Luxembourg	88	57	100	100	98	79	74	68	34	**77**	77	70	80	54	99	34	60	54	50	100	34	**65**
Macedonia, N.	56	57	34	63	57	84	53	62	87	**61**	31	50	30	42	70	54	95	56	22	34	3	**44**
Malta	79	57	92	100	74	81	74	100	55	**79**	91	76	96	46	79	62	71	23	26	92	81	**68**
Montenegro	69	57	42	100	85	87	46	63	84	**70**	68	71	40	45	66	68	98	65	13	42	7	**53**
Netherlands	89	57	79	100	87	87	74	69	42	**76**	61	94	83	50	95	91	60	32	85	79	42	**70**
New Zealand	85	57	89	100	77	76	74	100	37	**77**	94	98	77	49	91	90	71	85	84	89	55	**80**
Norway	93	57	97	100	98	93	74	100	38	**83**	87	96	87	79	99	88	95	92	83	97	75	**89**
Poland	83	57	84	100	80	100	74	67	35	**76**	58	85	57	89	64	79	83	35	42	84	48	**66**
Portugal	93	57	94	100	91	79	74	100	31	**80**	70	66	80	69	66	72	59	64	62	94	22	**66**
Romania	68	57	72	100	65	56	74	61	22	**64**	19	68	76	72	54	60	71	59	23	72	52	**57**
Russian Federation	71	57	18	100	67	63	66	55	95	**66**	36	79	71	95	70	89	83	38	63	18	75	**65**
Serbia	92	57	36	53	75	69	44	58	92	**64**	47	67	44	59	63	70	83	48	17	36	5	**49**
Singapore	24	43	23	100	98	79	0	100	100	**63**	18	80	19	64	85	93	60	15	66	23	85	**55**
Slovak Republic	83	57	74	65	75	90	74	61	47	**70**	42	81	80	76	83	64	95	44	52	74	32	**66**
Slovenia	90	57	83	100	99	81	74	100	45	**81**	63	89	77	85	76	89	56	52	52	83	44	**70**
Spain	95	57	76	100	93	93	74	71	26	**76**	44	79	85	64	85	97	60	56	64	76	7	**65**
Sweden	96	57	93	100	96	97	74	100	43	**84**	93	93	83	79	94	72	100	77	90	93	44	**83**
Switzerland	85	57	96	100	83	93	74	100	52	**82**	56	92	93	73	90	69	37	75	93	96	56	**75**
Turkey	64	43	15	100	56	69	28	53	88	**57**	48	48	24	26	52	99	60	54	9	15	28	**42**
Ukraine	89	57	29	69	65	63	66	100	92	**70**	80	74	66	81	48	93	71	20	41	29	54	**60**
United Kingdom	87	57	77	100	82	81	74	100	36	**77**	78	97	85	47	96	68	95	46	76	77	67	**76**
United States	81	57	95	100	73	72	74	51	26	**70**	60	93	50	79	78	97	0	33	56	95	83	**66**
Uruguay	75	57	83	100	66	71	56	67	92	**74**	48	62	76	91	62	66	37	89	74	83	43	**66**
Uzbekistan	62	57	2	50	37	54	71	100	17	**50**	97	52	22	40	44	13	60	43	40	2	61	**43**
Cluster Average	**78**	**55**	**68**	**90**	**79**	**79**	**65**	**81**	**55**	**72**	**62**	**79**	**70**	**66**	**76**	**78**	**68**	**50**	**53**	**68**	**44**	**65**

2.6 Conclusion

In recent years, welfare states across the world have undertaken substantial reforms, mostly in response to new social risks and needs posed by the new knowledge economy, gender and income inequality, and climate change. The objective of this study was to develop – for the first time – a comparative welfare state conceptual framework that takes into account the re-focusing of welfare states in recent years and is capable of capturing welfare state patterns on a global scale. As a result, I designed and deployed a novel and systematic theoretical framework for detecting such patterns. Following that, I moreover assembled a unique dataset for 150 countries, onboarding many of them for the first time in the literature, and ultimately used this information to validate the proposed framework utilizing a sophisticated data reduction technique. This study's most significant results may be summarized as follows.

First, I can show, using my conceptualization and model-based cluster analysis, that welfare states worldwide may be classified into three groups. One cluster identifies a group of countries with a greater welfare commitment/response to new social risks than to old social risks. As a result, I refer to this group's welfare states as the Proactive Welfare States. Another cluster identifies a group of welfare states that perform comparatively better on problems relating to old social risks, and I refer to them as the Reactive Welfare States. Additionally, my research identifies a third cluster, comprised of nations with almost equal levels of commitment/response to both old and new social risks, and I refer to them as the Dual Welfare States. Thus, I can demonstrate that – from a global comparative viewpoint – there is systematic variation in how welfare states prioritize their responses to existing and emerging social hazards.

Second, although the extent to which the welfare state is engaged is not an essential feature of this conceptualization, empirical evidence indicates that the proposed framework may provide such information within and across clusters. In terms of the latter, the Proactive Welfare State cluster exhibits, on average, the lowest welfare state engagement, followed by the Dual Welfare State cluster. The Reactive Welfare State cluster, however, exhibits the highest degree of welfare state effort. Clearly, these distinct levels seem to be linked to the disparities between developed and developing countries. However, while the level of development is rather logically related to the level of welfare state engagement, the results show that richer and poorer countries also differ with

respect to the orientation of their welfare states. The majority of developed countries have long-established a comprehensive welfare state to guard against traditional social risks, which has been extended but not supplanted by measures addressing emerging social hazards. This results in a high level of total welfare state engagement. By contrast, developing nations often lack the resources necessary to establish a compact social security net, preferring instead to concentrate on social investment and activation programs, which are usually less costly than social protection measures (Kuitto, 2016). This is reflected in these countries' much lower total level of welfare state involvement, as shown in this study.

Third, the comparative framework has a stated goal of identifying welfare state patterns on a global scale. To some degree, this comes at the expense of data constraints with indicators that are not always ideal representations of some specific countries' different welfare state dimensions. Nonetheless, my research demonstrates that the conceptual framework could be extended to a subsample of established democracies as well. The methodology, when concentrating on these nations, shows the various degrees to which these traditional welfare states have been refocusing their policies on new social risks. Future research may dig further into these disparities using this approach and benefit from the fact that better and more comprehensive data is available for subsamples of countries. Additional disaggregated data for different policy instruments, for example, may allow for the use of more input variables (expenditures and policies) to identify more fine-grained welfare state changes.

2.7 Appendices

Appendix A.

Table 2.5. Country Sample

Continents	Countries
Africa	Algeria Angola Benin Botswana Burkina Faso Burundi Cabo Verde Cameroon C. African Republic Chad Congo, Dem. Rep. Congo, Rep. Cote d'Ivoire Djibouti Egypt, Arab Rep. Ethiopia Gambia, The Ghana Guinea Lesotho Liberia Madagascar Malawi Mali Mauritania Mauritius Morocco Mozambique Namibia Niger Nigeria Rwanda Senegal Sierra Leone South Africa Sudan Tanzania Togo Tunisia Uganda Zambia Zimbabwe Kenya

Asia and Australia	Azerbaijan Bahrain Bangladesh Bhutan Brunei Darussalam Cambodia China India Indonesia Iran, Islamic Rep. Israel Japan Jordan Kuwait Lao PDR Lebanon Malaysia Mongolia Myanmar Nepal Oman Pakistan Philippines Qatar Saudi Arabia Singapore Sri Lanka Tajikistan Thailand Vietnam Yemen, Rep. Cyprus Korea, Rep. Kyrgyz Republic Uzbekistan Australia New Zealand
Europe	Albania Armenia Austria Belgium Bulgaria Croatia Czech Republic Denmark Estonia Finland France Georgia Germany Greece Hungary Iceland Ireland Italy Lithuania Luxembourg Macedonia, N. Montenegro Netherlands Poland Portugal Romania Russian Federation Serbia Slovak Republic Slovenia Spain Sweden Switzerland Ukraine United- Kingdom Norway Belarus Kazakhstan Latvia Malta Moldova Turkey
South America	Argentina Bolivia Brazil Chile Colombia Ecuador Guyana Paraguay Peru Uruguay Venezuela, RB Mexico
North America	Canada United States Bahamas, The Barbados Belize Costa Rica Cuba Dominican Republic El Salvador Guatemala Honduras Jamaica Nicaragua Panama St. Lucia Trinidad & Tobago

Appendix B.

Table 2.6. Variables, Descriptions, and Sources

Variable Code	Description	Relation to concept	Source
CivilLib	Civil liberties	Proactive (+) Reactive (+)	IDEA & FHI
TotSocProt	Total social protection expenditure, including health (% of GDP)	Reactive (+)	ILO
SocSecPoli	Number of social security policy areas covered by a statutory programme	Reactive (+)	ILO
Undernourish	Prevalence of undernourishment (% of population)	Reactive (-)	WDI
ChildMortR	Mortality rate, under-5 (per 1,000 live births)	Reactive (-)	WDI
MaternalMortR	Maternal mortality ratio (per 100,000 live births)	Reactive (-)	WDI
OldPensCov	Social protection effective coverage by group of population (older persons)	Reactive (+)	ILO
HealthCovDf	Legal health coverage deficit, % of population without legal coverage	Reactive (+)	ILO
WorkPov	Working poverty rate (age 15+)	Reactive (-)	ILO
EducExp	Education expenditure (% of GNI)	Proactive (+)	WDI
EducIndex	Calculated using mean years of schooling and expected years of schooling	Proactive (+)	UN
PrepriSchEn	Gross enrolment ratio, pre-primary (% of preschool-age children)	Proactive (+)	WDI
GenDIndex	Gender development index	Proactive (+)	UN
InternetUsage	Individuals using the Internet (% of population)	Proactive (+)	WDI
TertiaryEd	School enrollment, tertiary (% gross)	Proactive (+)	WDI
MaternityLe	Length of maternity leave (weeks), paid leave only	Proactive (+)	ILO
RenEnergOut	Renewable energy output (% of total output)	Proactive (+)	WDI
LaborForcePR	Labour force participation rates of population at ages 15-64 (%)	Proactive (+)	ILO
LUnderutility	Combined rate of unemployment and potential labour force (LU3) %, total 15+	Proactive (-)	ILO

Note: In section, 'Relation to concept, 'Reactive (+/-)' and 'Proactive (+/-)' classification suggests that respective variables are positively or negatively related to a specific regime. For example, the higher is the '*Total social protection expenditure, including health (% of GDP)'* the stronger is a country's preference towards 'Reactive' welfare state policies. Acronyms: ILO (International Labor Organization); WDI (World Development Indicators); UN (United Nations); FHI (Freedom House Index); IDEA (International Institute for Democracy and Electoral Assistance).

Appendix C.

Table 2.7. Summary Statistics of the Variables Measured

Indicator	N	Min	Mean	Max	St.Dev.
TotSocProt	150	0.17	10.84	31.69	8.03
SocSecPoli	150	1.00	6.63	8.00	1.52
CivilRights	150	0.22	0.68	0.98	0.20
Undernourish	150	2.50	11.13	67.30	12.06
ChildMortR	150	2.30	29.83	130.80	31.73
MaternalMortR	150	3.00	162.63	1360.00	237.22
OldPensCov	150	0.00	56.74	100.00	38.53
HealthCovDf	150	0.00	37.65	100.00	39.12
WorkPov	150	0.00	13.32	73.43	17.59
EducExp	150	0.70	4.48	15.52	2.09
EducIndex	150	0.21	0.66	0.94	0.18
PrepriSchEn	150	1.00	61.44	170.00	35.28
GenDIndex	150	0.55	0.94	1.03	0.07
InternetUsage	150	2.48	49.34	98.20	27.94
TertiaryEd	150	0.77	40.45	126.38	28.75
MaternityLe	150	0.00	16.70	60.00	8.96
RenEnergOut	150	0.00	37.06	100.00	32.95
LaborForcePR	150	42.18	69.88	88.76	9.74
LUnderutility	150	1.70	12.40	34.60	7.19

Note: The summary statistics table shows the data ranges vary significantly (e.g. see the minimum and maximum value of the variables 'Maternal Mortality Rate' and 'Child Mortality Rate'); hence, standardization of data is necessary since we look for relations among the variables.

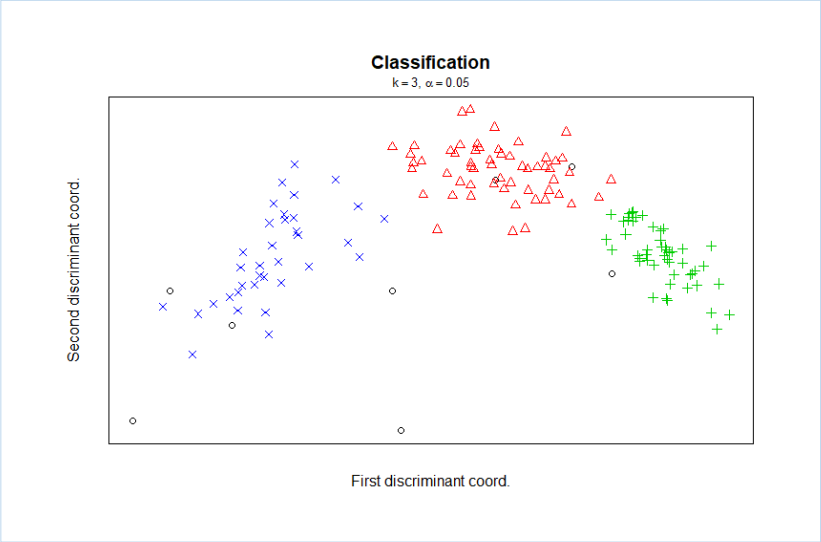
Appendix D. Robustness Checks

After obtaining and assessing the cluster results, in this section, we test for their robustness. Literature suggests that biased cluster results typically originate from the presence of outlying observations in the dataset and the deviations from essential theoretical assumptions (Garcia-Escudero et al., 2010). In this study, both issues are important because we use data with highly diverse observations and introduce two novel concepts[6] in welfare state research. For the model-based clustering approach, robustness methods, based on trimming, are highly praised and recommended (Fritz et al., 2012; Garcia-Escudero et al., 2010, 2011). Hence, we apply the trimming approach in our data,

[6] Reactive and Proactive Welfare States.

by excluding from the sample five percent of the potential extreme values. The trimmed results confirm that, predominantly, countries remain in the same clusters, as shown in the three above-listed tables[7].

Figure 2.3. Robustness Check: Trimmed Clusters



Note: This figure shows the cluster plots after the robustness check, using *tclust* in R Studio. The trimmed values are the 'outlier countries' shown in empty bullets '○'.

The second robustness check tests whether our theoretical and empirical approach also provides meaningful results when using specific subsamples. Accordingly, we apply our proposed approach to the subsample of countries from Cluster 3 that includes the well-developed welfare states of Europe and North America, for which many typologies exist. Applied to this country subsample, model-based cluster analysis again reveals three clusters. The first cluster within the Reactive welfare states consists of countries with a relatively lower general level of welfare state engagement, e.g., most Eastern European countries but also several Latin-American states. The two remaining clusters consist of all West European and Anglo-Saxon countries. While these countries seem to be quite similar concerning the old risk policies, one group of countries, forming a distinct cluster, namely Austria, Canada, Denmark, Iceland, New Zealand, Norway, Sweden, and Switzerland, stand out having a stronger emphasis on new social risks. Thus, while the strength of our framework is to compare welfare states around the world, this subsample analysis

[7] Trimming approach excluded five percent of the most extreme observations. In this case, the excluded countries are Albania, Burundi, Central African Republic, Cuba, Lesotho, Liberia, Namibia, and Republic of Yemen.

demonstrates that the conceptual and empirical approach presented in this study can also be used to identify welfare state patterns with specific country groups or regions.

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Chapter 3

3. The Shift towards an Eco-Welfare State: Growing Stronger Together

Poverty, inequality, and climate change are the world's greatest challenges of the twenty-first century (Stern, 2009). They are profoundly interconnected and represent grave threats to the future of our planet and civilization. Failing on one will result in failure on the other; thus, government responses to such threats must be meticulously coordinated, especially across environmental and welfare state programs. In recent years, a growing body of research has examined the links between these two domains, lauding the eco-welfare state as a viable path forward. As the literature on the eco-welfare state is at an early stage, this study proposes two essential theoretical and empirical contributions. First, it examines the most prominent theoretical interpretations of the concept of the eco-welfare state in an attempt to refine its definition and meaning. It does so by both unifying and strengthening theoretical clarity via definitions of synonymous concepts such as "ecosocial welfare state" and "ecostate", as well as by closely consulting the two sets of literature on the welfare state and environmental state regimes. Second, using model-based cluster analysis for forty-two developed and developing nations, this research empirically reveals global patterns of the shift towards and the existence of an eco-welfare state.

Keywords: Environmental state; welfare state; eco-welfare state; synergy; trade-off; model-based clustering.

DOI: https://doi.org/10.1017/ics.2023.2

3.1 Introduction

Rising global temperature, inequality, and poverty are the world's most pressing challenges today (Stern, 2009; Poschen, 2017; Voituriez, 2020; García-García et al., 2022). The emergence and acceleration of these 'multidimensional concerns,' as well as the public's growing awareness of their implications, have increased the demand and need for novel ways of living, producing, and consuming (Utting et al., 2014; Elias, 2019). These sustainability concerns cannot be addressed by specific policy instruments, but rather require highly compatible social and ecological systems (Breg and Saikkonen, 2019). As a result, this study intends to contribute to a foundational theoretical and empirical understanding of the significance and nature of welfare states' interaction with environmental states.

In recent years, welfare states and environmental states have adopted extensive and swift measures to meet the needs resulting from the ever-expanding and emerging old and new social and ecological risks. Numerous existing policies have been amended, and new policy intervention areas have been established. On the one hand, welfare states have expanded and refined policy tools aimed at addressing poverty, inequality, health care, education and training, and labor protection and activation (Esping-Andersen, 2002; Bonoli and Natali, 2012; Hemerijck, 2017; Hasanaj, 2022). On the other hand, relatively newly constituted environmental states have developed policy instruments in response to ecological concerns such as "climate change, deforestation, and the degradation of soil, water, and air" (Koch and Fritz, 2014, p. 679). While these two policy areas continue to go through major changes and address critical contemporary challenges, new proposals have been raised on the need for a "distinct network of environmental and welfare policy governance" (ibid, p. 679). There is a growing interest in implementing environmental state and welfare state initiatives that are not "conflictual" but rather cooperative (Dryzek, 2011). For example, according to Gough and Meadowcroft (2011), climate change will raise the need for existing social policy measures, as well as increase financial demands for additional environmental policy expenditures and the regulation of harmful consumption.

In this context, the importance of government efforts to develop, implement, and evaluate coherent and mutually supportive policies that contribute to sustainable development has received increased attention (OECD, 2016). Numerous scholars in the fields of

sustainability, environmental states, and welfare states (Fitzpatrick, 2004; Koch and Fritz, 2014; Gough, 2015; Hirvilammi and Koch 2020; McGann and Murphy 2021) have advocated for the advancement of an eco-welfare state as a viable path forward. This newly emerged concept has begun to appear in the literature on the welfare state and environmental state, and indeed deserves more extensive academic attention. The current research lacks a complete theoretical definition of the eco-welfare state concept and sophisticated empirical findings that identify possible movements toward or the presence of eco-welfare state patterns. This study has a dual purpose in response to these fundamental gaps in the existing research. First, I examine the most influential research that investigates the synergies and trade-offs between welfare states and environmental states, and then I evaluate the relevant conceptualizations of the eco-welfare state and other terms with similar meanings. This stage seeks to clarify the rationale behind this nexus and to unify and refine the meaning of this concept. Second, I plan to test empirically the presumption of global or regional transitions toward or the existence of an eco-welfare state pattern. I do this by employing advanced empirical methods such as model-based cluster analysis, and by including a wider range of vital environmental and welfare state indicators for forty-two developed and developing nations.

This study proceeds as follows. The second section reviews the literature on the welfare state and environmental state regimes, and the debate on potential synergies and trade-offs. The third section attempts to refine the meaning of the eco-welfare state concept by conducting a careful assessment of the existing theoretical descriptions of this or other synonymous concepts. The fourth and fifth sections include the data and model-based cluster analysis results, and unveil potential shifts toward an eco-welfare state. The fifth section presents conclusions and future research recommendations.

3.2 Connecting the dots between the environmental states and welfare states

3.2.1 An overview of the literature

The concept of the "welfare state" emerged in the 1950s, referring to the government's role in ensuring people's access to and receipt of social services (Meadowcroft, 2005). Included are government programs that intervene in health care, education,

unemployment insurance, pensions, and family benefits, as well as the management process and ideological foundations for such activities (ibid, p.2). In the early 2000s, the concept of the "environmental state" gained prominence, referring to government programs aimed at addressing environmental issues such as "climate change, biodiversity loss, and ozone depletion" (Duit et al., 2016, p.1). In this vein, numerous academics in this field have studied the potential of building such a state whose primary objective is "managing environmental burdens" (Lafferty, 2000; Lundqvist, 2004; Meadowcroft, 2005, p.3), precisely consisting of government activities aimed at minimizing environmental repercussions, promoting ecological values, and reducing environmental risks (Meadowcroft, 2005, p.3).

Recent scholarship has sought to examine a contemporary progressive policy direction that combines environmental state and welfare state objectives (Bailey, 2015). Ian Gogh's research work has made a significant contribution to this discussion by addressing a variety of critical challenges (ibid). Among them are the need to decarbonize social services, welfare state typologies and their ability to fulfill the demands of the 21st century, and the need to connect welfare and environmental state goals (Gough and Therborn, 2010; Gough, 2010, 2011a, 2011b, 2013b; Gough and Meadowcroft, 2011). This collection of research sparked a substantial academic discussion on the fundamental idea of linking two important policy domains in order to jointly address major and persistent global concerns. Existing research draws comparisons between the environmental and welfare states, often linking their past, present, and future (Meadowcroft, 2005; Dryzek, 2011; Gough, 2011b, 2015, 2016). While the timeframes and reasons for their emergence differ, there are indications of convergence between these two policy domains today.

Meadowcroft (2005) proposed parallels between these two domains, laying the groundwork for future investigation into possible connections. First, it is argued that both environmental states and welfare states reflect the expansion of governmental programs, activities, and expenditures into "new sectors of social life". Second, both include government responses to market failures and volunteerism. Thirdly, the two realms work "under significant economic and political constraints," which alters conventional economic cooperation patterns (ibid). For illustration, on one side, welfare state transfers impact wages, labor supply and conditions, corporate taxation, and corporate profits. On the other side, ecological factors impact pollution standards, industrial and consumer spending, planning constraints, and nature protection initiatives (ibid). Environmental

states and welfare states are, arguably, long-term processes of economic, social, and political development, particularly in response to (post)industrialization, urbanization, changes in family and life expectancy, shifts in production and consumption patterns, and a growing population (ibid, p.6-9).

Gough (2016) also developed a comparative framework for welfare and environmental state policies. His study outlines five growth drivers of the welfare state to explain the emergence of the environmental state. While a comprehensive explanation of the observed similarities and differences is outside the scope of this research, the results "illustrate two conceivable configurations and hypothesize on the circumstances for closer, more integrated eco-welfare states" (ibid, p.24). However, such interactions raise fundamental questions about economic objectives, environmental management, and social well-being systems (Meadowcroft, 2011). For example, are contemporary welfare states environmentally unsustainable, and can civilizations endure without inflicting net environmental costs on future generations? Can concerns about quality of life, economic disparities, and consumer protection, on the other hand, be linked to environmental burdens, individual and community well-being, and future material consumption (ibid)? These questions are congruent with two concepts of sustainable development: the concept of “needs"[8] and the concept of "limitations," paving the way for more research in the next subsection (World Commission on Environment and Development, 1987, p.43; Gough, 2015, p.1195).

