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MIDDLE CLASS AND AUTOMATION IN EUROPE: EMPLOYMENT POLARIZATION AND THE ROLE OF WELFARE POLICIES.

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Anno Accademico 2019/2020

A mamma, a nonna, a Nastassja.

"Gloria in excelsis deo
Gott mit Uns
Ein Zwei Drei
Prima che la terza Rivoluzione Industriale
Provochi l'ultima grande esplosione nucleare
Prepariamoci per l'esodo
Il grande esodo
Un esodo
Per noi giovani del futuro"

(*L'esodo*, F. Battiato, 1982)

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INTRODUCTION

Automation, middle class and welfare state.

Every industrial revolution has a dramatic impact on the labor market. Several occupations disappear and new professions arise. The main engine of this change is always represented by technical innovations. The first two industrial revolutions, which took place between the 18th and the 19th centuries, dragged the agrarian feudal society towards the industrialized world. Consequently, masses of peasants have been turned into production workers, radically changing their lifestyles.

A new technical breakthrough started in the 1960s, when the electronic calculators began to spread on the market. At the turn of the current century, the development and diffusion of digital technologies starkly accelerated, definitely bringing down the curtain on the industrial age. At the same time, a marked change occurred in the occupational distribution. Notably, from the late 1980s the jobs in the service sector started to outnumber the size of the industrial workforce. Indeed, the use of Information and Communication Technologies (ICT), together with the market globalization, made the service trade much more rewarding, while a significant number of production workers became redundant (Wren, 2013).

Many scholars put forward different hypotheses aimed at explaining the trends of the job distribution in the post-industrial society. Educational attainment immediately stood out as the main determinant of the service-led division of labor. The first theoretical paradigm aimed at interpreting the impact of new technologies on the labor market is the “skill-biased technical change”. The SBTC scholars argue that technology rises the demand for skilled workers at the expense of the unskilled ones (Manning, 2004). However, the occupations which appeared to suffer the most from this transition were the middle-skilled ones, whereas the least-skilled workers benefited from rising job opportunities. Therefore, the expected linear relation between the skills level and employability has been undermined since it turns out to be unable to justify the increasingly U-shaped trend of the employment distribution. The scholars Autor, Levy and Murnane in 2003 proposed a new hypothesis for interpreting this phenomenon, named the “routine-biased technical change” (RBTC), which relies on the operating mechanisms of computer technologies. These authors argue that the repetitiveness of tasks composing the middle-skilled occupations is the cause of their replaceability. As a matter of fact, the ICT result particularly capable in performing repetitive actions, while failing in reproducing non codifiable activities.

Giving the depth and speed of this technological revolution, its effects on the societal structure are expected to be remarkable. In this regard, some scholars argue that the decline of routine occupations would be associated with the hollowing out of the middle class (Kurer and Palier, 2019).

Several studies have been arguing for the shrinkage of the intermediate class following a rapid process of wealth polarization (Atkinson, 2015; Vaughan-Whitehead et al., 2016; OECD, 2019). Nevertheless, most of those research rely on income distribution rather than on class analysis. Although the latter has experienced changing fortunes, the occupation-based class scheme elaborated by Daniel Oesch (2006) has taken hold in the scientific debate, reinvigorating this approach.

Furthermore, several authors argue that the welfare state plays a key role in this economic transition. In fact, the impact of automation and de-industrialization on the labor force could be partially reshaped by the framing influence of the welfare institutions. Specifically, the intervention of the welfare state is supposed to unfold along two dimensions. Firstly, welfare institutions are able to modify the occupational distribution produced by the market dynamics (Oesch and Rodrìguez-Menés, 2011). Moreover, social protection systems usually release compensation policies aimed at retraining or sheltering the workers during labor mobility (Manow et al., 2013).

However, the direction and the effectiveness of the welfare state's intervention on the labor market are deeply linked to the nature of the welfare regimes. Esping-Andersen (1990) has elaborated a classification of welfare states which is still widely employed. As a matter of fact, the distinguishing features of the political economy's institutional arrangements appear to have outlived the industrial society, hence affecting the responses and the adaptability of the social protection systems facing the service transition.

The aim of this work is to answer two main research questions. Firstly, I will empirically test whether and how technical change is affecting the middle class. Secondly, I will investigate how the different responses provided by the welfare states to the challenges posed by automation and de-industrialization differ.

In the first two chapters I will review the literature on the topics presented so far. Furthermore, in the third and fourth chapters I will carry out some descriptive analyses on the European class structure and the welfare policies. More specifically, in the first chapter I will summarize the main contributions to the study of automation and de-industrialization processes. Hence, I will present the RBTC hypothesis and the causes of service transitions. In the second chapter I will provide an overview of the class analysis and welfare studies. Most importantly, I will describe the class scheme chosen to perform the quantitative analysis in the following section, i.e. the Oesch's model (2006), together with the theoretical background used to frame the influence of welfare regimes on labor market.

In the third chapter, I will answer to the first research question, referring to the impact of technical change on the middle class. The analysis is composed by two distinct steps. I will first apply Oesch's class schemes to the datasets provided by the European Social Survey in order to outline the

class structure of some European countries. These nations will be divided into welfare clusters. Then, I will measure the automation risk characterizing each social class through the synthetic indicator called “Routine Task Index” (RTI), which evaluates the repetitiveness of tasks composing each occupation. In accordance with the RBTC literature, I put forward the hypothesis that the typical middle-class occupations are less resilient to automation due to routinarity of their composing tasks, whereas both the most and the least educated social classes are expected to perform less repetitive tasks, hence less replaceable.

In the last chapter I will answer the second research question, regarding the different responses provided by the welfare institutions to face the economic transition presented above. Namely, I will check whether and how welfare policies can soften job polarization and compensate workers for job loss, particularly focusing on the different strategies put in place by the welfare regimes. This investigation will rely on the macro data collected by the OECD. I put forward the hypothesis that the encompassing and flexible Scandinavian welfare state is the best equipped to shelter workers from the automation risk, whereas the Conservative welfare cluster might be expected to be the most hostile to the rising service occupations and not particularly capable to face the surging “new social risks”. The Mediterranean cluster instead would be hit hardest by the spread of ICT, because of its workerist and familistic welfare state. Finally, the Liberal group is supposed to guarantee a minimal protection, which does neither hamper job polarization nor provide compensation for the replaced workers.

As regards the first research question, I find that the skills level counts more than the RBTC scholars argue. Although the middle-class occupations are confirmed to be the most prone to automation, the least skilled service workers also show a significant replacement risk. With regard to the second question, the Scandinavian countries appear the most committed in sheltering routine workers from the risks triggered by automation and de-industrialization. Indeed, their welfare regime is characterized by flexible and encompassing labor market institutions, a wide training system, generous measures of income support, and provisions aimed at reconciling working and care time. On the contrary, the Mediterranean welfare state seems less protective for routine workers, particularly lacking in terms of training, family-friendly policies and measures aimed at tackling poverty. The Conservative cluster instead appears to have been abandoning its workerist organization, despite not being able to prevent the rise of a secondary labor market enjoying worse economic conditions. Finally, the Liberal regime presents a homogenous and minimal protection, which does not alter the occupational distribution produced by the market.

CHAPTER I

Routine-biased technical change and de-industrialization.

1.1. Technological change and the "routine-biased" model.

The word "revolution" is usually employed to identify a path-breaking event. The human history is plenty of revolutionary examples, which were triggered by different causes: economic crisis, insufferable inequalities, wars, intolerance. Undoubtedly, one of the most powerful injectors of radical change is represented by new technologies. The first unprecedented shift in human life happened 10.000 years ago, thanks to the agrarian revolution, that enabled stable settlements and more generous livelihood. From the second half of the 19th century there has been a series of industrial revolutions, moving the burden of production from muscular strength to machines. The first one took place between 1760 and 1840, starting in Great Britain, it was mainly characterized by the invention of steam engine and the construction of railroads. The second revolution had covered the period between the late 19th century up to beginning of the 1900s, it spread mass production exploiting electricity and the Taylorist assembly line. Finally, a new technical breakthrough occurred in 1960s, involving the development of semiconductors and mainframe computing, followed by personal computing and the Internet in the next decades. More precisely, its prodrome stage occurred around 1945, when the transition from mechanical calculator to modern computers started (Nordhaus, 2007). However, some scholars argue that a fourth and distinct industrial revolution has started at the turn of the 21st century, marked by more sophisticated and integrated digital technologies. Klaus Schwab, founder and executive chairman of the World Economic Forum, in its work "The Fourth Industrial Revolution" (2016) lists three reasons supporting the distinctiveness of the last breakthrough: exponential velocity, breadth and depth, systems impact of change. The combination of these elements makes these technologies very transformative of societies and economy.

What concerns people the most is the impact of these technologies on the labor market. The debate around the future of work has been polarized between "tech-optimists" and "tech-pessimists". The former predict great opportunities of business and the satisfaction of rising expectations, whereas the latter look more doubtful. Indeed, the new technologies are accompanied by a work paradigm based on "a series of transactions between a worker and a company" (Schwab, 2016), that alters the durable standard employment relationship. Being more accurate, the so-called "human cloud" model seems to be characterized by the lack of that kind of "security", which Zygmunt Bauman (1999, p. 17) defines as "whatever has been won and gained will stay in our possession; whatever has been achieved will retain its value as the source of pride or respect". Moreover, the emerging "new social

risks" (i.e. precariousness, obsolescence of skills, etc.), usually chronical and more heterogenous than the traditional ones (Ferrera, 2019), worsen the perception of unpredictability.

However, the main concern regards the eventual loss of jobs due to automation. This fear mirrors that previously experienced by the workers who first foresaw the risk to be replaced by machines. A paradigmatic example is represented by the Luddite movement burst at the beginning of the 19th century, led by the English textile artisans destroying the machines that were automating their occupation. More recently, on February 24th, 1961, the *Time* magazine alarmed about of "The Automation Jobless", i.e. the possibility that the economy may have not been able to create sufficient new jobs supplanting those lost. At the same time, the "Blue-Ribbon National Commission on Technology, Automation and Economic Progress" appointed by the U.S. President Lyndon B. Johnson, while underestimating the impact of automation, recommended some crucial social policies to face the job loss (e.g. minimum income, improving free education, etc.).

Regardless of the punctual estimates on employment contraction, what seems to increasingly matter is skills. As Erik Brynjolfsson and Andrew McAfee (2014, p. 14) argued in *The Second Machine Age*:

> "there's never been a better time to be a worker with special skills or the right education, because these people can use technology to create and capture value. However, there's never been a worse time to be a worker with only 'ordinary' skills and abilities to offer, because computers, robots, and other digital technologies are acquiring these skills and abilities at an extraordinary rate."

Nonetheless, the relation between skills and automation is not as intuitive as it may appear. Scholars have been debating on this topic since the 1990s and complex models have been elaborated. Certainly, this transition appears more challenging than the previous one. In fact, the Fordist model has been able to produce a significant number of well-paid jobs covering the entire range of skills (Wren, 2013). On the contrary, the kinds of competences required on the labor market become increasingly demanding, leaving millions of people out. The prediction of the duration and hardness of this transition is what tears optimists and pessimists apart (Kurer and Palier, 2019), i.e. when the "capitalization effect" will overcome the "destruction effect" (Schwab, 2016).

1.1.1. Two models compared: skill and routine-biased technical change.

As noted above, skills are increasingly determinant for the equilibrium of the labor market. Particularly, after the wide spread of education following the Second World War, basic cognitive skills have gained more importance in determining the distribution of wage (Murnane et al., 1995). In this regard, Autor et al. (1998) argued that the growth of relative demand for more-skilled workers had shown a greater acceleration between 1970 and 1996 than in the previous three decades (1940-

1970). The authors suggested that the advent of computers could "account for" almost one-third of the skill upgrading which had marked the U.S. manufacturing sector between 1970s and 1980s. Giving a small taste of the historical context of the late 1990s, even in the political debate this framework became popular, as the rising "Third Way" shifted the focus of social policy on training, punishing the passive behavior (Arndt, 2013). The so-called "activation paradigm" (Ferrera, 2019), intended to strengthen the supply of skilled labor, may be summarized in the mantra of the former British Prime Minister Tony Blair: "education, education, education" (Manning, 2004).

The theoretical model aimed at interpreting the impact of new technologies on the labor market, elaborated in the 1990s, was named "skill-biased technical change" (SBTC). Its core idea is that technology rises the demand for skilled workers at the expense of the unskilled ones (Manning, 2004). Consequently, the SBTC scholars were expected to note an upgrading curve of employment, whose upward trend follows the distribution of skills. Graphically, the Figure 1 shows the rise in the relative employment and wages of skilled workers, suggesting an improvement of the equilibrium between the demand and supply curves.

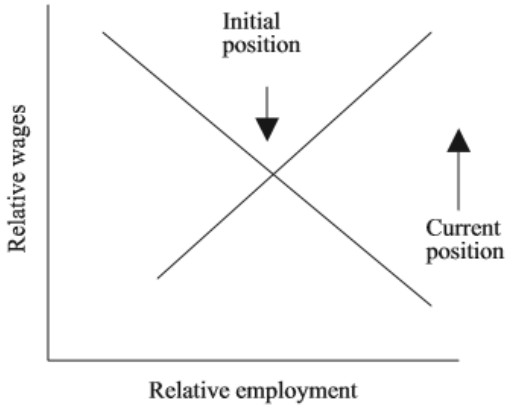


Figure 1: Representation of the evidence for SBTC (taken from Manning, 2004, p. 584).

The SBTC concepts may be operationalized through the so-called "canonical production function", which considers the roles of labor and capital (machinery) as distinct (Autor, 2013). Technology is defined as a "factor-augmenting" variable, hence complementing workers regardless of their skills' level (Acemoglu and Autor, 2010). Moreover, this economic model treats technology as an exogenous process, which is not affected by the economic environment (Van Reenen, 2011).

However, the SBTC approach failed to represent the changes of the employment distribution. Notably, it was not able to detect the fall of jobs that lie in the middle of the skill distribution. A more robust and reliable framework was elaborated by Autor, Levy and Murnane (2003) in the seminal paper *The Skill Content of Recent Technological Change: An Empirical Exploration*, named the "routine-biased technical change" (RBTC). These authors argued that technology does not

complement all the occupations. On the contrary, it works as a substitute for those jobs involving "limited and well-defined set of cognitive and manual activities, those that can be accomplished by following explicit rules", i.e. routine tasks. Meanwhile, computers can complement workers in "problem-solving and complex communication activities", which are certainly nonroutine.

Before moving forward, a preliminary distinction has to be set out between task and skill. The first one refers to a "unit of work activity that produces output", whereas the latter defines a "worker's stock of capabilities for performing various tasks" (Autor, 2013). One of the most relevant mistakes of the "canonical model" is the equation between the inputs and the services that they produce. Moreover, the static assignment of tasks to labor and capital blurs the distinctiveness of each input and their interactions. Finally, the exogeneity of technology does not account for the variation of skill bias over time and across countries (Acemoglu and Autor, 2010). For instance, China has experienced a significant technical breakthrough, modifying the skill demand, only after its inclusion in the World Trade Organization (Van Reenen, 2011).

Returning to the RBTC, what determines the relation between labor and technology (capital) is the degree of routine that characterizes the workers' activities. Particularly, the tasks that have proven to be easier to automate are those that follow codifiable procedures, whereas the ones that require creativity and adaptability seem more resilient. Referring to the latter, Autor et al. (2003) distinguish two sets of tasks: the first category includes activities requiring problem-solving capabilities and intuition, named "abstract" tasks, which characterize professional and managerial occupations; the second group involves in-person interactions and situational adaptability, named "manual" tasks, that are proper of several not highly skilled jobs (cleaning, serving, janitorial jobs, etc.).

The reason for the different endurance among tasks lies in computer science. As a matter of fact, before a computer becomes able to reproduce a certain task, a programmer has to fully understand the sequence of steps needed to execute that activity. Then, he must write down the program which enables the machine to accurately simulate the task (Autor, 2014). Thus, if the activity to perform involves a series of changeable steps, the programmer will not be able to code them. Overall, this process is effectively summarized in the so-called "Polanyi's paradox", named after the renowned economist, philosopher, and chemist who noted in 1966: "We know more than we can tell". This kind of tasks is understood only tacitly by the performer, even if he can easily accomplish it (Autor, 2015). It should be noted that the principle of computer simulation of working activities has not radically changed since the beginning of the computer era. What has changed the most is its cost. Indeed, the real cost of executing a standardized sequence of calculations, which is a reliable estimate of the computer powers, has starkly decreased by 1,7 trillion-fold since the 1980s (Nordhaus, 2007).

The affordability of these technologies is the main cause of their large dissemination. Recent data show that the stock of robots per million hours worked has risen by 150% in the last two decades (Dekker et al. 2017).

However, new technologies are challenging the "Polanyi's paradox". Until recently, the capability of computers to simulate a task has been limited to deductive instructions. But the Artificial Intelligence technologies (AI), such as machine learning, would allow computers to model tasks whose part of the information processing is unconscious (Levy, 2018). Indeed, this technology employs statistics and inductive reasoning to supplant the lack of deductive instructions (Autor, 2015). Thus, a "well-trained" computer would be able to replace even nonroutine workers. Another engineering method that would foster the power of computers is environmental control, that enables machines to work autonomously through simplifying their working environment. Nevertheless, in the near future AI is likely to remain confined to structured tasks' simulation, due to its embryonic stage development (Levy, 2018). Moreover, machine learning will only execute orders "on average", losing many important exceptions, and the lack of "purposiveness" makes autonomous work of computers impossible (Autor, 2015).

Finally, the hunches of Acemoglu and Restrepo (2018) need to be mentioned in order to have a comprehensive theoretical overview of the technological impact on labor market. These authors argue that the relation between employment and automation expansion is not always negative, outlining three countervailing forces alongside the displacement effect. Firstly, the productivity effect causes the reduction of the cost of certain tasks, which in turn makes households richer. Secondly, the accumulation of capital leads to the rise of labor demand, whereas the third force, which refers to the deepening of automation, would expand the set of tasks prone to be replaced by machines. Nevertheless, the force that most powerfully counterbalances the negative implication of technical change is the reinstatement effect, which entails the creation of new labor-intensive tasks. In fact, in times of growing automation, new jobs and industries use to appear, as the emergence of new factories in the early 20th century U.S. proves, coinciding with the mechanization of agriculture. The AI might be the new engine of this creation, although market incentives are essential.

1.1.2. Employment polarization and wage upgrading.

Bearing in mind the relation between technology and labor, a more detailed impact on occupations can be outlined. On one hand, a simultaneous growth of highly skilled and well-paid jobs, together with low-education and low-wage ones, has been detected. This increase seems to be developed at the expense of the middle-skilled and middle-wage occupations (Autor, 2015). This phenomenon is called "job polarization" and it is opposed to the upgrading pathway presented by the

SBTC scholars. The reason behind the U-shaped trend of the employment curve lies in the high concentration of routine-task occupations in the middle of the skill distribution. The degree of routine characterizing each occupation can be measured by the "Routine Task Index" (RTI), which is composed by three dimensions: "two referring to the degree of manual and cognitive task routinarity, the other to the degree of 'non-routinarity'" (Guarascio et al., 2018, p. 8).

$$RTI_{k,t} = RC_{k,t} + RM_{k,t} - (NRCA_{k,t} + NRCI_{k,t} + NRM_{k,t} + NRMIA_{k,t})$$ [1]

The table below reports all the descriptors used to calculate the RTI.

Routine cognitive (RC)
Importance of repeating the same tasks
Importance of being exact or accurate
Structured v. Unstructured work (reverse)
Routine manual (RM)
Pace determined by speed of equipment
Controlling machines and processes
Spend time making repetitive motions
Non-routine cognitive: Analytical (NRCA)
Analyzing data/information
Thinking creatively
Interpreting information for others
Non-routine cognitive: Interpersonal (NRCI)
Establishing and maintaining personal relationships
Guiding, directing and motivating subordinates
Coaching/developing others
Non-routine manual (NRM)
Operating vehicles, mechanized devices, or equipment
Spend time using hands to handle, control or feel objects, tools or controls
Manual dexterity
Spatial orientation
Non-routine manual: interpersonal adaptability (NRMIA)
Social Perceptiveness

Figure 2: The descriptors of RTI (taken from Guarascio et al., 2018, p. 9).

The formula below, elaborated by Autor and Dorn (2013), measures the routine task-intensity RTI by occupation, assuming that workers can perform either routine, abstract, or manual tasks. Each dimension respectively represents "the routine, manual, and abstract task inputs in each occupation k in 1980" (Autor and Dorn, 2013, p. 1570). This measure is expected to rise in correspondence of

[1] "Where for each 5-digit occupation k (k = 1,…,811) and ICP wave t (t=2007, 2012) the RTI index is computed as the sum of the standardized values of the Routine Cognitive (RC) indicator […]; Routine Manual (RM) indicator […] minus the Non Routine Cognitive Analytical (NRCA) […]; Nonroutine Cognitive Interpersonal (NRCI) […]; Non Routine Manual (NRM) […]; Non Routine Manual Interpersonal Adaptability (NRMIA)" (Guarascio et al., 2018, p. 8).

routine tasks and decline when it comes to the non-routine ones. Moreover, Figure 3 plots the share of routine occupations by skill percentile, showing the high "routine density" standing in the middle.

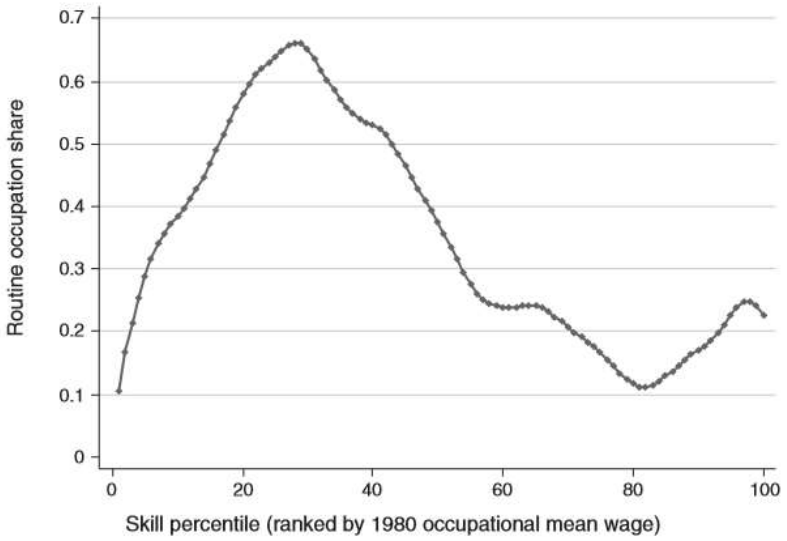


Figure 3: Share of Routine Occupations by Occupational Skill Percentile (taken from Autor and Dorn, 2013, p. 1572).

Source: Census Integrated Public Use Micro Samples.

$$RTI_k = \ln(T^R_{k,1980}) - \ln(T^M_{k,1980}) - \ln(T^A_{k,1980})$$

Moving on to a detailed analysis of the technological impact on occupations, we can divide them into three groups according to their skill level (Autor, 2015). On the right-end side of the distribution are the high-skilled occupations, which include managerial, professional, and technical jobs. On the opposite side are the low-skilled occupations, mainly referring to service jobs. These two categories are those who have benefited from automation, showing an increase in terms of employment. On the contrary, the remaining occupations are middle-skilled, comprising clerks, production workers, craftsmen, and sales. This group of occupations has experienced a steep fall in terms of employed people, especially in the last decade. More precisely, Frank Levy (2018) reports that the American employees in this category dropped from 39,2% in 2000 to 33,3% in 2016. Figure 4 resumes this information in a histogram, which illustrates the change in the US employment by major occupational category, as outlined above, between 1979 and 2012.

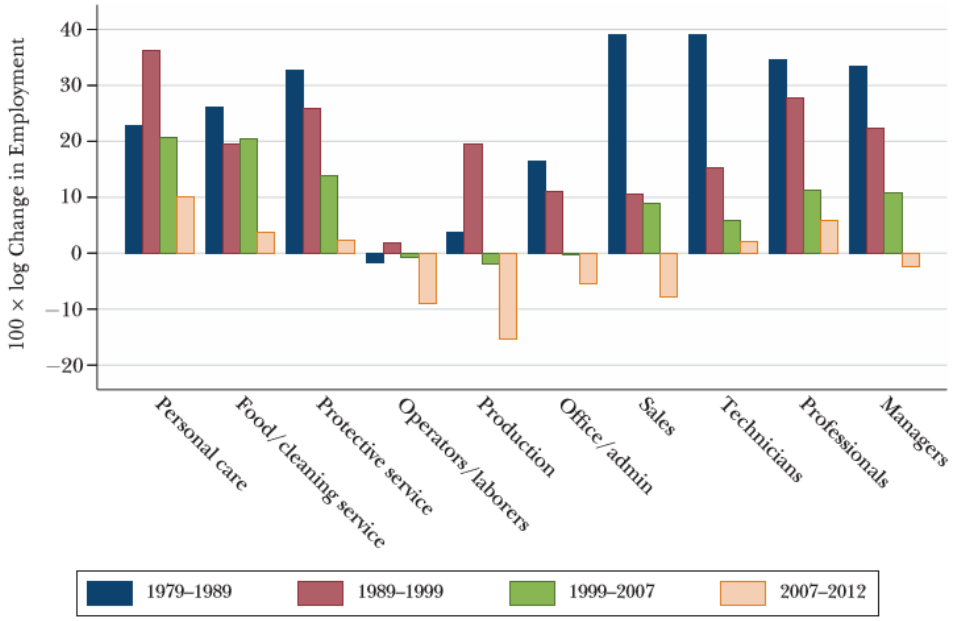


Figure 4: Change in Employment by Major Occupational Category, 1979–2012 (the y-axis plots 100 times log changes in employment, which is nearly equivalent to percentage points for small changes). Taken from Autor, 2015, p. 13.

Notes: "Author using data from the 1980, 1990, and 2000 Census IPUMS files, American Community Survey combined file 2006–2008, and American Community Survey 2012. The sample includes the working-age (16–64) civilian noninstitutionalized population. Employment is measured as full-time equivalent workers" (Autor, 2015).

Once the employment polarization is established, one may wonder whether the same trend characterizes the wage dynamics. In order to have a complete understanding of the interactions between technology and wage, three intervening variables need to be introduced. They may produce a mitigating or an augmenting effect on the wage gains (Autor, 2014). Firstly, workers that will benefit from automation are those whose tasks are complemented by machines, whereas the activities which can be substituted by technology will negatively affect the workers' wage. For example, a construction worker who is not able to drive an excavator is more likely to suffer from automation. Secondly, the changes in labor supply can greatly impact on the wage gains. If the market can easily provide the nonroutine tasks performed by a construction worker, the entrance of new workers may mitigate his/her wage gains. Finally, the combination of output elasticity and income elasticity of demand may either foster or temper the return from automation. In fact, if the productivity of the construction sector outstrips demand, perhaps together with a decline in the share of income spent for those services, the value of construction will fall.

These factors differently affect the two major occupational categories which, as seen before, show an upward employment trend. The abstract occupations benefit from a strong complementarity with technology, elastic output's demand, and inelastic labor supply. Thus, the ICT are likely to increase the earnings in these occupations. On the contrary, the manual task-occupations suffer from a weak complementarity with technology, an inelastic demand for services provided, and an elastic

labor supply. The combination of these elements reduces the wage gains. Therefore, the U-shaped trend of employment is not mirrored in the wage distribution. Conversely, the latter is best represented by an upward curve. As Figure 5 shows, its evolution plots a constant rise of the high-skilled earnings, whereas the growth of middle-skilled wages has decelerated. The gains of low-skilled jobs instead had grown more rapid than those of the routine ones until the 2000s, when a contraction may have been caused by the inflow of middle-skilled workers in the manual task-intensive occupations (Autor, 2015).

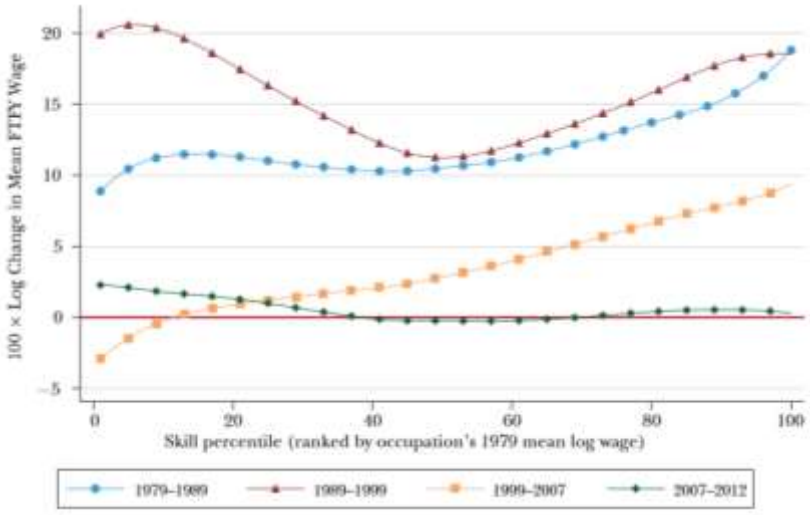


Figure 5: Changes in Mean Wages by Occupational Skill Percentile among Full-Time, Full-Year (FTFY) Workers, 1979–2012 (the y-axis plots 100 times log changes in employment, which is nearly equivalent to percentage points for small changes). Taken from Autor, 2015, p. 18.

Notes: "Author calculated using 1980, 1990, and 2000 Census IPUMS files; American Community Survey combined file 2006–2008, American Community Survey 2012" (Autor, 2015).