3.2.2 Trade-off or Synergy?

Although there is substantial evidence showing there are significant links between the welfare state and environmental state policies and objectives, this does not mean that the whole path between these two areas is devoid of tension. This subsection seeks to explore and highlight the key trade-offs and synergies between welfare states and environmental states.

Trade-offs imply that environmental state and welfare state policies and objectives may collide or compete. According to Dryzek (2011), despite the fact that some governments have not yet allocated adequate resources to environmental initiatives, competition between these two policy areas is imminent. He contends that global management of

[8] Gough (2015) defines this concept as the following: “Needs refers to a particular category of goals which are believed to be universalisable”.

climate change concerns will have an impact on other policy areas, notably welfare state programs. For example, due to the need to reallocate money to assist efforts aimed at mitigating climate change or compensating those affected, social welfare retrenchments may be inevitable (ibid, p.13). Gough (2016) also expressed similar concerns and in addition argues that many nations' capacity to address increasing social and environmental crises has been impeded by decades of "macroeconomic instability, fiscal austerity, and high inequality" (p. 40). As a result, policy goals may become conflicting. Furthermore, economists and public opinion scholars are also engaged in the debate on how climate change mitigation and adoption policies generate new demands for government spending, which are likely to conflict with social spending (Voituriez, 2020; Victor, 2008; Jackson, 2009; Bailey, 2015). The former emphasizes the importance of empirical evidence on the linkages between welfare and environmental policy while highlighting the possibilities of rivalry and tension between these two fields. The latter investigate the public's perception of environmental and social policy and finds significant variation (Jakobsson et al., 2015). In this vein, recent findings suggest that the generosity of the welfare state is associated with less environmental protection support, or vice versa (Parth and Vlandas, 2022), or that public support for welfare and climate change programs is split (Gugushvili and Otto, 2020).

Synergies, on the contrary, suggest that environmental state and welfare state policies and objectives may complement one another and share common ground. The incorporation of the notion of 'state' serves as a starting point for investigating potential synergies. Unlike welfare state research, until recently, environmental research –i.e., climate change, biodiversity, ozone depletion– has mostly focused on the international character of the challenges it addresses (Hoffman, 2005; Pattberg, 2007; Bierman and Siebenhüner, 2009). Recent studies, however, advocate "returning the state" to the center of environmental research (Duit et al., 2016) and designating it as the "central analytical category" (Bevir, 2011). This approach enhances links between environmental studies and studies of the modern state, particularly comparative welfare states (Esping-Andersen, 1990) and varieties of capitalism (Hall and Soskice, 2003) (Duit et al., 2016, p. 3-4). Institutionally, environmental states are built on top of welfare states. As a result, it reinforces the argument that welfare regimes may affect environmental policies and even influence governments to develop integrated eco-social programs as opposed to just adding new ones to existing ones (Gough, 2016). Gough (2013a) offers concrete examples

of possible synergies between environmental state and welfare state programs, such as the efforts to mitigate the risks deriving from climate change:

> "If business as usual prevails, then the prospects for human welfare across much of the planet are pessimistic. The priority in social policy will be to adapt habitats and infrastructures to new climatic threats, whether drought, floods, frequent storms, sea-level rises or unpredictable temperature changes; to foster individual and social adaptive capacities; and to protect the most vulnerable via aid transfers, disaster relief and managed migration" (p.3).

In a similar context, several further synergies between environmental and welfare states are highlighted. For example, reducing animal production and consumption, as well as shifting from driving to walking and cycling, has significant health benefits, including a reduction in 'heart diseases, depression, cancer, and dementia' (Gough, 2013a, p.6). Recently, programs for human and social welfare that were formerly handled by the welfare state have been reinforced with environmental state functions that are responsible for addressing common threats (i.e., climate change mitigation). Gough (2013a) states that:

> "…social policy needs to combine with environmentalism to forge a unified eco-social policy that can achieve ecologically beneficial and socially just impacts: by promoting new patterns of production, consumption and investment, changing producer and consumer behavior while improving wellbeing, and ensuring a fairer distribution of power and resources" (p.9).

The low-carbon energy transition is used as an example in support of the synergy approach (García-García, 2022). On the one hand, such transitions are accompanied by a number of social consequences that markets alone cannot address, such as "the destruction of jobs in former conventional sectors (without alternatives), the lack of labor mobility in some sociodemographic profiles, skill shortages, gender inequality, and regressivity" (ibid, p.1). On the other hand, welfare states are seen as the most effective way to address these negative outcomes and even influence new potential positive outcomes, particularly via social services such as social assistance, social insurance, and social investment programs (ibid).

3.3 Reviewing and refining the eco-welfare state concept

The formulation of policies on the interaction between welfare and environmental policies might take three distinct pathways (Sabato et al., 2021). First, "*the silos logic*"

entails a complete separation in the policy-making process. Second, "*parallel development of policies*" implies a logic of independent definition of policy objectives and tools, but with a dose of future understanding between these two domains. Third, "*eco-social integration*" refers to a policy-making process that attempts to create and achieve interconnected objectives (Sabato et al., 2021; Mandelli, 2021). This study is particularly concerned with the third pathway, representing the eco-social policies approach –known as "public policies designed to pursue explicitly (output-based) and interconnectedly (policy integration) both ecological and social policy goals" (Mandelli, 2021, p.1). In other words, the eco-social policy addresses the social consequences of environmental policies while simultaneously tackling the environmental consequences of welfare state programs – i.e., encouraging harmful production or consumption (Koch and Fritz, 2014; McGann and Murphy, 2021). Environmental sustainability and social justice are at the center of eco-social policy, which envisions a welfare state that is integrated with ecosystems and compliant with ecological limits (Hirvilammi and Koch, 2020; McGann and Murphy, 2021).

To comprehend the meaning, origin, and rationale of the eco-social welfare concept/regime, we should first revisit the welfare state and environmental state regimes. *In the welfare state regimes literature*, the most prominent study is Esping-Andersen's (1990) seminal work titled "The Three Worlds of Welfare Capitalism". In this work, he suggests that welfare states follow systematically divergent paths and proposes three types of regimes: *liberal, corporatist, and social-democratic regimes.* Numerous studies have replicated and improved this foundational work (i.e., Wood and Gough, 2006; Rudra, 2007; Sharkh and Gough, 2010; Hasanaj, 2022), creating a collection of research known as the "welfare modeling industry" (Powell and Barrientos, 2015). These studies use a wide range of research techniques, variables, and empirical methods, and they often corroborate the existence of Esping-Andersen's typologies or introduce new ones into the field (i.e., Wood and Gough, 2006; Rudra, 2007; Hasanaj, 2022). *In the environmental regimes literature*, environmental scholars place a strong emphasis on revealing international environmental regimes, viewing risks as worldwide concerns that require global solutions (Sprinz and Helm, 1999; Vormedal, 2010; Young, 2014). Various terminologies and conceptualizations for the environmental state have been proposed, such as "ecological state" (Lundqvist, 2001), "green state" (Dryzek et al., 2003), and "ecostate" (Meadowcroft, 2005). Koch and Fritz (2014) built on the last concept by

classifying ecostates as "*established ecostates*", "*deadlocked ecostates*," "*failed ecostates*", and "*emerging ecostates*" (p. 690-1). The vast majority of studies on welfare state and environmental state regimes have a common assumption: welfare states and environmental states follow systematically divergent paths, meaning that they are neither extremely different nor extremely similar, but rather follow specific patterns.

The classifications of welfare regimes and environmental regimes should not be interpreted as these policy areas are mutually exclusive. Rather, prominent literature (i.e., Meadowcroft 2005, Gough and Meadowcroft 2011) emphasizes similarities and links between the two areas, resulting in the emergence of new research pathways. First, Meadowcroft (2005) introduced one of the most influential studies by developing the concept of ecostate, and laying the path for further research into the synergies between environmental states and welfare states. According to the author, the ecological state is "predicated on a recognition that environmental systems are critical to long-term social welfare, and that their protection and enhancement require conscious and continuous adjustment by public power" (ibid, p.6). In other words, this concept proposes a state that is committed to maintaining a social development trajectory and sustainable growth within the boundaries of environmental sustainability (ibid, p. 3). Second, Koch and Fritz (2014) expand Gough's (2010) seminal work on the policy and structural linkages that exist between welfare states and environmental states. The authors use the synergy hypothesis to investigate whether various welfare regimes are associated with different 'environmental performances' (ibid, p.683). They contend that social-democratic welfare regimes and coordinated economies are "better positioned" than liberal welfare regimes to manage the interdependence of welfare and environmental state policies and hazards (Dryzek, et al., 2003; Dryzek, 2008). As a result, this synergy is often referred to as the "mutual reinforcement of welfare and environmental states" or "ecosocial state" (Koch and Fritz, 2014). Thirdly, in recent years, there is a novel attempt to further empirically explore the eco-welfare state's existence and sub-regimes. Zimmerman and Graziano (2020) revealed several eco-welfare states, which they characterize as "interaction in social and environmental protection" (p.2). This study's primary objective is to investigate possible relationships between "social and ecological performance" (ibid). They categorize the welfare and ecological data of 27 European nations into six categories using hierarchical analysis. The results indicate that the Nordic cluster outperforms other clusters, implying that it is the "best eco-welfare state" regime at present (ibid, p.17).

3.4 Data and method

Forty-two nations representing a wide range of regions and economic development levels were included in the dataset I compiled. This is the first study to include non-OECD nations –some of which are classified as middle-income or low-income– into the eco-welfare state literature. For operationalization purposes, I relied heavily on the literature review in the preceding sections to help me prepare Table 3.1, which contains the essential elements of the environmental state and the welfare state. Based on this classification, I can identify the key indicators representing each dimension, and use them to empirically check whether they could help to unveil potential shifts towards or existence of eco-welfare state regimes. The indicators representing the dimensions include policy inputs, outputs, and outcomes.

Table 3.1. Operationalization: Eco-Welfare State

Policy Areas	**Environmental State**	**Eco-Welfare State**	**Welfare State**
Dimensions	Climate Change	Overall policy inputs, outputs, and outcomes of the six dimensions demonstrate persistent **synergies**.	Social Protection
	Biodiversity Loss		Social Investment
	Ozone Depletion		Justice & Equality

Source: Author's classification.

The data sources include the World Bank, International Monetary Fund, United Nations, the Global Footprint Network, and ECOLEX (IUCN, UNEP, and FAO). Sixteen input, output, and outcome variables representing key environmental and welfare state dimensions– as presented in Table 3.1– are used for two periods, 2001 and 2015 (see Table 3.2 for details). This dataset provides valuable insights into the potential shifts of specific countries towards an eco-welfare state pattern:

- *Environmental state variables:* A set of seven input, output, and outcome indicators is used to represent the environmental state dimension of the analysis. As input indicators, I used *environmental protection expenditures*, *the number of environmental legislations, and environmental treaties in force*. As an output indicator, I used *the renewable electricity output relative to the total electricity produced in one country.* As outcome indicators, which capture the performance of a country in terms of environmental issues, I *used PM2.5 air pollution, mean annual exposure - CO2 emissions, and Ecological Footprint vs Biocapacity*.

- *Welfare state variables:* A set of nine indicators is used to represent the welfare state dimension of the analysis. As input indicators, I included *government expenditures on housing and amenities, health, education, and social protection.* As output indicators, *the education index, wage and salaried workers, pre-primary school gross enrolment ratio, and labor force participation rate* are included. Whereas, as an outcome variable, I used the *child mortality rate*.

Table 3.2. List of Indicators

Variable Code	**Description**	**Relation**	**Source[9]**
EnvironPE	Environment Protection/General government final consumption expenditure	Environmental State (+)	IMF
RenewEn	Renewable electricity output (% of total electricity output)	Environmental State (+)	WDI
PM2.5Air	PM2.5 air pollution, mean annual exposure (micrograms per cubic meter)	Environmental State (-)	WDI
CO2Ems	CO2 emissions (metric tons per capita)	Environmental State (-)	WDI
CFPrintPcap	Ecological Footprint vs Biocapacity (gha per person) (EFConsPerCap)	Environmental State (-)	GFN
Treaties	Environmental legislation in force	Environmental State (+)	ECOLEX
Legislation	Environmental treaties in force	Environmental State (+)	ECOLEX
HusingCAE	Housing and community amenities/General government final consumption expenditure	Welfare State (+)	IMF
HealthE	Health/General government final consumption expenditure	Welfare State (+)	IMF
EducExp	Education/General government final consumption expenditure	Welfare State (+)	IMF
SocialProE	Social Protection//General government final consumption expenditure	Welfare State (+)	IMF
EducIndex	Calculated using Mean Years of Schooling and Expected Years of Schooling.	Welfare State (+)	UN
ChildMort	Mortality rate, under-5 (per 1,000 live births)	Welfare State (-)	WDI
WageSalW	Wage and salaried workers, total (% of total employment) (modeled ILO estimate)	Welfare State (+)	WDI
PrePrimSc	Gross enrolment ratio, pre-primary (% of preschool-age children)	Welfare State (+)	UN
LFPR	Labor force participation rates of population at ages 15-64 (%)	Welfare State (+)	WDI

Note: 'Variable Code' represents the acronym for each indicator that is included in the cluster analysis results. 'Description' shows the complete name of the indicator. 'Relation', Environmental State (+/-) and Welfare State (+/-) classification suggest that the relevant indicator positively or negatively relates to that

[9] IMF= International Monetary Fund; WDI=World Development Indicators; GFN: The Global Footprint Network; ECOLEX (IUCN, UNEP, FAO); UN: United Nations.

specific field. For example, a higher '*Environment Protection expenditure'* signifies an overall positive impact on the policy domain.

To the best of my knowledge, two articles attempted to empirically shed some light on the existence and nature of eco-welfare states and used simple statistical techniques such as correspondence analysis and hierarchical cluster analysis. In this study, I applied model-based clustering– a sophisticated empirical methodology with "significant advantages over conventional clustering techniques"[10] (Ahlquist and Breunig, 2011, p. 96). The cluster analysis is carried out in R Core Team, 2017, using the *mclust* package (Scrucca et al., 2016), and the data is normalized due to the wide variation in indicator ranges. Three essential stages comprise the empirical methodology. First, two cluster analyses for the years 2001 and 2015 are conducted. Second, the results of the two sets of cluster analyses are analyzed to detect any trends concerning the shifts toward or existence of eco-welfare states. Third, I check whether environmental states and welfare states followed a "synergy" or "trade-offs" strategy based on the difference in indicator values between 2015 and 2001.

3.5 Results

3.5.1 Model-based cluster analysis: Snapshot results for 2001 and 2015

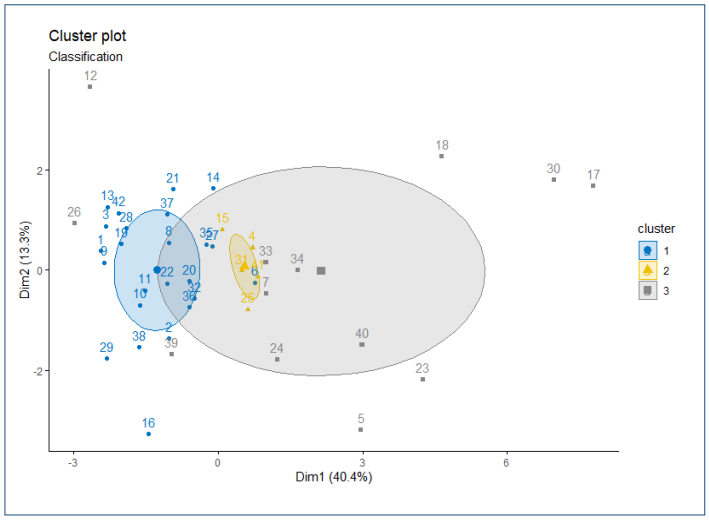
In the first part of the analysis, the main objective is to explore whether the eco-welfare state regimes already exist, as suggested by the recent literature. I reviewed several important papers on welfare state regimes to figure out the best empirical approaches for detecting systematically divergent patterns (i.e., Wood and Gough, 2006; Rudra, 2007; Sharkh and Gough, 2010; Hasanaj, 2022). Cluster analysis turns out to be the most commonly used approach, which categorizes nations on the basis of their common characteristics. Therefore, I employed model-based cluster analysis independently for the years 2001 and 2015, using the dataset for 42 countries and 16 environmental state and welfare state variables. These two snapshot cluster results may be used to determine if, between 2001 and 2015, a clearer grouping of countries with comparable characteristics has emerged. Furthermore, it allows for measuring the similarities and differences

10 Ahlquist & Breunig (2011) list four notable advantages of model-based clustering: "First, MBC derives the partition of the data from an estimated statistical model, thereby enabling "soft" clustering and statements of uncertainty about the resulting classification. Second, the choice of clustering method now becomes a problem of model selection. Third, if we assume that each component of the mixture is a cluster, the model-based approach identifies the number of clusters in the data. Fourth, MBC can accommodate several cluster shapes not readily implemented in most traditional methods" (p. 96).

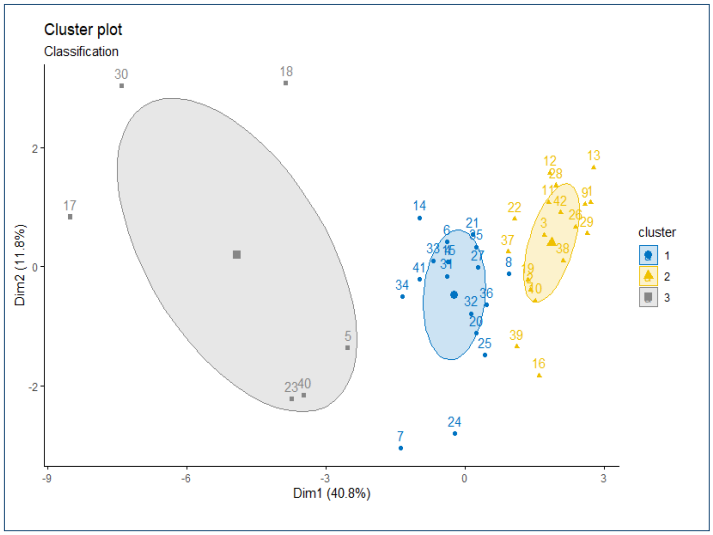
between these groupings of countries, examining how they vary from one another, and deciding if any of them displays substantial evidence of the emergence of an eco-welfare state pattern in 2015. Because I am mainly interested in cluster characteristics, country or indicator-specific analyses are beyond the scope of this study.

The model-based cluster analysis snapshot results for 2001 and 2015 reveal three clusters for each period, as illustrated in Figures 3.1 and 3.2 (See appendices B and C). The academic debate on possible synergies between environmental and welfare states began in the early 2000s. As a result, for comparative purposes, I used 2001 as the 'base year', and 2015 as the year I used to study the nature of the shift and the emergence of a potential eco-welfare state pattern. The 2001 model reveals three clusters, although the differentiation between them is fuzzy. The 2015 model, on the other hand, reveals three distinct clusters. Initial examination of the cluster plots suggests a likely shift toward more distinct, systemically divergent patterns. To analyze the key characteristics of each cluster, however, a more in-depth statistical analysis is required (See Table 3.3).

Figures 3.1. Cluster Plots for 2001



Figures 3.2. Cluster Plots for 2015



Note: Figures 3.1 and 3.2 show three cluster plots for each model. Each value represents one country.

This is the approach I followed to examine cluster characteristics (see Table 3.3 for details). Firstly, I obtained the 2015 data for each country's sixteen environmental and welfare indicators and assigned them to their respective clusters. Secondly, I calculated the *cluster average* and *total average* for each indicator. Thirdly, I separately divided each indicator's *cluster average* by the *total average.* Here I could find which indicator out/underperformed the sample's *total average*. Fourthly, since I am especially interested in cluster performance, I separately measured the average performance of the environmental state and welfare state indicators. To do so, I calculated the so-called *change average* for both policy areas– practically the average of the results deriving from the previous step. The *change average* results are of the greatest interest since they provide a comprehensive picture of each cluster's relative performance in environmental state and welfare state variables, respectively (Please read the *Note* under Table 3.3 for more details).

How do we interpret the *change average* results? If a cluster demonstrates positive performance in both the environmental state *change average* and the welfare state *change average*, there is a prospect for *synergy* rather than a *trade-off*, since it indicates that both policy areas are growing in parallel. The cluster should thus be perceived as an eco-welfare state regime. Furthermore, if a cluster performs positively in the *change average* in one policy area, and negatively in the other, this case is treated as a *trade-off*. For example, if one cluster is only performing positively in the environmental state *change average*, it should be regarded as an environmental regime, and the same logic should be applied to the welfare state scenario (see Table 3.3 for details). Lastly, negative *change averages* in both policy domains show that a cluster is below the total average. Consequently, there is less space for eco-welfare state discussion, as this group of nations may still be in the first stages of developing their environmental and welfare states. Based on these three principles, I interpret the results of the 2015 cluster analysis as the following:

- ***Cluster 1*** includes a mix of low-middle-income, upper-middle-income, and high-income countries. This cluster has a *change average* of a negative 1% in environmental state indicators and a positive 4.0% in welfare state indicators, suggesting that its relative average performance leans positively exclusively toward welfare state-

related concerns. While not yet there, this group of nations might be considered a prospective emerging eco-welfare state regime due to their narrow negative performance on *change average* on environmental state indicators. This argument is backed further by data in Table 3.4, which assesses the fourteen-year change in these indicators and will be explored in the next subsection.

- ***Cluster 2*** includes a group of high-income OECD countries. The results of this cluster demonstrate that environmental state and welfare state variables registered a positive *change average* of 8.7% and 13.7%, respectively, in both domains. Three significant findings emerged from this cluster. First, *change average* findings indicate that this group of nations performed positively in both the environmental state and welfare state areas, indicating that these countries pursued a strategy of parallel growth and synergy in these two areas. These data empirically reveal the existence of the eco-welfare state regime and validate the prevalent theoretical assumptions. Second, these findings show that eco-welfare regimes already exist, predominantly in high-income nations. Third, this cluster contains liberal, corporatist, and social-democratic states. Beyond the findings of Zimmerman and Graziano's (2020) study, such results might pave the way for more research on the various subtypes of eco-welfare state regimes.
- ***Cluster 3*** consists of a small set of upper-middle-income and lower-middle-income countries, with negative environmental state and welfare state *change averages* of 23.2% and 53.2%, respectively. This group's performance on environmental state and welfare state indicators is significantly below the sample's *total average*, ruling out any consideration of an eco-welfare state pattern at this time. However, it is important to highlight that the environmental state indicators perform far better than the welfare state indicators.