All in all, it is reasonable to expect that a relevant number of middle-skilled occupations will continue to exist in the medium term, since many of their tasks cannot be easily automated without a sensible decrease in quality (Autor, 2015). The economic adjustment following a path-breaking technical change may turn out to be very painful due to labor replacement and other side effects that goes along with it. For instance, a temporary mismatch between skills and technology may occur, slowing down the adjustment process (Acemoglu and Restrepo, 2018). Moreover, the automation might grow faster than socially desirable, suddenly reducing employment share and wasting resources. Thus, policymakers should be focused on managing this transition, by investing in human capital (i.e. education and training systems), in order to support middle-skilled workers facing the contamination of their tasks with technology (Autor, 2015).

1.1.3. Critics and job polarization in Europe.

Most of the papers and data mentioned above are geographically limited, focusing on the American and British labor markets. However, all the European countries are considered as advanced

market economies, included in the institutional brand of the "EU social model". Hence, they might be supposed to show a common occupational trend, shaped in accordance with the RBTC, that goes along with a consolidated process of economic convergence. On the contrary, the scholars Fernandez-Macìas and Hurley (2016) in their paper *Routine-biased technical change and job polarization in Europe* contest this argument asserting that the employment distribution of the European countries best fits the SBTC prediction, showing a general upward trend between 1995 and 2007. Indeed, the authors claim that the skill-biased approach is more in line with the theories of post-industrial society than the RBTC.

Their critique is directed against both the theoretical and the empirical findings of the routine-biased model. Firstly, they undermine the epistemological validity of the routine concept, since it might also complement "abstract" tasks, and it is considered too subjective. Thus, a new operationalization is required. The authors construct three indexes, two of which directly linked to the RBTC hypothesis: the routine index, the cognitive index, and the social interaction tasks' index. They find that routine tasks (slightly different assessed from the RTI) are not concentrated in the middle-skilled occupations rather at the bottom of the distribution. Moreover, they demonstrate that the social interaction index, presumably more resilient to automation, is positively correlated with education, wage and cognitive tasks, although the correlations steeply decrease for jobs with very high levels of social interaction. Hence, this index is largely unrelated with the skill distribution.

Drawing on these findings, Fernandez-Macìas and Hurley affirm that the skill and routine-biased models cannot be differentiated by their occupational outcomes, that instead converge on an upgrading trend. As regards Europe, despite the authors have found three cases of clear job polarization (e.g. Germany, France and the Netherlands), they ascribe this phenomenon to other unpredictable and national (economic and institutional) factors. Therefore, they conclude that different national patterns dissuade from the research of a universal determinant, orienting the investigation towards complex factors' interactions.

Nevertheless, other researchers have found evidence of job polarization in Europe. The authors Goos, Manning and Salomons (2009, 2016) have repeatedly argued in favor of this pattern, revealed both between and within industries. However, diverging trends are detected for low-skilled occupations, which are related to the wage distribution. Notably, the share of employment for those workers is weaker in countries with a constrained wage variation (Goos et al., 2009). Similarly, Oesch and Rodrìguez-Menés (2011) find a clear linkage between employment polarization and more flexible labor market institutions. As a matter of fact, a clear RBTC pattern has only been noted in Britain and Spain between the late 1990s and 2008, which have shown a significant increase of low-paid jobs. Moreover, they find that the growth of the unskilled occupations depends on the rise of interpersonal

services, which seem to be supported by an increasing inflow of migrants. These observations are line with the research of Cirillo and Guarascio (2015), which unveiled a polarization in Europe between the "German-centered core" and "Southern periphery" in terms of employment trend after the last economic crisis. The former has combined a strong protection for manufacturing sector and a growth of high-skilled occupations, whereas the latter shows an increase in construction and market services together with a downgrading occupational structure. Finally, a clearer trend towards job polarization is found by Camille Peugny (2019), who divides the European countries into three groups. The first set includes France, Sweden and Austria, and it easily fits the RBTC pattern, showing an overall decline of middle-skilled occupations. Slightly different, the second group, including Spain, Italy, Greece and Germany, restrains the erosion to industrial employees, shielding clerks. Lastly, Finland, Denmark, Portugal, the UK and the Netherlands maintain the same share of low-skilled workers, together with a drop in middle-skilled jobs, while the most educated occupations show a limited rise. Thus, these countries appear to be characterized by a more moderate type of polarization. This author, like those previously mentioned, charges public policies for the variation in responses to automation impact.

To sum up, two important conclusions can be drawn. Firstly, the framing influence of labor market institutions is proven. In order to strengthen the routinization hypothesis, it needs to be lowered into the multifaced world of labor relations, that may involve more rigid wage-setting institutions than the Anglo-Saxon ones, according to which the RBTC was tailored (Oesch and Rodrìguez-Menés, 2011). Finally, a relevant link has been found between service transition and job polarization. In fact, Autor (2015) demonstrates that most of the manual nonroutine occupations which seem to have benefited from the advent of ICT are composed by interpersonal service jobs (e.g. personal care, food and cleaning services). More specifically, the latter are supposed to form the lower tale of the U-shaped occupational distribution (Autor and Dorn, 2013). However, it should be pointed out that a remarkable rise has been characterizing the whole tertiary sector, including the most skilled occupations whose services has become more productive and tradable thanks to the digitalization of information and faster transports (Wren, 2013). All in all, the de-industrialization process cannot be separated from the ICT revolution since the latter represents the most important engine of service transition.

1.2. De-industrialization: the shift towards services.

Since the 1960s the idea of a new societal arrangement has emerged, usually referring to a "post-industrial society". The trigger of this transformation was supposed to lie in a combination of revolutions which involve technology, employment, consumption and management. Particularly, the

labor market would have seen the fall of "old-fashioned manual labor" relative to technical and managerial occupations, together with a rising consumers' interest for services (Esping-Andersen, 1990). It is noteworthy that all the post-industrial projections include the replacement of the factories by services as the driving force of employment growth.

A relevant change in the composition of the workforce has occurred with the rising female participation to the labor market. As regards the unprecedented expansion of demand for female labor, Iversen and Rosenbluth (in Wren, 2013) point out two main reasons. The first argument, more predictable, concerns the lower premium placed by service jobs on physical skills compared to agriculture or industry. The second reason refers to the degree of skill specificity required by service occupations, usually lower than the other sectors. Indeed, specific skills can only be acquired through on-the-job experience, which in turn requires continuity in the employment relation. However, women are more likely to show a discontinuous career due to pregnancy and child rearing, thus more prone to gain general competences.

As concerns the possible explanations of service expansion, Anne Wren (2013), in the book that she edited *The Political Economy of the Service Transition*, lists two "long-run" economic perspectives. The first theory is focused on changes within the consumers' demand. It is based on the well-known Engel's law, which outlines the decrease of income spent for agricultural products when income grows. The same process accounts for services, since the saturation of market with industrial goods entails the drop in income devoted to them relative to services, perceived as luxury items.

The second perspective was elaborated by William Baumol (1967) in his paper *Macroeconomics of Unbalanced Growth: The Anatomy of Urban Crisis*. He analyses the features of the service supply, condemning this sector to low productivity, given that a reduced time devoted to each interaction triggers a decrease in the quality of the service provided. The author takes the example of a teacher, whose class size cannot be expanded over a certain number of students otherwise the lesson itself would be unfeasible. Moreover, assuming that wages across sectors are bonded, the author states that the price of service outputs is expected to rise. Indeed, if the increase of industrial salaries is counterbalanced by a relatively high rate of productivity growth, the same effect cannot be detected in the service sector. The reason lies in the limited productivity of services demonstrated with the teacher's example, hence forcing the rise of prices to counterbalance the growth of service salaries. This effect reassumes the renowned "cost disease". Therefore, according to Baumol the "service-sector labor will tend to out-price itself" (Esping-Andersen, 1990, p. 193), constraining its expansion and the overall rate of output growth.

A first critique addressed to the Baumol's model refers to the concept of productivity itself. In fact, our contemporary understanding of the productive system does not involve non-material

outputs, leaving most of the workforce without an adequate measure of productivity (Esping-Andersen, 1993). This argument may lead to reconsider the notion of household from which the welfare has subtracted servile functions, creating a new employment sector. However, it is not the intent of this work. Moreover, it should be noted that the remarkable expansion of the service sector in the four decades, which lies at the foundation of the RBTC hypothesis, results incompatible with the Baumol's argument. Indeed, it would be hard to justify the growth of the interpersonal service branch without an increase of productivity, considering that it comprises well-remunerated occupations too (Oesch, 2006).

Nevertheless, Anne Wren (2013) asserts that both the demand and supply side perspectives ignore the impact of national institutional configurations on service transition. As a matter of fact, this process is not uniform across countries, as many authors cited in the previous paragraph already argued (Oesch and Rodrìguez-Menés, 2011; Cirillo and Guarascio, 2015; Peugny, 2019). In this regard, in the popular paper *Equality, Employment, and Budgetary Restraint: The Trilemma of the Service Economy* Iversen and Wren (1998) restrain the array of possible outcomes for service economy to three sets of policy trade-offs. Governments are forced to choose two out of three options to implement between employment creation, equality and budgetary restraint. The three different combinations of choices account for the welfare ideal-types designed by Esping-Andersen (1990), as shown in Figure 6.

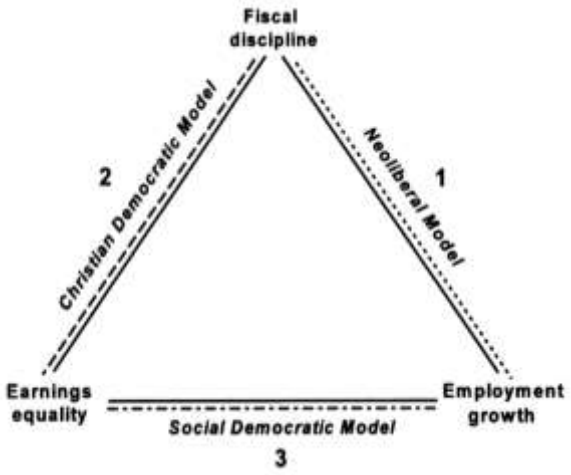


Figure 6: The Trilemma of Service Economy (taken from Iversen and Wren, 1998, p. 514).

Thus, if a policymaker wants to preserve a balanced budget must face a trade-off between the expansion of employment in services and intersectoral wage inequality. This argument reverses the pattern proposed by Rehn and Meidner at the *Landsorganisationen* (LO) congress in 1951, the biggest Swedish trade union, and implemented in Sweden between the 1950s and 1970s (Magnusson, 2000). This model was based on growing productivity and wages, which characterized the "golden age", and a deep-rooted collective bargaining system. A high minimum wage valid for all workers of the same

branch, fixed by social partners, forced the less productive businesses either to innovate or to fail. As a consequence, resources shifted towards dynamic sectors, reaching all the goals of the "trilemma". The combination of a sustained rate of employment growth, stable prices and equal wages challenged the Philips curve, which set a negative relation between employment and inflation. However, de-industrialization entailed a fall in price and income elasticities of demand, breaking this virtuous cycle.

1.2.1. ICT revolution and labor mobility: polarization in the service sector.

A path-breaking event in the history of service productivity is represented by the ICT revolution. The knowledge-intensive service sectors are those which have benefited the most (e.g. business, financial, telecommunication, services, etc.), whereas this effect has been less marked for those services requiring direct contact with customers (e.g. food, public administration, social services, etc.). But most important, the combination of technical change and liberalization of foreign direct investment (FDI) fostered an almost uninterrupted expansion in service trade started in the mid-1980s (Figure 7).

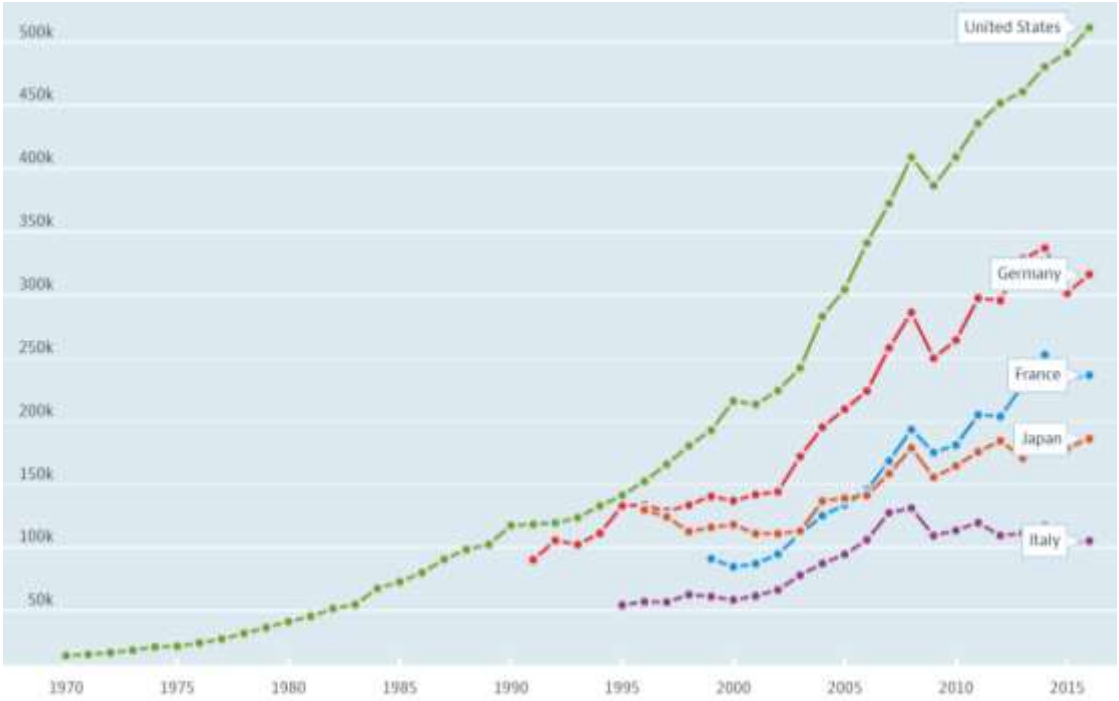


Figure 7: Trade in services (Net trade), Million US dollars, 1970 – 2016.

Source: OECD data.

Anne Wren (2013) argues that a significant variation has been characterizing the service jobs during their expansion, according to the skill levels of the workers. She separates the traditional sectors (e.g. agriculture, mining and manufacturing) from the service occupations, which in turn are divided into three categories: dynamic, non-dynamic and welfare services. The first category is the

most ICT intensive and shows an increasing growth in productivity and trade, including business, financial, transport and communication services. The second group does not involve a wide usage of new technologies and their activities are not suited for trade and intensive production, requiring interpersonal contact. These sectors comprise hotel and restaurant businesses, wholesale and retail commerce, personal and social services. Finally, the welfare branch (e.g. public administration, education, health and social work) shows a similar relational prerequisite to the non-dynamic sectors, together with public regulation, hence less prone to marketability.

The author displays a double shift within these sectors, whose direction depends on the skills acquired by the workers. The most skilled employees have been leaving the welfare services, joining the dynamic and traded sectors, whereas the least educated have been shifting from traditional occupations to non-tradable services. However, some countries show different patterns due to the shaping influence of their institutional configurations. For instance, Germany and the Nordics seem more able to retain workers, respectively, in manufacturing and welfare sectors. Overall, service occupations seem to polarize on the skill continuum. Valeria Cirillo (2018) confirms this hypothesis, outlining a divergent path between manufacturing industries and services in Europe. The industrial sector has shown a polarized trend in employment until 2009, whereas after the outbreak of the economic crisis a steep reduction of manual workers has accounted for job cuts at the bottom of the skill distribution and displacement of laborers towards services. Meanwhile, the fall of middle-skilled service jobs (e.g. clerks and skilled blue-collar workers) has produced a U-shaped employment pattern in the tertiary sector. This analysis accurately mirrors the prediction of RBTC, indeed Autor and Dorn (2013, p. 1559) argue that the "low-skill labor flows accordingly from goods to services, while high-skill labor remains in goods production, leading to employment polarization".

Microdata give a further validation of this framework. Groes, Kircher and Manovskii (2008), using Danish administrative data, detect a two-way mobility of workers at the extreme of the wage distribution, involving a fifth of the total workforce. They assert that low earners tend to switch to new jobs which are less remunerated than their former. On the contrary, those with high relative wages in their occupations are likely to move to better paid jobs. The authors ascribe occupational mobility to a combination of changes in the perceived ability, which seems to be revealed only through observations of labor performances, and comparative advantage. However, the polarized pattern is not detected for occupations with starkly rising or declining productivity. In fact, the scholars find that high productive occupations retain their high earners, while dismissing the low ones. Whereas in occupations with a steeply falling productivity goes the other way around.

Guido Matias Cortes (2016) develops a similar research, making a direct reference to the RBTC framework. He employs data from the Panel Study of Income Dynamics (PSID), that provide

information for individuals from nearly 9000 U.S. family between 1976 and 2007. He relies on the sorting mechanism elaborated by Gibbons et al. (2005), which attributes explanatory power to skill monetary returns, leaving little room for learning. Given that workers in routine occupations show a much worse wage premium than those performing nonroutine jobs, they are likely to switch to the latter. Indeed, the author finds that after 1990 the probability to switch to both cognitive and manual nonroutine occupations increases, especially towards the first. The direction of the shift is based on a selection on the worker's ability. The low-ability routine employees are more prone to shift towards nonroutine manual jobs, whereas the high-ability ones are more likely to switch to nonroutine cognitive occupations. Moreover, their wage gains show different patterns relative to those retaining their routine jobs. Workers switching to nonroutine manual occupations experience a lower wage growth than stayers (-14% over 2 years), recovering only in the medium-term (+5/12% over 10 years). Meanwhile, the employees opting for nonroutine cognitive jobs immediately show a comparative higher wage growth (+6/12% over 2 years). As regards economic sectors, Cortes argues that technical change fosters a short-term increase in nonroutine cognitive occupations in the manufacturing sector, which is followed by a growth in services demand due to the increased household income, pushing up the wages of manual jobs.

Furthermore, some research find that geography matters for employment polarization. As a matter of fact, David Autor (2019) demonstrates that population density is a key predictor of occupational change. The author outlines the migration of manufacturing U.S. factories from large cities to less dense areas, thanks to the improvement of transports. On the contrary, knowledge-intensive industries moved towards cities, where highly skilled workers are predominant. He argues that automation mainly affected non-college workers (Figure 8), who were evenly divided between middle-skill and low-skill jobs (respectively 43% and 42% of them in 1980), experiencing a downward shift towards the latter (absorbing up to 12,3% of those in the first category).

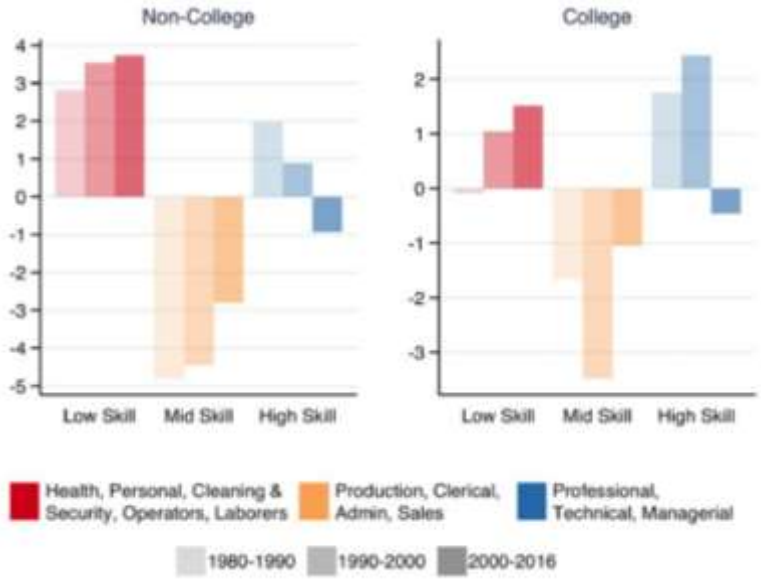


Figure 8: Changes in Occupational Employment Shares among Working Age Adults, 1970 – 2016 (taken from Autor, 2019, p. 10).
Source: March Current Population Survey Annual Social and Economic Supplement.

At the same time, the rise of highly skilled workers in urban areas fully compensates the fall of middle-skill ones. It is also noteworthy that polarization is not particularly concentrated among immigrants, having the same shape of the natives' pattern. Therefore, the shift of non-college workers from clerical and manufacturing occupations to low-paid jobs in non-tradable sectors (e.g. low-skill services, transportation and laborer occupations) is increasingly associated with the physical proximity to the more educated workers (Manning, 2004).

All in all, it can be asserted that the ICT revolution has fostered the expansion of the service sector, gathering the routine workers who moved away from manufacturing and clerical middle-skill occupations. The manufacturing sector has retained its more educated workers, while dismissing the others (Cirillo, 2018). Within services a polarization occurred between dynamic and non-dynamic branches, which have benefited differently from technology (Wren, 2013). Workers have been displaced in accordance with their skill levels, clustering low-skill employees in non-tradable and low-paid jobs, whereas the highly skilled have switched to dynamic and better remunerated service occupations.

1.2.2. The jobless recovery option.

In addition to job polarization, another process seems to affect the middle-skill occupations across all industries, namely jobless recovery. Jaimovich and Siu (2018) show that the loss of the routine occupations are concentrated in the economic crisis, particularly in the Great Recession. Although the downward trend in routine occupations began in 1967, proven by the growth of per-capita non-routine employment, it sharply accelerated in 1982, marking the onset of the polarization

era. According to the authors, nearly the entire loss of routine jobs has occurred during the last three recessions, bringing their share from 56% in 1982 to 42% in 2007 of the U.S. total employment. However, significant differences in terms of recovery have been found among occupations. While high- and low-skill jobs have demonstrated to recover after the crisis, the middle-skill occupations have disappeared (Figure 9, 10, 11). The scholars assert that the loss of routine jobs accounts for almost the entire occupational contraction during recessions: 89% in 1991, 91% in 2001 and 94% in 2009.

Figure 9: Non-routine cognitive workers (taken from Jaimovich and Siu, 2018, p. 10).

Figure 10: Non-routine manual workers (taken from Jaimovich and Siu, 2018, p. 10).

Figure 11: Routine workers (taken from Jaimovich and Siu, 2018, p. 10).
Source: Current Population Survey, Bureau of Labor Statistics.

In relation to this phenomenon, Cortes, Jaimovich and Siu (2017) argue that the disappearance of routine occupations can be partially ascribed to the changes in propensity of individuals with certain demographic features to accept those jobs. They lead back the fall in routine manual occupations to low skilled young and prime-aged men, who show both a change in willingness and a reduction of components, due to the ageing population and the increasing level of education. Meanwhile, the decline of routine cognitive occupations is mainly attributed to variation in employment propensity of young and prime-aged women with and intermediate educational attainment. The scholars find for these groups a rise in the propensity for non-employment (both in terms of unemployment and inactivity) and employment in nonroutine manual occupations. According to the authors, these changes account for almost one-third of the fall in routine occupations observed in the U.S. labor market over the past forty years. On the macro level, the changing propensity of these groups seems to explain the rising unemployment and the outplacement of workforce to low-paid occupations.

In sum, alongside with the polarization affecting services (Wren, 2013), where the risk of replacement for routine occupations is more significant (Guarascio et al., 2018), the jobless recovery hypothesis appears to contribute to the overall employment polarization. More specifically, this hypothesis could be considered as particularly useful since it helps lowering the RBTC in the reality of market dynamics, suggesting when the drop of routine occupations is more likely to be found. Over the past four decades, the people who have been performing middle-skill occupations have seen their expectations and social status threatened by automation. This process has first involved the manufacturing sector, then shifted to clerical occupations (Cirillo, 2018), both lying in the middle of the earnings-distribution. Therefore, a political reaction from this large group of workers should be expected, counting on a great capacity to voice their discontent (Kurer and Palier, 2019).

CHAPTER II

Class analysis and welfare regimes.

2.1. Employment polarization and class analysis

Behind job polarization, two main approaches can be found, both aimed at detecting the evolution of employment relations (Cirillo, 2018). The first approach focuses on the clear-cut divergence between insider and outsider workers in the labor market, whereas the second emphasizes the heterogeneity of technologies and skills required by different firms.

The so-called "dualization" framework claims that three developments have radically modified the "industrial equilibrium", namely tertiarization, feminization and upskilling of employment structure, fostering a marked division between standard and atypical workers in terms of labor stability and welfare protection. According to Häusermann and Schwander (2012), the insider-outsider categorization refers to clearly identifiable social groups, involving three kinds of divides. The first one concerns the labor market, showing structural disadvantages for atypical workers in terms of earnings and training. The second cleavage regards differences in terms of social protection, with standard workers usually benefiting from more generous welfare provisions. Finally, the political integration divides alienate the outsiders from the democratic process of decision making. However, these cleavages do not necessary lead to inequality, depending on the responses given by the institutional context (i.e. welfare policies). Moreover, Häusermann, Kurer and Schwander (2015) do not find a clear link between education and labor market vulnerability, showing that highly skilled workers appear to be exposed to employment risks too, as a consequence of the growth and heterogeneity of educated middle class in the post-war years (especially in the service sector).

On the other hand, the "segmentation" approach (Doeringer and Piore, 1971) heavily relies on skills. According to this theory, the labor market is mainly divided into two segments based on the dimension of firms and the skills required. A primary segment ("internal market") comprises large firms and high-skill jobs, whereas the secondary ("external market") involves small businesses and low-skill jobs (Berton et al., 2012). The workers in the first group are supposed to be shielded from "direct influences of competitive forces" and enjoy "rights and privileges" in terms of pricing and labor allocation (Doeringer and Piore, 1971, p. 9). The labor mobility is restricted to certain jobs, hence wage differential between those two segments is likely to rise. All in all, this theory appears to be more consistent with the RBTC framework than the "dualization" approach, since it founds employment polarization on skills, acknowledging the importance of technology.

Moreover, the increasing polarization in the labor market may reasonably suggest that economic inequality is rising. This issue has repeatedly hit the headlines worldwide, and in 2013 the

American *Globalpost* declared that "income inequality went mainstream"[2]. Empirical evidence is provided by *The Chartbook of Economic Inequality*, edited by Atkinson, Hasell, Morelli, and Roser (2017), which collected data from 25 countries covering more than one hundred years. The overall income inequality is measured in terms of Gini coefficient, that can be interpreted as expected difference between any two households taken randomly. Atkinson (2015) states that the history of income inequality cannot be outlined by general trends, rather as a series of "episodes" when inequality rise or falls. In the Western countries, data show a major decline of the Gini coefficient in the decades following the Second World War, more pronounced in the continental Europe (Figure 13). A rise in inequality instead is detected from the end of the 1970s, more marked in the Anglo-Saxon countries (Figure 12).

Figure 13: Overall income inequality 1945–2012 Continental Europe (taken from Atkinson, 2015, p. 215).
Source: The Chartbook of Income Inequality.

Figure 12: Overall income inequality 1945–2012 Anglo-Saxon countries (taken from Atkinson, 2015, p. 214).
Source: The Chartbook of Income Inequality.

In order to test whether RBTC is a valuable instrument to frame the rising inequality, an occupation-based analysis is needed since the "routine-biased" polarization is built on the latter. Relying on the Current Population Survey dataset, Weeden et al. (2007) measure the share of earnings inequality occurring between and within occupations. They find that the amount of inequality between occupations tend to increase, whereas the difference in earnings occurring within occupations is declining. Moreover, the scholars demonstrate that the inequality between classes, defined as aggregation of similar occupations, sharply increased in the 1980s and it continues to grow thereafter. Thus, the authors argue that the share of inequality "explained" by class differences has been increasing relative to the "individualized inequality" (Weeden et al., 2007, pp. 727 – 728). Therefore, a class analysis seems an effective means to investigate the societal implications of employment polarization.

[2] Moran, M. (2013), "2013: The year income inequality went mainstream", December 31st, 2013, Globalpost. Available at https://www.pri.org/stories/2013-12-31/2013-year-income-inequality-went-mainstream.

2.1.1. Birth, death and rebirth of class analysis.

The debate around the concept of social class has a long history, starting in the second half of the 19th century. The most renowned authors who first elaborated theoretical frameworks of class structure are certainly Marx and Weber. The theorist of scientific socialism, assuming the primacy of production, defines class as "any aggregate of persons who play the same part in the production mechanism" (Clark and Lipset, 1991, p. 398). He created a three-fold categorization based on the different relations with the means of production: capitalist (the means owners), workers (all the employees) and landowners (the survivors of feudalism). Differently, Max Weber argued that economic interests were only part of a larger group of "values", hence the sources of social hierarchy were multiple. According to the father of modern sociology, classes are composed by individuals sharing common life chances, "determined by their power to dispose of goods and skills for the sake of income" (Clark and Lipset, 1991, p. 398). Thus, in his view, market represents a fundamental pillar for social stratification.

Given the great influence of these authors on social sciences, it is worthy to use them as paradigms to categorize the class research of the last century. The Weberian approach is mainly based on "opportunity hoarding", namely the capability of incumbent workers to exclude the others from income advantages linked to their job position (Wright, 2009). This process of social closure triggers unequal locations of individuals within market relations, generating the social hierarchy. On the other hand, the Marxist approach is focused on the mechanisms of domination, i.e. "the ability to control the activities of others", and exploitation, i.e. "the acquisition of economic benefits from the labour of those who are dominated" (Wright, 2009, p. 107), which characterize the capitalist relations of production. It should be pointed out that the Marxist view hampers a neutral description of classes, implying a moral condemnation, which forces to interpret social relations as inherently adversarial (Oesch, 2006). Finally, a third approach relies on attributes (e.g. sex, age, religion, etc.) and material living conditions of individuals, identifying the term "class" through the interconnections between these two aspects (Wright, 2009).