Table 3.3. Cluster Analysis Results for 2015

	Environmental State Indicators							Welfare State Indicators								
Country	EnvironPE	RenewEn	PM2.5Air	CO2Ems	CFPrintPcap	Treaties	Legislation	HusingCAE	HealthE	EducExp	SocialProE	EducIndex	ChildMort	WageSalW	PrePrimSc	LFPR
CLUSTER 1																
Bulgaria	0.03	17.99	20.78	5.87	3.44	208.0	330.0	0.02	0.29	0.18	0.04	0.81	8.30	87.94	84.00	69.40
Croatia	0.01	66.83	19.21	3.97	3.79	186.0	3415.0	0.01	0.28	0.18	0.06	0.79	4.80	84.31	63.00	67.02
Cyprus	0.01	8.78	19.10	5.26	3.48	151.0	546.0	0.05	0.15	0.31	0.01	0.79	2.90	84.90	80.00	72.79
Czechia	0.03	11.40	17.42	9.17	5.56	181.0	614.0	0.02	0.30	0.19	0.05	0.89	3.10	82.64	105.00	74.13
Greece	0.02	28.66	17.74	6.18	4.13	244.0	1308.0	0.00	0.22	0.18	0.02	0.83	4.80	64.96	47.00	68.32
Hungary	0.01	10.58	17.23	4.27	3.55	221.0	631.0	0.02	0.23	0.19	0.07	0.82	5.10	89.11	81.00	68.37
Israel	0.02	1.89	22.78	7.86	5.74	104.0	419.0	0.02	0.20	0.25	0.07	0.88	3.80	87.93	111.00	72.43
Italy	0.02	38.68	17.89	5.27	4.45	265.0	2578.0	0.03	0.36	0.18	0.04	0.79	3.50	75.56	99.00	63.95
Latvia	0.02	50.17	13.97	3.50	6.26	159.0	684.0	0.06	0.14	0.25	0.07	0.87	5.00	87.35	87.00	75.71
Lithuania	0.04	39.41	12.46	4.38	5.60	169.0	169.0	0.02	0.25	0.26	0.08	0.88	5.00	87.70	89.00	74.09
Malta	0.06	7.67	14.72	5.40	5.21	119.0	890.0	0.01	0.30	0.22	0.10	0.81	6.60	86.01	111.00	67.64
Poland	0.01	13.80	22.69	7.52	4.17	217.0	1389.0	0.02	0.23	0.24	0.07	0.85	4.90	78.76	75.00	68.35
Portugal	0.02	47.53	8.82	4.33	3.99	195.0	2315.0	0.02	0.29	0.22	0.03	0.76	3.70	81.55	93.00	73.59
Korea Rep.	0.02	1.89	28.21	11.57	5.86	137.0	337.0	0.01	0.25	0.23	0.02	0.86	3.50	70.27	95.00	67.97
Romania	0.03	39.75	15.43	3.52	2.99	206.0	62.0	0.05	0.26	0.16	0.06	0.77	9.20	71.02	90.00	65.75
Slovakia	0.03	22.68	18.80	5.66	4.24	166.0	697.0	0.01	0.36	0.17	0.05	0.83	6.00	84.84	93.00	70.95
Slovenia	0.01	29.39	17.13	6.21	4.93	185.0	544.0	0.01	0.30	0.24	0.05	0.88	2.40	83.48	92.00	71.62
Ukraine	0.00	4.38	21.25	5.02	2.33	232.0	604.0	0.01	0.18	0.28	0.10	0.79	9.40	84.05	84.00	66.21
Cluster Average	**0.02**	**24.53**	**18.09**	**5.83**	**4.43**	**185.83**	**974.0**	**0.02**	**0.25**	**0.22**	**0.05**	**0.83**	**5.11**	**81.80**	**87.72**	**69.90**
ClustAvg/TotAvg	**28.0%**	**-28.4%**	**0.9%**	**11.6%**	**6.3%**	**-0.3%**	**-25.3%**	**29.1%**	**0.8%**	**2.6%**	**-41.1%**	**0.3%**	**43.2%**	**2.8%**	**0.5%**	**-2.2%**
Change Average			***-1.0%***									***4.0%***				
CLUSTER 2																
Australia	0.01	13.64	9.32	15.39	6.40	179.0	2174.0	0.01	0.32	0.17	0.11	0.93	3.80	82.89	125.00	76.98
Austria	0.01	76.49	13.54	6.87	5.97	161.0	2078.0	0.00	0.32	0.23	0.08	0.85	3.70	86.97	102.00	75.51
Belgium	0.01	20.80	13.57	8.33	6.39	224.0	2432.0	0.00	0.31	0.25	0.09	0.89	4.00	84.79	117.00	67.68
Denmark	0.01	65.51	10.66	5.94	7.22	226.0	1780.0	0.00	0.30	0.19	0.23	0.92	4.20	91.32	96.00	78.38
Estonia	0.03	14.42	7.00	14.85	7.10	149.0	262.0	0.01	0.23	0.24	0.07	0.87	3.10	90.62	88.00	76.80
Finland	0.01	44.50	6.06	8.66	5.85	224.0	770.0	0.00	0.25	0.19	0.21	0.90	2.40	85.74	80.00	75.63
France	0.03	15.86	12.75	4.57	4.70	362.0	3340.0	0.02	0.31	0.18	0.14	0.84	4.20	88.31	109.00	71.35
Germany	0.01	29.23	12.83	8.89	4.94	302.0	2798.0	0.01	0.34	0.17	0.18	0.94	3.90	89.21	107.00	77.69
Iceland	0.01	99.98	6.93	6.06	4.73	132.0	35.0	0.01	0.28	0.23	0.11	0.91	2.30	87.59	97.00	88.09
Ireland	0.02	27.97	8.67	7.31	5.23	145.0	2625.0	0.02	0.37	0.22	0.11	0.91	3.70	82.74	97.00	72.41
Japan	0.03	15.98	12.69	9.54	4.47	156.0	138.0	0.02	0.37	0.13	0.13	0.84	3.00	88.86	86.00	76.14
Luxembourg	0.01	32.38	11.01	17.36	12.81	187.0	1158.0	0.01	0.21	0.23	0.13	0.79	2.70	90.18	93.00	70.66
Netherlands	0.03	12.44	12.93	9.92	5.72	247.0	459.0	0.01	0.29	0.17	0.20	0.90	4.00	83.11	94.00	79.66
Norway	0.01	97.71	7.24	9.27	5.87	232.0	1638.0	0.00	0.29	0.20	0.19	0.91	2.70	92.95	97.00	78.18
Spain	0.02	34.95	10.45	5.03	3.98	237.0	3745.0	0.02	0.30	0.19	0.07	0.82	3.20	82.67	96.00	74.45
Sweden	0.00	63.26	6.32	4.48	6.16	222.0	260.0	0.00	0.25	0.23	0.24	0.90	2.90	89.72	94.00	81.88
Switzerland	0.01	62.20	11.17	4.31	4.75	233.0	2675.0	0.00	0.02	0.32	0.15	0.89	4.30	85.11	105.00	83.38
United Kingdom	0.02	24.84	10.75	6.50	4.59	251.0	5069.0	0.02	0.37	0.18	0.11	0.91	4.50	84.94	96.00	76.78
Cluster Average	**0.02**	**41.79**	**10.22**	**8.52**	**5.94**	**214.9**	**1857.6**	**0.01**	**0.28**	**0.20**	**0.14**	**0.88**	**3.48**	**87.10**	**98.83**	**76.76**
ClustAvg/TotAvg	**-7.9%**	**22.0%**	**44.1%**	**-29.1%**	**-25.6%**	**15.3%**	**42.4%**	**-36.3%**	**12.8%**	**-3.9%**	**52.5%**	**7.1%**	**61.4%**	**9.5%**	**13.2%**	**7.3%**
Change Average			***8.7%***									***13.7%***				
CLUSTER 3																
Costa Rica	0.01	99.00	16.88	1.62	2.53	99.0	1603.0	0.03	0.33	0.23	0.02	0.71	51.30	77.57	78.00	67.63
India	0.00	15.34	89.30	1.73	1.16	136.0	785.0	0.03	0.09	0.26	0.05	0.54	44.10	20.44	12.00	54.42
Iran	0.00	5.10	39.61	8.38	3.23	121.0	208.0	0.01	0.08	0.09	0.12	0.74	16.00	55.91	51.00	44.92
Kyrgyzstan	0.01	85.19	24.34	1.65	1.71	67.0	641.0	0.02	0.18	0.29	0.03	0.81	22.30	58.72	28.00	65.84
Pakistan	0.01	31.43	60.09	0.85	0.81	105.0	243.0	0.00	0.06	0.16	0.14	0.40	79.50	39.61	72.00	55.28
Thailand	0.01	8.54	27.34	4.62	2.46	88.0	326.0	0.03	0.16	0.30	0.01	0.64	10.40	48.34	68.00	75.53
Cluster Average	**0.01**	**40.77**	**42.93**	**3.14**	**1.98**	**102.7**	**634.3**	**0.02**	**0.15**	**0.22**	**0.06**	**0.64**	**37.27**	**50.10**	**51.50**	**60.60**
ClustAvg/TotAvg	**-60.4%**	**19.1%**	**-135.0%**	**52.4%**	**58.0%**	**-44.9%**	**-51.4%**	**21.7%**	**-40.6%**	**3.9%**	**-34.0%**	**-22.4%**	**-295.6%**	**-313.9%**	**-41.0%**	**-15.3%**
Change Average			***-23.2%***									***-53.2%***				
Total Average	**0.02**	**34.24**	**18.26**	**6.60**	**4.73**	**186.43**	**1304.14**	**0.02**	**0.25**	**0.21**	**0.09**	**0.83**	**9.00**	**79.54**	**87.31**	**71.51**

Note: *Cluster average: the average value of an indicator for countries within one cluster. *Total average: the average value of an indicator for all countries in three clusters. *Cluster Average/Total Average: how much above or below the total average is one indicator's performance in a certain cluster? *Change Average: this value is the average of Cluster Average/Total Average results. *Four variables have reversed Cluster Average/Total Average percentages (PM2.5, CO2Ems, CFPringPcap, and ChildMort) because higher values mean lower performance and vice versa.

3.5.2 Unveiling potential trade-off or synergy trends?

In the second step of the analysis, I plan to delve deeper into the patterns of the change in environmental state and welfare state indicators from 2001 to 2015 (see Table 3.4 for details). Is there any evidence of simultaneous progress in both policy areas in any of the clusters? Or, is there a fourteen-year change that suggests a prospective trend in which governments adopt synergy rather than trade-off approaches to environmental and welfare state policies? These results may assist us in comprehending potential cluster shifts towards an eco-welfare state pattern in the coming years. Specifically, we can assess whether or not other clusters would be considered eco-welfare regimes in the near to medium future based on this pattern.

Firstly, I computed the differences in indicator values between 2015 and 2001 for each country, using the classification derived from the 2015 cluster findings (please see *Note* under Table 3.4 for details). Secondly, for each indicator, I calculated the *cluster average* of the data derived from the first step. Thirdly, I divided the cluster average of the data derived from the difference in indicator values between 2015 and 2001 by the cluster average of the 2015 data. This value shows the relative performance of every nation in each indicator over fourteen years. Fourthly, since I am interested in the macro performance of each cluster, I then averaged the data from step three to get the so-called *change average* for environmental state and welfare state policies, respectively. The *change average* results are of the greatest interest because they provide a more comprehensive picture of each cluster's performance in environmental state and welfare state indicators over a longer time period. If the *change average* in both the environmental state and welfare state categories is positive, it indicates that these two groups progressed simultaneously throughout time and employed a synergy approach. If the *change average* in one domain is positive while in the other domain is negative, it indicates that the environmental state and welfare state domains in each cluster competed with one another and, therefore, employed a trade-off approach.

Surprisingly, the results reveal a positive *change average* in two policy areas and all three clusters, meaning that over a longer period, environmental state and welfare states followed a "synergy" approach (Table 3.4). *However, it does not necessarily mean that all of them have 'reached' the eco-welfare state stage, as indicated in the previous subsection.* The following are the characteristics of each cluster (Table 3.4):

- ***Cluster 1*** indicates that this group of countries made great progress in both environmental state and welfare state areas, with positive *change averages* of 24.6% and 13.9%, respectively. Though, the *change average* in the environmental state domain is significantly higher, indicating that, if the current trend continues, the negative 1% *change average* revealed in Table 3.3 could soon become positive. Hence, conditional that this trend continues, the prospect for this cluster (or several countries within it) to emerge as an eco-welfare regime is relatively high.
- ***Cluster 2*** findings corroborate the synergy trend of the group of nations categorized as an eco-welfare state regime as shown in the cluster analysis explained in the previous subsection (see Table 3.3). Though, The environmental state *change average* of 20.2% is significantly greater than the welfare state *change average* of 1.9%. This variation is explicable for two reasons. First, more developed countries have the financial and professional resources to meet the environmental concerns of the twenty-first century. Second, the more established welfare state systems in these nations allow them to allocate a greater proportion of their resources to environmental concerns while maintaining the stability and advancement of welfare state programs.
- ***Cluster 3*** suggests that this group of countries has shown progress in both policy domains; though, greater emphasis is being placed on welfare state measures (17.7% increase) compared to environmental state measures (7.2% increase).

Table 3.4. Cluster Analysis Results for Difference 2015 - 2001

	Environmental State Indicators							Welfare State Indicators							
Country	**EnvironPE**	**RenewEn**	**PM2.5Air**	**CO2Ems**	**CFPrintPcap**	**Treaties**	**Legislation**	**HusingCAE**	**HealthE**	**EducExp**	**SocialProE**	**EducIndex**	**ChildMort**	**WageSalW**	**PrePrimSc**	**LFPR**
							CLUSTER 1									
Bulgaria	-0.02	14.00	-3.31	0.07	0.03	28.0	244.0	0.01	0.13	-0.04	-0.08	0.12	-8.50	3.20	14.00	5.61
Croatia	0.00	10.60	-2.31	-0.77	0.33	24.0	2922.0	0.00	0.00	0.00	0.00	0.12	-3.20	8.64	11.00	2.63
Cyprus	0.00	8.78	-1.08	-1.87	-1.95	19.0	325.0	-0.01	0.01	0.04	0.00	0.11	-3.30	8.86	23.00	2.87
Czechia	0.01	7.93	-3.02	-2.94	-0.39	23.0	526.0	0.00	0.03	0.01	0.01	0.13	-2.10	-2.02	15.00	3.35
Greece	0.00	23.13	-2.18	-2.46	-1.56	34.0	511.0	-0.01	-0.05	0.02	-0.03	0.14	-1.20	4.63	-19.00	4.31
Hungary	0.01	9.88	-1.75	-1.33	-0.52	27.0	485.0	0.00	0.00	-0.02	0.00	0.07	-4.40	3.79	1.00	8.99
Israel	0.00	1.84	-1.72	-2.01	0.04	14.0	15.0	0.00	0.02	0.01	0.01	0.05	-2.80	-0.39	23.00	3.00
Italy	0.00	18.69	-1.89	-2.63	-1.01	25.0	1399.0	0.00	0.04	-0.03	0.00	0.08	-1.80	3.48	2.00	3.68
Latvia	0.01	-16.16	-2.75	0.51	2.25	21.0	467.0	0.01	0.02	-0.01	0.02	0.12	-8.40	2.64	31.00	8.06
Lithuania	0.03	37.12	-1.97	0.67	2.41	21.0	57.0	0.00	0.06	0.01	0.00	0.10	-5.30	7.92	37.00	3.99
Malta	0.01	7.67	-1.81	-0.93	-1.58	14.0	706.0	0.00	0.07	0.00	0.05	0.15	-0.90	-0.51	12.00	8.39
Poland	0.00	11.87	-3.13	-0.36	-0.16	26.0	1295.0	0.00	0.03	-0.02	0.00	0.07	-3.90	6.74	28.00	2.93
Portugal	-0.01	13.43	-1.30	-1.72	-0.70	21.0	1015.0	0.00	0.02	-0.07	-0.01	0.09	-3.00	9.37	21.00	1.80
Korea Rep.	0.00	0.52	-1.55	2.07	0.60	21.0	304.0	0.00	0.06	0.00	-0.01	0.07	-31.00	9.19	9.00	3.46
Romania	0.02	12.04	-2.26	-0.85	0.03	30.0	45.0	-0.01	0.02	-0.03	0.01	0.11	-11.90	17.11	21.00	-2.34
Slovakia	0.00	6.73	-2.92	-1.66	-0.02	24.0	574.0	0.00	0.06	0.04	0.00	0.13	-3.40	-6.60	12.00	0.75
Slovenia	0.00	2.65	-2.01	-1.40	0.29	21.0	516.0	-0.01	0.01	-0.01	0.01	0.06	-2.90	0.59	15.00	4.02
Ukraine	0.00	-2.59	-2.91	-1.59	-0.99	48.0	492.0	0.00	0.01	0.02	-0.04	0.07	-8.20	9.07	32.00	-0.19
Cluster Avg: Dif.'15-'01	**0.00**	**9.34**	**-2.22**	**-1.07**	**-0.16**	**24.5**	**661.0**	**0.00**	**0.03**	**0.00**	**0.00**	**0.10**	**-4.38**	**4.76**	**16.00**	**3.63**
ClustAvg '15	**0.02**	**24.53**	**18.09**	**5.83**	**4.43**	**185.8**	**974.0**	**0.02**	**0.25**	**0.22**	**0.05**	**0.83**	**5.11**	**81.80**	**87.72**	**69.90**
Change Percentage	**19.2%**	**38.1%**	**12.2%**	**18.3%**	**3.6%**	**13.2%**	**67.9%**	**-3.4%**	**11.8%**	**-2.2%**	**-8.2%**	**11.9%**	**97.0%**	**85.7%**	**18.2%**	**5.2%**
Change Average				***24.6%***								***13.9%***				
							CLUSTER 2									
Australia	0.01	5.54	-1.52	-1.34	-1.57	27.0	1785.0	-0.01	0.04	-0.02	0.02	0.03	-2.30	3.15	35.00	2.77
Austria	0.00	7.33	-1.81	-1.32	0.07	19.0	1496.0	0.00	0.02	-0.04	0.03	0.09	-1.70	0.42	22.00	4.96
Belgium	0.00	19.43	-2.10	-2.81	-1.38	24.0	1631.0	0.00	0.03	-0.01	0.02	0.05	-1.70	0.03	7.00	4.14
Denmark	0.00	50.01	-1.76	-3.94	-1.17	27.0	1606.0	0.00	0.05	0.00	-0.01	0.08	-1.20	0.24	5.00	-0.62
Estonia	0.00	14.21	-1.22	3.63	-0.44	18.0	168.0	0.00	0.03	-0.04	0.01	0.05	-7.00	-2.00	-4.00	7.34
Finland	0.00	15.57	-1.03	-2.34	-0.91	26.0	424.0	0.00	0.01	-0.03	0.04	0.09	-1.80	-1.23	32.00	1.00
France	0.01	1.60	-1.98	-1.58	-0.73	45.0	2070.0	0.00	0.03	-0.03	-1.28	0.08	-1.00	-0.72	-2.00	2.85
Germany	0.00	22.72	-2.08	-1.48	-0.50	46.0	2218.0	0.00	0.02	-0.01	0.02	0.10	-1.30	0.38	10.00	5.92
Iceland	-0.01	0.03	-1.03	-1.31	-0.39	11.0	14.0	0.00	-0.03	-0.01	0.03	0.11	-1.60	4.67	12.00	-0.21
Ireland	-0.01	23.80	-1.47	-4.07	-1.39	13.0	1661.0	-0.01	0.04	0.00	0.00	0.08	-3.20	1.10	-11.00	1.56
Japan	-0.03	7.02	-1.52	0.07	-0.71	17.0	68.0	0.00	0.03	-0.06	0.09	0.08	-1.30	6.69	3.00	3.46
Luxembourg	-0.03	13.00	-1.56	-2.57	-1.55	19.0	565.0	-0.01	-0.02	-0.02	0.04	0.06	-1.80	-2.51	15.00	6.80
Netherlands	0.00	8.92	-2.00	-1.10	-0.82	25.0	296.0	-0.01	0.08	-0.01	0.00	0.07	-2.10	-5.30	-6.00	4.05
Norway	0.00	-1.81	-1.43	-0.01	-0.62	28.0	1199.0	0.00	0.01	-0.01	0.06	0.03	-2.00	0.32	21.00	-2.06
Spain	0.00	13.80	-1.33	-2.26	-1.41	24.0	2426.0	-0.01	0.01	-0.03	0.01	0.10	-2.10	2.65	5.00	10.01
Sweden	0.00	11.70	-1.26	-1.27	-0.08	27.0	190.0	0.00	0.01	-0.02	0.02	0.02	-1.20	0.44	20.00	3.83
Switzerland	0.01	2.80	-1.53	-1.63	-0.62	24.0	2071.0	0.00	0.01	0.01	0.02	0.09	-1.20	2.29	13.00	2.24
United Kingdom	0.00	22.34	-1.86	-2.74	-1.58	26.0	3922.0	0.00	0.07	0.00	0.01	0.07	-1.90	-2.81	16.00	2.07
Cluster Avg: Dif.'15-'01	**0.00**	**13.22**	**-1.58**	**-1.56**	**-0.88**	**24.8**	**1322.8**	**0.00**	**0.02**	**-0.02**	***-0.05***	**0.07**	**-2.02**	**0.43**	**10.72**	**3.34**
ClustAvg '15	**0.02**	**41.79**	**10.22**	**8.52**	**5.94**	**214.9**	**1857.6**	**0.01**	**0.28**	**0.20**	***0.14***	**0.88**	**3.48**	**87.10**	**98.83**	**76.76**
Change Percentage	**-21.7%**	**31.6%**	**15.5%**	**18.3%**	**14.8%**	**11.5%**	**71.2%**	**-30.3%**	**8.3%**	**-8.8%**	**-33.9%**	**8.1%**	**58.1%**	**0.5%**	**10.8%**	**4.4%**
Change Average				***20.2%***								***1.9%***				
							CLUSTER 3									
Costa Rica	0.00	0.48	-2.53	0.19	0.10	19.0	1067.0	0.00	-0.01	-0.11	-0.01	0.12	-60.60	8.80	32.00	1.94
India	0.00	2.14	5.14	0.76	0.31	15.0	344.0	0.01	0.03	0.09	0.02	0.16	-44.00	8.65	7.00	-5.42
Iran	-0.01	1.19	1.19	2.39	0.65	18.0	69.0	-0.02	0.02	-0.02	0.00	0.20	-16.40	6.27	34.00	-1.03
Kyrgyzstan	0.01	-0.72	-2.74	0.86	0.68	8.0	451.0	0.00	0.05	0.08	-0.03	0.14	-25.00	16.07	18.00	-2.77
Pakistan	0.01	5.28	-1.02	0.11	0.02	11.0	81.0	0.00	0.03	0.00	-0.05	0.13	-30.50	4.03	6.00	3.02
Thailand	0.00	1.90	-3.62	1.56	0.46	12.0	152.0	0.01	0.05	0.00	0.01	0.11	-10.40	7.90	0.00	-2.47
Cluster Avg: Dif.'15-'01	**0.00**	**1.71**	**-0.60**	**0.98**	**0.37**	**13.8**	**360.7**	**0.00**	**0.03**	**0.01**	**-0.01**	**0.14**	**-31.15**	**8.62**	**16.17**	**-1.12**
ClustAvg '15	**0.01**	**40.77**	**42.93**	**3.14**	**1.98**	**102.7**	**634.3**	**0.02**	**0.15**	**0.22**	**0.06**	**0.64**	**37.27**	**50.10**	**51.50**	**60.60**
Change Percentage	**24.2%**	**4.2%**	**1.4%**	**-31.1%**	**-18.7%**	**13.5%**	**56.9%**	**0.3%**	**19.7%**	**2.9%**	**-16.1%**	**22.0%**	**83.6%**	**17.2%**	**31.4%**	**-1.8%**
Change Average				***7.2%***								***17.7%***				

Note: *Cluster Average: Difference 2015-2001: the average value of the difference between 2015-2001, of an indicator for countries within one cluster. *Cluster Average 2015: the average value of an indicator for the year 2015, in the respective cluster. *Change percentage: it represents Cluster Average: Difference 2015-2001 divided by Cluster Average 2015. *Change Average: this value is the average change percentage.

*Four variables have reversed Cluster Average/Total Average percentages (PM2.5, CO2Ems, CFPringPcap, and ChildMort) because higher values mean lower performance and vice versa.