However, in the early 1990s the class analysis was subjected to criticism from social scientists, proclaiming its demise. The "dealignment literature" claimed the decline of class politics, made evident by the weakening of class-based voting. Dalton (1996) argued that the traditional cleavages elaborated by Lipset and Rokkan (1967) had lost their explanatory power for electoral behavior. Moreover, the author suggested that post-materialist values were undermining the ideological bases of political conflict, together with the growth of issue-based volatile voting. In the recent book *Cultural Backlash*, Norris and Inglehart (2019) ascribe to the "Silent Revolution", fostered by the high levels of existential security in the last four decades, the shift from materialist to post-materialist

values across generations. Different causes for the decline of classes were listed, including the rise in wealth and education, the fragmentation of lifestyles, all aimed at explaining the end of class voting regardless of the persistence of socio-economic inequalities (Oesch, 2006).

A clear-cut death sentence for class was pronounced by Clark and Lipset (1991) in their influential paper *Are social classes dying?*, describing it as an "outmoded concept", incapable to grasp the increasingly intricate social stratification. According to the authors, new paths labelled as "fragmentation of stratification" were emerging, involving increased relevance of cultural factors relative to the economic ones, "de-familization" of social mobility, and fall of class-based politics. In addition, Esping-Andersen (1993) warns that the large majority of "silent" scholars can be more dangerous for the survival of class than the "active" skeptics, transforming this concepts in "little else than the button we press when it is suitable to invoke the colorful historical imagery of red banners waving on the May Day parades" (p. 7).

Although an unambiguous judgment on class voting has still not been released, several research have reaffirmed the epistemological validity of class analysis for social sciences (Esping-Andersen, 1990; Korpi and Palme, 2003). A reassessment of the empirical basis seems needed, especially for class-voting, in order to set a more refined and updated definition of class (Evans, 2000). The concept of class formation adopted by Jürgen Kocka (1980), one of the major figures of the "new social history", appears less rigid than the traditional approaches, hence more fruitful to interpret the changeable societal structure. He distinguishes between "economic class" and "social class", with the first referring to individuals sharing common economic position and latent interests, whereas the second includes people with a common social identity and organization. The historian portrays an ever-changing class structure without any automatic, irreversible, nor complete process linking the two concepts outlined above. Indeed, the always "competing economic structures, affiliations, loyalties and battle" (Kocka, 1980, p. 105) hamper a stable definition of class definition.

"Economic class" is a valuable notion that can be employed to describe more recent class studies. Indeed, most of the research of the last three decades relies, to different degrees, on minimal work hypothesis which defines class as a "proxy for similarity in the position within the occupational system" (Oesch, 2006, p. 13), very close to the Kocka's concept. Here, three modern examples of class schemes can be presented. The first example refers to the Marxist sociologist Erik Olin Wright, who founds his scheme on three axes: ownership of capital, authority within the employment relation and possession of skills and expertise (Wright, 2000). The intersection of these dimensions accounts for three productive relations: the capital-labor, the manager-worker, and the expert-nonexpert relation (Oesch, 2006). The complete Wright scheme counts twelve classes, which can be collapsed

into a six-fold model (Figure 14). The main criticism of Wright refers to the definition of working class that, resulting from a residual aggregate, embraces between 40% to 50% of the population. As a consequence, this "oversized" proletariat impedes a useful differentiation among those workers in terms of skills.

The second example is outlined by Pierre Bourdieu (1984) in his masterpiece *Distinction*. The renowned French sociologist draws his social classification on three different types of "capital", defined as "the set of actually usable resources and powers" (Bourdieu, 1984, p. 114). The varieties of capitals enable Bourdieu to build his argument linking the economic and cultural dimensions of social life. The kinds of capitals listed comprise: economic capital, such as the market power and material resources; cultural capital, defined not only as education, but including all the intangible assets needed to access to economic capital; social capital, meaning the net of social relations that a person can activate in case of need. Moreover, the social space is built on three axes: the "volume" of capital, its "composition" (prevailing concentration of economic or cultural aspect), and the trajectories followed by the incumbents in the social space (tracking the experience of individuals in volume and composition of capital). The main criticism concerns the conceptual intricacy of this model, which entails a difficult operationalization, appearing closer to an ethnographic analysis (Oesch, 2006).

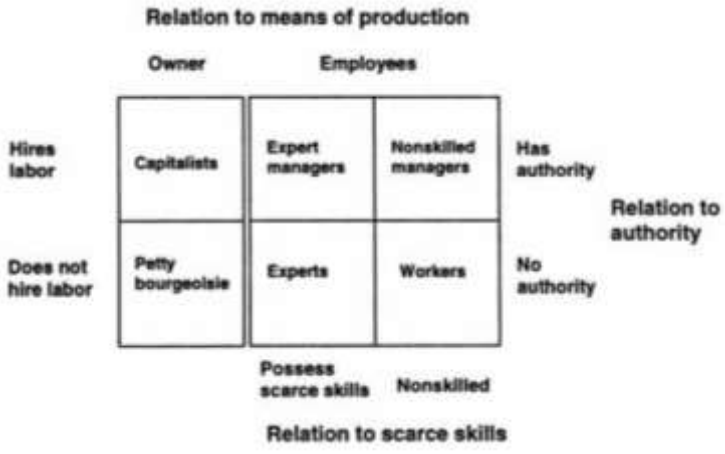


Figure 14: The Wright basic class schema.
Taken from Wright, 2000, p. 21.

Finally, the class scheme presented by Erikson and Goldthorpe (1993) is the one that most accurately mirrors the Kocka's "economic class", deriving class positions only from employment relations. The focus on market condition, avoiding any cultural or identity argument, places this model close to the Weberian approach (Oesch, 2006). Their classification is based on two dimensions: the first refers to employment status, separating employees, employers and self-employed workers, whereas the other, only applied to employees, distinguishes between two forms of regulation, i.e. service relationship and labor contract. Two factors are introduced in order to describe the differences between the employment relations, namely the problems of work monitoring and human capital specificity (Goldthorpe and McKnight, 2006). In a labor contract, where monitoring the work performance is easy, the remuneration directly refers to productivity, including low-level of trust and skills required. On the contrary, in the service relationship the specificity of certain skills is vital for

the organization, and contract relies on long-term and high-paid performances, which are hardly monitored. The outcome of the Goldthorpe's conceptualization consists of an 11-class scheme, possibly collapsed into a seven-fold model (Figure 15).

	Full 11-class version		*Collapsed 7-class version*	
Service relationship	I	Higher-grade professionals, administrators, and officials; managers in large industrial establishments; large proprietors	I+II	*Service class*: professionals, administrators and managers; higher-grade technicians; supervisors of non-manual work
	II	Lower-grade professionals, administrators, and officials; higher-grade technicians; managers in small industrial establishments; supervisors of non-manual employees		
Intermediate	IIIa	Higher-grade routine non-manual employees (administration and commerce)	III	*Routine non-manual workers*: routine non-manual employees in administration and commerce; sales personnel; other rank-and-file service workers
	IIIb	Lower-grade routine non-manual employees (sales and services)		
	IVa	Small proprietors, artisans, etc. with employees	IVa+b	*Petite bourgeoisie*: small proprietors and artisans, etc., with and without employees
	IVb	Small proprietors, artisans, etc. without employees		
	IVc	Farmers and smallholders; other self-employed workers in primary production	IVc	*Farmers*: farmers and smallholders; other self-employed workers in primary production
Labour contract	V	Lower-grade technicians; supervisors of manual workers	V+VI	*Skilled workers*: lower-grade technicians; supervisors of manual workers; skilled manual workers
	VI	Skilled manual workers		
	VIIa	Semi- and unskilled manual workers (not in agriculture)	VIIa	*Non-skilled workers*: semi- and unskilled manual workers
	VIIb	Agricultural and other workers in primary production	VIIb	*Agricultural labourers*

Figure 15: Goldthorpe's class scheme.
Taken from Oesch, 2006, p. 23.

According to Daniel Oesch (2006) the classification elaborated by Goldthorpe and Erikson turns out to be very useful, especially for its pragmatic scope, the differentiation within the working class and the uniqueness of hierarchical criterion (avoiding any prestige perspective). However, the Swiss scholar points out the lack of a skill-based horizontal distinction within the large group of middle-class workers. The author argues that the work role is better suited to explain this differentiation than economic assets. Hence, he adds three work logics: the "organizational work logic", characterized by a rigid chain of command and career sequence based on expertise; the "technical work logic", where job identity is linked to a scientific community or trade, and the tasks on the skill continuum range from technical to manual duties; the "face-to-face service logic", heavily relying on social skills, where care for clients or patients undermines the organizational hierarchy. Overall, the combination of employment statuses (employer, employee and self-employed), work logics and marketable skills produces a 17-class pattern, which can be collapsed into an 8-class version (Figure 16).

In conclusion of this brief overview of the class analysis development, it could be asserted that class still has a crucial epistemological value, at least in its minimal definition nested in the occupational system. What makes the Erikson and Goldthorpe's approach so fruitful is its goal-oriented conceptualization, clearly summarized in their answer to a question about the number of classes in contemporary Britain: "as many as it proves empirically useful to distinguish for the analytical purposes in hand" (Erikson and Goldthorpe, 1993, p. 46). As said before, an occupation-based analysis is needed to employ RBTC as an instrument to frame socio-economic implications of labor market changes, which is precisely the research intent of this work.

Self-employed		*Employees*			
Independent Work Logic		*Technical Work Logic*	*Organizational Work Logic*	*Interpersonal Service Work Logic*	*Marketable Skills:*
1. Large employers (>9) Firm owners Hotel owners Salesmen	**2. Self-employed professionals** Lawyers Accountants Medical doctors	**5. Technical experts** Mechanical engineers Computing professionals Architects	**10. Higher-grade managers** Business administrators Financial managers Public administrators	**14. Socio-cultural professionals** University teachers Medical doctors Journalists	Professional/ managerial
3. Small proprietors, artisans, with employees (<9) Restaurant owners Farmers Garage owners		**6. Technicians** Electrical technicians Computer equipment operators Safety inspectors	**11. Associate managers** Managers in small firms Tax officials Bookkeepers	**15. Socio-cultural semi-professionals** Primary school teachers Physiotherapists Social workers	Associate professional/ managerial
4. Small proprietors, artisans, without employees Shopkeepers Hairdressers Lorry drivers		**7. Skilled crafts** Machinery mechanics Carpenters Electricians	**12. Skilled office** Secretaries Bank tellers Stock clerks	**16. Skilled service** Children's nurses Cooks Beauticians	Generally/ vocationally skilled
		8. Routine operatives Assemblers Machinists Freight handlers	**9. Routine agriculture** Farm hands Loggers Gardeners	**13. Routine office** Mail sorting clerks Call centre employees Messengers	**17. Routine service** Shop assistants Home helpers Waiters	Low/ un-skilled

Figure 16: Oesch's class scheme.
Taken from Oesch, 2006, p. 68.
Note: The dotted lines indicate how classes are to be collapsed into the 8-class version.

2.1.2. The "shrinking" middle class and the populist appeal.

The replacement process fostered by automation, as outlined above, is expected to hit those occupations which lie in the middle of the skill continuum, particularly the manufacturing and clerical ones (Cirillo, 2018). Those mid-earnings jobs usually belong to middle-class workers, who have largely benefited from economic stability and upward social mobility (Kurer and Palier, 2019). Several scholars argue that the betrayal of these expectations is likely to trigger a fierce political reaction of the middle class, identified as the root cause of the rising of populism (Iversen and Soskice, 2019). This argument directly challenges the interpretation according to which the engine of the far-right movements would be mainly composed by the angry working class, the "left behind", the "outsiders". On the contrary, the "squeezed middle class" (OECD, 2019), especially those workers with low or obsolete skills (Iversen and Soskice, 2019), seems to have substantially contributed to the recent populist successes. For instance, Antonucci et al. (2017) challenge the political narrative that followed the Brexit referendum in 2016, showing that "leavers" are more frequently associated with an intermediate level of education than a low-skill level. Moreover, Brexiters prefer to identify themselves as middle rather than working class.

Given that the radicalization of middle class seems to be triggered by job polarization, economic reasons are expected to account for a large share of populist votes. However, some scholars argue that a new cultural cleavage has emerged due to the erosion of materialist values (Norris and Inglehart, 2019). Indeed, the nationalist propaganda often focuses on cultural issue, claiming for the

protection of the national "tribe" from external threats, usually identified with migrants. Nevertheless, Halikiopoulou and Vlandas (2016) demonstrate that labor market conditions are robust predictors of the far-right consensus. Moreover, this renewed interest in materialist issues appears to be also mirrored on the "supply side" of politics, proven by the shift of European nationalist parties towards a more pro-welfare agenda (Afonso and Rennwald, 2018). Although scholars continue to differentiate between materialist and post-materialist voting, Häusermann and Kriesi (2015) provide the ground for a solution to this debate, arguing that the borders between distributional and identity-based conflicts are increasingly confused. Thus, it is not worthy anymore to frame the electoral behavior on these separated axes, since they overlap in several issues, such as welfare chauvinism (i.e. particularistic organization of welfare state aimed at favoring one social group over the others). Even the attitude towards migrants includes both value- and material-based reasons, suggesting the falsehood of this dichotomy (Halikiopoulou and Vlandas, 2018).

2.1.3. Identifying the middle class: the operationalization.

Once the political reaction to automation is portrayed, the social agent responsible for it has to be identified. However, the operation may seem easier than it actually is. In fact, middle class is hard to define. Over the last two centuries it has radically changed, assuming different meanings across time and countries, often charged with a polemical value rather than a neutral significance. The historian Jürgen Kocka (1995) distinguishes four periods in the evolution of the European middle class. In the first two phases, going from the second half of the 18th century up to the 1850s, merchants, burghers and local officials laid the foundation of capitalism in the self-governed towns, making an alliance with nobles and upper classes. In the last one and a half century, the middle class has largely expanded, fighting against the labor movement, whose working-class base has been eventually eroded by the postwar improvement of living conditions. Given the changing nature of middle class, Kocka argues that it cannot be defined as a proper class, since it has always been including people with different market positions.

The difficulty in defining the middle class results in a disagreement over the empirical methodology employed to identify the latter, particularly diverging in accordance with the fields of study from which the scholars come. In this regard, Atkinson and Brandolini (2011) list three methods. The first one, largely employed by economists, relies on income. The authors refers to the Solow's income-based definition, namely the "middle 60%" of the population which is bracketed between the top (the well-off) and the bottom 20% (the poor or at risk of poverty). Alternatively, the share of people in the middle-income group is defined as households earning between 75% and 200% of the median national income. As regards Europe, data from the International Labour Organization

(Vaughan-Whitehead et al., 2016) show substantial variations in the size of middle class across countries (Figure 17), with a large middle-income group in the Scandinavian states (over 40% of the entire population) and a starkly smaller middle class in the Southern (Greece, Portugal) and Eastern countries (Estonia, Latvia, Romania). The table below relies on the median equivalized household disposable income as the distinguishing criterion for classes. The ranges of median income's percentage are set as follows: 0 – 60% for the lower-income class, 60 – 80% for the lower middle-income class, 80 – 120% for the core middle class, 120 – 200% for the upper middle-income class, above 200% for the upper class.

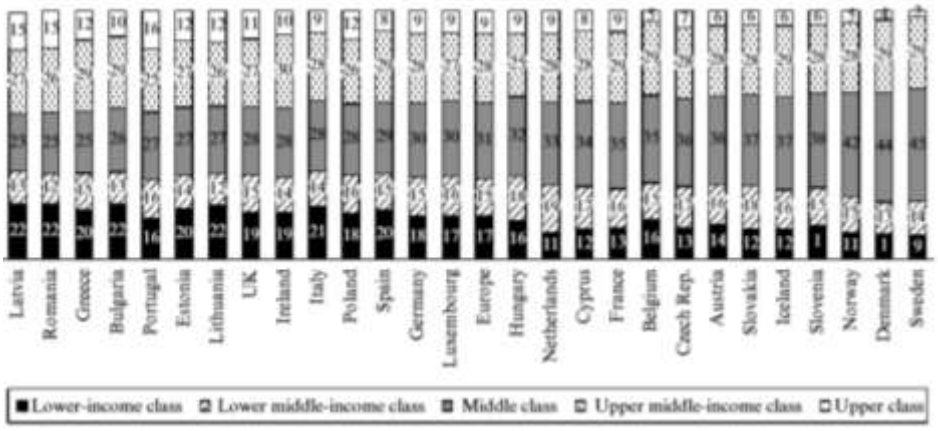


Figure 17: Size of income classes, Europe, 2006.
Source: ILO, 2016.

Moreover, since a strong correlation is found between this country ranking and the one realized with the Gini index (Atkinson and Brandolini, 2011), this methodology can be usefully employed to measure the growing inequalities in income distribution. The OECD (2019) shows a significant risk for many middle-class households to slide down into the lower-income group. Indeed, one-seventh of households in the middle 60% of the income distribution has shifted in the bottom 20% within four years, and this process has been accelerating in the last two decades (OECD, 2019). Thus, the job polarization described in the previous paragraphs seems to mirror in the overall wealth allocation, further evidenced by the higher annual rate of growth of top incomes relative to the middle ones. More specifically, over the past three decades the median incomes have expanded a third less than the average top 10% income (Figure 18).

Furthermore, ahead of the crisis, the prices of core consumption goods and services (e.g. health, education, housing) have grown more than the inflation rate (Figure 19). In turn, the rise of consumption expenditures, faster than income growth, accounts for the increase of over-indebtedness (i.e. debt-to-asset ratio of over 75%) of middle-income households, which is higher than that at both ends of wealth distribution. All in all, over the last three decades, the aggregate income of middle class has shifted from four times the upper-income aggregate to less than three times. Consequently,

if the 70% of baby boomers were considered part of the middle class, this figure has downsized to 60% for millennials (OECD, 2019).

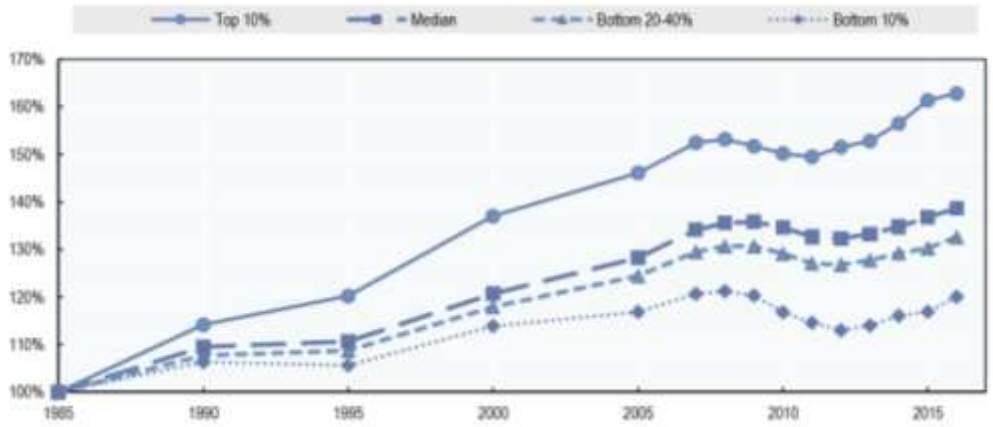


Figure 18: Real disposable income growth by income position, average for 17 OECD countries, 1985-2016 (1985 = 100%).
Taken from OECD, 2019, p. 21.

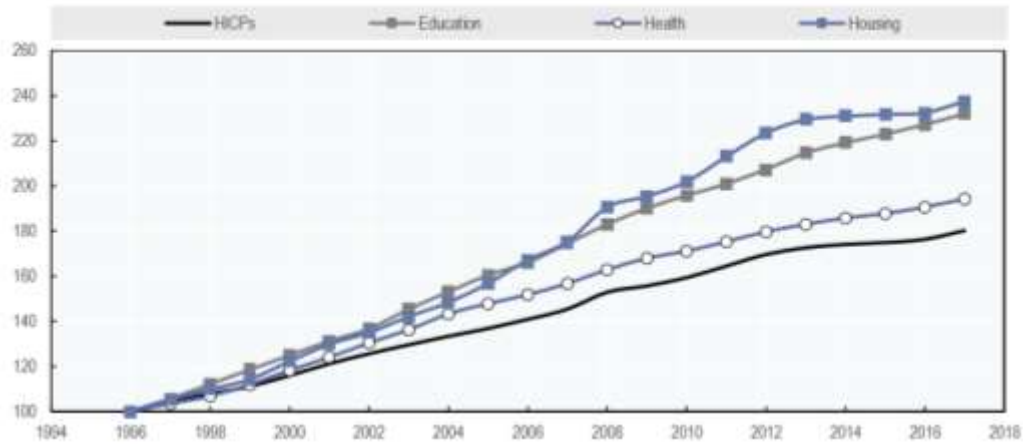


Figure 19: Average evolution of nominal prices, OECD average.
Taken from OECD, 2019, p. 24.
Note: HICP: Harmonised Indexes of Consumer Prices.

The second approach presented by Atkinson and Brandolini (2011) refers to property assets, which are more able to include all the resources needed to cope with everyday expenditures. In fact, the income-based measurement is incapable to count past savings, that play an insurance role when income is volatile. However, assessing a middle-class "asset standard" turns out to be quite difficult, since it is supposed to capture the risk of losing certain living conditions over a range of years, whereas the income-based method provides a static image. Moreover, differences across countries undermine the standardization of definitions and the collection procedure.

Finally, the third technique to identify middle class, usually chosen by sociologists, relies on the strong tie between class and labor market position, as outlined above. The contemporary authors identify middle class in different ways, according to their theoretical background. For instance, Erik Olin Wright (2000), in light of the exploitation and production process, defines middle class as all the

"employees who occupy a managerial or supervisory position within authority structures and/or are employed in a professional, managerial or technical occupations" (p. 147). Thus, he distances himself from the "popular" classification according to which the majority of workers lies in the middle class, since in his exploitation-based model most of labor force is considered part of the working class. However, the minimalist work hypothesis proposed by Erikson and Goldthorpe (1993) appears to be more in line with the aim of this work, which is not intended to analyze in depth the power relations in the labor market, rather the specific features of the middle-class occupations.

As a matter of fact, the analysis of the European class structure would enable to identify the groups of occupations of which I will test the propensity to automation. As said before, since the Goldthorpe's scheme does not provide a horizontal differentiation within that occupational group, I will mainly employ the Oesch's 8-class model (2006), which remedies to this lack by defining three work logics. According to a hierarchical categorization based on marketable skills, the author separates the employees between the "traditional" and the "petite bourgeoisie" (p. 125). In the first category the scholar merges technical experts with technicians, higher-grade and associate managers, socio-cultural professional and semi-professionals. Meanwhile, in the second one craft workers are grouped with routine operatives, skilled office workers with routine clerks, skilled service workers with routine ones. As regards operationalization, Oesch relies on the International Standard Classification of Occupations 1988 (ISCO-88), at the 4-digit level, that distinguishes jobs according to their tasks and the skills needed to perform them, guaranteeing a high degree of cross-national comparability (Figure 20).

Large employers SELF and 10 or more employees	*Self-employed professionals* SELF and 2000–2470 (and less than 10 employees)	*Technical experts* 2100–2213	*Higher-grade managers* 1000–1251, 2410–2419, 2441, 2470	*Socio-cultural professionals* 2220–2323, 2350–2351, 2359, 2420–2440, 2442–2443, 2445, 2451, 2460
Petty bourgeoisie with employees SELF and less than 10 employees (and not 2000–2470)		*Technicians* 3100–3213, 3471	*Associate managers* 1252–1319, 3410–3449, 3452	*Socio-cultural semi-professionals* 2330–2340, 2352, 2444, 2446–2450, 2452–2455, 3220, 3222–3224, 3226, 3229–3232, 3240–3400, 3450–3451, 3460–3470, 3472–3480
Petty bourgeoisie without employees SELF and no employees (and not 2000–2470)		*Skilled crafts* 110, 7120–7142, 7200–7233, 7240–7423, 7430–7520, 8311, 8324, 8333	*Skilled office* 4000–4112, 4114–4141, 4143, 4190–4210, 4213–4221	*Skilled service* 3221, 3225, 3227–3228, 5122, 5141, 5143, 5110–5113, 5150–5163, 5200–5210, 8323
		Routine operatives 7100–7113, 7129–7130, 7143, 7234, 7424, 8000–8310, 8312, 8334–8400, 9160–9162, 9300–9333	*Routine office* 4113, 4142, 4144, 4211–4212, 4222–4223	*Routine service* 5120–5121, 5123–5130, 5131–5140, 5142, 5149, 5169, 5220–5230, 8320–8322, 9100–9153
		Routine agriculture 6010–6210, 8330–8332, 9200–9213		

Figure 20: ISCO-1988 codes of each class.
Taken from Oesch, 2006, p. 222.
Note: The dotted lines indicate how classes are to be collapsed into the 8-class version.

In conclusion, I will describe the European class structure using both the 8- and the 16-class schemes elaborated by Oesch, then testing the impact of automation on them. I will particularly focus on the occupations' groups which lie in the middle of the table, which I would consider as part of a larger

middle class (in curly brace). Oesch divides the "restricted" middle class (technicians, associate managers and socio-cultural semi-professionals) from the "twilight zone" (p. 67), whose members are routine service workers and manual laborers. However, the latter show an intermediate level of education (apprenticeship or general secondary education), and their clerical and technical occupations can be classified as middle-income jobs (e.g. bank tellers, machinery mechanics, stock clerks, etc.) Hence, I will employ these two "macro-classes" as the target on which I will test the proneness to automation shown by the middle class in Europe.

2.2. The shaping influence of the welfare regimes.

Several scholars argue that the impact of automation and de-industrialization on labor market has to be framed by the welfare regime, since it may soften job polarization or compensate the workers who are more likely to be substituted by machines (Oesch and Rodrìguez-Menés, 2011; Wren, 2013). In order to grasp the possible outcomes of the interaction between social protection and technical change, a classification of welfare states is needed.

2.2.1. Esping-Andersen and the definition of welfare state.

The most accredited and popular welfare classification is the one elaborated by Gøsta Esping-Andersen (1990) in its masterpiece *The Three Worlds of Welfare Capitalism*. He relies on the Power Resources Theory (PRT), a sociological approach born in the late 1970s, which was aimed at finding a "middle way" between the Marxist-Leninist and the structuralist views, both following a functionalist rationale (Rothstein et al., 2012). The former interpreted the welfare state as a functionalist tool for the perpetuation of capitalist exploitation, whereas the latter found a similar relation between the welfare state and the process of modernization and industrialization. The PRT emphasizes the role of class-mobilization as the main agent of change, ascribing the variations in welfare states to the different results of the distributive class conflicts (Esping-Andersen, 1990). As Korpi and Palme (2003) clearly summarized, the PRT interprets the "welfare states as outcomes of, and arenas for, conflicts between class-related, socioeconomic interest groups and that in these distributive conflicts partisan politics is likely to matter" (p. 425).

The renowned Danish sociologist defines the welfare state as a system of social stratification, i.e. an "active force in the ordering of social relations" (Esping-Andersen, 1990, p. 23), rather than a mechanism correcting inequalities. He outlines three different welfare ideal-types, whose development was influenced by three main factors: the nature of class mobilization, the structure of class-political coalitions, and the historical legacy of regime institutionalization. In addition, the

German scholar Philip Manow (2009) supplements these variables with the electoral rules, that channel the socio-economic interests in different political coalitions.

The first cluster is the Liberal welfare state, which is inspired by market culture and work-ethic norms, hence limiting the role of social protection to means-tested assistance. The stigmatizing minimalist subsidies are complemented with individual private insurance schemes. This model mainly spread in the Anglo-Saxon countries, where the liberalist legacy prevailed and the "labor fails to realign the nation's political economy and assert dominance" (Esping-Andersen, 1990, p. 53). Moreover, Manow (2009) argues that the majoritarian electoral law, established in those countries, leads to a two-party system, where the middle class faced the tradeoff between being taxed for supporting a generous welfare state, the left's proposal, or avoiding taxes and social benefits, the right's proposal. Obviously, the bourgeoisie opted for the latter, thus creating a residual welfare system.

The second ideal-type is the Conservative welfare regime, which is characterized by a corporatist attitude intended to preserve status differentials within society. Unlike the Liberal cluster, public insurance schemes rule out the market option, despite being attached to occupational status, hence provided with less redistributive power. This regime is typically shaped by the Church, which is committed to protect the traditional familyhood. Thus, the principle of subsidiarity prevails, charging families with care services and assistance, in which the public authority does not interfere, forcing women out of labor market. This model characterizes the continental Europe, where PR system dominates, fostering an additional cleavage to the left-right one, namely the conflict between Church and state (Manow, 2009). This fracture is more marked in the southern European countries, where the nation-building process was frustrated by a hostile reactionary Catholic Church (Manow, 2015). This fight resulted in a "less Weberian" state, permeable to organized particularistic interests, characterized by a low level of "stateness" (Ferrera, 2019) Consequently, the anti-clerical labor movement was incapable of allying with the pious farmers, pushing the radicalized left out of government (Manow, 2009). Some scholars argue that the differences between the continental and the southern European models may need two distinct categories (Ferrera, 2019).

The last welfare regime is the Social Democratic type, characteristic of the Scandinavian countries, where the religious cleavage did not become politicized since the deep-rooted Protestant Church did not feel threatened by the consolidation of the nation state (Manow, 2009). Consequently, the workers were able to embrace a "politics of cross-class universalism" (Esping-Andersen, 1990, p. 67), which moved the welfare state from a means-tested provision of social rights, the original common ground for the coalition between social democrats and the agrarian parties, to more

encompassing and earnings-related benefits, including the rising white-collar middle class in the government alliance.