3.6 Conclusion

In the twenty-first century, the greatest challenges the world confronts are poverty, inequality, and climate change. The eco-welfare state, also known as the synergy between environmental and welfare states, is often regarded as one of the most feasible approaches to addressing these problems. Existing literature on eco-welfare states has yet to fill fundamental theoretical and empirical research gaps that might pave the way for further research in this area. In response, this study attempts to make two essential contributions to the literature.

First, this study attempts to refine the concept of eco-welfare and its rationale. It does this by pursuing a more organized research path. It begins by examining the broader linkages between environmental and welfare states. Then, it delves further into the mechanisms that lead to synergy, as well as possible trade-offs between these two domains. Later, it examines some of the most prominent environmental state and welfare state regimes or patterns, with the intention of better understanding their rationale and how they could explain or justify the emergence and the existence of the eco-welfare state. Finally, a further review of the current eco-welfare state and synonymous concepts was conducted, with the goal of refining the meaning of this concept. For the first time, this study brings together the most prominent theoretical information required to understand the concept of the eco-welfare state. *Second*, this is one of the first studies in the literature to verify empirically the transition towards an eco-welfare state pattern. Furthermore, these findings detect the presence of an eco-welfare state pattern in a group of developed countries while also hinting at the potential formation of new eco-welfare state patterns. The empirical approach that is pursued in this study offers other contributions. It proposes a novel operationalization process (see Table 1), employs advanced empirical methods– such as model-based clustering–, and for the first time, includes a sample of developed and developing countries.

Future research may be conducted in a number of ways; nonetheless, I believe these are some of the areas that demand further academic attention. First, the eco-welfare state concept should be validated empirically beyond OECD countries, including more countries in Asia, Africa, and South America. Second, causal and explanatory analysis

should be added to the empirical research on the eco-welfare state. Third, further research could include microanalysis, which would allow environmental and welfare state performance indicators to be studied in the context of a country or cluster (e.g., Cluster 2).

3.7 Appendices

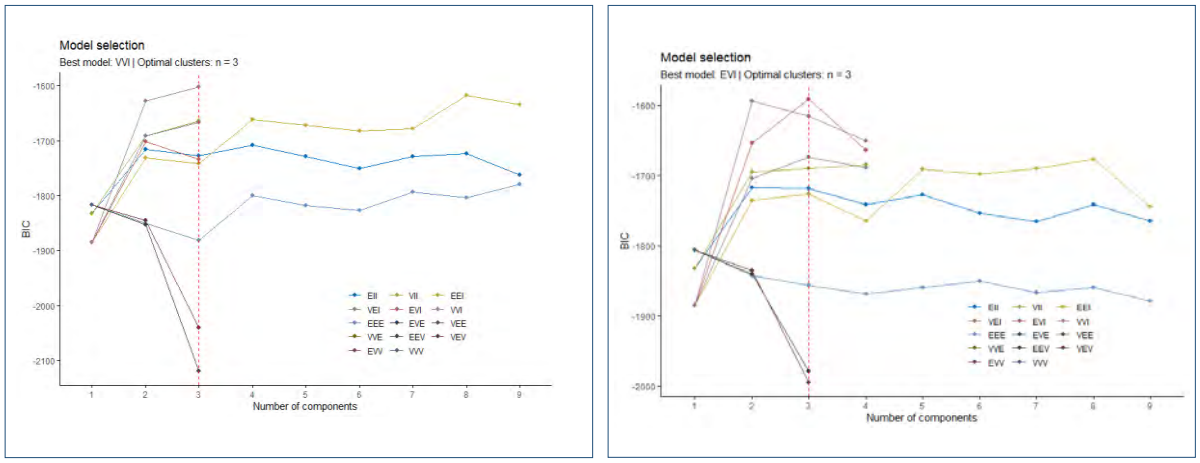
Appendix A.

Table 3.5. Country Sample

	Countries
Alphabetical Order	Australia; Austria; Belgium; Bulgaria; Costa Rica; Croatia; Cyprus; Czechia; Denmark; Estonia; Finland; France; Germany; Greece; Hungary; Iceland; India; Iran; Ireland; Israel; Italy; Japan; Kyrgyzstan; Latvia; Lithuania; Luxembourg; Malta; Netherlands; Norway; Pakistan; Poland; Portugal; Korea Republic; Romania; Slovakia; Slovenia; Spain; Sweden; Switzerland; Thailand; Ukraine; United Kingdom

Appendix B.

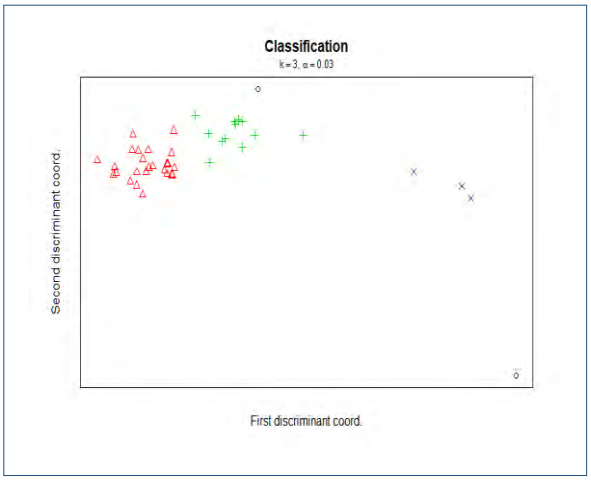
Figures 3.3 and 3.4. Model Selections: 2001 and 2015

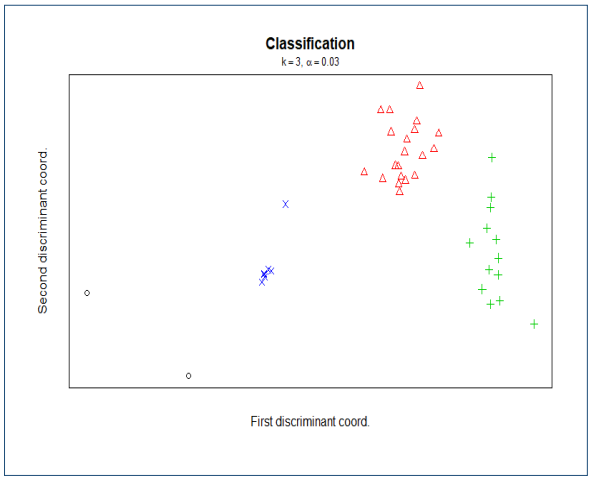


Note: The figure to the left shows the model selection for 2001 data, whereas the one to the right shows the model selection for the 2015 data. Bayesian Information Criterion (BIC) selects the best models or an optimal number of clusters. Hence, the model with the largest BIC score is chosen as the one with the strongest evidence.

Appendix C.

Figures 3.5 and 3.6. Robustness checks: Trimmed Clusters for 2001 and 2015





Note: Using *tclust* in R Studio, these two pictures show the cluster plots of the robustness check for 2001 and 2015, respectively. Outlier countries are shown in empty bullets '○'.

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Chapter 4

4. Is the Problem or the Solution Riskier? Predictors of Carbon Tax Policy Support

Climate change is posing significant threats to human societies and developmental prospects. Governments continue to design and propose comprehensive climate policies aimed at tackling the climate crisis but often fail to successfully implement them. One reason is that securing public support for such policy instruments has proven to be challenging. While public opinion research has often documented a positive correlation between beliefs in climate change and policy support, it has also become clear that the presence of such beliefs is in many situations not enough for policy support. This is the starting point of our study in which we delve deeper into the link between climate change beliefs and policy support by specifically integrating risk perceptions related to climate change but also related to policy solutions. Empirically, we leverage survey data from the United States and Switzerland and employ the random forest technique to further explore the mechanisms that link climate change beliefs, risk perceptions, and policy support. We use the case of carbon taxation, which is considered a particularly effective instrument by ecological economists but seems to be particularly unpopular politically. The results of this study suggest that beliefs and risk perceptions are very important predictors of support for carbon tax policies. Furthermore, they unveil the strongest predictors and specific patterns that generate the highest support in the United States and Switzerland.

Keywords: Climate change; beliefs; risk perceptions; policy support; carbon tax; random forest technique.

Note: This Chapter is co-authored with Prof. Dr. Stadelmann-Steffen and is published in the Environmental Research: Communications journal (IF: 3.237) by IOP Publishing Ltd. Formatted citation: Hasanaj, V., and Stadelmann-Steffen, I. (2022). Is the problem or the solution riskier? Predictors of carbon tax policy support. *Environmental Research: Communications*, 1-14. doi.org/ 10.1088/2515-7620/ac9516

4.1 Introduction

Climate change is a serious and persistent threat to human civilizations and the global economy over the long run (Lee et al., 2015; Swiss Re Institute, 2021). The recent decades of the escalating climate crisis have failed to produce the essential transformative policy adjustments needed to keep the crisis under control (Crawley et al., 2020; Rossa-Roccor et al., 2021). In 2015, at the Paris Climate Meeting, government representatives of 196 parties pledged to keep global warming below 2°C, 'preferably to 1.5°C' above pre-industrial levels (UNFCCC, 2015). Though, considering the existing mitigation measures of most countries, it is highly likely that global warming will exceed 1.5°C (Roelfsema et al., 2020; Baumann, 2021). We now observe an urgency for government action as the delays in dealing with this serious issue entail significant future consequences.

Carbon pricing is one of the instruments that has dominated the political debates on climate change in recent decades, and which has proven to be a better performer than emissions trading schemes (ETSs) (Green, 2021). While ecological economists consider carbon taxes "a key instrument […] to achieve future de-carbonization targets" (EAERE, 2019, p.1), these instruments are among the ones for which the lack of public backing has shown to be a crucial barrier to their implementation (Harrison, 2010; Williams III, 2016; Rhodes et al., 2017; Lachapelle and Kiss, 2019; Levi, 2021; Dermont and Stadelmann-Steffen, 2020). In fact, climate policy instruments usually require public support to be implemented, either and most obviously because in some contexts citizens can vote on them (Stadelmann-Steffen and Dermont, 2018; Stademann-Steffen and Thalmann, 2021; Carattini et al., 2019), but also because politicians who need to win elections are not likely to implement unpopular instruments (Harrison, 2012, Lachapelle and Kiss, 2019).

It has been constantly shown that strong climate change beliefs are related to higher climate policy support (Leiserowitz, 2019; Stoutenborough et al., 2014; Zieger 2017). However, at the same time, climate change concerns and beliefs do not always mean policy support, but more typically there is a gap between environmental attitudes and individual willingness to accept concrete policy measures (Blake, 1999; Dermont et al., 2017). This is the starting point of our study, in which we delve deeper into the link between climate change beliefs and policy support by specifically focusing on three critical dimensions: beliefs, risk perceptions, and policy support (Crawley et al., 2020, 2021). Recent evidence suggests that, at an individual level, the three dimensions of

climate opinion often intersect with one another. Therefore, it raises the question of how climate policy support may be influenced by interactive mechanisms related to beliefs and risk perceptions (Crawley et al., 2020). To the best of our knowledge, to date, there are a handful of studies that concretely assesses this intersection. Goldberg et al., (2020) confirm that climate beliefs and risk perceptions are important predictors of climate policy support, using survey data for the United States. In accordance with this study, we assume a predictive approach and argue that by exploring the predictive patterns behind policy support, we can gain new insights into how climate change mitigation shall be approached in the public debate.

However, we go beyond existing research by considering not only beliefs and risk perceptions related to the problem, namely climate change, but also risk perceptions related to the policy instruments themselves. In so doing, this study aims at contributing to the existing theoretical and empirical findings in three specific steps. First, theoretically, we argue that in order to better understand the predictive patterns between climate change beliefs and policy support, we not only need to consider beliefs and risk perceptions related to the problem, i.e., climate change, but also need to integrate risk perceptions related to potential solutions, e.g., negative effects on the economy or energy security. If individuals evaluate the latter as riskier than the risks directly related to climate change, they might oppose climate change policy despite high levels of climate change beliefs and strong risk perceptions. Second, empirically, we use a unique climate opinion survey dataset for the United States and Switzerland capturing carbon tax policy support, risk perceptions, beliefs, and socio-demographic indicators, and construct a policy support index for carbon taxation based on a conjoint analysis, which includes and therefore controls for varying policy designs. This should enable us to investigate rather general predictive patterns, considering the multidimensional nature of carbon tax policies (Dermont and Stadelmann-Steffen, 2018). Predictive patterns of policy support are likely to differ between nations (Taylor et al., 2014); hence, our two-country data may offer more detailed insights on this matter and the rationale behind such variations. Third, we use a mix of methods such as OLS regressions and random forest technique, to produce novel insights on the predictive patterns behind policy support.

4.2 Predictors of climate policy support

Changes in an individual's behaviour are important in reducing carbon dioxide emissions, though, they are far from sufficient. Bold government actions –for example, climate policies– are required to achieve a large-scale impact on emissions reduction. Climate policy formulation and design process might be smooth, but the policy adaptation most of the time requires citizens' approval (Bumann, 2021). According to the existing literature, public opinion plays a crucial role in shaping support for public policy, particularly climate policy (Agnone, 2007; McCright et al., 2013; Goldberg et al., 2020; Stadelmann-Steffen and Eder, 2020). In this vein, a series of individual-level factors that directly or indirectly influence climate policy support are identified. Among the most notable ones are climate change beliefs, risk perceptions, socio-demographics, socio-psychological, and party identification (O'Connor et al., 1999; Smith and Leiserowitz, 2013; Elgin, 2014; Lee et al., 2015; Drews and Bergh, 2016; Knight, 2016; Crawley et al., 2020; Bumann, 2021). Studies such as Drews and Bergh (2016) propose a more structured categorization of the factors that influence climate policy support: (1) "social-psychological factors and climate change perception; (2) the perception of climate policy and its design; and (3) contextual factors"[11] (p.855). In addition to the categorization of major factors, another branch of the literature has also expanded significantly on the climate policy design aspect, which indeed helps to sharpen our theoretical and methodological rationale (Baranzini and Carattini, 2017; Rhodes et al., 2017; Stadelmann-Steffen and Dermont, 2018; Dermont and Stadelmann-Steffen, 2020; Beiser-McGrath and Bernauer, 2019; Nowlin et al., 2020; Amdur et al., 2014; Dolšak et al., 2020; Jagers et al., 2019; Klenert et al., 2018). Lastly, Egan and Mullin (2017) worked on a study that reviews the results and polling data of Americans' attitudes on climate change over the long term. They find that aggregate opinion is rather stable in this and other issues in contemporary United States politics, mainly driven by partisan and ideological polarization. However, they suggest that "features of the climate change problem elicit some distinctive determinants of opinion, including individuals' trust in science, risk processing, and personal experience" (p.209).

Considering this claim, we concentrate on climate change beliefs and risk perceptions in the following. Previous research has repeatedly emphasized the relevance of *climate change beliefs* and defined them as the "Beliefs about timing, human cause, seriousness

[11] (1)"…the positive influences of left-wing political orientation, egalitarian worldviews, environmental and self-transcendent values, climate change knowledge, risk perception, or emotions like interest and hope; (2) the preference of pull over push measures, the positive role of perceived policy effectiveness, the level of policy costs, as well as the positive effect of perceived policy fairness and the recycling of potential policy revenues; (3) the positive influence of social trust, norms and participation, wider economic, political and geographical aspects, or the different effects of specific media events and communications." (p. 855).

and threat of climate change…" (McCright, 2013; Perera et al., 2022, p.2). However, beliefs are often subject to complexities, as the narrative of climate skepticism[12] has been particularly impactful in building social movements of denial and challenge to the community of scientists (Rensburg, 2015; Lejano and Nero, 2020). More recent studies emphasize that "just believing" that climate change is happening may not be a strong predictor of an individual's willingness to accept and pay for mitigation measures (Dermont et al., 2017; Crawley, 2020). Therefore, an individual's belief that climate change is a problem does not necessarily ensure the support for various climate policy measures. If the climate change issue is not prioritized by the government, individual support for explicit measures may still be limited (Stadelmann-Steffen and Thalmann, 2021). This suggests that whether climate change beliefs are translated into the willingness to act hinges on the issue's risk perception. This is corroborated by findings by Bromley-Trujillo and Poe (2020) who show that climate policy adoption is influenced by public risk perception.

The concept of risk is defined[13] by Beck (1992) as "a systematic way of dealing with hazards and insecurities induced and introduced by modernization itself" (p.21). Furthermore, he argued that today's risks are a result of modernization and globalization, and they are closely linked with the concept of reflexive modernization – which questions the political and economic management of risks in the contemporary area (ibid). Relevant climate policies are more likely to be supported and adopted in the places where climate change is perceived as a problem and where the attention on environmental issues is high. A key condition for climate change to be considered an important issue is the perception that global warming involves some dangers and risks. As risk perceptions have important power for predicting behavioural intentions (O'Connor et al., 1999), it is likely to assume that individuals who strongly perceive the risks related to climate change are also more willing to support mitigation measures.

Based on the extant literature, we thus expect that both climate change beliefs as well as the perception that global warming involves negative consequences are positively related to individual support for mitigation measures (Bromley-Trujillo and Poe, 2020). In this study, we focus specifically on examining the explanatory and, most importantly, the

[12] Climate change scepticism is a discourse that refers to a group of arguments and individuals that reject or question the orthodox view of climate issue (Rensburg, 2015).
[13] In addition, and more specifically, the perception of such risks is defined as the "subjective judgment of the probability and severity of current or future harm associated with climate change" (Wang et al., 2021, p.2).

predictive power of the two climate opinion dimensions, beliefs and risk perceptions (problem salience), on influencing climate policy support. Propositions that climate change beliefs and risk perceptions are important predictors of public climate policy support were further highlighted by recent findings among United States voters (Goldberg et al., 2020), where it was also argued that prior research has identified some important climate policy support predictors. Current research work, however, needs to focus more on unveiling the strongest predictors in specific countries (ibid). Hence, we intend to address this specific gap in the literature by including in our analysis the United States and Switzerland.

Furthermore, we argue that the previous literature has neglected another aspect of climate change-related risk perception, namely the *risks related to climate change mitigation measures*. Recently, a growing literature has investigated public support for such measures, especially for carbon taxation policies (e.g., Rhodes et al., 2017; Lachapelle and Kiss, 2019; Levi, 2021; Harrison, 2010; Dermont and Stadelmann-Steffen, 2020). While these studies have focused on the role of policy design, the related discussion documents that policies to mitigate climate change are often characterized by visible and short-term costs, while their benefit – namely successful climate change mitigation – is uncertain and only materializes in the future (Stadelmann-Steffen and Dermont, 2018). Hence, from the perspective of individuals, such measures involve risks related to higher economic costs (e.g., for energy prices) and uncertainty (e.g., concerning energy security). When individuals evaluate whether or not to support a policy they tend to evaluate the risks of climate change itself alongside the risks of implementing the proposed solution, i.e., the mitigation measures (e.g., negative effects on the economy or energy security). We, therefore, suggest that to understand individual policy support, we also need to include this type of risk perception. Consequently, we contend that individual support is a function of climate change beliefs, risk perceptions of the problem, and risk perceptions related to mitigation measures.

4.3 Data and methods

In this study, we used novel climate opinion data from the United States and Switzerland to determine how individual beliefs and risk perceptions interact and influence the individual's climate policy support. The survey was conducted in both countries in

December 2019 and has 1094 (United States) and 968 (Switzerland) final respondents. Both the United States and Switzerland, as two federalist states, are characterized by modern direct democracy that shapes political life, with citizen participation as a central element of their democracies.

Dependent variable: As a dependent variable, we used carbon tax policy support, which is one of the most intensively discussed policy instruments in this context (Harrison, 2010). Policy support is not easy to measure in a survey context. In particular, single-item questions often fail to capture the multidimensionality of these policies and are moreover prone to a social desirability bias (Stadelmann-Steffen and Dermont, 2018). The policy acceptance research has therefore seen the increasing popularity of factorial survey designs, especially conjoint analysis, which has been shown to at least partially solve the aforementioned problems (Hainmueller et al., 2014). Hence, in this study, we used individual responses from a conjoint analysis, in which respondents had to rate four paired policy packages on a scale of 0 to 10. Those packages contain randomly generated measures including various carbon tax policy designs based on the net costs to households, what is taxed, how tax revenues should be used, and possible exemptions for energy-intensive companies. As we are not interested in policy design but in the individual propensity to support this type of policy, our dependent variable reflects the average rating of an individual for the eight policy packages. This policy support index broadly displays the level of readiness and willingness of individuals to support carbon tax policy packages targeted at resolving the climate change challenge, regardless of tax policy micro arrangements or designs.

Independent variables: Table 1 displays the eight independent variables that represent climate opinion dimensions of *beliefs* and *risk perceptions*. We do this variable classification by heavily relying on a similar approach implemented by 'Yale Climate Opinion Maps 2021' (Marlon et al., 2022). *Beliefs* are related to whether or not a respondent thinks climate change is a problem. *Risk perceptions,* by contrast, capture perceived risks related to climate change but also potential risks related to specific measures. It is essential to note that risk perceptions do not necessarily need to involve potential negative effects, i.e., classical "risks" but can also be related to potential (but unsure) positive effects, i.e., chances. Hence, we applied a broad conceptualization of risk perceptions, which generally denotes uncertain future outcomes that might be positive or negative. In this vein, we used three indicators that represent the perceived risks and

insecurities associated with potential synergies or trade-offs between some critical climate change-related mitigation measures and potential outcomes. First, two indicators – *Renewables risk* and *Transition* capture classical risks related to climate change mitigation, namely the risk that the energy transition towards renewable energy sources involves a trade-off between energy security and energy costs. The other two items, *Money and Jobs* and *Renewables promise*, represent potential but unsecure chances related to the energy transition with respect to the labour market outcomes and investments. Individuals who do not acknowledge this potential (i.e., exhibit low agreement to these items) again interpret the consequences of climate change mitigation as risky rather than as a chance. Lastly, we used education, age, gender, and income as control variables.

Table 4.1. Details about the independent variables

Name	**Survey Question**	***Operationalization***
Beliefs		
Happening	Recently, you may have noticed that global warming has been getting some attention in the news. Global warming refers to the idea that the world's average temperature has been increasing over the past 150 years, may be increasing more in the future. *What do you think: Do you think that global warming is happening?*	Yes=1 No=2 Don't know=3
Consensus	To the best of your knowledge, what percentage of climate scientists think that human-caused global warming is happening?	Ranking presented in percentage, from the lowest to the highest values.
Risk perception: problem		
Personal	How much do you agree with the following statement: "I have personally experienced the effects of global warming".	Strongly agree (1) Somewhat agree (2) Neither agree nor disagree (3) Somewhat disagree (4) Strongly disagree (5)
Energy dependence	Do you agree or disagree with the following statement? *US and Swiss version:* "In the long-term, the United States/Switzerland needs to have an energy system that does not depend on fossil fuels".	Agree (1) Somewhat agree (2) Don't know (3) Somewhat disagree (4) Disagree (5)
Risk perception: solution		

Money and Jobs	Do you agree or disagree with the following statement? *US version:* "Investing in local, renewable energy keeps money and jobs here in the United States." *Swiss version: "*With domestic, renewable energies, the money and work stay here. With the Energy Strategy 2050, we, therefore, keep the value creation in Switzerland. "	Agree (1) Somewhat agree (2) Don't know (3) Somewhat disagree (4) Disagree (5)
Renewables promise	Do you agree or disagree with the following statement? *US version:* "Investing in renewable energy is an investment in the future." *Swiss version:* "Investments in renewable energy sources are investments in the future. The Energy Strategy 2050 takes responsibility for this."	Agree (1) Somewhat agree (2) Don't know (3) Somewhat disagree (4) Disagree (5)
Renewables risk	Do you agree or disagree with the following statement? *US and Swiss version:* "Renewable energy will not be able to provide enough safe and cheap energy to replace nuclear energy for the foreseeable future."	Agree (1) Somewhat agree (2) Don't know (3) Somewhat disagree (4) Disagree (5)
Transition	Do you agree or disagree with the following statement? *US version:* "The energy transition will destroy our existing energy supply system and will make energy much more expensive." *Swiss version:* "The Energy Strategy 2050 destroys our proven energy supply and makes energy massively more expensive. "	Agree (1) Somewhat agree (2) Don't know (3) Somewhat disagree (4) Disagree (5)
Controls: socio-demographic		
Income	*US version:* What was your household income before taxes during the past 12 months?	Less than $40,000 (1) $40,000 to $59,999 (2) $60,000 to $89,999 (3) $90,000 to 139,999 (4) $140,000 or more (5)
	SWISS version: What was your monthly net household income?	Less than 5000 Fr. (1) 5001 to 7000 Fr. (2) 7001 to 9000 Fr. (3) 9001 to 13,000 Fr. (4) 13,001 or more Fr. (5)
Gender	What is your gender?	Female(1) Male(2) Other(3) No answer(4)
Education	What is the highest education level you have completed?	Ranking from the lowest to the highest level of education (starting from primary, professional, and tertiary education).
Age	How old are you?	18 to 24 (1) 25 to 34 (2) 35 to 44 (3) 45 to 54 (4) 55 to 64 (5)

	65 to 74 (6) 75+ (7) No answer (8)

Note: 'neither agree nor disagree' in the '*Personal*' indicator is not an option in the Swiss survey. Thus, the ranking for this indicator in the Swiss version is 1 to 4.