In order to assess the coverage and extension of the welfare states, Esping-Andersen (1990) abandoned the mere expenditure-based estimation, defining two parameters that refer to social rights. The author builds his argument on the well-known dissertation of T. H. Marshall (1950) *Citizenship and Social Class*, in which the British sociologist argues that the egalitarian aspirations, rising from the end of the 19th century, "have in part been met by incorporating social rights in the status of citizenship and thus creating a universal right to real income which is not proportionate to the market value of the claimant" (p. 47). Hence, according to both the scholars, the concept of social citizenship constitutes the foundation of the welfare state.

The first defining element of welfare regimes is de-commodification, described as "the degree to which individuals, or families, can uphold a socially acceptable standard of living independently of market participation" (Esping-Andersen, 1990, p. 37). This concept was first named by Karl Polanyi (1944) in *The Great Transformation*, intended as a necessary reaction to the conversion of labor force in normal commodity, due to the industrialization process. In a Conservative welfare regime, the level of de-commodification is usually intermediate, squeezed between a morally negative view of commodification and a non-progressive corporativism. On the contrary, the socialist model shows a strong commitment to workers' emancipation from the market yoke, whereas liberalism heavily relies on the emancipatory power of industriousness and self-sufficiency for individuals.

The second criterion employed by Esping-Andersen directly refers to his definition of welfare state as a system of social stratification. Indeed, the author argues that the organization of welfare state influences the divisions of class and status differentials. As regards this defining feature, the worst performer is again the Liberal regime, where the state, according to its liberalist background, has no reason to interfere with the stratification produced in the marketplace. In the Conservative welfare state, the repulsion for class struggle leads to a rigid hierarchical society, preserving the status differentials. Finally, the Social Democratic model shows the strongest commitment to redistribution, resulting in a broad universal and egalitarian system of social protection.

Table 1: Classification of countries in terms of de-commodification (Source: Esping-Andersen, 1990, p. 52.)

Social Democratic	**Conservative**	**Liberal**
Sweden	Switzerland	United Kingdom
Norway	Finland	Ireland
Denmark	Germany	Canada
Netherlands	France	New Zealand
Belgium	Japan	United States
Austria	Italy	Australia

Although the Esping-Andersen's classification still holds its well-deserved popularity, several scholars attempted many criticism to his work. The first critique regards the scant attention paid by the author to gender, missing some areas of social policy (Arts and Gelissen, 2002). The feminist arguments move on two lines: the absence of a serious analysis of women's exclusion from labor market and the failure to incorporate sexual division of paid and unpaid work in the welfare typologies. The second criticism refers to the misclassification of certain countries within the three-fold model. As noted above, the southern European countries, among which Esping-Andersen only picks Italy, could deserve a distinct category since they show some relevant differences with the continental regimes. Ferrera (2019) particularly points out four distinguishing features for the Mediterranean welfare systems: a dualistic model of income support, more favorable to standard than outsider workers; a significant assistance's burden charged on families; universal national health services; particularistic welfare provisions, typical of countries with a low degree of "stateness".

Furthermore, some scholars undermine the whole Esping-Andersen's categorization, exposing methodological doubts. For instance, Clare Bambra (2006) argues that the operationalization chosen by the Danish sociologist is influenced by a priori theoretical prediction of a three-fold differentiation. Moreover, she criticizes the variable weighting and some miscalculations, questioning the existence of the *Three Worlds*' typologies itself. Scruggs and Allan (2006) reach similar conclusions, suggesting that de-commodification is not a valuable instrument for regimes' classification. Moreover, some authors propose alternative indexes to measure the expansion of welfare state. For example, Olivier Pintelon (2012) distinguishes between a "benefit de-commodification" and "in-work de-commodification", devoting the second index to underline the de-commodifying potential of some labor market institutions. This scholar relies on a paper written by Theo Papadopoulos (2005), who contests the alleged neutrality of the labor markets, rather considered as "power-framed socially instituted processes" (p. 23).

A further sophistication is proposed by Carl Jensen (2008), who argues that the social care's dimension needs to be included in the analysis, together with transfers. He does not find any empirical relation between these dimensions, detecting a predominant link between de-commodification and transfers, whereas services appear to be bound with de-familization. As regards the latter, Scandinavian countries stand out due to their ideological preference for gender equality, using public services as a female gateway to labor market. Moreover, Claus Wendt (2013) asserts that the traditional classification of welfare regimes does not fit with the change of healthcare systems. Although the labels used to name the latter did not change since their birth (e.g. the German health insurance system of 1883, the British National Health Service of 1946), they do not take into account the transformation of governance. Therefore, the author provides a new categorization based on the

patient's access to healthcare, resulting in three types: the "health service provision-oriented type", characterized by a significant number of healthcare providers and free access for patients to doctors (Austria, Belgium, France, Germany, and Luxembourg); the "universal coverage-controlled access type", guaranteeing equal access to healthcare as a social citizenship (Denmark, UK, Sweden, Italy and Ireland); the "low budget-restricted access type", which has limited resources and the access to healthcare is restricted by high private co-payments and long waiting times (Finland, Portugal, Spain).

Country	Social-democratic	Christian-democratic	Liberal	Mediterranean	Radical	Hybrid	Total classifications	Type
Social-democratic								
SE	**[22] 100%**	[0] 0%	[0] 0%	[0] 0%	[0] 0%	[0] 0%	22	Pure
NO	**[20] 95%**	[0] 0%	[1] 5%	[0] 0%	[0] 0%	[0] 0%	21	Pure
DK	**[20] 91%**	[1] 5%	[1] 5%	[0] 0%	[0] 0%	[0] 0%	22	Pure
FI	**[12] 67%**	[5] 28%	[0] 0%	[0] 0%	[0] 0%	[1] 6%	18	Medium-high consistency
Average	**88%**							
Christian-democratic								
FR	[1] 5%	**[21] 95%**	[0] 0%	[0] 0%	[0] 0%	[0] 0%	22	Pure
DE	[0] 0%	**[21] 91%**	[0] 0%	[0] 0%	[0] 0%	[2] 9%	23	Pure
AT	[2] 12%	**[14] 82%**	[1] 6%	[0] 0%	[0] 0%	[0] 0%	17	Pure
BE	[4] 18%	**[16] 73%**	[1] 5%	[0] 0%	[0] 0%	[1] 5%	22	Medium-high consistency
IT	[0] 0%	**[12] 63%**	[1] 5%	[6] 32%	[0] 0%	[0] 0%	19	Medium-high consistency
Average		**81%**						
Liberal								
US	[0] 0%	[0] 0%	**[20] 100%**	[0] 0%	[0] 0%	[0] 0%	20	Pure
CA	[1] 5%	[3] 16%	**[15] 79%**	[0] 0%	[0] 0%	[0] 0%	19	Medium-high consistency
UK	[1] 4%	[1] 4%	**[18] 78%**	[0] 0%	[1] 4%	[2] 9%	23	Medium-high consistency
AU	[0] 0%	[2] 10%	**[15] 71%**	[0] 0%	[4] 20%	[0] 0%	21	Medium-high consistency
JP	[0] 0%	[3] 21%	**[9] 64%**	[0] 0%	[0] 0%	[2] 14%	14	Medium-high consistency
NZ	[1] 7%	[1] 7%	**[9] 60%**	[0] 0%	[3] 20%	[1] 7%	15	Medium consistency
IE	[0] 0%	[6] 32%	**[10] 53%**	[1] 5%	[0] 0%	[2] 11%	19	Medium consistency
Average			**72%**					
Hybrid								
CH	[2] 13%	[3] 19%	[8] 50%	[1] 6%	[0] 0%	[2] 13%	16	Unclassified
NL	[3] 13%	[11] 48%	[2] 9%	[1] 4%	[0] 0%	[6] 26%	23	Unclassified
Average consistency all groups: 80%								

Key: AT = Austria, AU = Australia, BE = Belgium, CA = Canada, CH = Switzerland, DE = Germany, DK = Denmark, FI = Finland, FR = France, IE = Ireland, IT = Italy, JP = Japan, NL = Netherlands, NO = Norway, NZ = New Zealand, SE = Sweden, UK = United Kingdom, US = United States.

Figure 21: Classification in the same model as percentage of the total number of classifications.
Taken from Ferragina and Seeleib-Kaiser, 2011, p. 588.

Nevertheless, other research corroborate the Esping-Andersen's classification. Ferragina and Seeleib-Kaiser (2011) assess the reliability of typologies, reviewing 23 studies related to the *Three Worlds*. They show that, most of the time, the countries' assignment to welfare regimes converges (Figure 21). The authors identify three groups based on the consistency of the classifications of each country: the "pure countries" placed more than 80% of the time in the same regime, the "medium-high internal consistency countries" classified between 61% and 80% of the time in the same type, and the "medium internal consistency countries" assigned between 51% and 60% of the time in the same category.

Overall, the classification proposed by Esping-Andersen continues to be a valuable and widely used pattern to identify relevant cleavages among welfare regimes, despite some criticism should be borne in mind. Namely, I will supplement the original scheme with a distinct type, the Mediterranean countries, since it is the most consolidated adjunct cluster in the literature, showing distinguishable figures regarding class structure. Therefore, I will refer to his typologies when empirically testing the welfare states' responses and adaptation to technical change.

2.2.2. Are welfare states prepared? The impact of technical change on social protection systems and class coalitions.

Before analyzing the shaping effect of welfare regimes on automation impact, the adaptation of social protection systems to technical changes needs to be assessed. As Busemeyer et al. (n.d.) argue, the welfare state adjustment will not be automatically triggered by technical change, rather the political struggle is likely to be determinant for the reconfiguration of social protection. The division between "tech-optimists" and "tech-pessimists" recurs in the debate about the welfare state reorganization (Busemeyer at al., n.d.). The former expect the disappearance of the insider-outsider cleavage in the labor market, fostering a more egalitarian welfare system, and an upgrade in effectiveness of social service delivery due to digitalization. On the other hand, pessimists foresee a harsh period of transition, when inequalities and employment polarization will grow, and durable side effects of dualization, such as the erosion of national labor market and fiscal regulations. However, the two visions do not necessary conflict with each other, since an optimistic view may be embraced for the long-term, whereas a more pessimistic perspective can be usefully employed to detect the difficulties encountered by welfare states in dealing with technical change in the short-run.

All in all, scholars mainly underline two kinds of adjustment problems for the social protection systems. Firstly, Bent Greve (2017) emphasizes the issue of the welfare state's financing. Indeed, the increasing dualization of labor market is likely to require a rise in expenditures, due to the growing number of non-standard workers, who often need social benefits to cope with their unstable career (Greve, 2019). In turn, public revenues might decrease as a result of fragmented social contributions and the risk of narrowing of tax base. As regards the latter, the sharing economy appears to have a significant impact, due to its capacity to slide into the hidden market (Greve, 2017). Secondly, Palier (2019) highlights that the set of social risks to cover will rise, following the expansion of intermittent careers, such as "precarious" workers, self-employed people and part-timers (usually women). Nonetheless, the traditional social risks, i.e. health and old age, will not recede. Hence, the fall of mid-paid and stable jobs, as a result of automation, will both require more funds to protect non-standard workers, while reducing the available resources for social spending (Palier, 2019).

Country	*Social protection % GDP, 2015*	*Taxes and duties as % of GDP, 2016*	*Gini-coefficient, 2016*
Nordic welfare states			
Denmark	32.3	47.3	27.7
Sweden	29.2	44.6	27.6
Continental welfare states			
Germany	29.1	40.4	29.5
France	33.9	47.6	29.3
Liberal welfare states			
UK	28.6	35.1	31.5
Ireland	16.3	23.8	29.5
Southern Europe			
Italy	29.9	42.9	33.1
Spain	24.6	34.1	34.5
Eastern Europe			
Czech Republic	19.0	34.8	25.1
Poland	19.1 (2014)	34.4	33.9

Figure 22: Spending on social protection, overall level of taxation and inequality (taken from Greve, 2020, p. 167).
Source: Eurostat (2018).

Therefore, the exposure of welfare states to technical change can be separately portrayed in terms of pressure on spending and change in the labor market. With respect to the first issue (Figure 22), the Nordic welfare regime seems to be the most concerned, due to its relevant size, followed by the Continental type (Greve, 2020). On the other hand, the Scandinavian countries are provided with a universal system of social protection, which is more able to meet the social needs of people with unstable employment. Meanwhile, the Bismarckian model appears to be the worst equipped to cope with a polarized labor distribution, envisaging a dualization in terms of social protection (Palier, 2019). In this regard, Bonoli (2007) identifies the timing of post-industrial transition as crucial to explain the diverging levels of protection devoted to the new social risks. Notably, the Nordic countries, followed by the Anglo-Saxons, are those who first, around the 1970s, came across deindustrialization, expansion of female employment, and family instability, at a time when these new demands could count on strong labor mobilization and little competition with traditional risks. On the contrary, in the continental Europe, this kind of needs emerged after the consolidation of the industry-based welfare system, supported by broader interest groups.

Thus, if we combine the two aspects of the welfare state's exposure to technological impact, i.e. budget size and adaptability to the new social risks, the Conservative ideal-type results to be the most affected, showing a corporatist ill-suited insurance organization that requires a considerable level of financing.

Furthermore, the technical change also hits the class coalitions supporting welfare systems. As noted in the previous paragraphs, in the near future a significant amount of middle-skilled occupations is likely to be resilient to automation, combining routine tasks with new technologies, especially when supported by education and training systems (Autor, 2015). However, a marked slippage towards nonroutine occupations at both ends of the skill continuum has been detected, especially in the service sector (Guarascio et al., 2018), complemented with the jobless recovery option (Jaimovich and Siu, 2018). This has resulted in the weakening of the middle class that, as many authors argue, is turning towards populist parties (Kurer and Palier, 2019). It should be also noted that, in the second half of the last century, the welfare state has been targeted on the standards and needs of this aspirational middle class (Esping-Andersen, 1990), which now seems to shrink. Hence, a reassessment of the class coalition supporting the welfare state appears inevitable, which in turn is likely to reshape its organization and functions.

In order to properly examine the evolution of class coalitions, two further elements should be added. First of all, the electoral rules have turned out to be significantly influential in the process of coalition-building already since the birth of welfare states (Manow, 2009). In this regards, Iversen and Soskice (2019) argue that in a multiparty PR system middle-income classes have an incentive to

ally with low-income representatives, whereas in a majoritarian system the middle class is more likely to choose the parties that advocate lower taxes and benefits, excluding low-income delegates from the government. Moreover, the articulations through which social demands are channeled, i.e. political parties, should realign on the new socio-economic interests of changing classes, proposing policy solutions to the distributional conflicts (Busemeyer et al., n.d.). Indeed, it should be borne in mind that, assuming bounded rationality, a fundamental asymmetry distinguishes market from democracy. While the distributional outcomes on market are essentially linked to class structure, in the political democracy the correlation between the right to vote and classes disappears, enabling multiple distributional combinations which result in the welfare state (Korpi and Palme, 2003).

Although it goes beyond the scope of this work, some suggestions of future welfare class coalitions can be cherrypicked from the literature. According to Daniel Oesch (2006), the declining group of production workers shares a high potential for political mobilization and a left-wing political orientation with the rising categories of socio-cultural professionals and semi-professionals. The author argues that a cross-class coalition between these two categories might support a wider democratic control of markets and a redistributive welfare system. On the other hand, Gingrich and Häusermann (2015) look instead at the shift in the composition of the left-wing electorate from the working class to the service middle class, asserting that this change would move the emphasis of pro-welfare parties from income redistribution to activation policies and social investment. Indeed, policy analyses have confirmed that those who benefit the most from this kind of provisions are middle-class households, fostering a phenomenon known as “Matthew effect” (European Commission, 2019). The rise of this large new welfare state support coalition is more pronounced in the Social Democratic regimes, where both the left mobilizing capability and the transition towards services are more marked. The expectation of a strengthening of the “supply-side-oriented” welfare state is shared with Iversen and Soskice (2019), who see in the skilled workforce of the advanced sectors, interested in economic growth rather than redistribution, the decisive voters.

Anyway, the changes affecting middle-class workers, provoked by the rise of automation, will inevitably shake the very foundations of the welfare state. Drawing on the Polanyi’s representation of the evolution of market society (1944), the process of coalition-building presented may be considered as a second “constructive movement”, following the “disruptive” fall of middle-skilled routine occupations. In the meantime, the transition needs to be managed and the welfare systems play a key role in softening job polarization and supporting workers threatened by automation.

2.2.3. The "agentic" historical institutionalism and the welfare studies.

Several scholars argue that the welfare institutions have a significant influence on how technical change reshapes the labor market, softening the employment polarization (Goos et al., 2009; Oesch and Rodrìguez-Menés, 2011), preserving the manufacturing workforce (Cirillo, 2018), and molding the service transition (Iversen and Wren, 1998; Wren, 2013). The theoretical framework best suited to investigate the impact of political institutions on structural changes is the historical institutionalism. This theory derives from the institutionalist approach, the major family of political theories, and it considers institutions as the independent variable in politics (Fabbrini, 2008). Two leading figures of this branch of political science, Pierson and Skocpol (2002), underline that the purpose of historical institutionalists is to "make visible and understandable the overarching contexts and interacting processes that shape and reshape states, politics, and public policymaking". According to these authors, three important features characterize this scholarship: the focus on big and substantial issues, which are of interest for both the general public and for scholars; the great importance ascribed to time and sequences, theorizing about historical dimension of causation; the attention paid to macro contexts and combined outcomes of institutions and processes.

A key concept put forward by historical institutionalists is represented by path dependency, generally understood as the "causal relevance of preceding stages in a temporal sequence" regarding social processes (Pierson, 2000, p. 252). Its explanatory power is determined by the "dynamics of self-reinforcing or positive feedback processes in a political system" (Pierson and Skocpol, 2002, p. 6), what economists usually call "increasing returns" (Pierson, 2000). The most relevant claims concerning path dependency are brilliantly summarized by Paul Pierson (2000, p. 251):

> "Specific patterns of timing and sequence matter; starting from similar conditions, a wide range of social outcomes may be possible; large consequences may result from relatively "small" or contingent events; particular courses of action, once introduced, can be virtually impossible to reverse; and consequently, political development is often punctuated by critical moments or junctures that shape the basic contours of social life."

As regards the welfare studies, Lynch and Rhodes (2016) assert that the historical approach in the comparative analysis of welfare institutions has been predominant since the 1980s. However, the hard core assumption of institutionalist-oriented welfare research, "policy creates politics", has been challenged by many criticism, which follow two lines: the definition of welfare state, and the insufficient attention paid to class conflicts and power dynamics responsible of change. Hence, a fruitful encounter of the institutionalist approach with the Power Resources Theory would help to welcome these critiques, creating what Pierson calls "a hybrid of institutional and power resource elements" (cited in Lynch and Rhodes, 2016, p. 525). This "agentic" version

of historical institutionalism uncovers the manipulative role of political actors on welfare state, bringing out the differences among various political economies (Lynch and Rhodes, 2016).

Returning to the technological impact on labor market, the "hybrid" approach described above may help us to understand the reactions triggered by the introduction of technical innovations in different countries. For instance, Kathleen Thelen (2018) reports the responses of institutional arrangements to the advent of the popular platform-as-a-service company Uber in three different countries. She finds that in the U.S. Uber was able to launch a campaign against the taxi lobby, strengthening the alliance with consumers, thanks to a fragmented political context. On the contrary, the well-organized German taxi associations deployed a coordinated response, isolating Uber. Finally, in Sweden, a broad coalition of taxi drivers, unions and public officials imposed to the American service company to pay its fair share of taxes, adjusting the fiscal regulatory framework. This specific example persuades the author to say that the institutional configurations not only channel the same conflict in different ways, but they may also foster the emergence of distinct problems from similar patterns, due to the different national contexts.

2.2.4. The molding influence of welfare systems: innovation management and workers' compensation.

Once the theoretical compound approach is assumed, it can be applied to the research topic of this work, i.e. job polarization. The impact of political arrangements on technology might be distinguished into two lines of action: the direct influence of government on technical change, through the management of the speed of innovation and the protection of certain sectors or categories, and the compensation for the workers affected by substitution, through income support and training.

As regards the first aspect of government intervention on automation, a preliminary assumption should be recalled, namely the endogeneity of technology. Indeed, the paradigmatic example of China previously mentioned proves the relevance of political and economic shocks for innovation technology and skill demand (Van Reenen, 2011). More specifically, Anthony Atkinson (2015) asserts that governments can intervene on both sides of labor market. On the one hand, public policies can influence the speed of adjustment of the labor supply curve related to the wage premium put on high-skill occupations, investing in human capital. On the other hand, governments can also shape the rate and direction of technological change both directly, through research and development resources, and indirectly, influencing the decisions of firms on the techniques of production. With particular reference to the latter, the British author reminds that the social consequences of this kind of business choices not only concern the stakeholders, but also

workers and consumers. Since their interests will be hardly taken into consideration by firms, the state should intervene to reduce the extent of inequality and make the outcomes more socially acceptable, moving beyond the usual redistributive function.

Furthermore, as already noted, the ICT-led evolution of economic sectors does not show a homogeneous trend across countries. In fact, Fernandez-Macias and Hurley (2016) do not found a clear pattern of employment polarization in Europe between 1995 and 2007, suggesting that specific economic and institutional configurations are likely to play a more significant role in determining the occupational distribution than computerization. Similar arguments are exposed by other authors too (Oesch and Rodrìguez-Menés, 2011; Wren, 2013), who nonetheless find a general trend towards job polarization in line with the RBTC hypothesis. The *Three Worlds* typologies turn out again to be very useful to underline the differences in terms of political economy's responses to technical change.

Starting with the Liberal welfare regime, it has been demonstrated that the RBTC hypothesis is fully deployed in those countries, due to more flexible wage-setting institutions which do not hamper the rise of low-paid occupations, especially in the interpersonal service (Oesch and Rodrìguez-Menés, 2011). Within the service sectors, the predominant uncoordinated wage bargaining system allows the remuneration in traded and non-traded branches to be set independently from each other, resulting in a significant earnings inequality (Wren, 2013). Moreover, it should be underlined that the employment and income growth of high-productivity services would have not been able to support the observed increase of low-skill occupations without relying on private indebtedness. As a matter of fact, the expansion of those service occupations at the bottom of the skill distribution in Liberal regimes goes hand in hand with the rise of consumer-credit-based in their domestic demand (Wren, 2013). However, the nefarious consequences of high level of private debt, burst during the U.S. subprime mortgage crisis, question the sustainability of this system. Hence, the expansion of internationally traded services will remain the principal boost for the future economic performance of Liberal countries, subjected to more restrictive credit conditions.

On the contrary, the Conservative institutional arrangements show a less marked U-shaped occupational curve. Particularly after the last economic crisis, the German-centered core countries has been characterized by the growth of high-skill positions (e.g. managers and clerks) and a modest loss of low-skill occupations (Cirillo and Guarascio, 2015). This trend could be traced back to two structural elements. Firstly, the more coordinated wage bargaining system ties together the wage of traded e non-traded service workers, hampering the rise of low-paid jobs (Wren, 2013). Besides, the so-called "manufacturing imperative" fosters the preservation of industrial mid-paid

workers, facilitating the international tradability of manufactured goods. However, a significant difference is detected with the southern European countries, where the share of construction and market services has increased significantly relative to the industrial sector (Cirillo and Guarascio, 2015). Overall, the Christian Democratic regimes present a less unequal earnings distribution than the Liberal countries, with the partial exception of the "southern periphery", due to the interventionism of governments in the labor market. Nevertheless, as the service transition continues, the expansion of tertiary sector, together with the increase of female participation, appear essential to support the economic performance of those countries and the sustainability of their welfare systems (Wren, 2013).

As said before, I will add the Mediterranean cluster to the Esping-Andersen's typologies since many differences emerge in both the class structure and the welfare institutions. Although the Southern bargaining system has always been quite rigid, the recent austerity labor market reforms appear to have undermined its robustness, partially dismantling its coverage and coordination (Picot and Tassinari, 2016). Hence, a limited capability in preventing the rise of low-paid jobs is expected, together with a lower commitment in retaining the traditional industrial workforce (Cirillo and Guarascio, 2015)

Finally, the Social Democratic regime shows a large concentration of workers in the "sheltered" welfare sector who are moving to the international tradable services, due to their high level of skills. Moreover, the constrained flexibility of wage-setting institutions is counterbalanced by high levels of public spending, which is aimed at both creating public service employment, that can compensate for the fall of manufacturing occupations, and upskilling of the workforce, that can be placed in the dynamic sectors (Wren, 2013). Consequently, this system does not rely on private indebtedness, being more resilient to economic shocks. Overall, the Social Democratic model seems to guarantee great adaptability to service transition, high international competitiveness, and a more egalitarian distribution of wage.

Another way to investigate the responses of welfare institutions to technical change concerns the individual forms of compensation and support for those workers whose occupations are more prone to be replaced by machines. From a comparative historical perspective, Manow, van Kersbergen and Schumacher (in Wren, 2013) argue that welfare compensation played a greater role during de-industrialization, in the 1970s and 1980s, rather than during the preceding "de-ruralization", between the 1950s and 1960s. Indeed, the transition from agriculture to industry was less painful than the following shift to services, since the skills traveled comfortably between the first two sectors, and the working conditions offered by factories represented an upgrading in the farmers' life. On the contrary, the transferability of skills between the secondary and tertiary

sectors appeared harder, and the replacement of industrial middle-skill jobs did not entail a univocal improvement of wages, rather polarizing the employment at both ends of earnings distribution. Relying on data collected by Iversen and Cusack for two papers[3], the authors demonstrate that a drop of one percentage point in industrial employment corresponds to an increase of 0,7% in welfare state transfers and 0,65% rise of government consumption. A similar decrease in agricultural employment makes the transfers to rise by 0,5% and consumption by 0,4%.

As repeatedly pointed out above, technical change and employment polarization are fostering the emergence of new social risks, which are likely to reshape the functions of the welfare state. The balance of power between the current dimensions of welfare systems (i.e. social insurance, redistribution and social investment) may be modified in response to changing class coalitions and new social needs. Particularly, Busemeyer et al. (n.d.) suggest that the social investment pillar is likely to gain weight relative to the redistributive function, due to the reskilling need of many workers. As a matter of fact, social investment, defined as "policies designed to strengthen people's skills and capacities and support them to participate fully in employment and social life" (European Commission, 2019, p. 124), seems perfectly suited to smooth the complicated transition of competences from routine to nonroutine jobs, facilitating an upward occupational trend. However, while this dimension of the welfare state is equally required by workers across countries, the redistributive pillar appears to be more subjected to the outcomes of distributional class conflicts. Hence, the fate of this crucial function looks intrinsically linked to the future arrangements of class coalitions, variable across countries.

Based on these arguments, we can newly employ the Esping-Andersen's three-fold typologies to describe the responses of welfare regimes to the new social risks. In the Liberal welfare regime, the minimal means-tested assistance and the strong link between social protection and market positions are likely to let poverty expand in the increasingly intermittent workforce (Palier, 2019). Here, the shift away from the male breadwinner model has been focused on the manipulation of the incentive structure rather than on providing protection to the new social risks (Bonoli, 2007). However, the emphasis placed on private school- and college-based education in those countries provides workers with strong general skills, which act as a complement with ICT in the tradable service sectors (Wren, 2013). Thus, the redistributive and insurance potential in Liberal regime does not seem adequate to the new social challenges, whereas the training system appears competitive, even if mirroring the wage differentials.

[3] Iversen, T., Cusack, T. R. (2000), *The Causes of Welfare State Expansion: De-industrialization or Globalization?*, "World Politics, 52, pp. 313 – 349; Iversen, T. (2001), "The Dynamics of Welfare State: Trade Openness, De-industrialization, and Partisan Politics", in Pierson, P. (edited by), *The New Politics of the Welfare State*, New York, Oxford University Press.

Differently, the Conservative welfare systems use to invest in industry-specific skills, heavily relying on vocational training schemes. Although this model may also provide general competences, it depends on the decision taken by the state in its role of financier and supplier of training. Anderson and Hassel (in Wren, 2013) argue that in the case of continental European countries (e.g. Germany, Austria, Switzerland), the skills provided are highly specific, in line with the significant presence of industrial firms. As regards income support measures, the Bismarckian model turns out to be the worst equipped to guarantee social protection in an increasingly fragmented labor market, instead more inclined to prevent the creation of new forms of employment (Palier, 2019). Although, in the short term, the middle-skill occupations, especially clerks and manufacturing workers (Cirillo and Guarascio, 2015), benefit from corporatist social protection, the precarious fiscal sustainability (Greve, 2017) and the pressure from international markets might force policymakers to undermine their privileged status.

The Mediterranean cluster instead seems to pay for three main disadvantages, which make its welfare institutions the worst equipped with regard to compensation policies. Firstly, the workerist approach, combined with the late adoption of a universal measure against poverty, does not provide an adequate level of social protection for workers with fragmented and low-paid careers (Ferrera, 2019). Moreover, the comparatively low level of expenditure on training (Pinelli et al., 2017) reduces the possibility of upskilling for workers with obsolete routine occupations. Thirdly, the Catholic legacy, deeply influencing the Southern welfare regime (Ascoli, 1991), hampers the release of family-friendly services aimed at reconciling the working and care time, which has become a key issue following the rise of female employment.

Finally, the Nordic-type welfare system appears to be the most capable to meet the new social needs of workers in a volatile economy, due to the universal provision of social rights based on citizenship, and peculiar combination between centralized wage bargaining and active labor market policies (Bonoli, 2007). This quality is complemented with a training system based on state-financed vocational schools, which supply workers with more general and transferable skills (Anderson and Hassel, 2013).

All in all, bearing in mind the impact of the institutional welfare configurations on the employment distribution, and their interventions in terms of compensation for the workers affected by automation, it is possible to estimate the overall molding influence of each welfare regime. More specifically, the different capabilities of each welfare regime in softening the job polarization and compensating workers for job loss would enable to answer to the second research question of this work.

It can be reasonably asserted that the Social Democratic model is the one which best combines competitiveness and social protection. Indeed, the internationally tradable services are supported by a public vocational system aimed at providing general skills. Moreover, the growth of low-skill services is not prevented, rather sheltered in the public sector or retrained, and a universal coverage is guaranteed to everyone. Instead, the Liberal regime magnifies the labor market dualization in the access to training and social protection, founding its competitiveness on the fragile basis of private debt. The Conservative ideal-type proves to be the least service-friendly, both in terms of educational and economic policies, hence non-competitive, hardly sustainable and non-homogenously protective. Finally, the Mediterranean regime is expected to be the suitable to face the challenges surging with automation and de-industrialization, due to its weakened wage-setting institutions and the insufficient welfare guarantees against the “new social risks”.

CHAPTER III

Comparative descriptive analysis: class structure and RTI in Europe.

In this chapter I will outline the class structure of some European countries, using the Oesch's scheme (2006), together with the proneness to automation shown by those classes, which it will be measured with the "Routine Task Index" (RTI). I will divide the chapter in two paragraphs, devoting the first section to class analysis and the second one to RTI. The class analysis will serve as an empirical test of the molding influence of welfare institutions on the labor market, investigating the quality and direction of service transition (Wren, 2013). Hence, the preliminary conclusions of this chapter would enable me to answer to the first research question of this work, regarding the replaceability of the middle-class occupations due to the technical change.

3.1. Class analysis: the Oesch's scheme applied to the ESS dataset.

In the previous chapter the Oesch's model of social stratification has been widely described both in terms of theory and operationalization. I decided to rely on his classification because its focus on occupations and skills fits perfectly with the aim of this work, bringing out the linkage between labor market position and social class. As already mentioned, I will mainly refer to the 8-class version to outline the class structure of the European countries of interest. However, the 16-class scheme will be also employed when more detailed information are deemed useful. For instance, I will use the more specific classification to release some comments on the "large" middle class that I define by merging those groups of occupations labeled as "associate professional/managerial" and "generally/vocationally skilled". Before moving to quantitative analysis, few words should be spent with regard to the data and methodology chosen.

3.1.1. Data and methodology.

The quantitative analyses performed in this chapter refer to the data collected in the European Social Survey (ESS), and they are processed by the statistical software Stata. The ESS project was established in 2001, becoming one of the most popular cross-national survey, which provides information about social structure and conditions, together with moral, political and economic attitudes in Europe (Schnaudt et al., 2014). It is released every two years, covering more than thirty European countries, and it involves tens of thousands of respondents randomly selected amongst the general population. The ESS counts nine waves, enabling both single-country and cross-national analyses. Moreover, longitudinal studies can also be performed thanks to the ESS Cumulative Data Wizard.

As regards methodology, I will apply the Oesch's scheme to the ESS dataset by running the do-files produced by Tawfik and Oesch, available online[4], which permit to construct the class indicators using the variables isco08, emplrel, emplno, isco08p, emprelp. It should be underlined that the larger Oesch's classification only involves 16 classes rather than the 17 categories presented by the author (Oesch, 2006). The reason lies in the operationalization process, which merges the "routine operatives" with the "routine agriculture" workers in the "low-skilled manual" class.

Since the main aim of this chapter is to highlight the differences in terms of class structure among welfare regimes, and the associated propensity to automation, I will cluster countries according to the welfare state's classification elaborated by Esping-Andersen (1990). However, as pointed out in the second chapter, I will add a distinct ideal-type to his classification, composed by the Mediterranean countries. This analytical need appears quite undeniable, given the distinctive and homogenous features outlined in the literature (e.g. universal healthcare systems, familism, etc.). The statistical tool that I will use to plot the differences among welfare regimes is the frequency distribution, represented both by tables and histograms. The countries chosen to represent each welfare family are the following: Austria, France, Belgium and Germany for the Christian Democratic type; the United Kingdom and Ireland for the Liberal model; Sweden, Norway, Finland and Denmark for the Social Democratic cluster; Italy, Portugal and Spain for the Mediterranean family. As regards the Scandinavian countries, it should be noted that neither the Swedish nor the Danish 9th round data had yet been released at the time of writing. Moreover, Denmark did not take part in the previous ESS round. Therefore, in order to work with comparable data concerning the Nordic countries, I will rely on the 7th ESS round (2014) when performing analyses on their class structure. Besides, a similar issue rises with regard to the Southern nations since neither Portugal nor Spain had released their data for the last ESS wave. Hence, I will use the 8th round data (2016) when referring to this cluster.

A further annotation needs to be pointed out regarding weights. The ESS dataset provides three types of weight variables: the "design weight" (dweight), adjusting for different selection probabilities; the "post-stratification weights" (pspwght), adjusting for sampling error, non-response bias, and different selection probabilities; the "population size weights" (pweight), which should be applied when analyzing aggregates of two countries or more. The second weight variable mentioned should be used when working with a single country, whereas the product between pspwght and pweight is required when looking at cross-national aggregates. However, since the pspwght had not yet been released for the last ESS wave at the time of my analysis, I will replace it with the dweight when using that dataset.

[4] Tawfik, A., Oesch, D., *Script for Social Class*. Available at http://people.unil.ch/danieloesch/scripts/.

In addition, I will describe the differences in terms of individual features between classes and countries (i.e. gender, age, net income, highest education). Finally, I will plot time series using the ESS Cumulative Data to outline the evolution of class structures and their features in Europe, particularly focusing on the middle class.

3.1.2. Class structure and welfare regimes: differences among European countries.

3.1.2.1. Work logics and the 8-class scheme.

Following the criteria elaborated by Oesch (2006) to create his classification, I would first plot the relative sizes of the different work logics in each welfare cluster.

Table 2: The work logic distribution. Source: ESS.

Work Logic – Conservative regime	Country				
	AT	BE	DE	FR	**Total**
	%	%	%	%	**%**
Independent	11.46	14.40	11.99	13.15	**12.56**
Technical	26.96	27.68	28.99	29.13	**28.85**
Organizational	26.19	26.58	29.67	27.08	**28.31**
Interpersonal service	35.39	31.34	29.35	30.64	**30.29**
Total	100.00	100.00	100.00	100.00	**100.00**

Work Logic – Liberal regime	Country		
	GB	IE	**Total**
	%	%	**%**
Independent	18.46	14.85	**18.23**
Technical	18.53	20.77	**18.67**
Organizational	27.67	27.08	**27.64**
Interpersonal service	35.34	37.30	**35.46**
Total	100.00	100.00	**100.00**

Work Logic – Social Democratic regime	Country				
	DK	FI	NO	SE	**Total**
	%	%	%	%	**%**
Independent	10.34	13.33	10.44	12.06	**11.65**
Technical	25.32	31.54	22.88	23.42	**25.48**
Organizational	24.31	19.19	25.67	23.75	**23.26**
Interpersonal service	40.03	35.94	41.00	40.76	**39.61**
Total	100.00	100.00	100.00	100.00	**100.00**

Work Logic – Mediterranean regime	Country			
	ES	IT	PT	**Total**
	%	%	%	**%**
Independent	18.72	22.78	19.22	**20.76**
Technical	28.19	32.24	34.24	**30.75**
Organizational	19.96	20.43	17.62	**19.96**
Interpersonal service	33.14	24.55	28.92	**28.53**
Total	100.00	100.00	100.00	**100.00**

The frequency distributions charted here confirm some of the arguments reported in the previous chapters, which were taken from the literature. Firstly, the relative size of the independent work logic in the Liberal countries (18,2%) is well above that one measured in the other clusters. This observation is in line with the market friendly attitude of the Liberal regime. Secondly, the reduced size of the interpersonal service logic in the Conservative countries relative to the other two clusters confirms their hostility towards this economic sector (Wren, 2013). Moreover, the Social Democratic regime seems to outperform the Liberal cluster in the interpersonal service dimension, although a deeper analysis is required to detect the different occupations responsible for those results. Finally, a last difference emerges with regard to the technical work logic, peaking in the Conservative group

(28,9%) and in Finland, an exception among the Scandinavian countries, while falling in the Liberal cluster (18,7%), These figures may be traced back to the corporatist preservation of the traditional working-class occupations (Cirillo and Guarascio, 2015), despite it should be checked in the Oesch's more detailed classification.

As already said, I consider as noteworthy to present separately the distribution of work logic for the so-called Mediterranean countries, in order to point out some of the differences between this cluster and the Conservative one. Indeed, this table shows a significant performance of the independent work logic and the weakness of the organizational dimension relative to the Conservative group (respectively above and below 20%), whose causes need to be investigated more in detail using the class scheme. Meanwhile, the technical and interpersonal service logics present similar figures in both the Christian Democratic and the Southern regimes.

Once the differences in terms of work logic has been outlined, we can move to the Oesch's 8-class distribution in order to acquire more specific information on class structure.

Table 3: The 8-class scheme distribution. Source: ESS.

Final Oesch class position - 8 classes – Mediterranean regime	Country			
	ES	IT	PT	**Total**
	%	%	%	**%**
Self-employed professionals and large employers	2.85	3.66	2.40	**3.20**
Small business owners	15.87	19.12	16.83	**17.55**
Technical (semi-)professionals	6.45	4.47	4.39	**5.28**
Production workers	21.74	27.77	29.85	**25.47**
(Associate) managers	12.72	9.72	8.06	**10.80**
Clerks	7.24	10.71	9.56	**9.16**
Socio-cultural (semi-)professionals	6.63	7.93	8.21	**7.42**
Service workers	26.51	16.62	20.71	**21.11**
Total	100.00	100.00	100.00	**100.00**

Final Oesch class position - 8 classes – Liberal regime	Country		
	GB	IE	**Total**
	%	%	**%**
Self-employed professionals and large employers	2.76	2.01	**2.72**
Small business owners	15.69	12.84	**15.51**
Technical (semi-)professionals	7.40	7.68	**7.41**
Production workers	11.13	13.10	**11.26**
(Associate) managers	17.99	13.83	**17.73**
Clerks	9.68	13.26	**9.90**
Socio-cultural (semi-)professionals	11.86	13.64	**11.97**
Service workers	23.48	23.65	**23.49**
Total	100.00	100.00	**100.00**

Final Oesch class position - 8 classes – Conservative regime	Country				
	AT	BE	DE	FR	**Total**
	%	%	%	%	**%**
Self-employed professionals and large employers	1.51	2.88	3.11	2.77	**2.88**
Small business owners	9.95	11.53	8.88	10.38	**9.67**
Technical (semi-)professionals	5.60	11.45	10.41	8.77	**9.61**
Production workers	21.36	16.23	18.58	20.36	**19.25**
(Associate) managers	11.82	16.00	16.91	13.46	**15.28**
Clerks	14.37	10.58	12.76	13.62	**13.03**
Socio-cultural (semi-)professionals	10.90	12.94	15.37	10.61	**13.19**
Service workers	24.49	18.40	13.98	20.03	**17.10**
Total	100.00	100.00	100.00	100.00	**100.00**

Final Oesch class position - 8 classes – Conservative regime	Country				
	AT	BE	DE	FR	**Total**
	%	%	%	%	**%**
Self-employed professionals and large employers	1.51	2.88	3.11	2.77	**2.88**
Small business owners	9.95	11.53	8.88	10.38	**9.67**
Technical (semi-)professionals	5.60	11.45	10.41	8.77	**9.61**
Production workers	21.36	16.23	18.58	20.36	**19.25**
(Associate) managers	11.82	16.00	16.91	13.46	**15.28**
Clerks	14.37	10.58	12.76	13.62	**13.03**
Socio-cultural (semi-)professionals	10.90	12.94	15.37	10.61	**13.19**
Service workers	24.49	18.40	13.98	20.03	**17.10**
Total	100.00	100.00	100.00	100.00	**100.00**

Firstly, it seems clear that the variation of the independent work logic among welfare regimes has to be traced back to the small business owners' class, since the figures regarding large employers and self-employed professionals are quite homogenous across clusters. On the contrary, the small entrepreneurs count for the exceptional size of the independent work dimension in both Mediterranean and Liberal countries, peaking in Italy (almost 20%). As regards technical professionals, Conservative countries show the highest result, whereas the Southern group presents the lowest share in this class. Coupling this evidence with the data concerning production workers, it corroborates the argument of Cirillo and Guarascio (2015) according to which the German-centered core countries have upskilled their laborers, preserving the traditional working-class jobs (19,25%). Moreover, these countries were also able to retain the largest share of clerks (13%), ranking above the rest of the nations included in the analysis. At the same time, the oversized amount of production workers in Southern Europe, which is a quarter of its whole workforce, seems to demonstrate the capability of this welfare regime to preserve those routine jobs.

Unsurprisingly, the Liberal cluster shows the highest relative size of associate managers (almost 18%) and a remarkable figure for service least-skilled workers (23,5%). However, the Nordic countries outperform the British Isles in the entire interpersonal service dimension, including both high-skill socio-cultural professionals (14%) and low-skill service workers (25,6%). Hence, relying on this evidence, the Scandinavian way to support service employment appears more successful than the Anglo-Saxon one, boosting the whole sector. Combining these data with the literature (Wren, 2013), the Nordic approach to service transition may turn out to be the most efficient and sustainable, although further investigations are needed to understand the quality of jobs created in the least tradable service sector.

Instead, the service dimension looks more polarized in the other two welfare clusters. While in the Christian Democratic group the number of socio-cultural professionals almost equals the Nordic figure (13,2%) and the share of low-skill service workers is more constrained (17,1%), in the Mediterranean family the share of service employees exceeds 20% and their high-skill counterpart shows its lowest comparative result (7,4%). Thus, the hostility of Central European countries to low-

skill and low-paid service jobs seems confirmed (Wren, 2013), whereas the more flexible Southern wage-setting institutions have not hampered their expansion. Moreover, the vocational training system of the Conservative regime does not seem to have constrained the growth of highly educated service occupations. This observation is in contrast to the argument of Anderson and Hassel (2013), who argue that the Continental European training systems mainly provide workers with specific skills that are less employable in the service sector. Indeed, the overall share of socio-cultural professionals in Central European countries comes very close to the one shown by the Scandinavian group, outperforming the Liberal result. On the contrary, the Mediterranean institutional configurations turn out to be the worst equipped to train service professionals.

Although homogenous trends have been detected within the welfare clusters, I have to point out some differences which slightly undermine their internal consistency. Starting from the Conservative group, Austria stands out clearly for its anomalous class structure, especially referring to two work logics. Firstly, this country shows, within the interpersonal service dimension, a significantly larger share of low-skill service workers relative to socio-cultural professionals (respectively 24,5% and 10,9%). Moreover, looking at the technical logic, the production workers are almost four times as much as the technical professionals (respectively 21,4% and 5,6%). Hence, the Austrian workforce looks less skilled than the rest of the Central European countries, resembling to the Southern cluster. However, the important share of highly skilled service workers, together with the constrained figure of small business owners, requires a more detailed analysis to assess whether Austria comes closer to the Mediterranean or the Scandinavian cluster, particularly focusing on the quality of the least-educated service jobs.

In the Mediterranean group, the outliers are less threatening for the welfare state's classification than the one previously mentioned. Italy presents a restrained share of service workers (16,6%), which is more in line with the Conservative rather than the Southern figures, which might be the result of a stricter wage-setting institutions, while leading in the small business sector (19,1%). On the other hand, Spain shows a clearly de-industrialized labor market, displaying a significant amount of service workers (26,5%) and an overall higher skilled industrial workforce than the other "cluster-mates" (21,7% of production workers and 6,5% of technical professionals). Nevertheless, in order to check the quality of Spanish service transition, a deeper investigation is needed.

Finally, the remaining two welfare regimes show few outlying values. As regards the Social Democratic family, Norway presents a slightly more de-industrialized and market-friendly class structure, thanks to the remarkable sizes of the associate managers (19,6%) and service workers (28,1%) relative to the production laborers, whereas Finland seems able to retain its industrial workforce (almost 22%), being more cautious in fostering the expansion of low-skill services

(23,1%). Lastly, in the Liberal group, Ireland appears more able to hold the routine occupations, i.e. production workers (13,1%) and clerks (13,3%), and to train socio-cultural professionals (13,6%) than the United Kingdom.

3.1.2.2. The 16-class scheme: an analysis of service transition in Europe.

Overall, the questions emerged in the preceding paragraph mainly concern the three least skilled classes: production workers, clerks and service workers. For this reason, I will only tabulate the Oesch's 16-class scheme for these categories, while representing the general class distribution for each welfare regime by histograms.

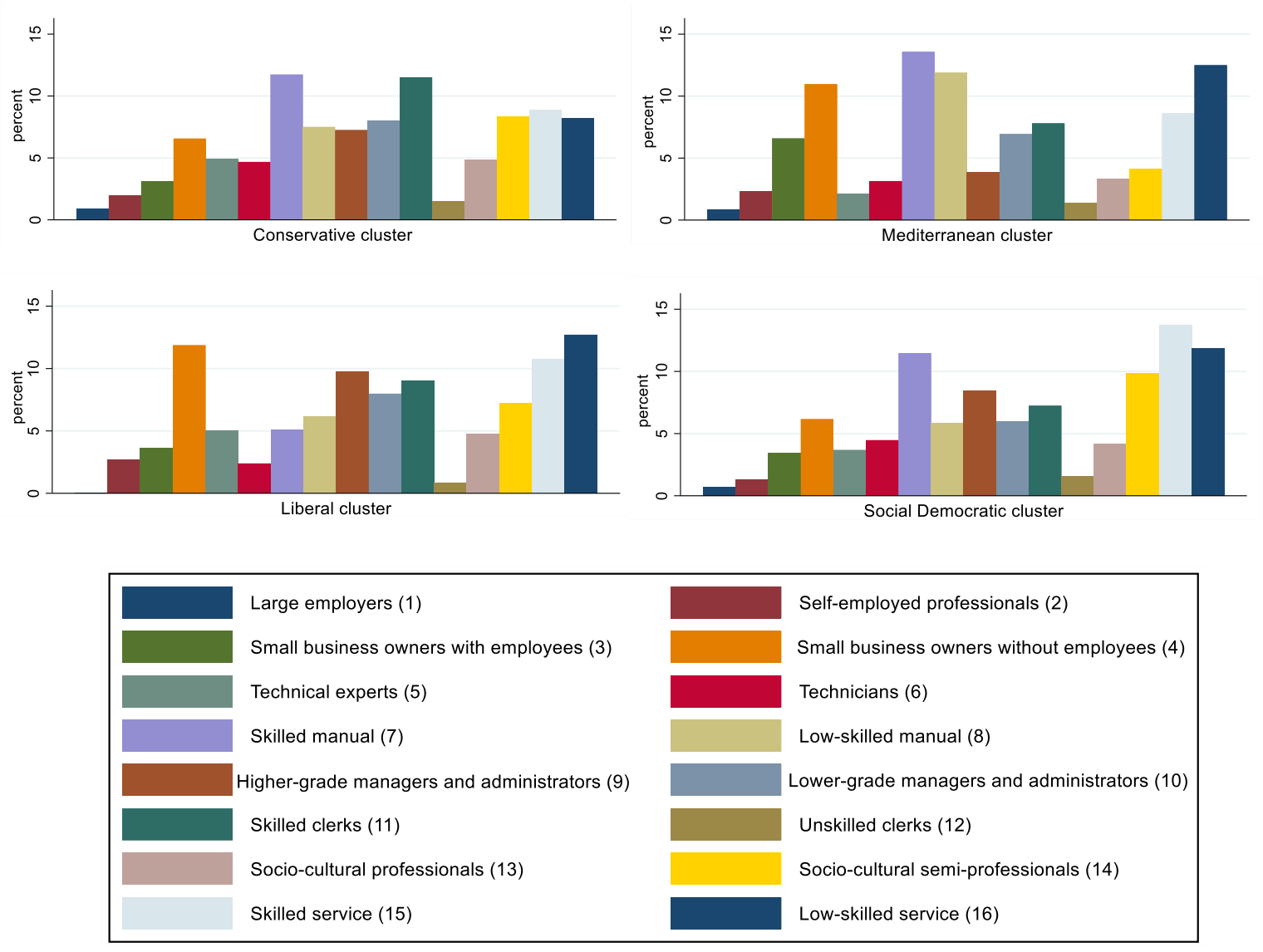


Figure 23: The 16-class scheme distribution. Source: ESS.

The histograms plotted above provide with a general overview of the 16-class scheme applied to each welfare family. What immediately sticks out is the great importance of the skilled manual workers for the Conservative and the Mediterranean clusters, and the remarkable size of service

workers and small business owners without employees in the Anglo-Saxon and Southern countries. Moreover, the distributions of the interpersonal service dimension in Liberal and Social Democratic countries look similar, except for the greater size of skilled service workers in the Nordics, especially relative to their low-skilled counterpart. The Christian Democratic group also shows a great number of skilled clerks, while the Southern highly skilled socio-cultural semi-professionals are starkly undersized compared to their colleagues in the other three welfare families. Moreover, the Scandinavian countries still hold their skilled manual laborers, while falling in the Liberal labor markets.

However, these histograms, quite dispersive, may not be very useful to perform a detailed investigation of class structure. Given that the issues risen in the 8-class analysis mainly involve the three least skilled categories, I only tabulate the larger classification for those classes (the alternation between white and grey lines refers to the eight-fold division). Moreover, this specific analysis would help to better understand the quality of de-industrialization, examining the skill distributions among the least educated classes in different welfare regimes.

Table 4: The 16-class scheme distribution (low-skill classes). Source: ESS.

Final Oesch class position - 16 classes – Conservative regime	Country AT	BE	DE	FR	**Total**
	%	%	%	%	%
Skilled manual	15.37	10.21	12.26	10.77	**11.73**
Low-skilled manual	5.99	6.02	6.31	9.59	**7.51**
Skilled clerks	12.78	9.83	11.05	12.25	**11.52**
Unskilled clerks	1.59	0.75	1.71	1.37	**1.51**
Skilled service	13.77	7.88	8.52	8.87	**8.89**
Low-skilled service	10.72	10.52	5.46	11.16	**8.21**
Total	100.00	100.00	100.00	100.00	**100.00**

Final Oesch class position - 16 classes	Country DK	FI	NO	SE	**Total**
	%	%	%	%	%
Skilled manual	12.00	14.33	9.59	10.50	**11.48**
Low-skilled manual	6.64	7.59	3.94	5.38	**5.85**
Skilled clerks	8.40	7.29	5.49	7.45	**7.24**
Unskilled clerks	2.01	1.00	0.63	2.17	**1.59**
Skilled service	13.71	12.59	17.86	12.34	**13.76**
Low-skilled service	13.90	10.49	10.24	12.34	**11.88**
Total	100.00	100.00	100.00	100.00	**100.00**

Final Oesch class position - 16 classes – Liberal regime	Country GB	IE	**Total**
	%	%	%
Skilled manual	4.95	7.34	**5.10**
Low-skilled manual	6.19	5.76	**6.16**
Skilled clerks	8.90	11.15	**9.04**
Unskilled clerks	0.78	2.10	**0.86**
Skilled service	10.62	13.07	**10.78**
Low-skilled service	12.86	10.58	**12.71**
Total	100.00	100.00	**100.00**

Final Oesch class position - 16 classes – Mediterranean regime	Country ES	IT	PT	**Total**
	%	%	%	%
Skilled manual	12.41	14.14	15.74	**13.58**
Low-skilled manual	9.33	13.63	14.11	**11.89**
Skilled clerks	5.82	9.40	8.24	**7.81**
Unskilled clerks	1.42	1.30	1.32	**1.35**
Skilled service	11.61	6.46	6.71	**8.62**
Low-skilled service	14.90	10.17	14.00	**12.50**
Total	100.00	100.00	100.00	**100.00**

The clerks' class shows a homogenous cross-cluster distribution between skilled and unskilled, with the clear predominance of the former. However, it stands out again the significant relative size of these occupations in the Conservative group, confirming the special protection reserved to them (Cirillo and Guarascio, 2015). The picture becomes more varied when looking at production workers. The Central and Northern European countries presents similar figures, with skilled manual workers clearly outnumbering their unskilled colleagues, despite the Nordics experience a more significant drop in the least educated category. On the contrary, the Liberal cluster, whose industrial workforce is clearly undersized compared to the rest of the sample, shows an upside down distribution. Namely, the low-skill production workers slightly outperform the high-skill counterpart (respectively 6,2% and 5,1%), although this outcome is mainly led by the United Kingdom. Finally, the Mediterranean countries confirm their capability to retain the largest share of production workers, which is almost equally distributed between the more and less skilled classes. Given that Southern Europe is the only cluster which shows a two digit figure for unskilled laborers (almost 12% of the total workforce), it could be argued that those countries have been the most committed to shelter the entire traditional industrial labor force, whereas the Anglo-Saxon islands have turned out to be the worst equipped both in terms of upskilling and job protection in this sector.

Nevertheless, many scholars argue that the main criterion to identify the different types of de-industrialization lies in the expansion of the least tradable interpersonal services (Wren, 2013). In fact, the people performing these occupations are usually the least skilled service workers who, according to the RBTC hypothesis, compose the lower tail of the U-shaped job distribution (Goos et al., 2009; Oesch and Rodriguez-Menés, 2011). As regards the most competitive services, it has been already pointed out that the Scandinavian cluster is the best performer, particularly peaking in the size of socio-cultural semi-professionals (e.g. primary school teachers, social workers), reaching about 10% of the overall workforce. On the other hand, the Southern institutional configurations appear to be those which have least facilitated the growth of those occupations (only 3,3% and 4,1% for each category).

Moving to the non-tradable service sector, the Christian Democratic family is apparently characterized by the lowest figure, fairly allocated between high- and low-skilled (respectively 8,9% and 8,2%). Nevertheless, these values could be mainly traced back to Germany, whereas its "cluster-mates" present figures closer to the Nordics. Hence, this observation appears to partially corroborate the literature's finding, which ascribes the constrained expansion of those occupations to the rigidity of corporatist wage-setting institutions (Wren, 2013). In this regard, the Austria is the Continental country which is most comparable with the Scandinavian family, due to the clear predominance of skilled manual and service workers over their unskilled counterparts. On the contrary, the Social

Democratic group shows the greatest performance in this sector, with the most educated workers slightly outnumbering their low-skill colleagues. This finding seems to support the Wren's argument (2013), according to which the Scandinavian countries do not hamper the expansion of non-tradable services, rather shielding and retraining these workers thanks to their generous public sector. Finally, the Liberal and Mediterranean countries both present a significant amount of service workers concentrated in the low-skilled class. However, it should be noted that this trend is widely predominant only in the Southern cluster, since in the other group Ireland shows a more Nordic-oriented distribution (13,1% of high- and 10,6% of low-skill workers). Moreover, Italy confirms to be an outlying case regarding this sector since its figures are closer to the Conservative cluster, whereas the Spanish service transition, due to its weaker industrial sector, resembles to the Liberal one. Overall, it could be asserted that the less uneven service workers' distribution in the Liberal cluster is counterbalanced by a remarkable number of socio-cultural professionals in the tradable sector. This finding is in line with the argument of Anne Wren (2013), who states that the rise of the highly skilled service professionals in the Liberal countries is mainly supported by the expansion of low-skill service workers financed by private indebtedness. On the other hand, the expansion of non-marketable services in the South, led by the least educated workers, does not comprise the development of the most productive interpersonal service occupations.

Before analyzing the individual composition of class structures in each welfare regime, I would briefly resume the findings of class analysis presented so far, sorted by cluster. The Liberal group is characterized by the weakest industrial sector and the largest independent work logic. Moreover, the expansion of the non-tradable service sector seems to have supported the significant size of the socio-cultural (semi-) professionals class. However, the Scandinavian model turns out to be more efficient in managing the service transition since it has been able to both foster the expansion of high- and low-skill interpersonal services. The Nordic production workforce appears smaller than that of the South Central Europe, where those occupations have been preserved. Notably, the Christian Democratic countries have been also committed to retain their most skilled clerks and to upskill the workers in the other two dependent work logics, fostering the growth of technical and socio-cultural professionals. In this regard, the claim made by Anderson and Hassel (2013), concerning the better efficiency of the general skill-based relative to the workplace-based training in creation of skilled service jobs, is not supported by a convincing evidence in the data. Indeed, the Scandinavian advantage over the Central European countries in socio-cultural occupations is not significant, whereas the Liberal cluster is overtaken by both. Finally, the Mediterranean family are mainly characterized by an oversized small business owners' class and a comparatively less skilled secondary and tertiary sectors, with a noticeable number of manual and service workers.

3.1.3. The individual composition of social classes.

Once the Oesch's class schemes have been applied to the welfare regimes, I will outline some of the individual features which I consider relevant to deepen the class analysis. In this section I will only refer to the 8-class scheme.

3.1.3.1. Gender.

First of all, it should be noted that the ESS sample shows an almost perfect distribution of respondents in terms of gender in each country.