Initially, we used the *mice* package in R– with the random forest option— to impute the very few missing values in the survey data after we excluded the respondents that submitted incomplete surveys (Buuren and Groothuis-Oudshoorn, 2011). We then conducted a two-step empirical analysis – the first for explanatory purposes, and the second and most importantly, for prediction purposes. Firstly, we intended to estimate the relationship between our dependent variable, Carbon Tax Policy Support, and all of the independent variables listed in Table 1 using the Ordinary Least Squares (OLS) model. The main aim of this analysis is to generate reference results with which the findings of the second step can be compared. Secondly, we proceeded with the random forest technique, a powerful machine-learning approach that solves complex regression, prediction, and classification problems using randomized recursive partitioning, particularly exemplified by the non-randomized partitioning tree model (Levi, 2021). "Random forests fit a high number of single partitioning tree models and inject elements of randomization in each of them…" (ibid, p.8), which substantially increases the model's predictive performance. According to Levi (2021), random forests have two significant advantages over conventional regression techniques. First, random forests have excellent compatibility with various relationships or types of data[14]. Second, they may 'inductively' find relationships by simply estimating the manner in which dependent and independent variables relate to one another, without needing any prior assumptions (ibid, p.8).

Specifically, we used the *VSURF* package in R to identify and rank the most important variables and remove those which are not strongly related to the response variable. The package does this by first generating a subset of important variables relevant for interpretation[15], and then by generating a smaller subset that avoids redundancy and focuses more on the prediction[16] objective (Genuer et al., 2015). Furthermore, using the *ctree* function in the *partykit* package in R, we constructed conditional inference

[14] "In particular, they can estimate the effect of a large number of mixed type predictors, can operate comfortably under non-parametric distributions, and are able to capture complex non-linear relationships, even under the presence of high-dimensional interactions among co-variates and multi-level clustered data…"(Levi, 2021, p.8)

[15] "*For interpretation*: construct the nested collection of RF models involving the k first variables, for k = 1 to *m* and select the variables involved in the model leading to the smallest OOB error" (Genuer et al., 2015, p.22).

[16] "*For prediction:* starting with the ordered variables retained for interpretation, construct an ascending sequence of RF models, by invoking and testing the variables in a stepwise way. The variables of the last model are selected" (Genuer et al., 2015, p.22).

classification trees for Switzerland and the United States, using the variable indicators derived from the *VSURF* approach (Hothorn and Zeileis, 2015; Genuer et al., 2015) (see Figures 4.1, 4.2 and Appendix C for details).

4.4 Results and discussion

4.4.1 Random forests – classification description

Results from the regression models show that beliefs and risk perceptions are significantly related to policy support while displaying some level of country-specific variation (Appendix A). They so far suggest that policy support in Switzerland is mostly driven by climate change beliefs and risk perceptions related to the problem, whereas in the United States, the strongest variable is the experience with the problem. In the second step of our empirical analyses, we use the random forest model to delve deeper into the predictive power of climate change beliefs and the various risk perceptions, to identify which factors and in what combination are strongest in predicting policy support in the two countries. The results are presented in Figures 4.1 and 4.2 (supporting information related to these figures can be found in Appendix C). Using the R package *VSURF*, random forest models for Switzerland and the United States[17] are generated. The decision tree, as a central unit of random forest classifiers, is a hierarchical structure created based on the independent variables in the data set (Suthaharan, 2016). This approach (1) firstly drops all the irrelevant variables from the model, (2) then moves with a selection of variables for *interpretation* purposes, and (3) finally refines the selection process of the variables, keeping part of the *prediction* process just a few most important ones (Genuer et al., 2015, p.23).

The circles in the conditional inference (CI) classification trees (Figures 4.1 and 4.2) are called 'inner nodes' on which splitting decisions are made, i.e., denoting different paths that need to be followed to reach the highest or lowest predicted carbon tax policy support outcome presented in boxplot format called 'terminal nodes'. Such a classification helps us to extract at least three important pieces of information. First and foremost, from inner nodes we understand which are the selected indicators with the highest predictive power to unveil high or low policy support for each country. Second, it helps to map the

[17] Both models generate classification accuracy rates of 43.0 and 46.3 percent, respectively.

pathways to the highest or lowest policy support patterns, and the respective results are presented in terminal nodes. Third, it helps to identify the pathway that leads to the existing majority pattern or the largest group, and its current level of policy support. This group is used to extract key insights into the potential trade-offs between the existing problem (the majority not pursuing the highest policy support path) and the solution (pursuing the path that leads to the highest policy support).

The random forest model for ***Switzerland*** reveals the three most important selected variables as *Energy dependence* (risk perception of the problem)*, Renewables promise* (risk perception of the solution)*,* and *Consensus* (belief), for both interpretation and prediction purposes. These are the variables of the model leading to the smallest out-of-bag (OOB) error (See Appendix C, Figure 4.1.4). We use these most important predictor variables in the conditional inference (CI) classification tree for predicting carbon tax policy support. The classification tree shows that the splitting decision begins with the *Energy Dependence* indicator, implying that this is the most important predictor variable out of the three selected (Figure 4.1).

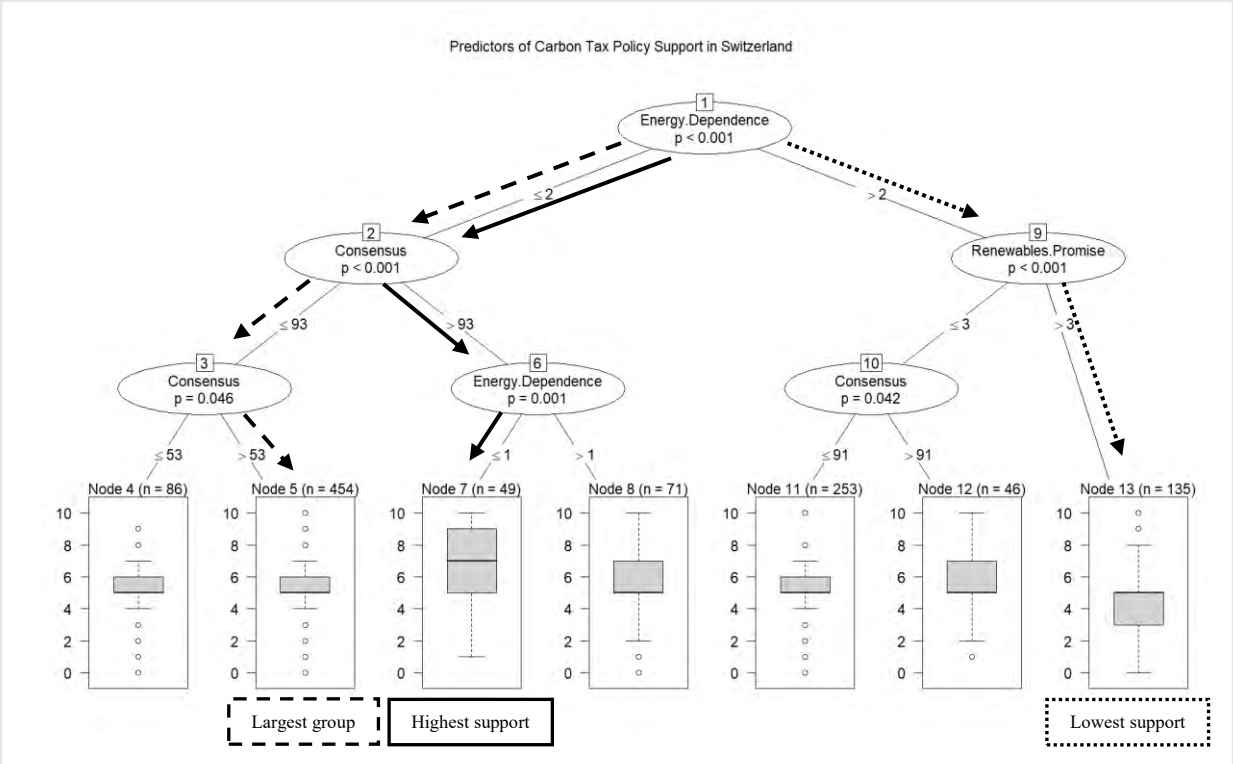
Firstly, the results on the center-left side of the conditional inference classification tree unveil the pathway that leads to terminal node 7, which represents the group of individuals with the highest declared carbon tax policy support (7.1, on a scale of 1 to 10). Hence, if we want to know in more depth the key characteristics of these individuals, we have to analyze the details that exist in the path from inner nodes 1 to 2, 2 to 6, and 6 to 7, using the information below the Figure 4.1 (See Appendix C, Figure 4.1.2 for more details). Based on these results, we could predict that the individuals who are most likely to vote for carbon tax policy packages are the ones who are highly aware of what most scientists think about human-caused global warming, and who strongly agree that in the long-term, Switzerland needs to have an energy system that does not depend on fossil fuels. As a result, in the case of Switzerland, it could be argued that specific indicators representing an individual's stronger belief and risk perception (problem) do translate into higher climate policy support, while for these individuals negative risk perceptions related to the solution, e.g., the fear that climate change mitigation hurts the economy or challenges energy security, do not feature among the most important variables.

Secondly, the results on the right side of the conditional inference classification tree unveil the pathway that leads to terminal node 13, which represents the group of individuals

with the lowest declared carbon tax policy support (4.3, on a scale of 1 to 10). Primarily, these individuals are characterized by the fact that they do not acknowledge the need to move to a fossil-free energy system, and show a lack of a strong risk perception related to the problem. Interestingly, for this group, risks related to the solution also matter: here, respondents are skeptical that investments in renewable energy sources are investments in the future, i.e., they do not accept the fundamental solution to the problem. Interestingly, Figure 4.1 reveals, however, that even if individuals do not see the need for the energy transition (*Energy Dependence*) and do not perceive the chances of investing in renewable energy sources (*Renewables Promise)*, there is still a path to rather high policy support. This can be demonstrated by observing the group of individuals in node 12; despite their skepticism with respect to the problem and the solution, their strong belief in scientific consensus leads to rather strong policy support.

Thirdly, the results on the left of the conditional inference classification tree unveil the pathway that leads to terminal node 5, which represents the majority pattern or the largest group of individuals with a declared carbon tax policy support of 5.5 (on a scale of 1 to 10). Comparing the paths of the high support group with this largest group is curious in that, while the two groups follow the same path to note 2, the largest group is less convinced about the scientific consensus regarding climate change. The results imply that this somewhat lower *belief* is highly relevant as it is associated with a support gap of 1.6 points compared to the highest declared support of 7.1., which is to raise the awareness of the public about the percentage of climate scientists who think that human-caused global warming is happening.

Figure 4.1. Predictors of the carbon tax policy support in Switzerland



Consensus: To the best of your knowledge, what percentage of climate scientists think that human-caused global warming is happening? *Belief.*	Response in %: from lowest to highest.
Energy Dependence: In the long-term, Switzerland needs to have an energy system that does not depend on fossil fuels. *Risk perception (problem).*	Agree (1) Somewhat agree (2) Don't know (3) Somewhat disagree (4) Disagree (5)
Renewables' Promise: Renewable energy will not be able to provide enough safe and cheap energy to replace nuclear energy for the foreseeable future. *Risk perception (solution).*	

***Note*:** The circles are inner nodes on which splitting decisions are made, whereas the p-value represents the significance level of the splitting decision. The box plots at the bottom are called terminal nodes and show the level of carbon tax policy support.

The random forest model for the ***United States*** reveals that the three most important selected variables are *Personal (risk perception of the problem),* as well as the two indicators capturing risk perceptions of the solution, *Money and Jobs,* and *Transition.* These are the variables of the model leading to the smallest out-of-bag (OOB) error (See Appendix C, Figure 4.2.4). The classification tree shows that the *Personal* indicator is used to begin the splitting decision (Figure 4.2).

Firstly, the results on the left side of the conditional inference classification tree unveil the pathway that leads to terminal node 7, which represents the group of individuals with the highest declared carbon tax policy support (8.0, on a scale of 1 to 10). Hence, if we want to know in more depth the key characteristics of these individuals, we have to analyse the

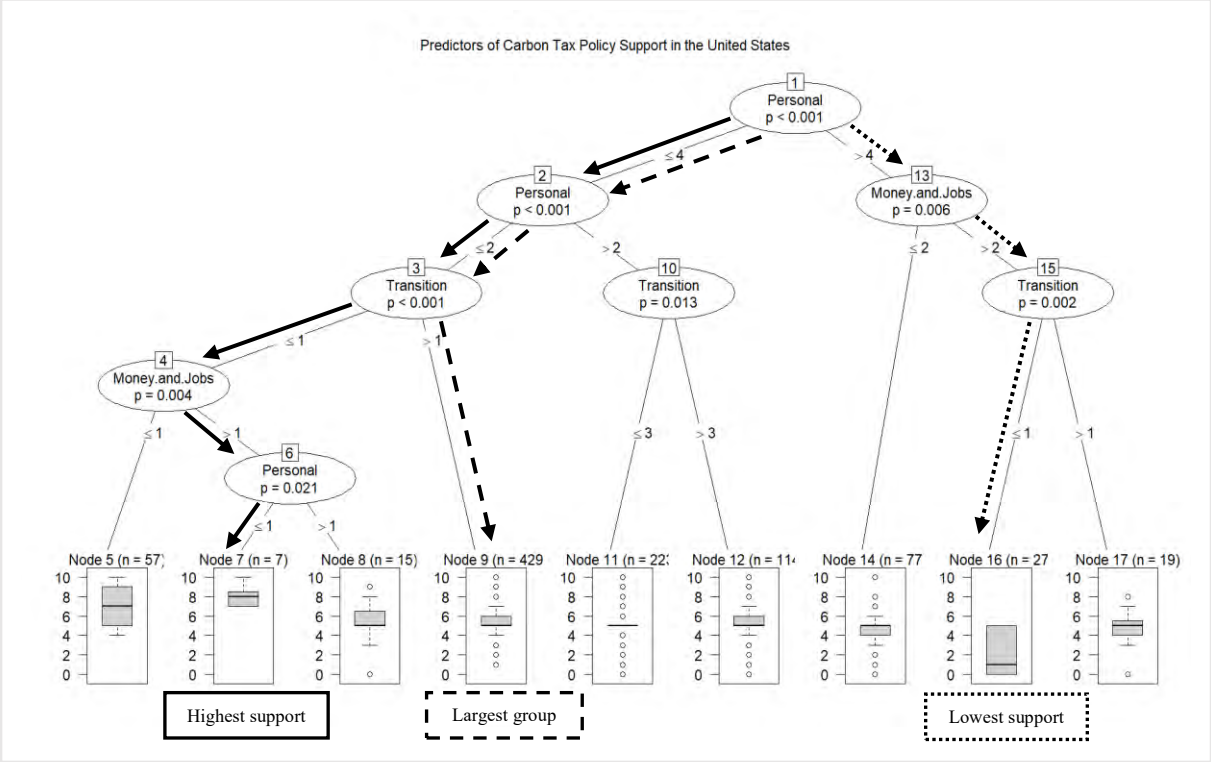
details that exist in the path from inner nodes 1 to 2, 2 to 3, 3 to 4, 4 to 6, and 6 to 7, using the information below the Figure 4.2 (See Appendix C, Figure 4.2.2 for more details). As a result, in the case of the United States, it could be argued that the predictive pattern of strong policy support is dominated by the risk perception of the problem, namely by exposure to the negative effects of global warming. In fact, the chain of nodes 1 to 7 representing the path leading to the highest policy support, uses the *Personal* indicator three times for splitting decisions and ending with the group of people who '*strongly agree*' that they have personally experienced the effects of global warming. The strong exposure, in these cases, seems to compensate for the fact that the solutions are perceived as a risk rather than a chance. We need to keep in mind that this finding could also partly be the result of the fact that our dependent variable focuses specifically on carbon taxation, while the risk perceptions related to the solution – which are crucial in this model– mostly concern renewable energy production.

Secondly, the results on the right side of the conditional inference classification tree unveil the pathway that leads to terminal node 16, which represents the group of individuals with the lowest declared carbon tax policy support (2.1, on a scale of 1 to 10). The chain of nodes 1-16 representing the path that leads to the lowest policy support includes only the individuals that '*strongly disagree*' that they have personally experienced the effects of global warming, while climate change beliefs – namely climate change concern– are not correlated with policy support in a relevant way. Moreover, as node 15 suggests, this group thinks that the energy transition will destroy our existing energy supply and will make energy much more expensive, i.e., strongly perceives the risk for the economy and energy supply. Hence, this pattern suggests that the combination of a lacking problem perception and a strong perception of risks related to climate change policy go hand in hand with particularly low policy support.

Thirdly, the results on the center-left of the conditional inference classification tree unveil the pathway that leads to terminal node 9, which represents the majority pattern or the largest group of individuals with a declared carbon tax policy support of 5.7 (on a scale of 1 to 10). The comparison with the high support group reveals that this largest group's risk perception related to the solution is even less dominated by the fear of energy security and trigger of higher energy prices. However, in contrast to the individuals with the highest policy support, the path of the largest group does not include strong personal experience with negative climate change effects. The findings suggest that these different

experiences of the climate change-related risks are associated with a support gap of 2.3 points compared to the highest declared support of 8.0.

Figure 4.2. Predictors of carbon tax policy support in the United States



Personal: I have personally experienced the effects of global warming. *Risk perception (problem).*	Agree (1) Somewhat agree (2) Don't know (3)* Somewhat disagree (4) Disagree (5)
Transition: The energy transition will destroy our existing energy supply system and will make energy much more expensive. *Risk perception (solution).*	
Money and Jobs: Investing in local, renewable energy keeps money and jobs here in the United States." *Risk perception (solution).*	

***Note*:** The circles are inner nodes on which splitting decisions are made, whereas p-values represent the significance level of the splitting decision. The box plots at the bottom are called terminal nodes and show the level of carbon tax policy support. *Personal* variable's response 3 is 'Neither agree nor disagree (3)'.

4.4.2 Country comparisons

From a comparative perspective, the results from the random forests – the method that ultimately selected the most important predictor indicators – highlight some important similarities and differences between the United States and Switzerland. First, regarding similarities between the two country models, it was found that the beliefs and/or risk perceptions are the most important predictor indicators that could influence the level of support for the carbon tax policy packages, while none of the models suggest that any

socio-demographic indicator is an exceptionally important predictor. This corroborates the relevance of more closely looking at beliefs and risk perceptions to better understand public support for ecological taxes. Second, both countries' results reveal that there could be different paths towards reaching high carbon tax policy support. Third, for both the United States and Switzerland, the most important predictors that are used to begin the splitting are risk perceptions related to the problem. In both countries, risk perceptions related to the solution, i.e., the negative economic or supply effects of climate change mitigation, are detrimental to low policy support only if they are accompanied by a lack of problem-related risk perception.

Meanwhile, some major variations in the results also deserve attention. First, the type of problem-related risk perception, i.e., the salience of the problem, is different in nature. For the United States, *Personal* experience of the effects of global warming, i.e., the problem, is crucial whereas, for Switzerland, it is the *Energy Dependence*, emphasizing the need for climate change mitigation, namely the need to have an energy system that does not depend on fossil fuels. Second, climate change beliefs – in accordance with the regression models – are not among the most important predictors for the United States case. This is different in Switzerland, where the conditional inference classification tree contains one *belief* measure, *Consensus.* Third, the gap in carbon tax policy support between the group with the *highest support* pattern and the *largest group* is higher in the United States than in Switzerland, suggesting a higher polarization in climate policy support.

4.5 Conclusion

Climate policy support in the twenty-first century has the potential to significantly influence the future of human civilization. Numerous climate change policy packages in countries throughout the globe need public support, and policy instruments such as carbon taxes – which are often at the heart of such plans – are not always readily endorsed and implemented. As such, the primary goal of our study is to identify potential pathways that might help in better understanding and predicting support for climate policies. In accordance with previous research, we assume that climate change-related beliefs and risk perceptions are strong predictors of climate policy support. We thereby emphasize that not only risk perceptions related to the problem, i.e., climate change, but also related

to the solutions, e.g., negative effects of mitigation measures on the economy or energy security, should be considered in order to better understand individual policy support.

Our main findings and conclusions can be summarized as follows. First, it was found that an individual's climate change-related beliefs and risk perceptions are indeed very important predictors of the level of carbon tax policy support, and are stronger than socio-demographic variables. For policymakers and advocates, these findings suggest that building support for climate policies is highly influenced by these two dimensions. These results are in line with the existing theory and the recent empirical findings (Crawley et al., 2020, 2022; Goldberg et al., 2020). Second, the most important selected indicators deriving from random forest analysis vary between the United States and Switzerland. While the belief in the scientific consensus is a crucial explanatory factor for policy support in Switzerland, policy support seems to be more strongly and more exclusively shaped by risk perceptions in the United States. Interestingly, in both countries, the main difference between the group with the highest policy support and the largest group can actually be found in these two respective variables. Thus, the majority group does not demonstrate a very low level on these measures, but rather a little less belief in the scientific consensus and a little less personal experience with the harmful effects of climate change. This implies that information or sensitization measures to increase climate change beliefs and the visibility of climate change-related risks have the potential to considerably enlarge the group with high support.

The observed heterogeneity in predictor importance in the two countries shows that each country has its unique set of beliefs and risk perceptions that have a significant influence on the level of carbon tax policy support. Nevertheless, we also found major commonalities. Most important, risk perceptions related to the problem are crucial predictors of policy support in both countries. Moreover, risk perceptions related to the solution are also among the most important predictors in both countries. In particular, the perception that mitigation measures are risky leads to lower policy support if this view is combined with a lacking problem perception. Conversely, especially the findings from the United States context imply that if the problem, i.e. climate change, is strongly perceived, even some risks related to the solution can be compensated for. Third, in the public debate, it has been often argued that economic arguments, mostly framed as costs in the context of climate change mitigation, are crucial. Overall, our results suggest that

these arguments may be overcome by a stronger emphasis placed on the problem rather than on the risks related to the solution.