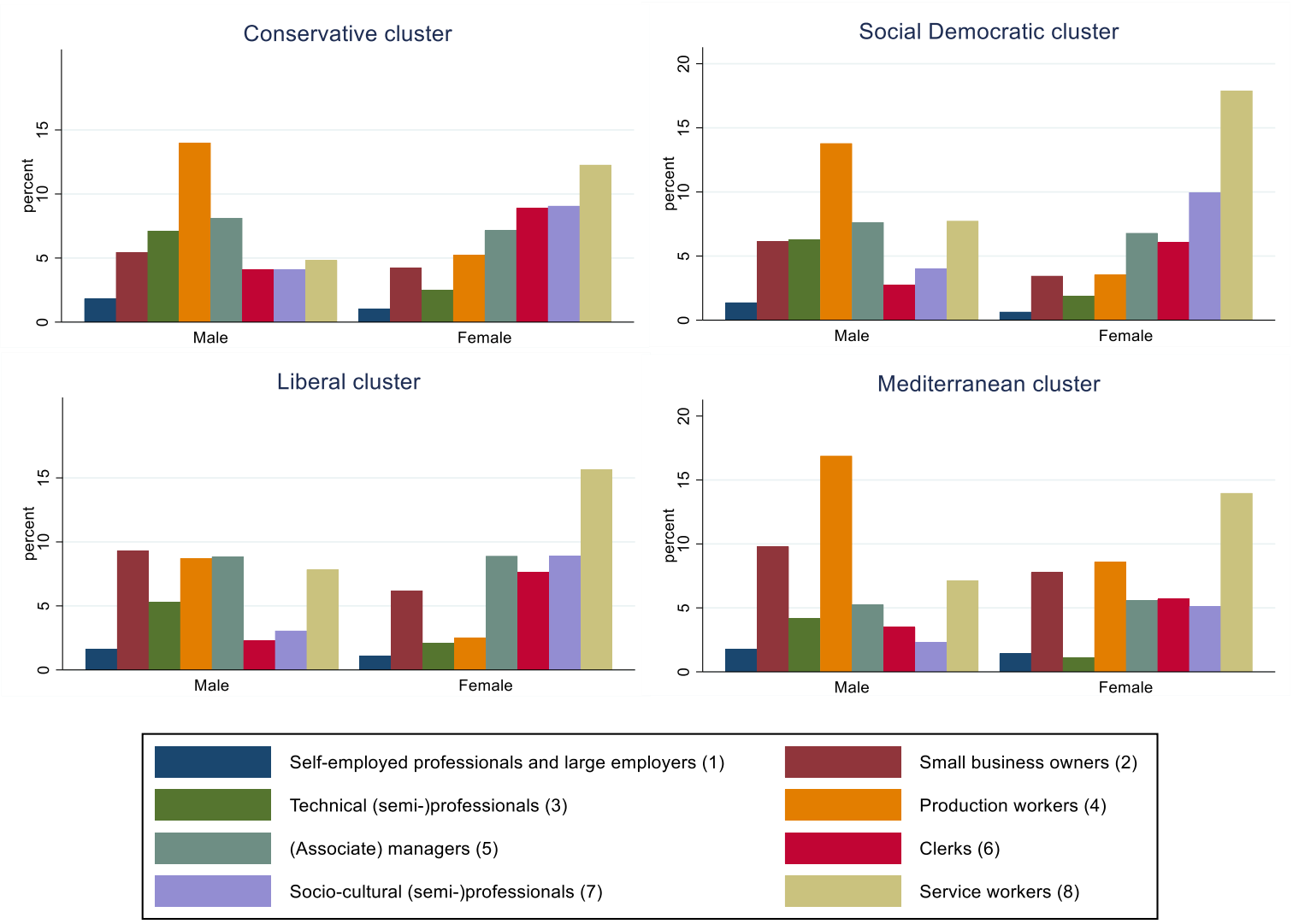


Figure 24: The 8-class scheme distribution between genders. Source: ESS.

What is immediately evident is the gender-biased division of economic sectors, which overcomes the clusters' borders, particularly between the predominantly male industrial workforce and the prevalence of women in the service classes. The only classes which do not appear particularly gender-biased are the large employers and self-employed, the small business owners and the associate managers, reporting a slight advantage for men. On the contrary, the male component of production

workers and technical professionals turns out to be largely predominant across all clusters, at least doubling the female colleagues.

Surprisingly, the most unequal distribution is found in the Social Democratic group, where the male production workers are four times the size of the female laborers. On the other hand, the tertiary sector (except for managers) is clearly biased towards women in all welfare families. This observation is line with the argument of Iversen and Rosenbluth (2013), who find a clear correlation between the service growth and the incredible expansion of demand for female labor, especially from the late 1970s. The relative size of female in these three classes (i.e. clerks, socio-cultural professionals and service workers) is stable across clusters, and it is usually twice as the men. Surprisingly, the alleged "female ghetto" does not characterize the Scandinavian low-skill service sector only, since a slightly more gender-biased non-tradable service class is found in the Conservative group, where female workers are more than two times and a half their male colleagues. On the contrary, a stronger presence of women characterizes the Scandinavian socio-cultural professionals and the Liberal clerks (respectively 2,5 and 3 time their male colleagues).

Overall, the argument elaborated by Iversen and Rosenbluth (2013) seems largely corroborated by the data. Indeed, the premium posed on physical skills in the manual occupations still consists in a great advantage for male workers. On the other hand, the general skills required by service jobs may account for the clear predominance of women in tertiary sector, particularly referring to clerks and the most skilled workers of the interpersonal work logic. Nevertheless, what may look quite unexpected is the homogeneity of class composition across clusters in terms of gender.

3.1.3.2. Educational attainment.

Daniel Oesch uses marketable skills as the hierarchical criterion to organize classes within each work logic. However, he does not provide a comprehensive educational hierarchy which would be useful to plot the entire class structure along a unique skills continuum. Notably, a class scheme sorted by skills would help to frame the class structure in the RBTC studies. In order to release this new classification, a more detailed analysis of educational attainment is needed. Hence, I will tabulate the frequency distribution of the "highest level of education" variable (eisced), coded according to the ISCED 1997 statistical framework, in the 8-class scheme grouped in the four welfare regimes used so far. The observations classified as "others", in terms of education, are excluded from the tables reported here.

Table 5: The ISCED classification in the 8-class scheme. Source: ESS

CONSERVATIVE CLUSTER	Highest level of education, ES - ISCED							
	ES-ISCED I, less than lower secondary	ES-ISCED II, lower secondary	ES-ISCED IIIb, lower tier upper secondary	ES-ISCED IIIa, upper tier upper secondary	ES-ISCED IV, advanced vocational, sub-degree	ES-ISCED V1, lower tertiary education, BA level	ES-ISCED V2, higher tertiary education, >= MA level	Total
	%	%	%	%	%	%	%	%
Self-employed professionals and large employers	0.5	2.6	8.8	8.2	11.9	14.4	53.6	100.0
Small business owners	7.4	12.5	29.8	11.7	18.2	8.7	11.7	100.0
Technical (semi-)professionals	1.9	5.9	15.3	14.1	20.2	14.8	27.8	100.0
Production workers	11.3	17.2	52.0	6.6	8.8	1.3	1.0	100.0
(Associate) managers	1.0	3.7	19.6	11.5	17.9	20.3	25.9	100.0
Clerks	4.0	9.9	42.8	15.7	16.7	5.6	5.2	100.0
Socio-cultural (semi-)professionals	0.4	1.7	15.5	5.8	21.6	22.4	32.6	100.0
Service workers	8.6	19.8	43.9	11.9	9.8	4.2	1.8	100.0
Total	5.5	11.0	33.5	11.0	14.9	10.1	13.9	100.0

SOCIAL DEMOCRATIC CLUSTER	Highest level of education, ES - ISCED							
	ES-ISCED I, less than lower secondary	ES-ISCED II, lower secondary	ES-ISCED IIIb, lower tier upper secondary	ES-ISCED IIIa, upper tier upper secondary	ES-ISCED IV, advanced vocational, sub-degree	ES-ISCED V1, lower tertiary education, BA level	ES-ISCED V2, higher tertiary education, >= MA level	Total
	%	%	%	%	%	%	%	%
Self-employed professionals and large employers	0.7	2.7	7.5	7.5	17.0	17.0	47.6	100.0
Small business owners	15.6	14.0	17.4	20.0	18.5	9.9	4.6	100.0
Technical (semi-)professionals	2.3	3.0	9.2	13.4	23.9	24.4	23.9	100.0
Production workers	18.6	19.2	22.5	27.1	9.4	2.5	0.7	100.0
(Associate) managers	2.1	5.6	9.5	11.3	22.4	23.9	25.3	100.0
Clerks	8.1	19.8	11.6	23.3	21.1	11.9	4.2	100.0
Socio-cultural (semi-)professionals	1.0	2.2	2.3	6.2	16.1	42.4	29.8	100.0
Service workers	10.9	20.1	18.1	29.7	14.1	5.7	1.3	100.0
Total	8.5	12.3	13.3	19.2	16.9	16.7	13.1	100.0

MEDITERRANEAN CLUSTER	Highest level of education, ES - ISCED							
	ES-ISCED I, less than lower secondary	ES-ISCED II, lower secondary	ES-ISCED IIIb, lower tier upper secondary	ES-ISCED IIIa, upper tier upper secondary	ES-ISCED IV, advanced vocational, sub-degree	ES-ISCED V1, lower tertiary education, BA level	ES-ISCED V2, higher tertiary education, >= MA level	Total
	%	%	%	%	%	%	%	%
Self-employed professionals and large employers	7.1	4.5	0.0	13.6	3.9	14.9	55.8	100.0
Small business owners	26.0	30.1	6.6	22.2	5.2	4.3	5.5	100.0
Technical (semi-)professionals	5.9	9.4	8.2	20.8	14.1	11.0	30.6	100.0
Production workers	38.6	36.5	5.5	12.8	4.5	0.9	1.2	100.0
(Associate) managers	2.6	8.6	6.0	31.3	6.8	13.2	31.6	100.0
Clerks	7.6	21.5	7.6	45.7	4.7	7.2	5.7	100.0
Socio-cultural (semi-)professionals	1.5	3.9	4.4	15.7	5.7	21.4	47.4	100.0
Service workers	25.8	34.5	8.0	20.8	5.2	3.5	2.2	100.0
Total	21.0	25.4	6.4	22.0	5.6	6.6	12.9	100.0

LIBERAL CLUSTER	Highest level of education, ES - ISCED							
	ES-ISCED I, less than lower secondary	ES-ISCED II, lower secondary	ES-ISCED IIIb, lower tier upper secondary	ES-ISCED IIIa, upper tier upper secondary	ES-ISCED IV, advanced vocational, sub-degree	ES-ISCED V1, lower tertiary education, BA level	ES-ISCED V2, higher tertiary education, >= MA level	Total
	%	%	%	%	%	%	%	%
Self-employed professionals and large employers	1.0	7.0	2.0	5.0	18.0	30.0	37.0	100.0
Small business owners	17.2	17.4	7.0	16.8	21.6	10.1	9.8	100.0
Technical (semi-)professionals	5.2	5.2	3.3	13.4	24.5	25.8	22.5	100.0
Production workers	33.3	20.7	7.6	15.7	15.1	3.8	3.8	100.0
(Associate) managers	5.5	6.7	5.3	13.7	22.2	21.6	25.0	100.0
Clerks	9.3	16.8	9.7	21.6	24.1	13.1	5.4	100.0
Socio-cultural (semi-)professionals	1.5	2.8	1.3	5.1	24.5	29.2	35.5	100.0
Service workers	19.5	19.1	7.5	20.2	21.8	7.6	4.4	100.0
Total	13.7	13.4	6.1	15.4	21.7	15.1	14.7	100.0

As regards the big picture, the class including self-employed professionals and large employers turns out to be the most skilled, since the majority of them has reached the highest educational level. More than a half of the socio-cultural professionals have graduated (either BA or MA level), whereas the technical experts and the managers present a more significant concentration in the IV and the V1 ISCED level than the highly skilled service workers. The clerical workers instead stand in the middle of the ISCED classification, usually attaining the secondary education. Instead, the service and production workers occupy the bottom half of the skills continuum, although the former are more likely to attain an upper secondary education. Finally, the distribution of small business owners also results biased towards the bottom of the ISCED classification, particularly in the Mediterranean cluster.

Moving to a more detailed analysis, the employers and self-employed workers show their greatest relative size in the Central-Southern Europe, where the majority gets an MA degree. The socio-cultural professionals result to be significantly concentrated in the highest skills range in the Mediterranean cluster, whereas they are more equally distributed in the other regimes. The reason could be traced back to the constrained size of Southern high-skill service professionals relative to the rest of the sample, becoming a more exclusive type of occupations. Vice versa, the distribution of technical professionals looks slightly less biased towards the highest levels of education in the Conservative group than in the other clusters. This finding may be justified by the greater importance of the industrial sector in Central Europe, which might make easier to access to those occupations. While the distribution of managers seems quite homogenous across countries, the small business owners show a lower level of education in the Mediterranean nations. Once again, the remarkable

size of this class in Southern Europe could make these occupations more accessible to less educated people.

With regards to the least skilled classes, the clerks show a significant concentration in the upper secondary education (levels IIIa and IIIb) in the Conservative and Mediterranean groups, whereas they look more educated in Northern Europe. Finally, both the service and production workers achieve their lowest educational attainment in the Southern countries, although the Anglo-Saxon industrial laborers also present a weak result in terms of skills.

Overall, the skill criterion chosen by Oesch is confirmed as a valuable instrument to organize the class hierarchy. The inter-regime differences do nothing but reaffirm the general undersized level of education of the Mediterranean workforce relative to the rest of the sample. Indeed, the Southern countries show the largest concentration of workers in the first two ISCED classes, i.e. 46,4% of their total workforce. On the contrary, the other clusters present much fewer low-skilled workers: 16,5% in the Conservative group, 20,8% in the Social Democratic regime, 27,1% in the Liberal cluster. Consequently, the skills distribution seems more polarized in the Mediterranean regime, with the least skilled classes clearly biased towards the lowest levels of education, and the most educated occupations heavily concentrated at the top of the ISCED classification. Therefore, it could be asserted that the size of the social classes appears to stand in proportion to the accessibility to the occupations which compose them.

Table 6: The 16-class scheme reordered by skills. Source: ESS.

The 16-class scheme sorted by educational attainment (ISCED)
Low-skilled manual
Low-skilled service
Skilled manual
Skilled service
Unskilled clerks
Small business owners without employees
Small business owners with employees
Skilled clerks
Technicians
Lower-grade administrators
Large employers
Socio-cultural semi-professionals
Higher-grade administrators
Technical experts
Self-employed professionals
Socio-cultural professionals

Nevertheless, a deeper analysis involving the 16-class scheme seems required to reassess the Oesch's classification along a unique skill axis. Hence, I reordered the larger model according to the average educational attainment shown by each class in the four regimes, from the least to the most skilled class. The new variable, which I have created to reorganize the class scheme, appears to be

sufficiently correlated with the skills distribution (eisced) in all clusters. The groups of countries which show the highest correlation coefficient r are the Conservative and Mediterranean families (respectively r = 0,61 and r = 0,63). A slightly weaker correlation is presented by the Scandinavian countries (r = 0,59), whereas the lowest linear relationship characterizes the Liberal regime (r = 0,49). These scatterplots display the correlations mentioned. I intend to use this classification when graphing the RTI values along the whole class structure.

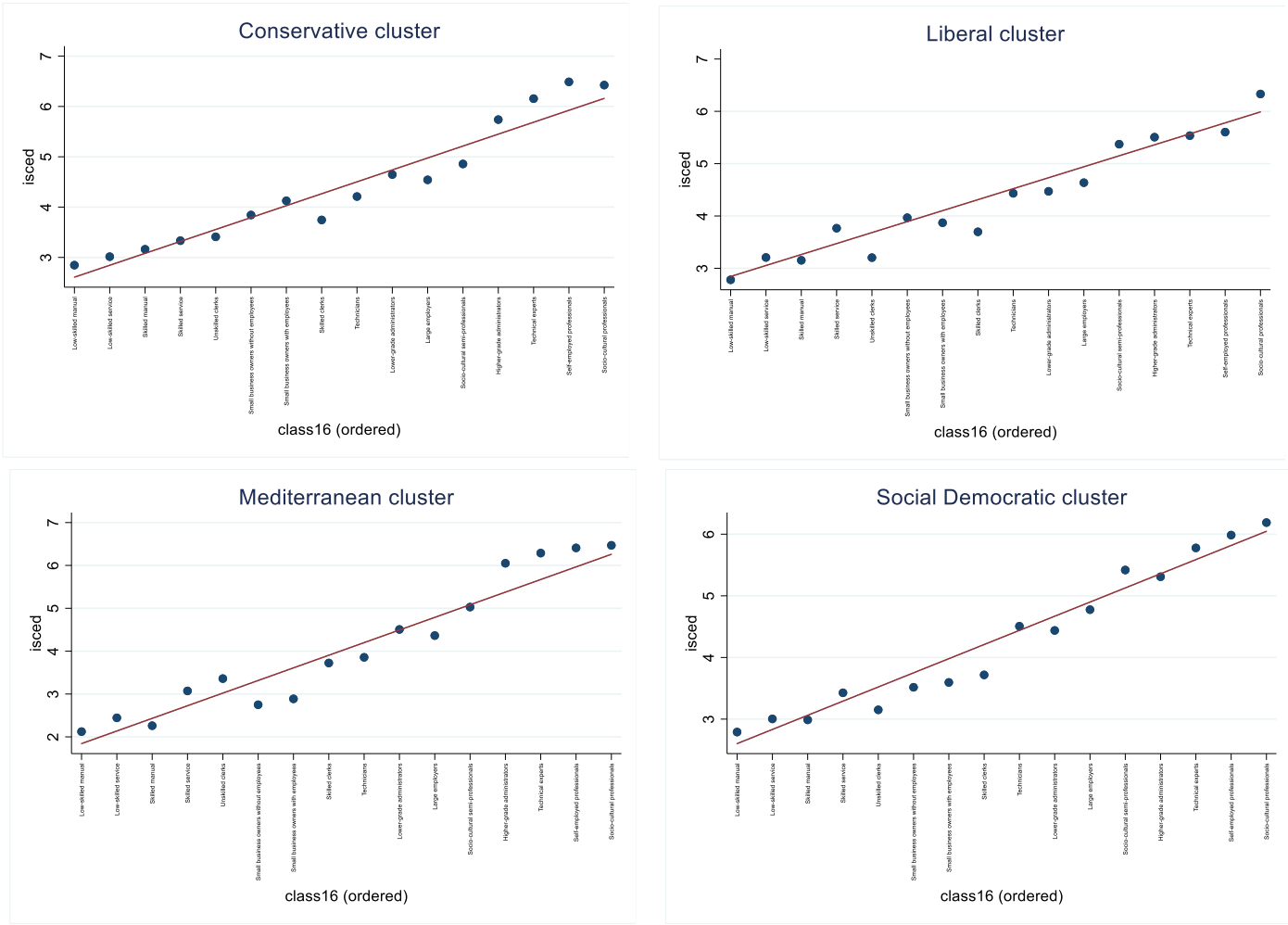


Figure 25: The correlations between ISCED classification and the 16-class scheme reordered. Source: ESS

3.1.4. The evolution of class structure in Europe.

Once a snapshot of the current European class structure is taken, it might be interesting to describe the evolution of social classes in different welfare regime across time. The intent of this analysis is twofold. On the one hand, it would be possible to detect which classes have been most

severely hit by the automation process. On the other hand, the different institutional strategies of social protection, and their various outcomes, are likely to newly emerge.

In this regard, time series are a fruitful statistical instrument to record societal trends, which can be plotted thanks to the ESS Cumulative Data Wizard, including data from the first eight ESS waves. However, some additional methodological notes need to be pointed out. Firstly, the ESS is based on survey data, hence the reliability of trends reported depends on the quality of sampling. Secondly, a change has to be made in the composition of the Conservative cluster. Namely, the French data referring to the first five ESS rounds can be hardly processed by the Tawfik and Oesch's do-file, thus it will be excluded from the sample. Furthermore, the time coverage of each cluster varies because of the inconstant participation of some countries to the ESS surveys. More precisely, the sample of Scandinavian countries covers up to the 7th round, since Denmark did not participate to the following edition. Moreover, the Mediterranean cluster only includes four waves (1st, 2nd, 6th and 8th), given that Italy did not participate to the others.

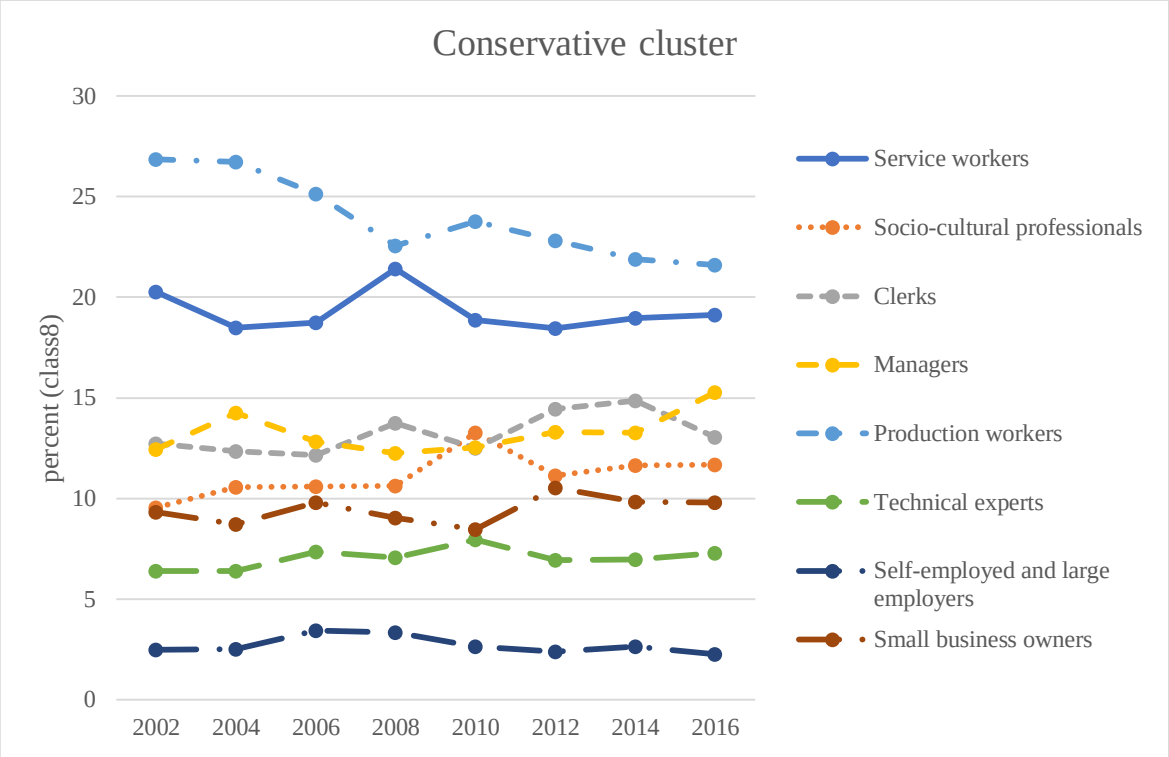


Figure 26: The evolution of the 8-class structure in the Conservative cluster. Source: ESS.

Starting with the Conservative cluster, the most evident change affects the production workers, who suffered an overall drop of five percentage points (from 26,9% in 2002 to 21,6% in 2016). It should be noted that the decline has accelerated during the Great Recession in 2008, hence supporting the jobless recovery option (Cortes, Jaimovich and Siu, 2017; Jaimovich and Siu, 2018). On the contrary, both the managers and the socio-cultural professionals show a slight increase in the

period considered (respectively +3 and +2 percentage points). As regards the other classes, the data do not detect any significant variation.

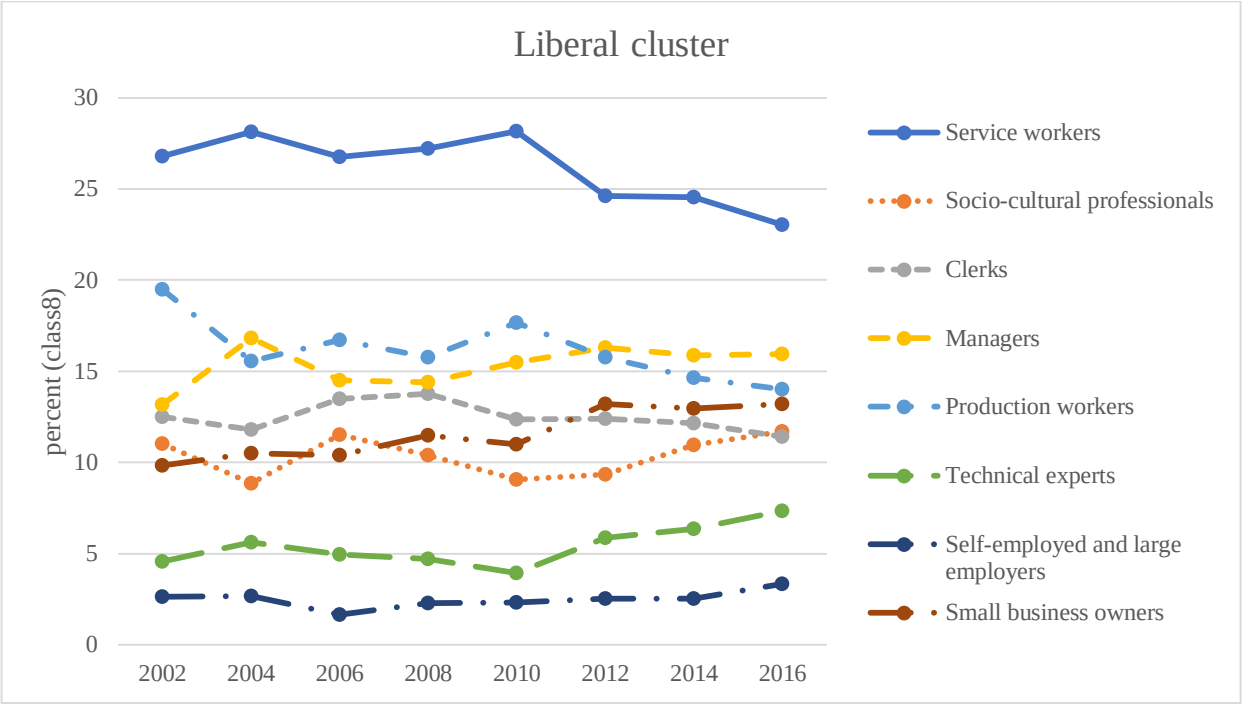


Figure 27: The evolution of the 8-class structure in the Liberal cluster. Source: ESS.

The Liberal countries present a similar drop for production workers (from 19,5% to 14%), although their higher skilled colleagues, the technical experts, show a remarkable increase of three percentage points (from 4,6% to 7,3%) during the same crisis period. Surprisingly, the service workers fell by 3% (from 26,8% to 23%), showing a significant decrease in the last three rounds considered. The remaining classes present stable trends, except for the managers and small business owners which present a slight increase (both around three percentage points).

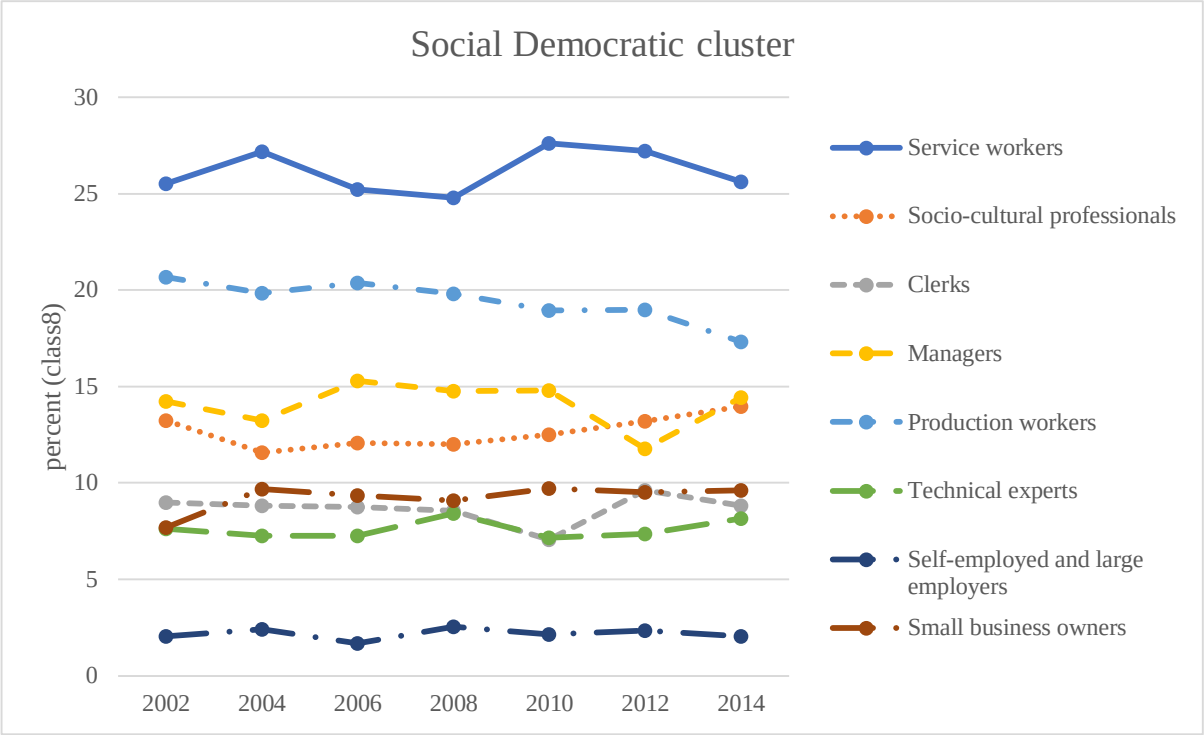


Figure 28 The evolution of the 8-class structure in the Social Democratic cluster. Source: ESS.

The Scandinavian countries show the least changeable class structure. Indeed, the only noticeable change regards the production workers, who lost 3% of their workforce (from 20,7% in 2002 to 17,3% in 2014). The other classes mostly retain their figures, except for the increase of the small business owners (from 7,7% in 2002 to 9,6% in 2014).

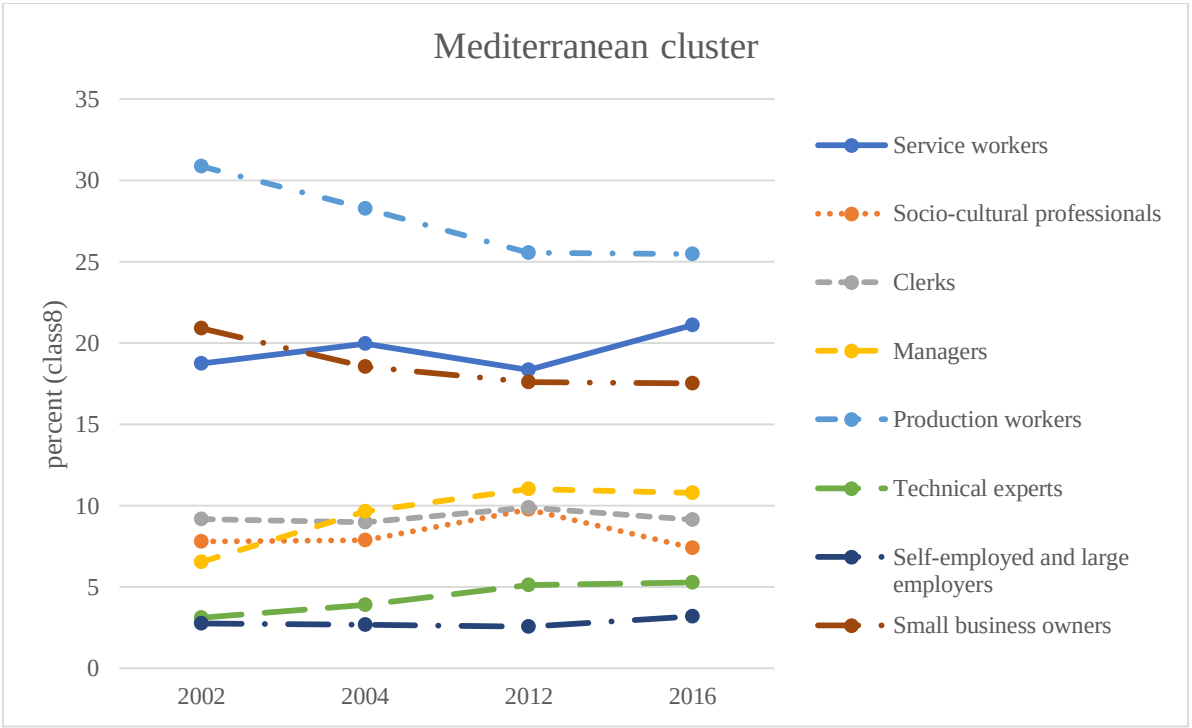


Figure 29: The evolution of the 8-class structure in the Mediterranean cluster. Source: ESS.

On the contrary, the Mediterranean cluster shows a quite lively labor market. As detected in the other groups, the traditional working class fell by more than five percentage points (from 30,9% to 25,5%). Another decrease has affected the small business owners, which has passed from 20,9% to 17,6%. On the other hand, in the tertiary sector both service workers and managers experience a noticeable increase, respectively +3% and +2%. However, the most remarkable rise, considering their relative class size, concerns the technical experts who grew from 3,1% in 2002 to 5,3% in 2016.

Overall, a clear decreasing trend characterizes the production workers, accelerating during the last economic crisis. As previously mentioned, this observation corroborates the jobless recovery thesis which argue that the loss of routine occupations is mainly concentrated in periods of crisis, since they are less capable to recover after the recession (Jaimovich and Siu, 2018). Nevertheless, a significant increase is detected in the most skilled group of industrial occupation, the technical professionals, proving the general upgrading of the secondary sector's workforce, accompanied by job cuts at the bottom of the skill distribution (Cirillo, 2018). Instead, the tertiary sector looks less dynamic since few changes have been found. The expected rise of low-skill service workers, due to the service transition, is only traced in the Mediterranean countries, whereas their relative size remains stable or decreases in the other clusters. However, a consolidated rise of managers is detected at the top of the skill distribution, while socio-cultural professionals only grow in the Conservative group. Finally, the small business owners present various trends across clusters. Namely, their relative size increases in the Liberal and Social Democratic cluster, shrinks in the Mediterranean group, and remains stable in the Conservative countries.

Although the 8-class scheme might be useful to trace labor market changes, it is not suitable to plot the evolution of middle class, which is the main topic of this work. As already said, I would adopt a "large" definition of middle class, using the Oesch's 16-class model. The author divides a "restricted" middle class, composed by technicians, associate managers and socio-cultural semi-professionals, from what he calls the "twilight zone" (Oesch, 2006, p. 67), formed by the skilled members of clerks, service and production workers. Hence, based on the 16-class scheme, I will plot four time series, covering all the welfare state typologies, which will include four "macro-classes": the middle class will be split into the upper and lower components, following the Oesch's division previously mentioned, and two residual classes will involve the most and the least skilled working categories.

Self-employed		*Employees*			
Independent Work Logic		*Technical Work Logic*	*Organizational Work Logic*	*Interpersonal Service Work Logic*	*Marketable Skills:*
1. Large employers (>9) Firm owners Hotel owners Salesmen	**2. Self-employed professionals** Lawyers Accountants Medical doctors	**5. Technical experts** Mechanical engineers Computing professionals Architects	**10. Higher-grade managers** Business administrators Financial managers Public administrators	**14. Socio-cultural professionals** University teachers Medical doctors Journalists	Professional/ managerial
3. Small proprietors, artisans, with employees (<9) Restaurant owners Farmers Garage owners		**6. Technicians** Electrical technicians Computer equipment operators Safety inspectors	**11. Associate managers** Managers in small firms Tax officials Bookkeepers	**15. Socio-cultural semi-professionals** Primary school teachers Physiotherapists Social workers	Associate professional/ managerial
4. Small proprietors, artisans, without employees Shopkeepers Hairdressers Lorry drivers		**7. Skilled crafts** Machinery mechanics Carpenters Electricians	**12. Skilled office** Secretaries Bank tellers Stock clerks	**16. Skilled service** Children's nurses Cooks Beauticians	Generally/ vocationally skilled
		8. Routine operatives Assemblers Machinists Freight handlers	**9. Routine agriculture** Farm hands Loggers Gardeners	**13. Routine office** Mail sorting clerks Call centre employees Messengers	**17. Routine service** Shop assistants Home helpers Waiters	Low/ un-skilled

→ Upper class
→ Upper middle class
→ Lower middle class
("twilight zone")
→ Lower class

Figure 30: Oesch's class scheme. Source: Oesch, 2006, p. 68.
Note: the rectangles identify the four "macro-classes".

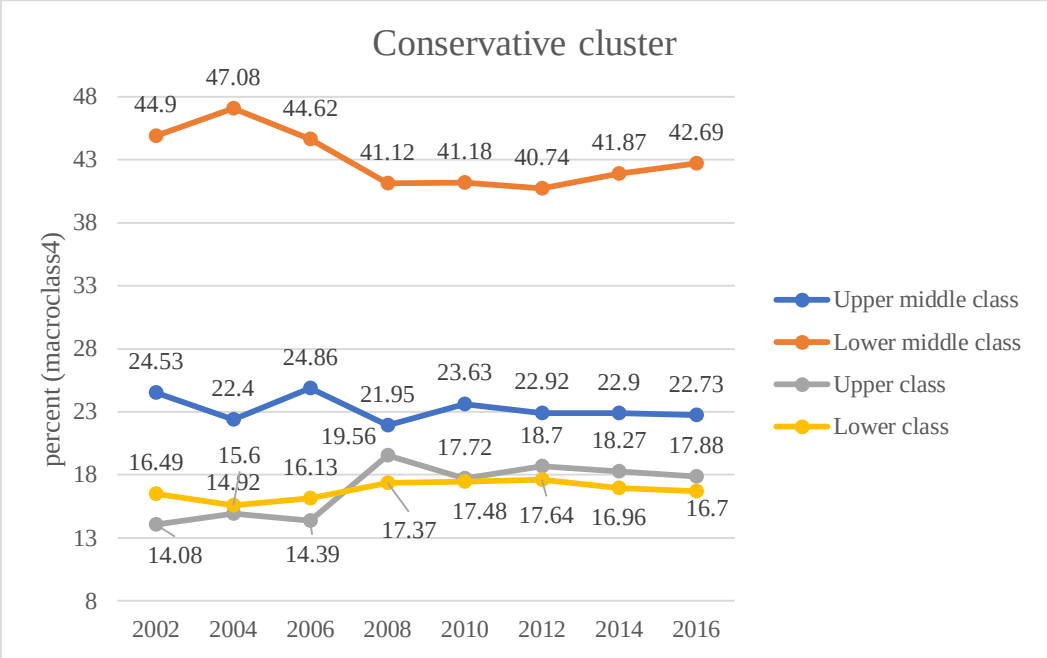


Figure 31: The evolution of the four "macro-classes" in the Conservative regime. Source: ESS.

The conservative cluster presents a remarkable decrease of the "lower-middle class" (-2,2%), particularly falling between 2004 and 2008. At the same time, the "lower class" shows a slight increase within a general stable trend. On the contrary, the "upper-middle class" is characterized by a decreasing trend (almost -2%), especially during the economic crisis, which seems to be partially compensated by the rise of the "upper class" (+3,8%), which peaks in 2008. Therefore, it could be asserted that a slight polarization has taken place, since the middle-class occupations have been shrunk relative to the residual extreme "macro-classes", especially in favor of the most skilled.

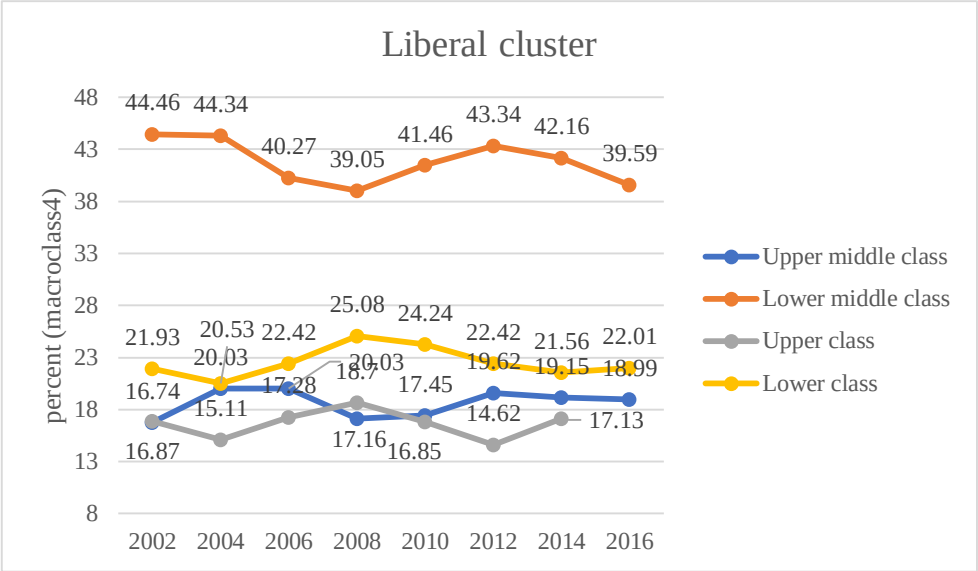


Figure 32: The evolution of the four "macro-classes" in the Liberal regime. Source: ESS.

A similar trend characterizes the Liberal cluster, despite being more pronounced. Indeed, the "lower-middle class" experienced a significant drop around 2008, repeated in 2016 after a short period of recovery (overall -5%). While the "lower class" seems to compensate the contraction of the "lower-middle class" in 2008, it has newly curbed its trend thereafter. On the upper side of class structure, the "restricted" middle class presents a reduction in the period of crisis, recovering immediately after. These changes seem to be counterbalanced by the growth of the "upper class" in 2008, which has decreased in the following surveys. All in all, the most significant contraction has affected the so-called "lower-middle class", which includes the most routine middle-class occupations.

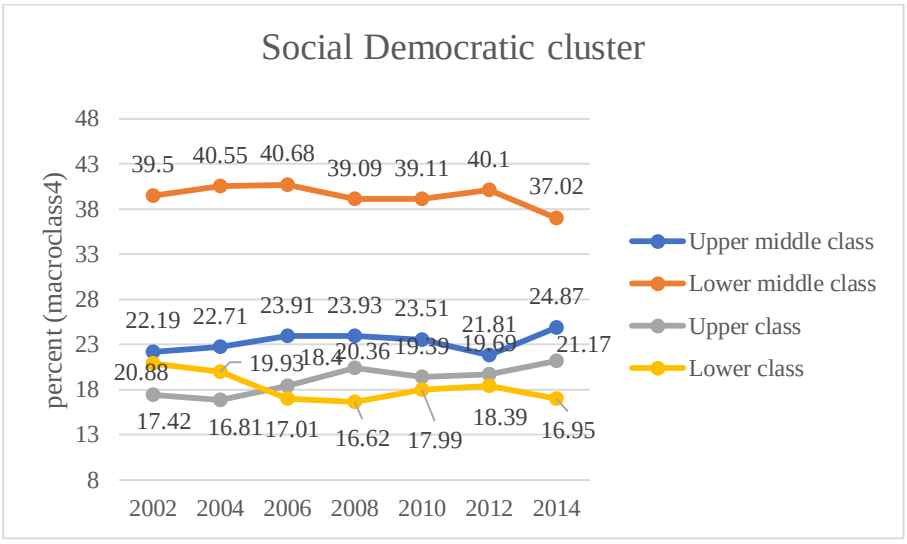


Figure 33: The evolution of the four "macro-classes" in the Social Democratic regime. Source: ESS.

The two remaining clusters show the least polarized "macro-class" structure. The Social Democratic regime presents a similar trend for the "lower" and "lower-middle" classes, both

constantly decreasing (respectively -4% and -2,5%). On the other hand, the two most skilled “macro-classes” display a rising trend, peaking in 2014.

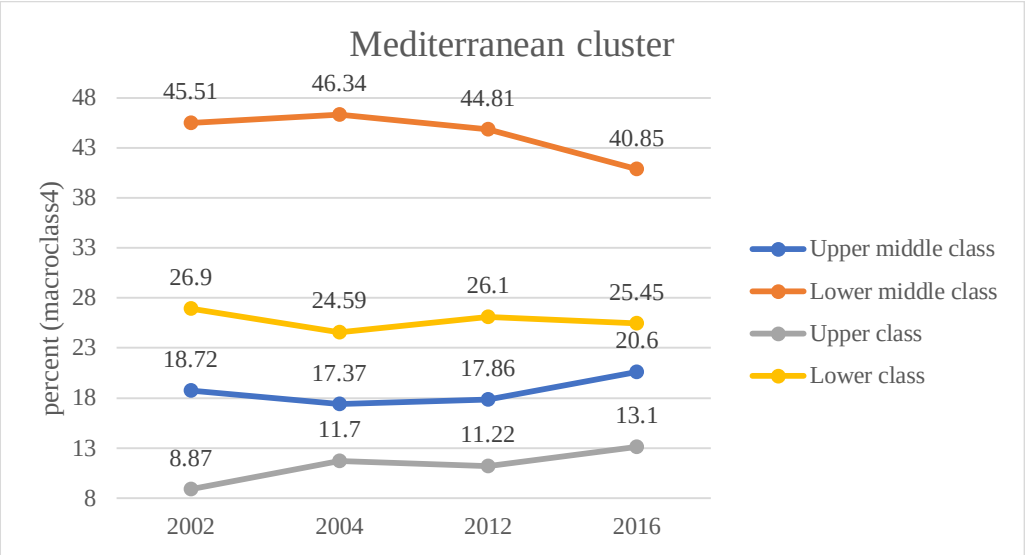


Figure 34: The evolution of the four "macro-classes" in the Mediterranean regime. Source: ESS.

An analogous trend could be detected in the Mediterranean group, although few surveys are available to trace it. In fact, both the least skilled “macro-classes” has reduced their relative sizes, despite the contraction of the “lower-middle class” is definitely the most marked (losing five percentage points). Moreover, the “upper” and “upper-middle” classes show a rising trend, which is substantial for the former (from 8,9% to 13,1%).

In conclusion, some of the preliminary methodological notes should be recalled. The inter-temporal analyses presented above are based on survey data, which cannot be relied upon to plot the shifts of workers among occupations and classes. Indeed, panel data are required since they are a fundamental instrument to track the changes within the same cohort of people across years. However, these time series might be fruitful to draw some general changes affecting the class structure and the impact of institutional configurations.

As mentioned above, a major division elapses between the Nordic and Southern clusters, which have experienced a slight converging process in their class structure, and the Conservative and Liberal groups, that show a polarizing class scheme. As expected, the Social Democratic regime presents the most egalitarian societal arrangement. The relative size of the “large” middle class (“upper-middle” and “lowe-middle”) remains almost unchanged (61,7% in 2002 and 61,9% in 2014). Moreover, the lower side of the class structure reduces its dimension relative to the most skilled “macro-classes”. This upgrading trend could be led back to the regime’s capability to shelter and upskill the routine workers (Anderson and Hassel, 2013).

A converging trend within class structure also characterizes the Mediterranean cluster, although it seems to be grounded on different reasons. Namely, the comparatively significant share

of small business owners and production laborers, together with the rising amount of service workers, seem to account for the resilience of the Southern middle class. Moreover, the increasing number of managers and technical experts has fostered the upward trend of the most educated classes. Although the total size of the "large" middle class results constrained, from 64,2% in 2002 to 61,4% in 2016, this change can be mainly ascribed to the decrease of the "lower-middle class", which in turn does not provoke the expansion of the "lower class".

As regards the Christian Democratic group, a slightly polarizing process seems to characterize its class structure, which does not radically undermine the Central European societal arrangement. Those countries show the most remarkable contraction of the "large" middle class, passing from 69,4% in 2002 to 65,4% in 2016. This decrease can be mainly attributed to the drop of production laborers and the limited figure of service workers. Meanwhile, the rise of the managerial class seems to be the main responsible for the expansion of the "upper class". Overall, the societal polarization looks to be biased towards the top of the skill distribution, hence being accompanied by a general upgrading trend.

On the contrary, the "macro-class" polarization stands out clearly in the Liberal regime. Indeed, the drop of both service and production workers appears to undermine the "lower-middle class" size, whereas the rise of managers and technical experts fosters the growth of the most educated classes. Although the total variation of class structure does not seem dramatic, comparing the figures of 2002 with those of 2016, the Anglo-Saxon societal arrangement proves to be the most sensible to the economic downturns (Wren, 2013). In fact, a surge of class polarization is plotted around 2008, when the financial crisis has significantly hollowing out both the components of the "large" middle class. All in all, the dimension of the intermediate class has shrunk from 61,2% in 2002 to 58,6% in 2016, confirming to be the smallest of the sample.

Assembling all the observations, it could be argued that the welfare regime which is mostly affected by class polarization is the Liberal cluster. Instead, the Conservative group experiences a light polarization, due to the fall of the traditional working-class occupations, but it is still able to prevent the rise of low-paid jobs. The Mediterranean class structure shows a converging trend, although the least educated "macro-class" continues to be the largest of the sample (a quarter of the whole Southern population). Moreover, its exposure to the market changes cannot be analyzed since the data from third to the fifth ESS round are not available (from 2006 to 2010). Finally, the Social Democratic regime confirms to be the most able to shield its middle class from economic downturns, preserving the most egalitarian societal structure (followed by Central Europe).

As regards occupations, it would be expected to see the contraction of both industrial and service middle-skill occupations. Nevertheless, production workers seem to be the worst affected in

terms of job loss, particularly during the economic crisis, whereas the service employees, both in the interpersonal and organizational dimensions, appear to be more resilient. In order to assess whether these differences could be led back to automation, a further analysis is required. Namely, the RTI should be applied to those groups of occupations, checking whether technical change plays a role in the evolution of class structure. Moreover, this investigation would help to better understand the impact of the welfare state institutions on job polarization.

3.2. The proneness of the European class structure to automation.

Once the European societal structure has been analyzed in detail, the propensity of social classes to automation can be measured using the RTI. Before reporting the data and findings, I would briefly present the methodology employed. In this paragraph I will first apply the RTI to the Oesch's 8-class scheme of the four welfare clusters, then I will outline the distribution of RTI on the class structure ordered in accordance with the educational attainment (v. paragraph 2.1.3.3). The aim of this investigation is two-fold: on the one hand, it would enable to test whether the middle-class occupations are the most prone to automation, on the other hand, it would point out which group of countries is likely to be most severely hit by this transition.

As regards the Routine Task Index, I will use the indicator calculated on the occupations at the 3-digit ISCO that it is based on the dataset of the American Occupational Information Network (O*NET), developed under the sponsorship of the U.S. Department of Labor/Employment and Training Administration. However, another measurement of the RTI has been realized by Sacchi et al. (2019) at the 4-digit ISCO combining two Italian databases: the *Indagine Campionaria sulle Professioni* (ICP) and the *Rilevazione Continua sulle Forze di Lavoro* (RCFL). Although the Italian scholars employ the same methodology of O*NET, the tasks composing each occupation vary, hence resulting in different RTI scores for the same occupation. Although the latter provides a more detailed measurement, I will apply the O*NET definition of RTI to the European countries sampled in order comply with the widely recognized scientific standard. Nevertheless, I will attach the tables elaborated with the Italian-based RTI in the appendix, which would enable to make comparisons between these two measurements in this paragraph.

3.2.1. The distribution of RTI in the Oesch's class scheme.

I will apply the O*NET version of RTI on the Oesch's 8-class scheme of the four welfare clusters. As already pointed out, the data for the Conservative and the Liberal clusters are taken from the 9th ESS round, those for the Mediterranean group come from the 8th wave, and the information for the Social Democratic regime are based on the 7th ESS survey. The tables below represent the

distribution of quintiles of RTI in each group of countries, taking the value 1 for the least automatable occupations and 5 for those who are most at risk of replacement. The quintiles distribution is calculated on the RTI scores of the whole ESS dataset, hence making the values reported below comparable both between classes and clusters. I would expect a higher concentration of routine tasks in the classes composing the technical and organizational work logics, particularly in the low-skill groups of occupations, due to the rigid command structure which may involve repetitive tasks. Meanwhile, the independent and interpersonal service work dimensions are likely to result less routine since their tasks are carried out in a more changeable context, including problem-solving skills and in-person interactions.

Table 7: The distribution of RTI quintile in the 8-class scheme. Source: ESS.

Conservative cluster	5 quantiles of RTI					
	1	2	3	4	5	Total
	%	%	%	%	%	%
Self-employed professionals and large employers	59.08	19.77	19.10	0.99	1.07	100.00
Small business owners	13.44	39.46	20.32	14.47	12.31	100.00
Technical (semi-)professionals	3.92	37.62	20.15	38.31	0.00	100.00
Production workers	0.00	5.78	26.00	17.05	51.17	100.00
(Associate) managers	50.53	34.41	7.90	7.16	0.00	100.00
Clerks	0.00	9.21	7.01	26.08	57.69	100.00
Socio-cultural (semi-)professionals	75.76	5.06	19.18	0.00	0.00	100.00
Service workers	1.91	46.76	7.81	36.65	6.87	100.00
Total	21.08	24.29	15.39	19.30	19.94	100.00

Liberal cluster	5 quantiles of RTI					
	1	2	3	4	5	Total
	%	%	%	%	%	%
Self-employed professionals and large employers	46.19	19.29	34.41	0.00	0.11	100.00
Small business owners	20.85	31.35	28.52	8.98	10.30	100.00
Technical (semi-)professionals	8.17	27.48	42.39	21.96	0.00	100.00
Production workers	0.00	4.81	19.35	17.50	58.34	100.00
(Associate) managers	63.49	17.70	11.76	7.05	0.00	100.00
Clerks	0.00	13.99	17.64	36.39	31.97	100.00
Socio-cultural (semi-)professionals	77.47	6.71	15.81	0.00	0.00	100.00
Service workers	1.05	56.45	6.96	28.49	7.05	100.00
Total	25.00	27.32	17.78	16.98	12.92	100.00

Mediterranean cluster	5 quantiles of RTI					
	1	2	3	4	5	Total
	%	%	%	%	%	%
Self-employed professionals and large employers	61.17	11.84	25.02	0.80	1.17	100.00
Small business owners	10.39	41.48	23.98	13.38	10.77	100.00
Technical (semi-)professionals	27.76	4.30	36.47	31.47	0.00	100.00
Production workers	0.00	4.11	24.15	26.26	45.47	100.00
(Associate) managers	35.42	45.81	7.61	11.15	0.00	100.00
Clerks	0.00	3.37	19.54	21.17	55.91	100.00
Socio-cultural (semi-)professionals	88.50	5.54	5.52	0.43	0.00	100.00
Service workers	2.59	37.97	4.82	46.27	8.36	100.00
Total	15.76	22.79	17.12	23.95	20.38	100.00

Social Democratic cluster	5 quantiles of RTI					
	1	2	3	4	5	Total
	%	%	%	%	%	%
Self-employed professionals and large employers	65.85	11.19	19.13	3.33	0.50	100.00
Small business owners	14.95	36.60	22.39	13.26	12.80	100.00
Technical (semi-)professionals	21.98	6.00	38.85	33.17	0.00	100.00
Production workers	0.00	5.76	31.29	23.43	39.52	100.00
(Associate) managers	54.28	29.87	8.03	7.81	0.00	100.00
Clerks	0.00	9.46	13.00	26.04	51.50	100.00
Socio-cultural (semi-)professionals	77.97	7.59	14.44	0.00	0.00	100.00
Service workers	1.41	56.17	3.69	26.59	12.14	100.00
Total	22.61	26.14	16.44	18.70	16.11	100.00

First of all, I will outline some cross-cluster observations. The social classes which appear to be the least prone to automation are the self-employed professionals and large employers, the socio-cultural professionals and the managers. The distribution of technical professionals and the service workers instead is more concentrated in the central RTI quintiles. Finally, the production laborers and the clerks turn out to the workers who are most likely to be replaced by machines.

Looking at the RTI calculated on the Italian dataset (v. Appendix), some differences emerge. Namely, the highly skilled technical occupations result to be less routine than in the O*NET-based analysis. Moreover, the clerks present a much lower concentration of respondents in the last quintiles, appearing less replaceable, whereas in the tables reported above the clerical occupations turn out to be the most prone to automation compared to the rest of the classes. Lastly, the RTI distribution of production workers in appendix looks more biased towards the last quintiles.

The origins of these variations could be led back to the different allocation of the RTI scores to the tasks composing each occupation. It could be asserted that the tasks included in the same occupation, and their degree of routine, vary between the American and the Italian labor markets.

Hence, the RTI score of an occupation, and its social class, changes between these two datasets, despite the authors use almost the same methodology. Moreover, the American scholars rely on expert surveys, updated regularly, whereas their Italian surveys are addressed to workers. These methodological difference may also partially account for the variations of the RTI values. Therefore, bearing in mind the differences outlined above, it could be supposed that the American clerks perform tasks which are more repetitive than those realized by their Italian colleagues.

Some relevant differences emerge among welfare clusters. The Conservative group presents the most routinized clerical occupations (57,7% of clerks are in the 5th RTI quintile) and an easily automatable low-skill working class (51,2% of production workers lie in the last RTI quintile). On the contrary, the Central European technical professionals and service workers show relatively lower values in terms of RTI. The Anglo-Saxon production workers turn out to be the most replaceable of the sample (58,3% of them occupies the last RTI quintile), whereas the clerks and managers show the lowest RTI figures compared to the other welfare regimes. Instead, the whole Southern technical work logic results harder to be replaced relative to the first clusters mentioned (27,8% of technical experts lies in the first quintile and 45,5% of production workers occupies the last interval), together with the socio-cultural professionals, while the managers and service employees display the comparatively highest RTI score (only 35,4% of the former in the first quintile and 54,6% of the latter in the last two intervals). Finally, the Social Democratic regime shows the least automatable production workers (only 39,5% of them lie in the 5th quintile) and service employees (whose RTI distribution looks similar to the Liberal group).

As previously pointed out, the RTI quintiles distribution based on the Italian datasets (v. Appendix) presents some differences which slightly alter the findings exposed above. Namely, the Central European production workers look less replaceable, while their Anglo-Saxon colleagues are even more concentrated in the last RTI quintile (69,52%). Moreover, the distribution of RTI in the clerical occupations appears to be more biased towards the central quintiles (especially the 2nd and 3rd intervals), while the socio-cultural professionals seem to be more homogenously distributed across clusters, being almost entirely placed in the first RTI quintile. Overall, the allocation of classes along the RTI quintile distribution characterizing each welfare regime is influenced by the cross-cluster variations presented above, hence confirming the inter-regime variations detected with the O*NET-based analysis.

In order to evaluate the impact of automation on the different welfare clusters I will sum the total relative sizes of the last two RTI quintiles in each group. The regime which appears to be the most affected by automation is the Mediterranean cluster, that places 44,4% of its labor force in the 4th and 5th RTI quintiles. On the contrary, the Liberal countries show the lowest share of easily

replaceable workforce, namely 29,9%. In the middle of the ranking, the Social Democratic group presents a smaller number of automatable workers (34,8%), while the Conservative cluster comes closer to the Southerners (39,2%). The order of the standings does not change using the Italian-based RTI, since the Anglo-Saxons result to be the most sheltered from automation (22,5% in the last two RTI quintiles), followed at a close distance by the Nordics (27,1%) and the Central Europeans (27,2%). The last place is newly occupied by the Mediterranean group (40,2%). However, it should be noted that the Social Democratic and the Conservative regimes show much more similar figures in this second analysis. The reason for this shift might be found in the relevant share of clerks characterizing the Conservative cluster, which are considered as less replaceable using the RTI measurement elaborated by Sacchi et al. (2019). On the contrary, the Southerners present similar scores in both the analyses. In this case, the large share of production workers, which are deemed more automatable in the Italian RTI design, seems to counterbalance the clerks' contribution to the remarkable Southern RTI score shown in the O*NET-based analysis.

All in all, the Mediterranean cluster appears the group of countries which will be hit hardest by automation. On the contrary, the workforce of the Liberal regime shows the lowest proneness to replacement. Finally, the Social Democratic cluster presents a remarkable resilience to automation, while the impact on the Conservative regime heavily depends on the methodology employed, resulting more sheltered when the clerical occupations are deemed less routine (Sacchi et al., 2019).