Climate policy encompasses a huge range of policy instruments beyond carbon taxes, and it is of vital importance to help shape the understanding of whether the beliefs and risk perceptions could be useful predictors of the support for various other policy instruments. In our analyses, we focused on carbon taxation policies, which are among the more disputed climate policies and can struggle to gain popular support. We cannot, however, exclude the possibility that our results are to a certain degree driven by this specific instrument but also by specific solution-related risks included in our survey. Our findings thus pave the way for further research examining how far the predictive patterns of climate change beliefs, problem-related and solution-related risk perceptions vary when looking at support for other climate change instruments or when including different framings of risks and chances related to climate change policy.

4.6 Appendices

Appendix A

Results of Regression Analysis

In Table 4.2, we present the OLS regression coefficients of the relationship between *Carbon Tax Policy Support* in the United States and Switzerland and the individual's climate change-related *beliefs* and *risk perceptions*. Regression results reveal rather different outcomes for the two countries and show that numerous climate change-related *beliefs* and *risk perceptions* indicators are significantly associated with the level of support for carbon tax policy packages in the United States and Switzerland.

Initially, it was observed that the *beliefs* variables in both countries reveal an expected relationship to carbon tax policy support. Individuals who believe that global warming is happening and think that a high share of climate scientists say that global warming is human-made are more likely to support tax policy packages. However, interestingly, in Switzerland, the association between these beliefs and policy support is stronger than in the U.S., where it even fails to reach statistical significance.

Moving to the risk perceptions related to the problem, we see that this type of risk perception is relevant in both countries. In the U.S., the *Personal* indicator representing

the statement "*I have personally experienced the effects of global warming*" is one of the strongest variables in the model. The results suggest that the less an individual experienced the effects of global warming, i.e., the risk related to the problem, the lower the support for the carbon tax policy packages, specifically by 0.333 (on a scale from 0 to 10, from the lowest to the highest level of support). In Switzerland, this relationship is not statistically significant. Conversely, respondents who agree that Switzerland needs an energy system in the future that does not depend on fossil fuels, exhibit higher policy support.

Theoretically, we argued that policy support might also be contingent on risk perceptions related to the solution. The regression models clearly support this view, especially for the Swiss case where three out of four of these variables are significantly associated with policy support. The perception that climate change mitigation measures involve economic or energy-related risks, is associated with lower support for the proposed policy measures. More specifically, individuals who do not agree that the energy transition "*destroys the Swiss energy supply and makes energy massively more expensive",* are more likely to support the proposed carbon tax policy packages by 0.096. Accordingly, respondents who do not perceive the risk that renewable energy *"will not be able to provide enough safe and cheap energy to replace nuclear energy for the foreseeable future*", are more likely to support the proposed carbon tax policy packages by 0.105. Further, a higher level of agreement with the statement that '*Investments in renewable energy sources are investments in the future*…', i.e., the perception of a chance related to climate change mitigation, increases the likelihood of support for the proposed carbon tax policy packages by 0.109. In the regression model using the *United States* data, only one solution-related risk perception variable –namely *Money and Jobs*– is statistically significant. This indicator *represents* the statement "*Investing in local, renewable energy keeps money and jobs here in the United States*", suggesting that a higher level of disagreement with this (positive) risk perception decreases the likelihood of support for the proposed carbon tax policy packages by 0.078.

Table 4.2. Carbon Tax Policy Support in Switzerland and the United States

	Switzerland	***United States***
Dependent variable	***Carbon Tax Policy Support***	***Carbon Tax Policy Support***
Independent variables		
Beliefs		
Happening	-0.282 (0.15)+	-0.127 (0.25)

Consensus	0.006 (0 .00)*	0.003 (0.00)
Risk perception: problem		
Personal	-0.104 (0.07)	-0.333 (0.07)***
Energy dependence	-0.186 (0.06)**	-0.047 (0.08)
Risk perception: solution		
Money and Jobs	-0.013 (0.06)	-0.078 (0.08)**
Renewables promise	-0.109 (0.06)+	-0.062 (0.09)
Renewables risk	0.105 (0.05)*	-0.071 (0.05)
Transition	0.096 (0.05)+	-0.042 (0.05)
Controls		
Income	0.012 (0.04)	-0.068 (0.04)+
Gender[M]	0.021 (0.11)	-0.130 (0.12)
Education	-0.004 (0.01)	-0.021 (0.03)
Age	-0.071 (0.03)*	-0.107 (0.03)**
Observations	1094	968

Note: The values in the table represent the OLS regression coefficients with robust standard errors in parentheses: + p < 0.10, * p < 0.05, ** p < 0.01, *** p < 0.001.

Appendix B

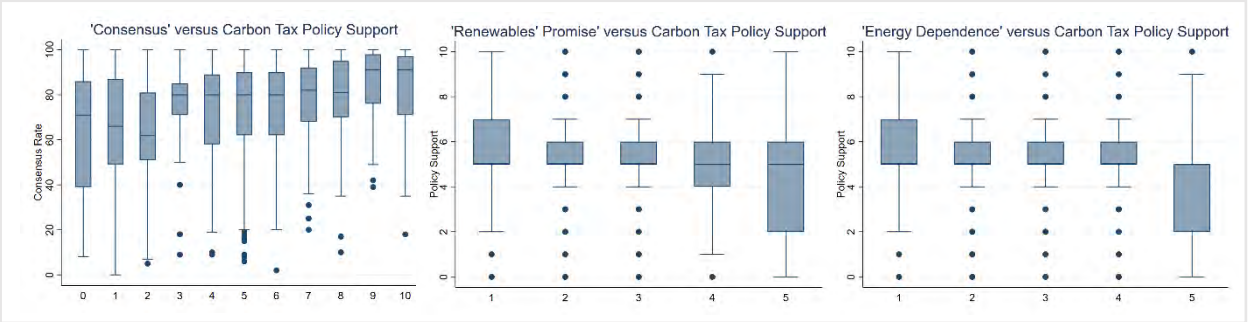
Table 4.3. Carbon Tax Policy Packages

Tax category	**Opt.1**	**Opt.2**	**Opt.3**	**Opt.4**	**Opt.5**
Net cost for the average household.	Same	$8+/month	$15+/month	$23+/month	$30+/month
What is taxed?	CO2	Gasoline	Electricity	Jet Fuel	Heating Oil
Net cost for a household with low energy consumption.	Same	$8+/month	$15+/month	$8- /month	$15-/month
Use of tax revenues	Subsidies for healthcare	Reduction of individual income tax	General government spending	Reduction in payroll taxes	Subsidies for renewable energy
Exemptions for energy-intensive industries	Yes	No			

Appendix C

In Figure 4.1.1, we group Switzerland respondents based on how they weigh the most important selected predictors representing beliefs and risk perceptions. The boxplot results just show in more detail, for each group of individuals, where is policy support declared more strongly.

Figure 4.1.1. Categorized Individuals' Responses and Policy Support in Switzerland



***Note*:** Individual responses of the three most important predictor variables versus their response policy support rate. In the first figure, the y-axis represents the 'Consensus rate', whereas the x-axis represents the level of policy support. In the 'Renewables Promise' and 'Energy Dependence' figures, the y-axis represents the level of policy support, whereas the x-axis represents the individual responses for the respective answers, starting from 'agree (1)' and ending to 'disagree (5)' (see Appendix 2 for details).

Figure 4.1.2. Predictors of Carbon Tax Policy Support in Switzerland, in percentages

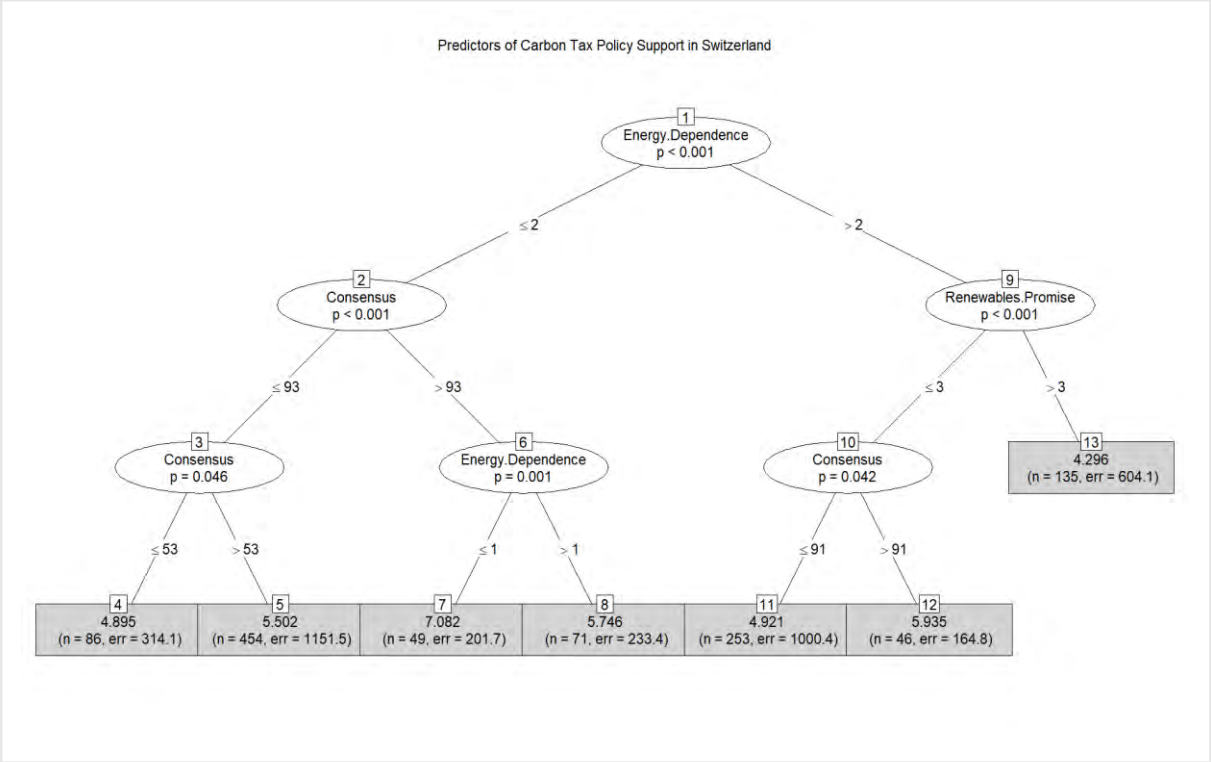


Figure 4.1.3. Predictors of the Carbon Tax Policy Support in Switzerland, in Barplot Format.

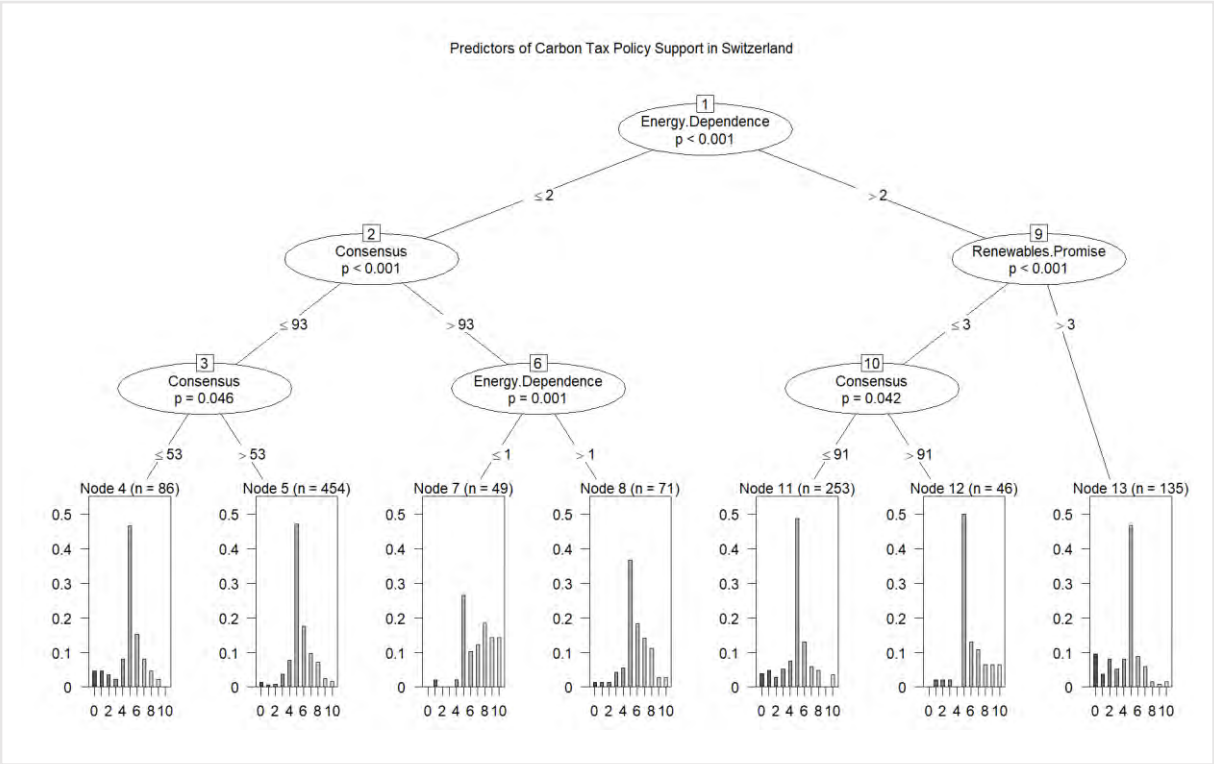
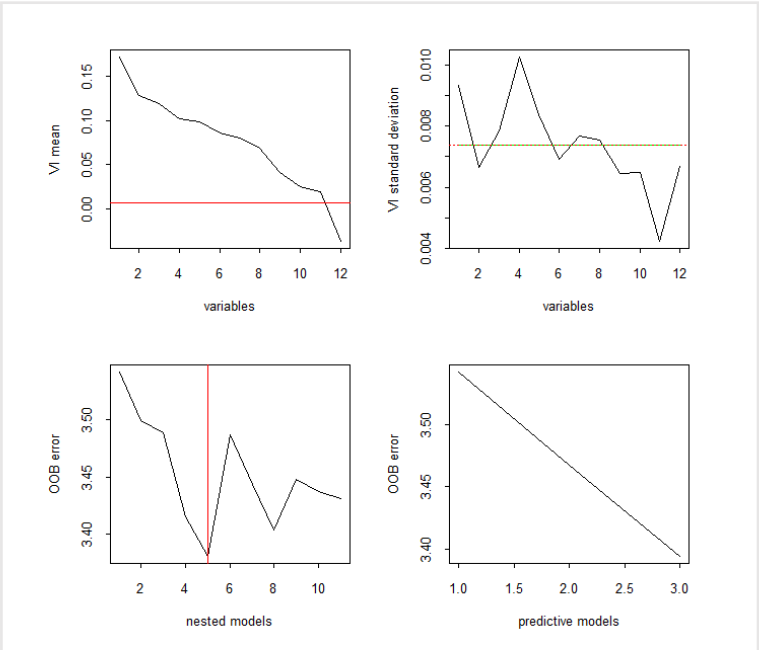


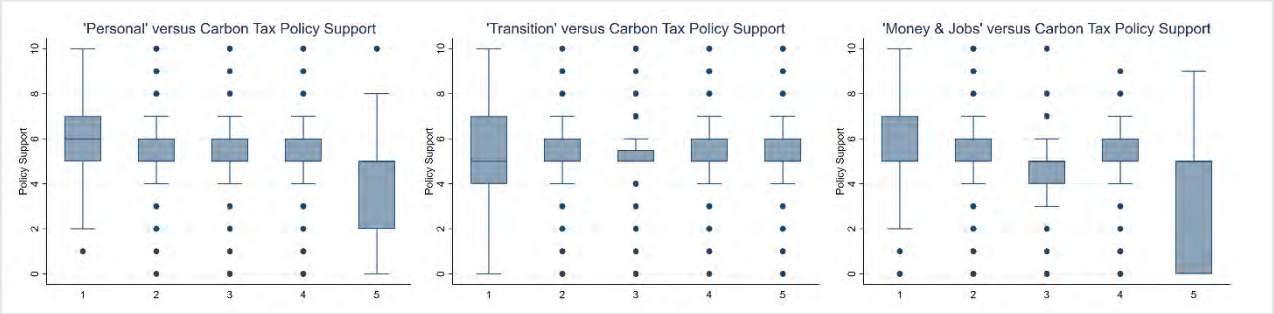
Figure 4.1.4. Thresholding, Interpretation, and Prediction Steps Generated from the VSURF Package.



Note: Top graphs illustrate the thresholding step, bottom left and bottom right graphs are associated with interpretation and prediction steps respectively.

In Figure 4.2.1, we group the United States respondents based on how they weigh the most important selected predictors representing beliefs and risk perceptions. The boxplot results just show in more detail, for each group of individuals, where is policy support declared more strongly.

Figure 4.2.1. Categorized Individuals' Responses And Policy Support In The United States



***Note*:** Individual responses of the three most important predictor variables versus their policy support response rate. The y-axis represents the level of policy support, whereas the x-axis represents the individual responses for the respective answers, starting from 'agree (1)' and ending to 'disagree (5)' (see Appendix 2 for details).

Figure 4.2.2. Predictors of the carbon tax policy support in the United States, in percentages.

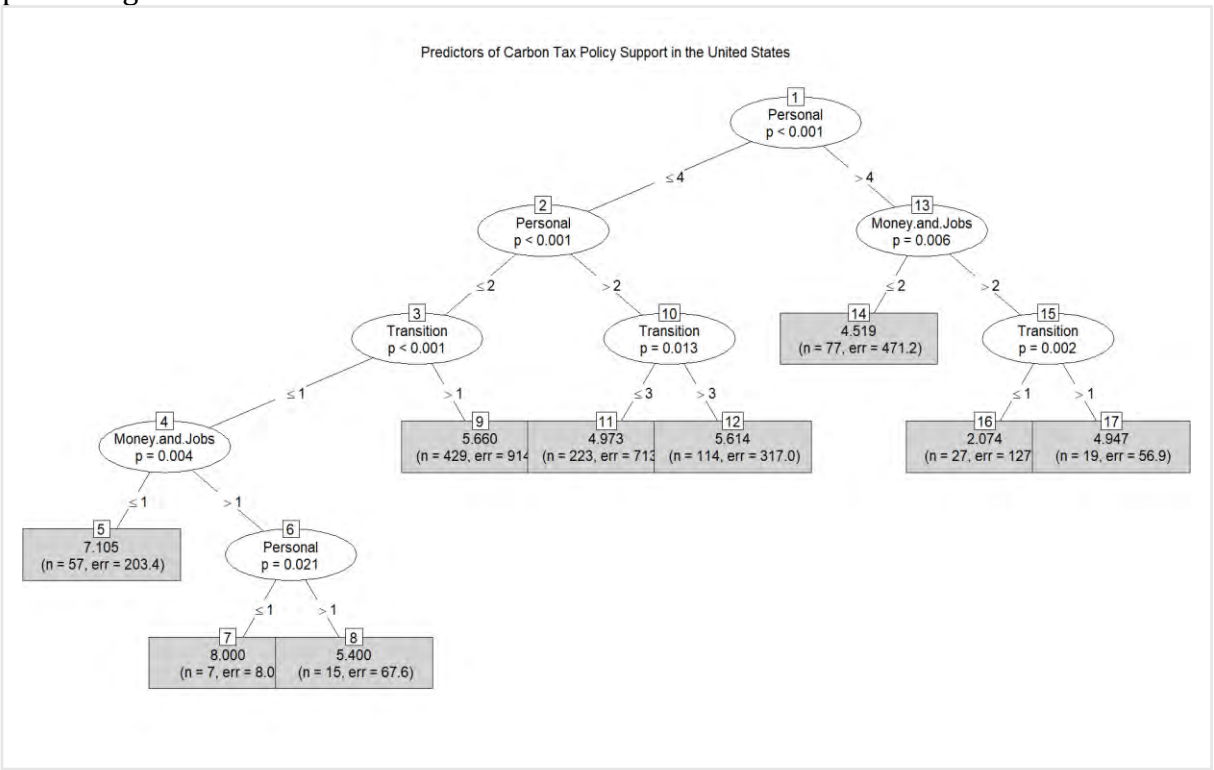


Figure 4.2.3. Predictors of the carbon tax policy support in the United States, in barplot format.

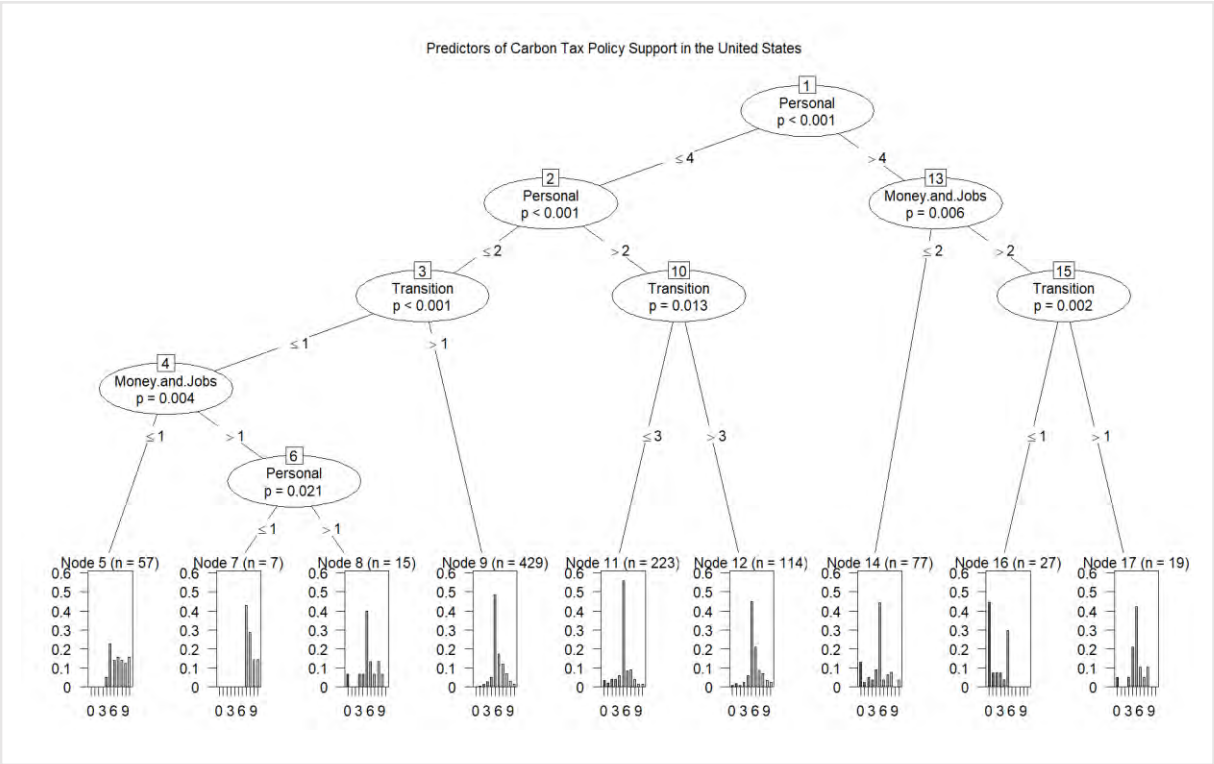
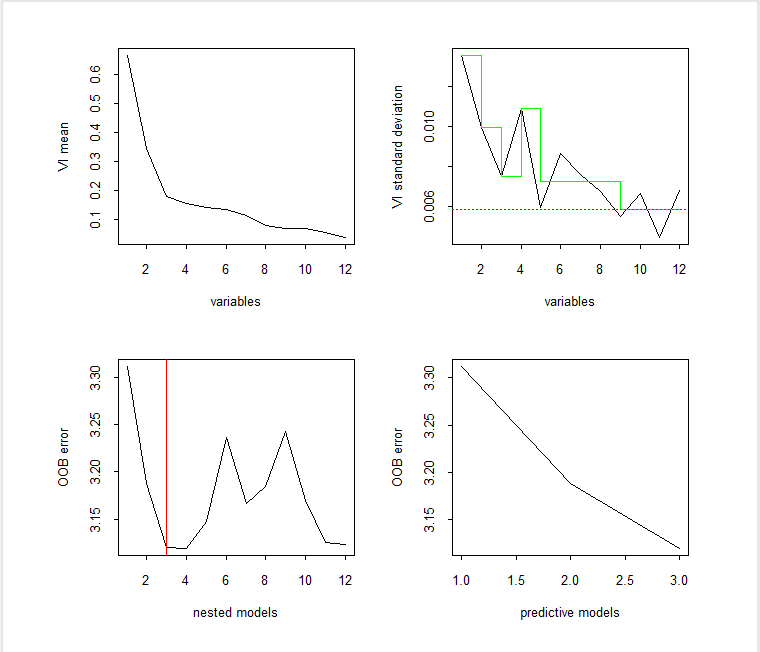


Figure 4.2.4. Thresholding, interpretation, and prediction steps generated from the VSURF Package.



Note: Top graphs illustrate the thresholding step, bottom left and bottom right graphs are associated with interpretation and prediction steps respectively.

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Chapter 5

5. Demonstrating Calm before the Storm: Gender Disparities in Leaders' Responses in Times of Crisis

Crises, more crises, everywhere. Individual countries across the world are confronted with numerous crises, which, in nature, are either unique and domestic or shared and global. Just in the past two years, almost all countries have been directly or indirectly exposed to or expected to face several crises. Climate change, coronavirus, security, food, energy, and financial crises are among the most serious global challenges that have become the toughest leadership tests for most of the current country leaders. Using the coronavirus crisis as an example, and intending to help shape the understanding of other crises responses, we ask the following question: Do we detect gender disparities in government leaders' responses to the coronavirus crisis? We argue that in order to isolate a potential gender effect, we need to consider the varying political institutions within which male and female leaders decide and act.

Keywords: global crises; gender disparities; government responses, patterns of democracy.

5.1 Introduction

A crisis is "*a time of great danger, difficulty or doubt when problems must be solved or important decisions must be made*" (Oxford Learner's Dictionaries). A few words that remind us of some very complex and even unprecedented times were are currently going through. In recent years, countries around the world have taken numerous measures to prevent, mitigate, and respond to multiple and simultaneous global crises. For instance, climate change is a 21st-century long-term and persistent crisis that is posing serious threats to human well-being, the health of the planet, and development, in response to which 196 countries committed to designing and implementing comprehensive mitigation policies (United Nations, 2015; Rogers, 2010; Intergovernmental Panel on Climate Change, 2022). In early 2020, the world was exposed to another major crisis –a large-scale pandemic–, which resulted in a health catastrophe, with over 6 million people dead, and 500 million infected (WHO Coronavirus Dashboard, 2022). This crisis' consequences also severely affected global social, economic, and political stability. The magnitude of the economic repercussions of this pandemic has not been witnessed since the Great Depression. The contraction of the economic activity in 2020, even with extraordinary policy support, was approximately -3.3 percent, and the estimated loss of production in the global economy over the following five years is approximately $28 trillion (IMF, 2021; Gopinath, 2020). As a consequence, the rates of poverty, unemployment, and inequality have either reversed or increased (UNDP, 2020; UNIDO, 2020). Specifically, in the World Economic Outlook 2021, the IMF finds that youth, women, and workers with lower educational attainment have been hit the hardest and that 95 million more people have fallen into extreme poverty in 2020. To make things even worse, in early 2022, the Russian Federation waged a full-scale war in Ukraine, adding another major crisis that would double down on global instability. The United Nations' Global Crisis Response Group in their latest report argues that "The war in Ukraine has a ripple effect on the world's food, energy, and finance sectors. Because of the impact on these sectors, the conflict risks tipping up to 1.7 billion people — over one-fifth of humanity — into poverty, destitution, and hunger" (2022, p.6).

Evidently, from every crisis, some countries become stronger while others weaker. Some suffer severe short and long-term consequences and losses, while others barely feel the effects. There are various explanations for the variations in a country's performance in such challenging times (Sorci et al., 2020). It could be the level of socio-economic

development, geographical location, the type of political system, or the leadership's style of crisis response. Our research objective is rather specific and straightforward, as the comprehensive assessment of the countries' various crisis performances and explanatory roots is beyond the capacity of this study. *First*, we aim at exploring countries' experiences in one recent crisis, specifically during the coronavirus pandemic. Our rationale for choosing this crisis is because of its enormous impact in the past few years, a broad range of available objective and comparative data, and the clarity of its timespan in terms of its start and the timing of concrete waves of the crisis. Different from other crises, in which the variety in prior policies, conditions, and affectedness is huge, the pandemic urged almost all governments across the world at almost the same time to react to a new threat. *Second*, we concretely focus on gender disparities in government leaders' response to the coronavirus crisis, and whether the gender difference appears to be dependent on the type of democracy. The overarching question of this study is as follows:

1. Do we detect gender disparities in government leaders' responses to the coronavirus crisis?

> *1.1. If yes, then, are these differences persistent at the beginning and the peak of the crisis, and across response dimensions?*
>
> *1.2. Are these differences contingent on the type of democracy in which they operate?*

The ultimate objective of this study is to shed more light on varying country leaders' responses during the coronavirus crisis, hence helping shape the understanding of the current and future government responses to other crises.

The coronavirus pandemic has tested leaders' and governments' fundamental capacities to respond effectively in the pursuit of controlling and curing both, public health and economic crisis. From a micro perspective, these challenging times have not affected all countries in the same way. Instead, significant variations in national performance and responses are evident, particularly among OECD members (Johns Hopkins University, 2021). Some countries, for example, registered lower rates of infections and deaths, less economic damage, and/or stricter government responses than others. Such country differences have aroused the attention of social science researchers. A small body of recently published academic work aims at shedding light on these national differences during the coronavirus crisis, departing from the premise that the leader's gender could be an important pathway that could help to explain such variations (Garikipati and

Kambhampati, 2020; Harder, M., and Harder, C., 2020; Sergent and Stajkovic, 2020; Coscieme et al., 2020). Overall, these empirical findings explicitly or implicitly suggest that female-led countries are somehow associated with better public health results throughout the coronavirus crisis. While these findings provide an intriguing approach to explaining national *performance* differences, they also highlight that much more research is needed. In this vein, we aim at expanding this infant area of study by questioning and methodically examining if the gender of the leader helps to explain variations in government *response* in times of crisis. More precisely, we are focusing on policy output and not – as most existing studies have done – on outcomes such as the number of deaths or economic growth. Conceptually, in our study, we expand the definition of '*response'* by using an aggregate response index and three multidimensional indexes such as political, health, and economic areas. We think that these three response metrics may offer a more comprehensive and clearer picture of a leader's types of responses in leading a nation through a pandemic crisis. Theoretically, the literature on leadership effectiveness and gender enlightens us and serves as a useful starting point (Megargee, 1969; Eagly and Heilman, 2016; Sergent and Stajkovic, 2020). Furthermore, we integrate our study with the literature on the importance of democratic patterns in national performance in times of crisis (Lijphart, 2012), with an aim of broadening the range of potential reasons for country response differences beyond the leader's gender. Empirically, we use covariance and matching analyses to test our proposed hypotheses, using a dataset of 37 OECD countries at two different points in time during the crisis.

The remainder of this study proceeds as follows. In the second section, we present existing research on gender and leadership effectiveness, with a particular emphasis on the leader's decisions and their outcomes in times of crisis. This section helps us in laying the groundwork for this study. In the third part, we propose three hypotheses on the leader's gender and the strictness of government response during the coronavirus crisis. In the fourth and fifth sections, we present the dataset and empirical methods, and then we convey the results of the analyses. In the sixth section, we propose further directions for research and then conclude.

5.2 Reviewing the evidence on leader's response in times of crisis

Differentiating leadership effectiveness by gender is an academic practice of more than a half-century, which began with Megargee's (1969) research on the impact of gender on leadership demonstration. Academic research on gender and leadership effectiveness has accelerated significantly in recent years and is clearly reflected in Sergent's and Stajkovic's (2020) comprehensive analysis of this area lately. These scholars emphasize, among other research, three special issues that more thoroughly address critical questions and issues. It begins with *The American Psychologist's* special issues on gender and leadership effectiveness. The most important concern that this special issue raises is how leadership theories hardly address the diversity problem, despite the fact that nations across the globe are becoming more diverse (Chin, 2010). Additionally, it suggests that attention to diversity must expand beyond concerns about representation and should also contribute to "explanations of how dimensions of diversity shape our understanding of leadership" (ibid, p.156). This debate is further extended in a special issue of *The Leadership Quarterly* (Eagly and Heilman, 2016), where several scholars study gender and leadership in greater detail, particularly in terms of the role of women on corporate boards, women in politics, women emerging as leaders, as well as women's decision-making authority, and the style of 'heart-led leadership' (ibid, p. 349-536). In this vein, yet another recent special issue of *Education Sciences* (O'Connor, 2018) builds on the debate on gender and leadership effectiveness. Its first three articles shed light on women's leadership positions in academia while reiterating the idea that gender does matter organizationally (ibid, p.1). Indeed, the scope of this article precludes a thorough analysis of the results of these three special issues.

Although we would argue that this area of research continues to expand, it remains mostly focused on either micro-level analysis, such as the leader's conduct, or macro-level analysis, such as the leader's outcomes (Sergent and Stajkovic, 2020; Nicholls, 1988). Hoobler et al., (2018) critique this divisive approach, pleading for research work that bridges these micro and macro studies. Just recently, Sergent and Stajkovic (2020) responded to this request by bringing in their paper leaders' sex as a micro indicator and COVID-19 death count as a macro outcome. While we will return to the combined micro-macro analysis and findings in the next section, it is necessary to quickly review certain micro-and macro-level studies. On the one hand, Ryan et al., (2001, 2016) believe that, in times of crisis or uncertainty, women are sought after more than males. Among other things, they emphasize women's ability to recover more quickly from failures, handle

risks more effectively, and lead with compassion and empathy. Further studies emphasize that the key factors that contribute to shaping women leaders' personalities are 'family connections, culture, and domestic responsibilities' (Hallward and Muellers, 2019). From a macroeconomic viewpoint, Hoobler et al., (2018) and Post and Byron (2015) show that women in leadership roles or on boards of directors result in better company performance. These studies, however, mostly utilize private sector indicators to assess measures and success, a shortcoming that our article will address by using public sector indicators. On the other hand, the development of this academic literature and even public opinion about possible evidence of female leadership advantage is actually contested, not just by data arguing that male leaders are considered to be more successful. Paustian-Underdahl et al., (2014) use 95 papers to perform a meta-analysis to quantify gender disparities in views of leadership effectiveness. The results of this study indicate that when all leadership situations are considered, women and men "do not differ in perceived leadership effectiveness" (ibid, p. 1129). Actually, these results suggest that possible variations in national performance during times of crisis may be due to the specific conditions under which leaders operate.

Whereas the leader's effectiveness is very important, it is indeed mostly dictated by his/her political interests in specific arenas (Lambert, 2008; Ennser-Jedenastik, 2017; Sánchez-Vítores, 2018), and the style of measures he/she decides to take in response to the various crises. This argument leads us to very relevant 21st-century governing concepts such as hard power and soft power, which portray the differences between male and female leaders, respectively. Whereas the first infers to leading by coercing, the latter is defined as 'the ability to attract and persuade… arising from the attractiveness of a country's culture, political ideals, and policies' (Nye, 2005). In line with these concepts, Global Soft Power Index 2020, conducted a survey with 55'000 respondents in 100 countries, intending to measure the soft power nations. Overall, the results show that female-led countries have a higher net positive influence and better reputation, as well as outperform male-led countries in 'Governance, International Relations, and Business & Trade'. Practically, female-led nations are perceived significantly better in the following attributes: A strong and stable economy; acts to protect the environment; good relations with other countries; safe and secure; an appealing lifestyle; politically stable and well-governed; trustworthy; strong educational system; and high ethical standards and low corruption. Most of these attributes relate to the themes of 'stability, safety and security,

and trust and ethics', key common traits that characterized female leaders during the coronavirus pandemic (Sinek, 2014; Salinas and Soni, 2020).

5.3 Theoretical arguments and hypotheses

5.3.1 A leader's gender and political response in pandemic times

If anything, the coronavirus crisis has required extraordinary leadership response and effectiveness to address not just epidemiological but also economic and political challenges. The stark disparities across government response and performance metrics have highlighted the importance of leadership differentiation. The media, and subsequently academic studies, suggested that gender may be a factor in determining leadership (un)effectiveness. Specifically, they claimed that female-led nations outperformed male-led ones in terms of crisis containment. Such arguments raise questions on whether or not such a systematic gender pattern can be seen in the strictness of government response in times of coronavirus crisis?

Existing research on leaders' gender and effectiveness in times of coronavirus crisis finds that female leaders performed better in managing the pandemic consequences and that they responded earlier to the crisis (Harder, M. and Harder, C., 2020; Sergent and Stajkovic, 2020). Additionally, it is claimed that the government response measures put 'public health ahead of economic concerns' (Coscieme et al., 2020, p. 2). Female leaders' political responses are described as more 'proactive and coordinated,' and therefore are strongly linked with public health results (Ng and Muntaner, 2018; Garikipati and Kambhampati, 2020). These explanations are also consistent with findings from research on gender differences in risk tolerance. Women, it is claimed, are more risk-averse than males (Borghans et al., 2009) or more averse to uncertainty than men (Friedl et al., 2017). Additionally, based on public policy study results, female leaders are more inclined to expand state involvement (Chen, 2010) and show a more cooperative, inclusive, positive, and efficacious political "style" (Bochel and Briggs, 2000; Baskaran et al., 2018). These factors indicate that female leaders are expected to be not only more ready to adopt far-reaching state measures to combat the pandemic but also more capable of forming essential political coalitions inside the nation. On the basis of these reasons, we might think that female leaders, overall, reacted more strongly than male leaders by enacting

tougher anti-virus measures. Based on these arguments, we formulate the first hypothesis:

Hypothesis 1: *The strictness of the aggregate government responses in times of coronavirus crisis is higher in countries with women leaders than in countries with male leaders.*

However, there is also an argument for a contrasting view, namely that female leaders react with softer government measures towards a crisis like the pandemic. Recent studies and reports find that the general public prefers more female leadership styles and traits (Deloitte, 2018; Salinas and Soni, 2020). For illustration, "being communicative, flexible, and patient – soft power traits which are usually considered feminine – were among the five most important factors for strong leadership" (Salinas and Soni, 2020, p.1). In this vein, according to the 2018 Harris Poll, 50 percent of Americans would prefer to work for a 'female-led company over a male-led company' (ibid, p.1). In a study surveying 64'000 people in 13 countries, Gerzema and D'Antonio (2013) sought to understand if people, in general, are placing more value on the feminine side of human nature in times of globalization, and rapid economic development and technological change. They find that 66 percent of their respondents said that "the world would be a better place if men thought more like women", and 57 percent were "dissatisfied with the conduct of men in their country." As part of this work, Gerzema and D'Antonio (2013) also found that the definition of leadership is changing, and that feminine attributes such as 'collaboration and flexibility' are more effective than masculine traits such as 'aggression and control'. Garikipati and Kambhampati (2020) while focusing on the outcome dimensions based on a dataset covering 194 nations, show that coronavirus outcomes are consistently better in countries led by female leaders.

In a similar line, another research utilizing state-level data for the United States found that female governors recorded fewer coronavirus fatalities than male governors (Sergent and Stajkovic, 2020). Coscieme et al., (2020) also add to this issue with their study of female leadership and health outcomes across 35 nations using COVID-19 health data. A mechanism behind this relationship could be citizens' compliance with existing rules and practices to fight the pandemic. One might argue that when people hear such messages from a female leader rather than a male leader, they are more inclined to obey (Bauer et al., 2020). For instance, women's communication abilities and 'heart-led leadership' enable them to reach a larger audience (Eagly and Heilman, 2016). While Bauer et al.,

(2020) find only limited evidence for such a gender difference in the US context and on the basis of experimental evidence, we expect that this compliance mechanism could account for the empirical comparative pattern in which female-led countries experienced lower death rates while also more effectively containing infection rates. As a result of these current results and debates in this field of study, one could thus argue that female leaders do not need very restrictive responses. Building on higher compliance, they might go for softer not more restrictive responses than their male counterparts. This leads to our second hypothesis:

Hypothesis 2: *The leader's gender is significantly more important in the government dimensions that directly tackle the crisis, such as containment and public health, compared to economic measures that tackle the crisis' indirect effects.*

Specifically, we expect the leader's gender to be important when it comes to direct causes and consequences of the crisis, in this case making human tragedy a top priority (McKinsey and Company, 2020). Whereas, a leader's gender might be less relevant in the responses to the indirect effects of the crisis, such as the economic instability. This is also known as 'Making smart trade-offs', as part of the 'framework for rapid decision-making' in times of crisis (Shoma et al., 2020). "Instead of thinking about all possibilities, the best leaders use their priorities as a scoring mechanism to force trade-offs" (ibid, p.1).

5.3.2 Is it gender, political institutions, or both?

However, the issue arises as to whether the leader's gender is dependent on the political system in which they operate. To help shape our understanding of this matter, we first examine the literature on the character of democracy. According to Bernauer and Vatter (2019), the 'political-institutional configuration of democracy changes with regard to the diffusion of power,' implying that such variation may influence the conduct of political actors as well as the performance and legitimacy of political systems. Bernauer and Vatter's monograph on the diffusion of power is based on the ideas of proportional (consensual) and majoritarian democracy. This study often differs from the notion that consensual democracies are kinder and gentler (Lijphart, 2012; Manatschal and Bernauer, 2016). Given that male and female leaders are often linked with distinct ways of how to lead or do politics, this line of the study suggests that this kind of democracy may be more suited to female leaders and make them more effective in dealing with issues

that arise during a pandemic. However, it might be claimed that the gender of the leader matters more in majoritarian systems, where these leaders are better able to do politically "what they want," while consensual democracies limit the leader's independence and, therefore, possibly diminishes the leader's effects. As a result, we deploy and test the third hypothesis, which suggests a potential relationship between a leader's gender and patterns of democracy, while – against the background of diverging arguments – we refrain from formulating a directional hypothesis.

Hypothesis 3: *A leader's gender is dependent on the democratic patterns of the respective countries they lead.*

5.4 Data and methods

To test our hypotheses, we assembled a dataset for 37 OECD countries and ten variables. Our data contains two time periods that required quick, tough, and courageous leadership emergency measures. The years 2020 and 2021 represent the beginning and the peak of the coronavirus crisis, respectively. The University of Oxford's COVID-19 Government Response Tracker constructed the aggregate index based on three dimensions: health support, stringency, and economic support measures (Table 5.1). We used these indexes as the dependent variables.

Table 5.1. Government Response Index

Index Name	School closing	Workplace closing	Cancel Public Events	Gathering Restrictions	Public Transport Closing	Stay At home Order	Movement Restrictions	International Travel	Income Support	Debt Relief	Public Info campaign	Testing policy	Contact Tracing
Government Response index	x	x	x	x	x	x	x	x	x	x	x	x	x
Containment and Health Index	x	x	x	x	x	x	x	x			x	x	x
Stringency Index	x	x	x	x	x	x	x	x			x		
Economic Support Index									x	x			

Note: The University of Oxford's COVID-19 Government Response Tracker.

As a result, we also proposed a specific hypothesis pertaining to these specific dimensions. This intends to help us extract a more detailed view of the leader's response to the coronavirus crisis. The gender of the leader is the main independent binary variable, with 1 and 0 values for female and male leaders, respectively. We chose a national leader, either the President or the Prime Minister, who was in charge of the executive branch of

government. In addition, four control variables are included: the Index of Power Dispersion in Direct Democracy, GDP per Capita, Health Expenditures, and the Social Progress Index. The majority of the data is obtained from the International Monetary Fund, the United Nations, Johns Hopkins University, the University of Oxford, and the Cambridge University Press (Table 5.2).

Table 5.2. Summary Statistics

		2020				*2021*				
Covariates	***Obs.***	***Mean***	***Std. Dev.***	***Min***	***Max***	***Mean***	***Std. Dev.***	***Min***	***Max***	***Sources***
Gender	***37***	0.216	0.42	0	1	.216	.417	0	1	GS
Government Response	***37***	48.36	6.27	34.96	60.71	61.01	8.08	44.58	79.65	UO
Stringency Index	***37***	49.56	7.90	32.61	64.67	54.97	9.11	37.80	74.89	UO
Health Response	***37***	47.34	6.58	33.21	61.75	60.93	8.10	46.38	78.52	UO
Economic Response	***37***	55.94	14.14	17.05	78.42	61.71	23.96	11.99	100	UO
Covid Cases 1/mil.	***37***	32088	19648	421	73115	123895	62835	2754	25160	JHU
Social Progress	***37***	86.96	5.51	68.27	92.73	86.47	5.81	67.99	8 92.63	SPI
Health Expenditures	***37***	8.76	2.39	4.22	17.06	8.76	2.39	4.22	17.06	WB
GDP per Capita	***37***	39455	24235	5334	11601	39455	24235	5334	11601	WB
Power Dispersion	***37***	1.03	3.06	-2	4 13.5	1.03	3.06	-2	4 13.5	CUP

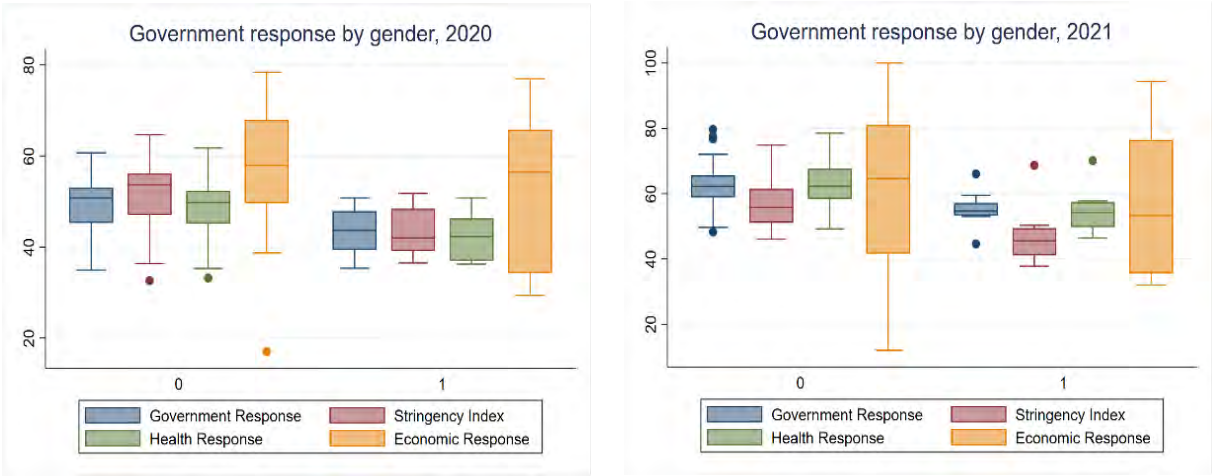
Note: GS (Government Sources), SPI (Social Progress Imperative), WB (World Bank), UO (University of Oxford), JHU (Johns Hopkins University), IMF (International Monetary Fund), CUP (Cambridge University Press).

Our methodological approach consists of two stages that are used to test for the hypothesized relationships. The first empirical stage involves using the analysis of covariance (ANCOVA) to test for the interaction of a leader's gender with government response variables. ANCOVA is defined as a 'hybrid form of multiple regression and ANOVA' that statistically removes the effects of covariates on the dependent variable before comparing two or more groups (D'Alonzo, 2011, p. 804). However, we are aware of the possible shortcomings of utilizing this estimate, since it may suffer from the constraints of a small sample size, given that only 8 of the 37 nations are led by women (Garikipati and Kambhampati, 2020). Another limitation is that most female-led nations may have particular features (e.g., a focus on equality, generosity, human needs, or special institutional setups) that could provide them with greater tools to react to this crisis (Coscieme et al., 2020; Garikipati and Kambhampati, 2020). Thus, we proceed with the second empirical step to test for our hypothesized relationships. To address the two aforementioned shortcomings, the current literature offers a quasi-experimental method such as matching. Stuart (2010) proposes the nearest neighbor matching technique, which matches each female-led nation with its "closest comparator and estimates the effect of being female-led on the dependent variable" (Garikipati and Kambhampati, 2020,

p.5). This method reduces confounding bias by allowing a comparison of these two groups' (female/male) outcomes to estimate the effect of treatment.

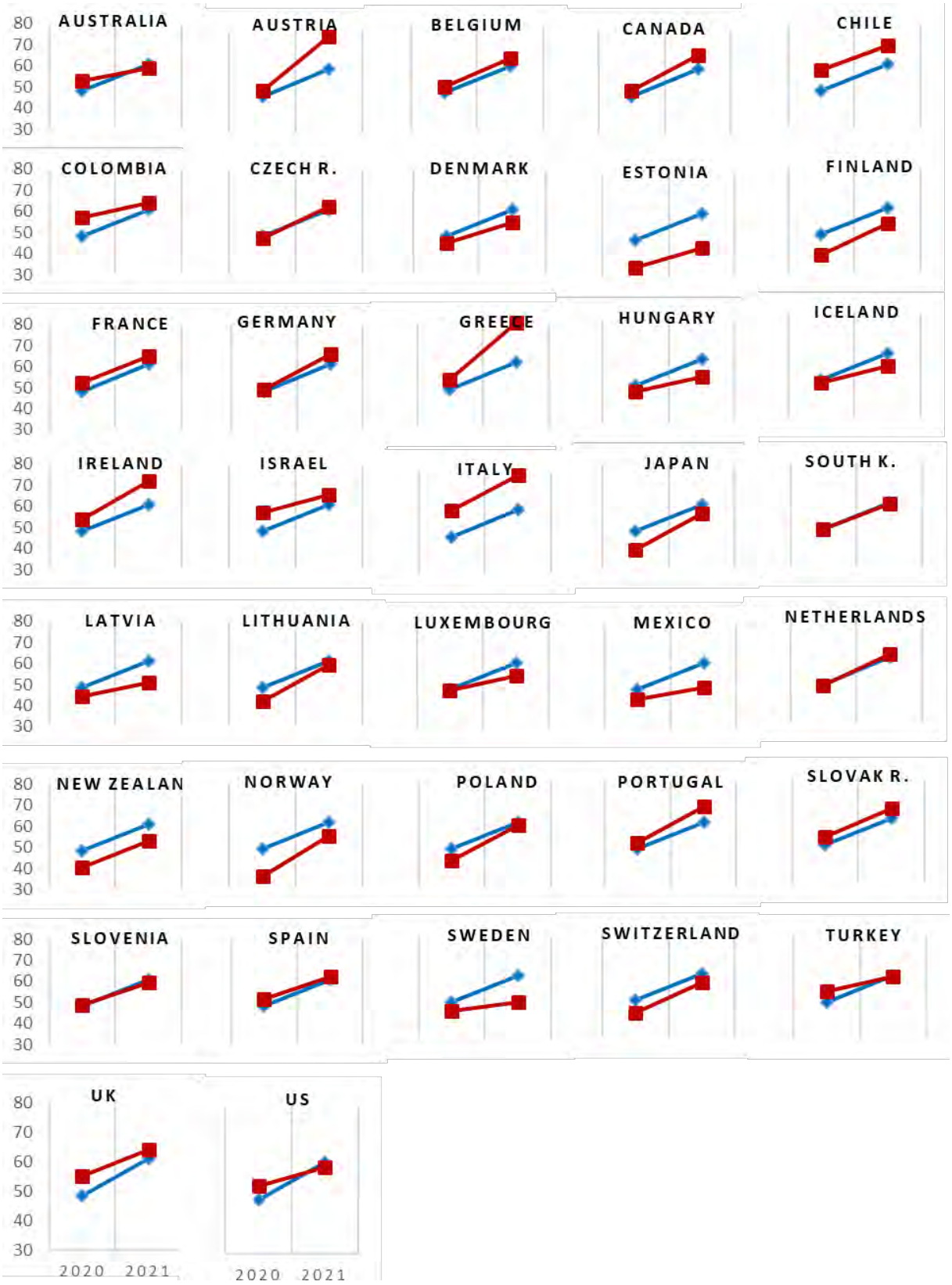
In Figures 5.1.1. and 5.1.2, we present in boxplot format Government Response Index and its dimensions for the years 2020 and 2021. Based on simple averages, we detect variations in gender groups; hence, it gives us important and interesting preliminary results to move forward with the proposed analysis.

Figures 5.1.1 and 5.1.2: Government Responses by Gender, 2020 and 2021.



In Figure 5.2, the blue line shows the average value of the government response index in OECD countries, and the red line displays country values for the two time periods. Clearly, these results show which countries have taken on average stricter response measures at the beginning and the peak of the coronavirus crisis. Out of nine female-led countries in 2020 and 2021 (Switzerland only in 2020, Estonia in 2021), seven of them, Denmark, Finland, Iceland, Norway, New Zealand, Sweden, and Estonia recorded a government response index below the OECD average.

Figure 5.2. Government Response Index by Country.



Note: Blue line shows the average value of the government response index in OECD countries, and red line displays country values. In 2020, female-led countries were: Belgium, Denmark, Finland, Germany, Iceland, New Zealand, Norway, and Switzerland. In 2021, female-led countries were: Denmark, Estonia, Finland, Germany, Iceland, Lithuania, New Zealand, and Norway.

5.5 Empirical findings

In the first methodological stage, we applied analysis of covariance (ANCOVA) to test for an interaction between the gender of national leaders and the strictness of the aggregate response to the coronavirus crisis. Four covariates such as the Index of Power Dispersion, GDP per Capita, Health Expenditure, and the Social Progress Index, are included in the analysis, relying on the existing literature and theories. This article substantially benefits from Sergent and Stajkovic (2020) and Keppel (1991) in terms of applying the ANCOVA method in the context of a leader's gender and coronavirus crisis. Table 5.3 summarizes the findings of the models.

To test hypothesis 1, we run models 1.1 and 1.2, using the Government Response Index as the variable that represents the government's level of response in times of crisis. Both models reveal a significant relationship between leaders' gender and the aggregate government responses. Precisely, they reveal that female leaders, in general, responded to this crisis with less strict measures, hence, rejecting Hypothesis 1. Furthermore, this approach is reflected in all three dimensions of the Government Response Index, in models 2.1, 3.1, 4.1, 2.2, 3.2, and 4.2, where Stringency Index and Health Response Index turned out to be statistically significant. These are also the dimensions that are aimed at tackling directly the areas related to the crisis, such as people's movements and health protection. These models show a systematic and statistically significant inverse relationship between female-led nations and stricter coronavirus protective measures. However, the economic response, as a policy area that relates to the indirect effects of the crisis, turned out to be statistically insignificant in both models. Overall, these findings lend support to Hypothesis 2 rather than to Hypothesis 1.

In addition, including two crisis stages in this analysis, enables us to also get better insights into understanding whether there is a difference in how male or female leaders responded at the beginning and peak of the coronavirus. Was their response strictness consistent in both stages or not? ANCOVA results unveil that, in both 2020 and 2021, female-led countries pursued less strict aggregate government response policies, and this is also reflected in all three dimensions of the Government Response Index. This suggests that the patterns we find are not contingent on specific points in time during the crisis.

Furthermore, among the control variables, Health Expenditure is the most important variable. While higher expenditures are positively related to higher levels of the

stringency index and more restrictive health responses, the opposite can be observed with respect to the economic response. All other variables, including Power Dispersion, the variable of high interest and related to hypothesis 3, are not statistically significant.

Overall, we find that female-led governments responded with less strict measures, similarly at the beginning and peak of the crisis, and that gender effect was higher in government responses that directly tackled the crisis.

Table 5.3. ANCOVA Results**:** Effects of leader's gender on government response in times of coronavirus crisis.

	2020				***2021***			
Covariates	Government Response (1.1)	Stringency Index (2.1)	Health Response (3.1)	Economic Response (4.1)	Government Response (1.2)	Stringency Index (2.2)	Health Response (3.2)	Economic Response (4.2)
Gender	-5.401	-6.341	-5.362	-5.786	-8.153	-9.539	-7.561	-11.830
	(2.689)*	(3.618)*	(2.886)*	(6.749)	(3.267)**	(4.106)**	(3.520)**	(12.190)
Covid Cases 1/mil.	0.000	0.000	0.000	0.002	0.000	-0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.00)
Social Progress	-0.361	-0.652	-0.504	0.648	0.280	-0.073	-0.005	2.268
	(0.236)	(0.264)**	(0.205)**	(0.745)	(0.286)	(0.370)	(0.306)	(0.970)**
Health Expenditures	0.689	1.275	1.015	-1.616	0.352	1.225	0.751	-2.423
	(0.467)	(0.656)*	(0.490)**	(0.777)**	(0.570)	(0.718)*	(0.575)*	(1.522)
GDP per Capita	0.000	0.000	0.000	0.000	-0.000	-0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)*
Power Dispersion	-0.080	-0.210	0.034	-0.875	0.027	-0.119	0.048	-0.126
	(0.361)	(0.340)	(0.034)	(0.689)	(0.461)	(0.415)	(0.429)	(0.941)
Constant	72.660	96.202	82.184	5.763	37.007	57.364	57.408	-104.333
	(17.766)***	(18.994)**	(82.199)**	(63.910)	(21.657)*	(26.913)**	(22.443)**	(72.285)
Observations	37	37	37	37	37	37	37	37

Note: OLS regression coefficients with robust standard errors in parentheses: *** p<0.01, ** p<0.05, * p<0.1.

We further expand the test on Hypothesis 3, which is that the gender impact is dependent on the type of democracy in which political leaders operate. As a result, we include an interaction term between the leader's gender and the Index of Power Dispersion in our models (Table 5.4). The latter, which measures a country's degree of consensual democracy, was shown to be statistically insignificant in all models when the Government Response Index and its sub-categories were used as the dependent variable. No empirical evidence shows that female leaders are more or less likely to emerge under consensual democracy. These findings also coincide with the results from Gerring et al., (2022) who, from a pool of 1100 cross-country analyses from 2000, found that "Across these diverse outcomes, most studies report either a positive or null relationship with democracy" (p.357). In addition, they suggest that the outcomes that are measured or proxied objectively reveal a less strong positive relationship than the subjectively measured ones.

Table 5.4. Regression analysis including interaction terms.

	2020				***2021***			
Covariates	Government Response (1.1)	Stringency Index (2.1)	Health Response (3.1)	Economic Response (4.1)	Government Response (1.2)	Stringency Index (2.2)	Health Response (3.2)	Economic Response (4.2)
Gender	-5.136	-6.191	-5.245	-4.474	-8.912	-10.003	-8.101	-14.111
	(0.084)*	(3.586)*	(2.948)*	(7.219)	(3.469)**	(4.475)**	(3.805)**	(0.306)
Covid Cases 1/mil.	0.000	0.000	0.000	0.000	0.000	0.012	0.016	0.078
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.020)	(0.020)	(0.139)
Social Progress	-0.379	-0.662	-0.512	0.558	0.272	-0.334	-0.275	4.862
	(0.242)	(0.273)**	(0.210)**	(0.000)	(0.303)	(0.788)	(0.627)	(1.649)***
Health Expenditures	0.747	1.308	1.040	-1.328	0.395	0.275	0.162	-0.209
	(0.531)	(0.717)*	(0.544)*	(0.889)	(0.616)	(0.122)	(0.098)	(0.285)
GDP per Capita	0.000	0.000	0.000	0.000	-0.000	-0.041	0.001	-0.372
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.062)	(0.052)	(0.172)**
Power Dispersion	0.084	-0.117	0.016	-0.066	-0.116	-0.207	-0.053	-0.555
	(0.671)	(0.786)	(0.727)	(0.786)	(0.544)	(0.507)	(0.521)	(0.938)
Gender#PowerDisp.	-0.329	-0.186	-0.144	-1.627	0.752	0.460	0.535	2.262
	(0.796)	(0.863)	(0.822)	(1.333)	(0.755)	(0.741)	(0.725)	(2.265)
Constant	73.298	96.562	82.463	8.916	37.588	57.720	57.821	-102.587
	(17.810)**	(19.351)**	(14.280)**	(63.068)	(22.830)	(27.844)**	(23.333)**	(73.990)*
Observations	37	37	37	37	37	37	37	37

Note: OLS regression coefficients with robust standard errors in parentheses: *** p<0.01, ** p<0.05, * p<0.1.

Robustness test: Matching Analysis

While the analyses presented so far do not allow for causal conclusions, we test the robustness of our previous findings with matching analysis to delve deeper into a potential causal effect of female leadership. We apply the nearest neighbor matching method, which is the most common form of matching (Thoemmes and Kim 2011; Zakrison et al., 2018). "It involves running through the list of treated units and selecting the closest eligible control unit to be paired with each treated unit" (Greifer, 2020). In this case, it matches eight female-led countries with twenty-nine male-led countries based on four matching characteristics such as Index of Power Dispersion, GDP per Capita, Health Expenditures, and Social Progress Index. In table 5.5, we present the results of the matched estimations for the Government Response Index, Stringency Index, Health Response Index, and Economic Response Index. For the robustness check, we did the matching with the two, three, and four nearest neighbors. We controlled for the same four variables as we did in the covariance analysis, and obtain remarkably similar results. Female-led countries implemented less strict overall government response measures, be it at the beginning or the peak of the coronavirus crisis.

Table 5.5. Comparing government responses with nearest neighbors.

	2020			***2021***		
Covariates	***Nearest Neighbor (1)***	***Nearest Neighbor (2)***	***Nearest Neighbor (3)***	***Nearest Neighbor (1)***	***Nearest Neighbor (2)***	***Nearest Neighbor (3)***
Government Response	-3.501 (2.091)*	-3.773 (1.907)**	-4.004 (1.942)**	-5.631 (3.106)*	-6.140 (2.909)**	-6.434 (2.717)**
Stringency	-5.937 (2.714)**	-5.592 (2.634)**	-5.707 (2.647)**	-6.628 (4.287)	-7.145 (4.106)*	-7.480 (3.947)*
Health Response	-4.444 (2.586)*	-4.615 (2.463)*	-4.602 (2.475)*	-5.083 (3.282)	-5.532 (3.142)*	-5.761 (2.976)*
Economic Response	2.965 (7.548)	2.002 (7.578)	0.0727 (7.361)	-8.915 (9.632)	-10.011 (9.294)	-10.821 (9.161)
Observations	37	37	37	37	37	37

Note: Differences in response measures between female and male-led countries. Robust standard errors in parenthesis; *** p<0.01, ** p<0.05, * p<0.1. N = 37. The statistically significant matched estimations confirm that the Government response, Stringency Index, and Health Response are lower in female-led countries.

5.6 Conclusion

Since the beginning of this decade, almost all countries are exposed to or expected to experience numerous simultaneous crises, which in nature are common and global. Climate change, coronavirus, threats of wars, food shortages, inflation, energy insecurity, and financial instability are just some of the crises – which are at different stages of 'progress'– and for which the world is bracing to keep under control. Everything comes down to the individual country's responses, with their executive leaders as the main protagonists. In this study, we explore in more detail the variations in government responses to the coronavirus crisis, with the ultimate goal of being able to predict or understand the current or future government responses to other aforementioned crises.

The coronavirus pandemic is one of the largest crises of the twenty-first century, with unprecedented public health, economic, and political repercussions. Country leaders have been pushed into the center of this global crisis, tasked with delivering their best efforts toward managing and resolving it. According to data and recent research, the response and the performance of countries across the world paints a picture of stark contrasts. Whereas some countries seemed to have the crisis under control, others suffered severe human and economic losses. A small number of academics have recently conducted research in an attempt to explain such national variations. A frequent finding from these early studies, which was also widely reported in the media, is that nations led by women fared better at controlling and curing this crisis. But did they do it by responding with stricter or softer government measures?

Using the Government Response Index during this crisis, we analyse more systematically whether female leaders responded with stricter measures in handling this crisis at its beginning in 2020 and the peak of the crisis in 2021, using a dataset for 37 OECD nations. Two steps comprise our methodological approach: covariance analysis and matching analysis. The two techniques provide reasonably consistent results. Contrary to predictions, there is evidence that nations headed by women used less strict government measures to control the crisis. The gender effect remained significant in both periods, representing the beginning and peak of the crisis, and suggesting that there was a consistency in response in both phases of the crisis. There are three explanations for such outcomes. First, soft power traits which are usually considered feminine – which are the most important factors for strong leadership– might have served female-led countries well. Second, female leaders may benefit from a more compliant population. This is consistent with the idea that it is not the strictness of rules but rather the degree to which people adhere to the (perhaps milder) measures adopted that matter. Collaboration and flexibility are more effective leadership traits and are mostly attributed to female leaders. Our results may be interpreted as evidence that female leaders are more adept at mobilizing people. However, more study is required to clarify this mechanism. Third, based on recent research in this area, female leaders may not have responded with stricter measures, but they responded sooner (Harder, M. and Harder, C., 2020; Sergent and Stajkovic, 2020), a move that could have made a difference. Last but not least, when considering whether a leader's role may depend on the system in which they act, we find no significant differences between female and male leaders in majoritarian or consensual democracies.

Finally, our research does have certain limitations. First, our study uses the Index of Power Dispersion to account for the effects of the types of democracy on a leader's gender, whereas other indicators related to democracy need to be employed to ensure that the results we found are consistent. Second, there is a research need to examine whether a leader's gender is contingent on any indicator beyond democracy, i.e., level of development, socio-cultural, etc. Third, use other indicators (beyond Oxford's) that could objectively or subjectively represent the government's response to the coronavirus crisis.

5.7 References

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Chapter 6

6. Conclusion

This dissertation focuses on two policy areas, the welfare state and the environmental state,–domains that together are well-positioned to address the three most pressing challenges of our time: poverty, inequality, and climate change. The future of humanity and our planet hinges on our response to these three issues, which in my study I refer to as '***the three red waves'***. In recent years, poverty, inequality, and climate change have deteriorated and shown alarming tendencies. First, following a downward trend of twenty-five years, worldwide extreme poverty has reversed and increased, with about three-quarters of a billion people living in dire circumstances. Key causes of such a crisis include climate-change-related shocks, floods and drought, and inequality. Second, economic inequality, namely income and wealth inequality, has reached worrying levels, with the wealthiest 10 percent of the world's population sharing 52 percent of the income and 76 percent of the wealth (Chancel et al., 2022). These disparities are also reflected in gender and carbon footprint. Third, the Earth's temperature has risen at alarming rates in recent decades, and as a consequence, the previous six years have been the warmest ever recorded. Climate change caused by humans is real, it threatens the future of humanity and the planet, and it disproportionately affects the poor. There is ample academic research and data indicating that the three aforementioned concerns are interconnected. Though more academic research is required to assist shape the knowledge of whether and how various policy domains should collaborate to jointly counter the "three red waves" in the coming years. And this is exactly what this dissertation is primarily concerned about. In the following paragraphs, I summarize the important contributions of this study, as well as the major limitations of the literature and future research directions.

First, I argue that an important approach to examining how poverty, inequality, and climate change are jointly addressed is by initially clearly conceptualizing and understanding the contemporary welfare states –as the legacy systems–, and then exploring and conceptualizing various synergies and pathways for cooperation between welfare state and environmental state ***policy areas***. In response, I undertook two major theoretical and empirical steps. *In the first step*, I contend that contemporary welfare states face new and growing risks and challenges (e.g., inequality, climate change) and therefore implement significantly more new policy measures, which existing welfare regimes literature barely takes into account. In response, I proposed a novel and systematic theoretical framework that helps to shed some light on global contemporary welfare state variations and directions. I accomplished this step by formally establishing a three-stage global yet comparative conceptual framework, then compiling a unique dataset for 150 nations (representing more than 90 percent of the world population), and validating the framework using sophisticated empirical methodologies. This is, to the best of my knowledge, the first study to propose and evaluate a framework that ensures consistency, inclusiveness, and compliance on a global scale. Indeed, these results also contribute to the identification of further research directions. To be more specific, future research might employ this approach and test it for a subsample of countries that may have more comprehensive datasets available –notably disaggregated data for different policy instruments– to identify certain welfare state changes more clearly. *In the second step*, I attempt to explore possible arrangements to integrate the welfare state and environmental state policy areas. I do so by refining the newly suggested concept in the recent academic welfare state and environmental state literature, called 'eco-welfare state'. Concretely, I investigate the actual pathways that lead to a synergy between welfare states and environmental states, and empirically unveil worldwide trends of the shifts towards an eco-welfare state regime using a unique dataset for forty-two developed and developing countries. Again, a much more detailed study is required in the future. The concept and methodology that I propose should be also validated using a dataset that includes additional countries from Asia, Africa, and South America. Moreover, causal and explanatory analysis might be conducted, in addition to a comprehensive country-specific analysis.

Second, it is clear that significant effort is necessary in adopting specific ***policy instruments*** in order to develop and strengthen policy areas and synergies as indicated

in the prior section. While governments design and propose various policies, I contend that their successful implementation is not always guaranteed. Obtaining support for certain policy instruments has often proven to be challenging. Using a carbon tax policy instrument as an example and employing sophisticated machine learning methods, this dissertation provides a unique approach to identifying the strongest predictors and pathways that generate the highest (and detect the lowest) public support. Although it is policy instrument-specific, this approach may be easily replicated to study pathways that lead to high public support for any other welfare state or environmental state policy instrument. For example, future research may expand further in this direction, using additional poverty, inequality, or climate change-related policy measures.

Third, as this research is concerned with ongoing significant challenges or even crises, it was also of great interest to examine the responses of ***policy actors*** during such difficult periods. I use the coronavirus pandemic as an example because it is one of the most significant and recent crises of the twenty-first century, with profound social, economic, and political repercussions. Taking into account the diverse political frameworks within which male and female leaders make decisions and take action, I choose to investigate if there are gender-based differences in the responses of government leaders to the coronavirus outbreak. Using a dataset for 37 OECD countries and employing a two-step empirical strategy, I demonstrate that female-led nations used less stringent government measures to respond to crises, and their results were significantly better than those of countries led by men. Whereas differences in political institutions were not significant. However, these findings and approaches need to be tested using other crises and countries. If they were reproduced with other contemporary challenges pertaining to climate change, extreme poverty, energy, etc., would they provide equivalent results? And may they also help explain why some countries handle and recover from certain crises far better than others?

Declaration of Originality

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I hereby declare that this thesis represents my original work and that I have used no other sources except as noted by citations.

All data, tables, figures and text citations which have been reproduced from any other source, including the internet, have been explicitly acknowledged as such. I am aware that in case of non-compliance, the Senate is entitled to withdraw the doctorate degree awarded to me on the basis of the present thesis, in accordance with the "Statut der Universität Bern (Universitätsstatut; UniSt)", Art. 69, of 7 June 2011.

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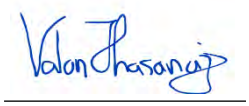

Place, date

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