In order to provide a more detailed investigation of the automation impact on each cluster, I will tabulate the distribution of RTI quintiles along the Oesch's 16-class scheme (v. Appendix for the tables based on the RTI calculated on the Italian datasets). However, I will only select the least-skilled classes (i.e. clerks, production and service workers), since most of the contribution to routinization have been found in those groups of occupations.

Table 8: The distribution of RTI quintiles in the 16-class scheme (low-skill classes). Source: ESS.

Conservative cluster	5 quantiles of RTI					
	1	2	3	4	5	Total
	%	%	%	%	%	%
Skilled manual	0.00	9.40	42.06	18.03	30.51	100.00
Low-skilled manual	0.00	0.00	0.32	15.49	84.19	100.00
Skilled clerks	0.00	10.43	6.81	29.53	53.22	100.00
Unskilled clerks	0.00	0.00	8.51	0.00	91.49	100.00
Skilled service	3.36	75.49	9.05	11.42	0.68	100.00
Low-skilled service	0.31	15.22	6.45	64.35	13.66	100.00

Liberal cluster	5 quantiles of RTI					
	1	2	3	4	5	Total
	%	%	%	%	%	%
Skilled manual	0.00	10.58	42.59	23.47	23.36	100.00
Low-skilled manual	0.00	0.00	0.00	12.52	87.48	100.00
Skilled clerks	0.00	15.45	19.31	40.19	25.06	100.00
Unskilled clerks	0.00	0.00	1.67	0.00	98.33	100.00
Skilled service	2.39	83.07	5.47	7.25	1.83	100.00
Low-skilled service	0.00	35.55	8.13	45.17	11.15	100.00

Mediterranean cluster	5 quantiles of RTI					
	1	2	3	4	5	Total
	%	%	%	%	%	%
Skilled manual	0.00	7.74	44.52	15.12	32.62	100.00
Low-skilled manual	0.00	0.00	1.08	38.89	60.03	100.00
Skilled clerks	0.00	3.96	18.39	24.85	52.79	100.00
Unskilled clerks	0.00	0.00	26.16	0.00	73.84	100.00
Skilled service	6.00	73.59	6.09	14.32	0.00	100.00
Low-skilled service	0.25	13.60	3.96	68.12	14.08	100.00

Social Democratic cluster	5 quantiles of RTI					
	1	2	3	4	5	Total
	%	%	%	%	%	%
Skilled manual	0.00	8.67	45.95	21.07	24.31	100.00
Low-skilled manual	0.00	0.00	2.34	28.09	69.56	100.00
Skilled clerks	0.00	11.51	10.38	31.66	46.45	100.00
Unskilled clerks	0.00	0.00	25.13	0.00	74.87	100.00
Skilled service	2.62	82.64	3.80	10.63	0.31	100.00
Low-skilled service	0.00	25.28	3.57	45.21	25.94	100.00

It looks crystal clear that the lower skilled workers present higher RTI scores than their more educated colleagues. It could be noted that the low-skilled production workers look much more replaceable in the Conservative and Liberal clusters than those in the other two groups. Although the Mediterranean unskilled production workers result to be comparatively less automatable, their significant relative seize (11,9% of the workforce) is likely to increase the proneness of the Southern labor market to automation. Moreover, the large share of Southern unskilled service workers (which amount to 12,5% of the workforce) in the last two RTI intervals further contributes to toughen the impact of the ICT revolution on the Mediterranean labor force. As regards Central Europe, bearing in mind its remarkable share of skilled clerks (11,5% of the workforce), it could be asserted that their concentration in the last RTI quintile seems to bring down the whole Conservative resilience to automation. As expected, the influence of unskilled clerks on the Conservative RTI figures results softened when considering the indicator tailored on the Italian datasets (v. Appendix). On the contrary, the lower concentration of the Scandinavian skilled-manual and skilled service workers in

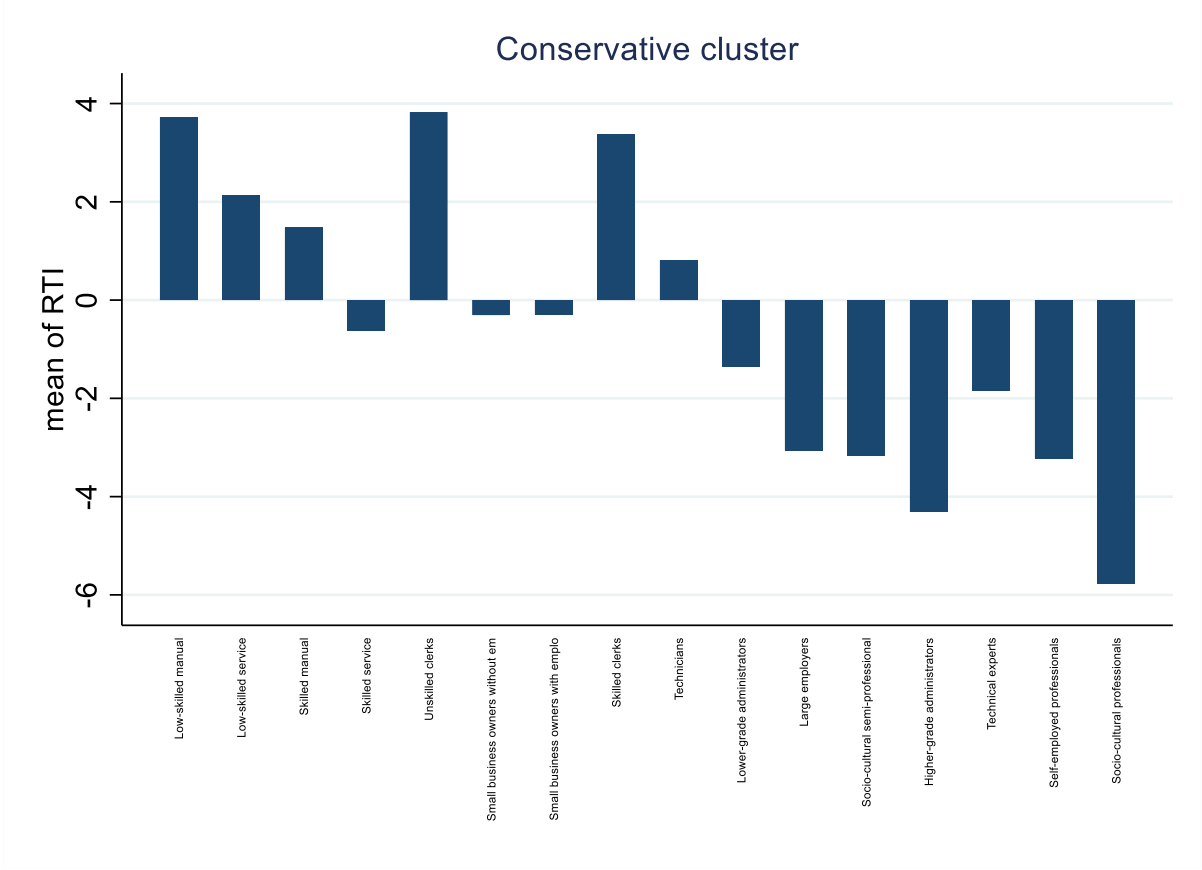
the last RTI quintile appears to significantly contribute to the predicted smoother impact of automation on its labor market. Lastly, the limited number of clerks and production workers in the Liberal countries (respectively 9,9% and 11,3% of the workforce), together with the reduced risk of service workers to be replaced, seems to justify the limited concentration of the Anglo-Saxon low-skilled workers in the higher RTI quintiles.

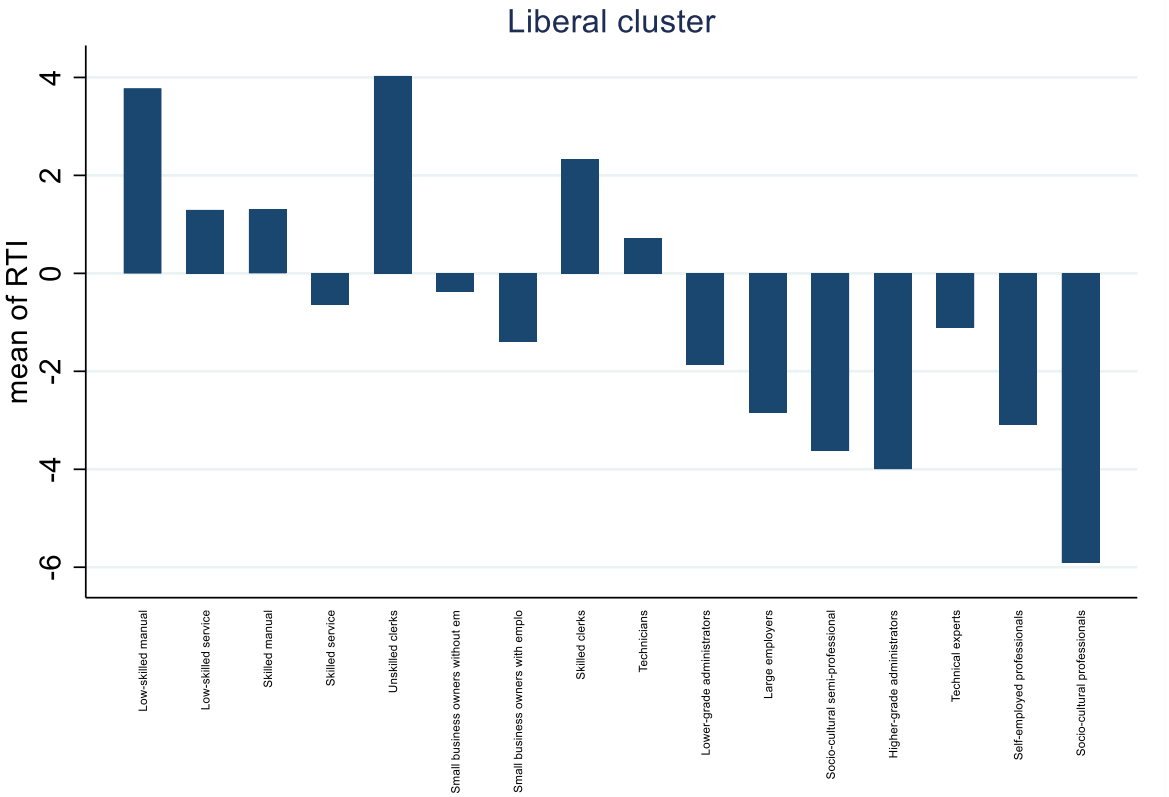
In the end, the expectations regarding the impact of automation on different work logics are confirmed. As a matter of fact, the independent and interpersonal dimensions appear to be the most resilient to replacement, whereas the technical and organizational logics, especially the low-skilled classes, are those hit hardest by the spread of ICT. Therefore, the countries showing higher share of traditional industrial and clerical occupations, i.e. the Conservative and the Mediterranean clusters, are more likely to suffer from job losses.

3.2.2. The impact of automation on the middle class.

In this section I investigate the influence of the ICT revolution on the middle class. I have reordered the Oesch's 16-class scheme with the view to distribute the social classes on a single skill continuum (v. paragraph 2.1.3.3). Plotting the distribution of RTI on the reordered Oesch's 16-class scheme it would be possible to test whether the job polarization hypothesis is confirmed. However, it should be noted that the American RBTC scholars usually refer to the wage as a proxy of the skills level. Thus, I also represent the RTI scores of the 8-clss scheme (ordered according to the ISCED classification), which may resemble the wage distribution due to its more limited focus on the educational attainment of respondents.

The RTI is expected to peak in the middle of the class distribution, while showing negative scores at both extremes. Hence, the trend of the RTI distribution is supposed to present an inverted-U shape (Autor and Dorn, 2013), meaning that the typical middle-class occupations are the most exposed to the replacement risk.


Conservative cluster
mean of RTI
-6
-4
-2
0
2
4
Low-skilled manual
Low-skilled service
Skilled manual
Skilled service
Unskilled clerks
Small business owners without em
Small business owners with emplo
Skilled clerks
Technicians
Lower-grade administrators
Large employers
Socio-cultural semi-professional
Higher-grade administrators
Technical experts
Self-employed professionals
Socio-cultural professionals


Liberal cluster
mean of RTI
-6
-4
-2
0
2
4
Low-skilled manual
Low-skilled service
Skilled manual
Skilled service
Unskilled clerks
Small business owners without em
Small business owners with emplo
Skilled clerks
Technicians
Lower-grade administrators
Large employers
Socio-cultural semi-professional
Higher-grade administrators
Technical experts
Self-employed professionals
Socio-cultural professionals

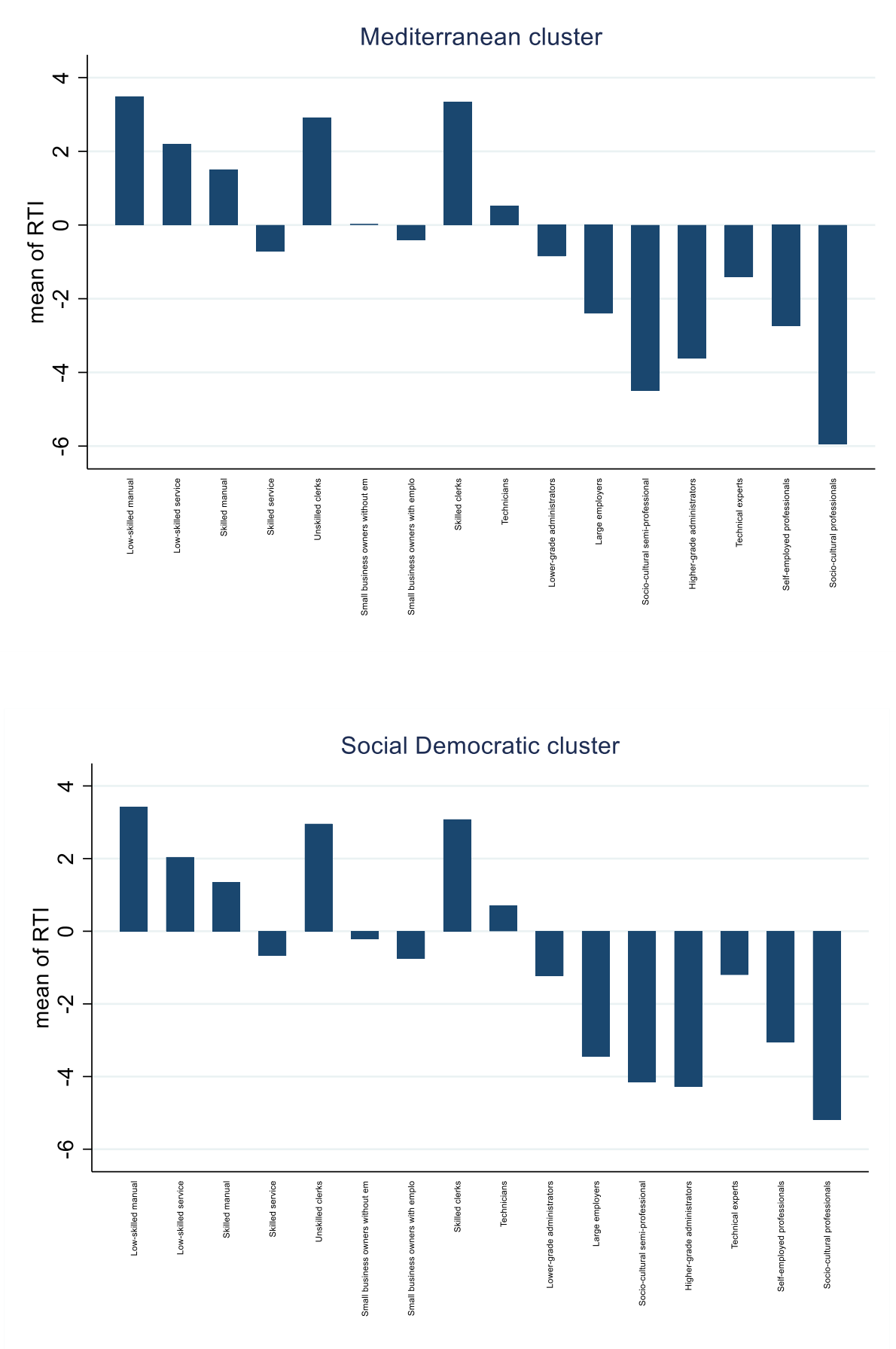


Figure 35: The distribution of the mean of RTI in the 16-class scheme reordered. Source: ESS.

However, the graphs reported above do not entirely mirror our expectations. Although all the welfare clusters present remarkable positive RTI scores in the middle of their class distribution and negative figures for the most skilled occupations, significantly positive results are detected for the least educated classes. Therefore, the risk of automation does not seem to affect the middle-class occupations only, while also threatening the lower-class jobs. Namely, the least skilled occupations which result most automatable are the production and low-skilled service workers, whereas the middle-class jobs more routinized belong to the clerical class. A similar picture is portrayed by the graphs elaborated using the RTI tailored on the Italian datasets (v. Appendix).

Table 9: The 8-class scheme reordered by skills. Source: ESS.

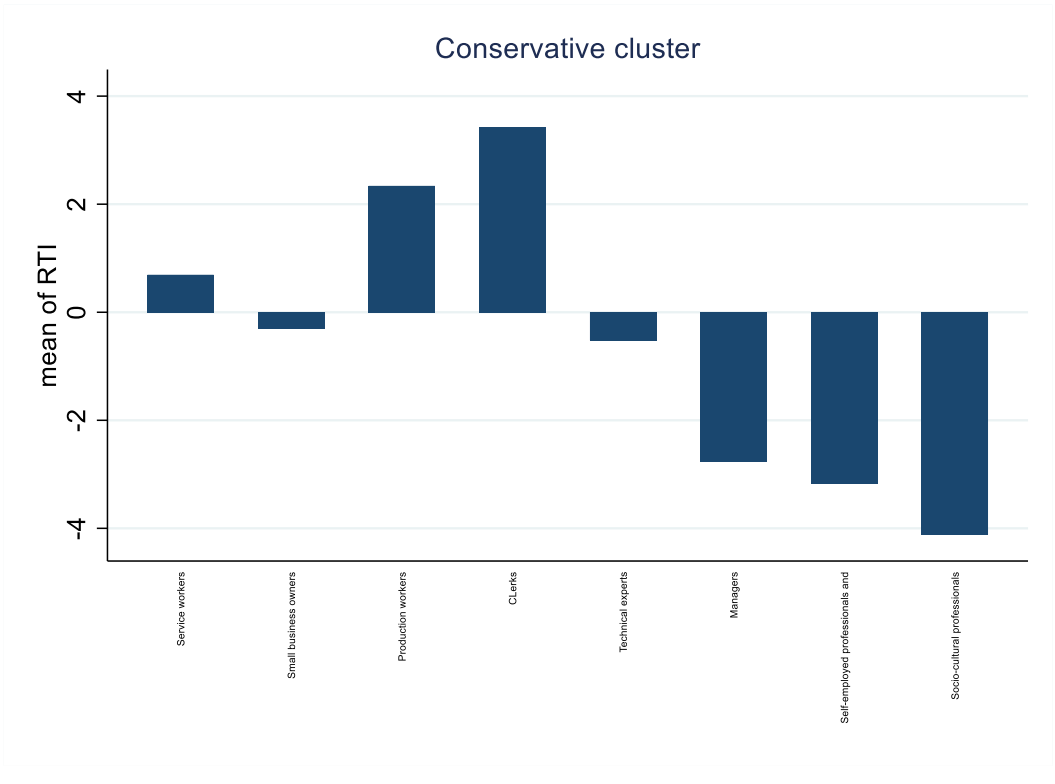
The 8-class scheme sorted by educational attainment (ISCED)
Service workers
Small business owners
Production workers
Clerks
Technical experts
Managers
Self-employed professionals and large employers
Socio-cultural professionals

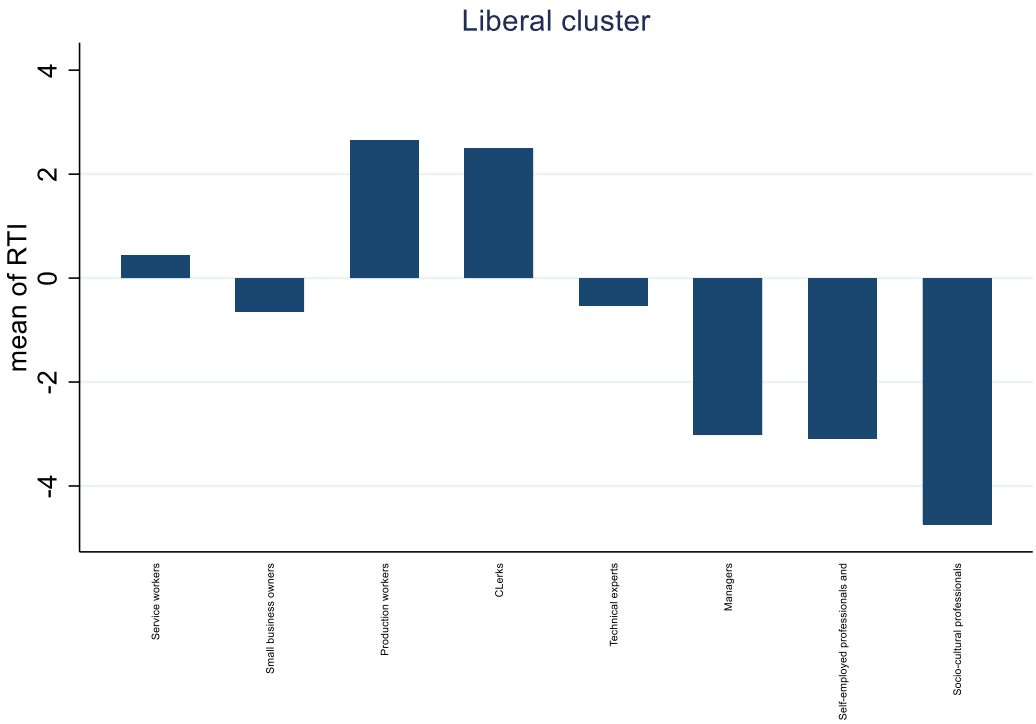
Although these graphs dos not entirely confirm the RBTC hypothesis, at the same time they present a clear polarization of the replacement risk between the lower- and the upper-end of the class distribution. One of the reason for justifying this apparently disappointing outcome could be traced back to the criterion employed to order the social classes. Indeed, the American scholars usually refer to the wage as a proxy of the skills level. On the contrary, I have made directly reference to the educational attainment of workers, hence I might have presented a different allocation of classes along the x-axis. In order to make the skills continuum look like the wage distribution, I need to reduce the degree of detail of class scheme. As a matter of fact, using the 8-class scheme reordered according to the educational level, the class structure would closely resemble to the wage distribution within different economic sectors.

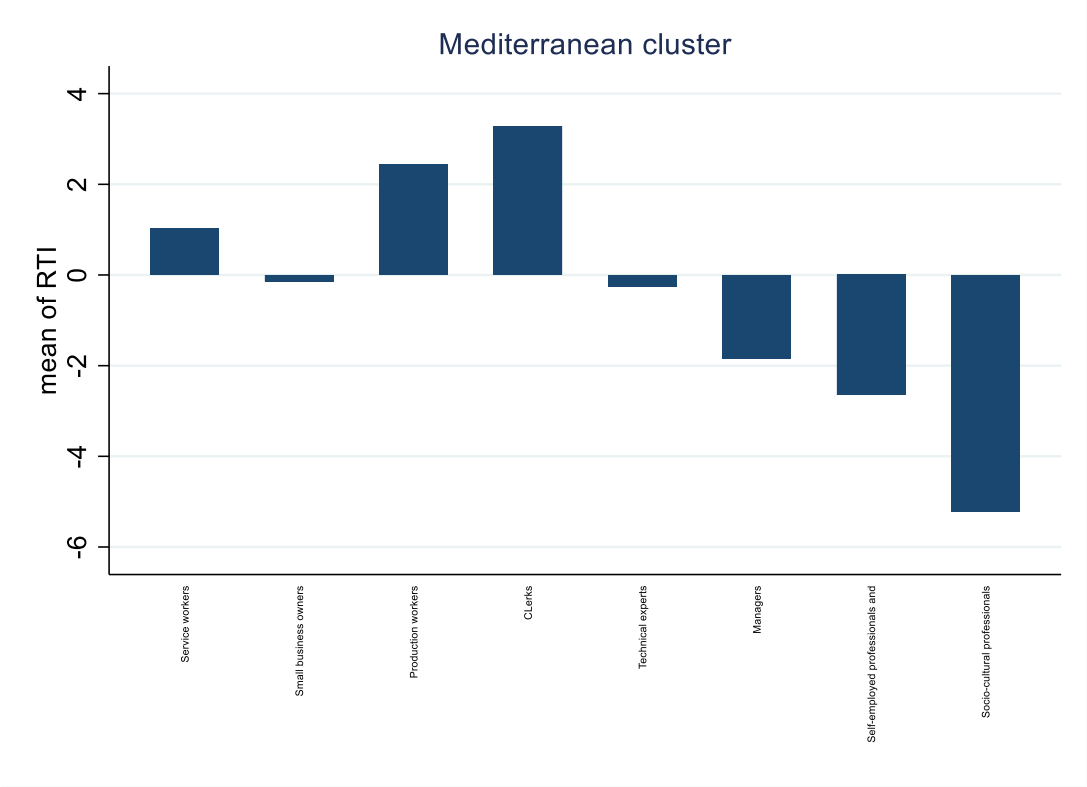
The graphs plotted below present an RTI distribution which more closely resembles the one presented by RBTC scholars (Autor and Dorn, 2013). Indeed, the highest RTI scores are reached by the middle-class occupations (i.e. production workers and clerks), while much lower figures characterize the least and the most educated occupations. However, it should be noted that the service workers still present positive scores in all clusters, despite close to zero. Moreover, as expected, the 8-class bar charts realized using the methodology of Sacchi et al. (2019) attributes a lower risk of replacement to clerks.

Overall, the quantitative descriptive analyses realized so far demonstrate that the RTI distribution in the European class structure does not fully comply with the RBTC hypothesis. Although the simplified version of class structure, resembling to the wage distribution, presents an allocation of automation risk which appears more in line with RBTC, the interpersonal service

workers still show a much higher proneness to automation compared to the most skilled group of occupations. The lower tail of the expected U-shaped occupational distribution, mainly composed by low-skilled interpersonal service workers, would appear less pronounced than the upper tail, composed by the most educated occupations (e.g. socio-cultural professionals, etc.). Therefore, the RBTC hypothesis could be only partially verified since the service employees result more replaceable than expected.







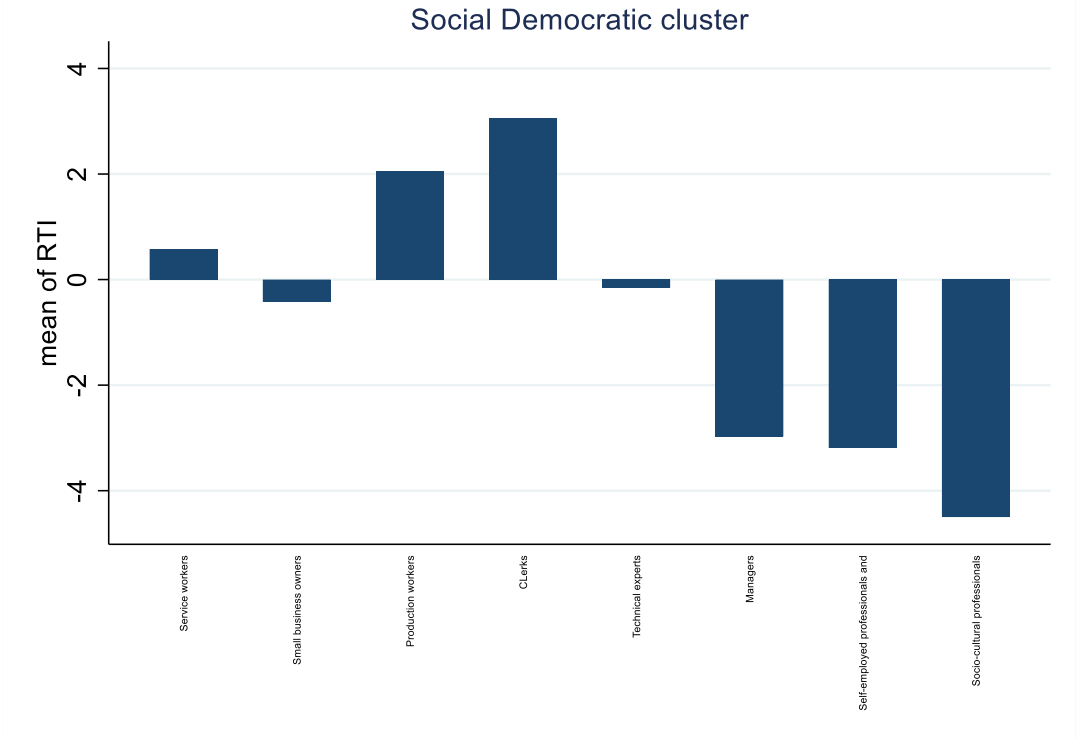


Figure 36: The distribution of the mean of RTI in the 8-class scheme reordered. Source: ESS.

Nevertheless, the non-full compliance with the theory of Autor et al. (2003) does not automatically condemn the "shrinking" middle class hypothesis (Kurer and Palier, 2019). Indeed, the polarization of the replacement risk, detected in the first more detailed analysis, between the lower-end and the upper-end of the class distribution might suggest the emergence of a cleavage within the middle class. In order to provide a synthetic representation of this fracture I will plot the distribution of RTI along the four "macro-classes" already defined.

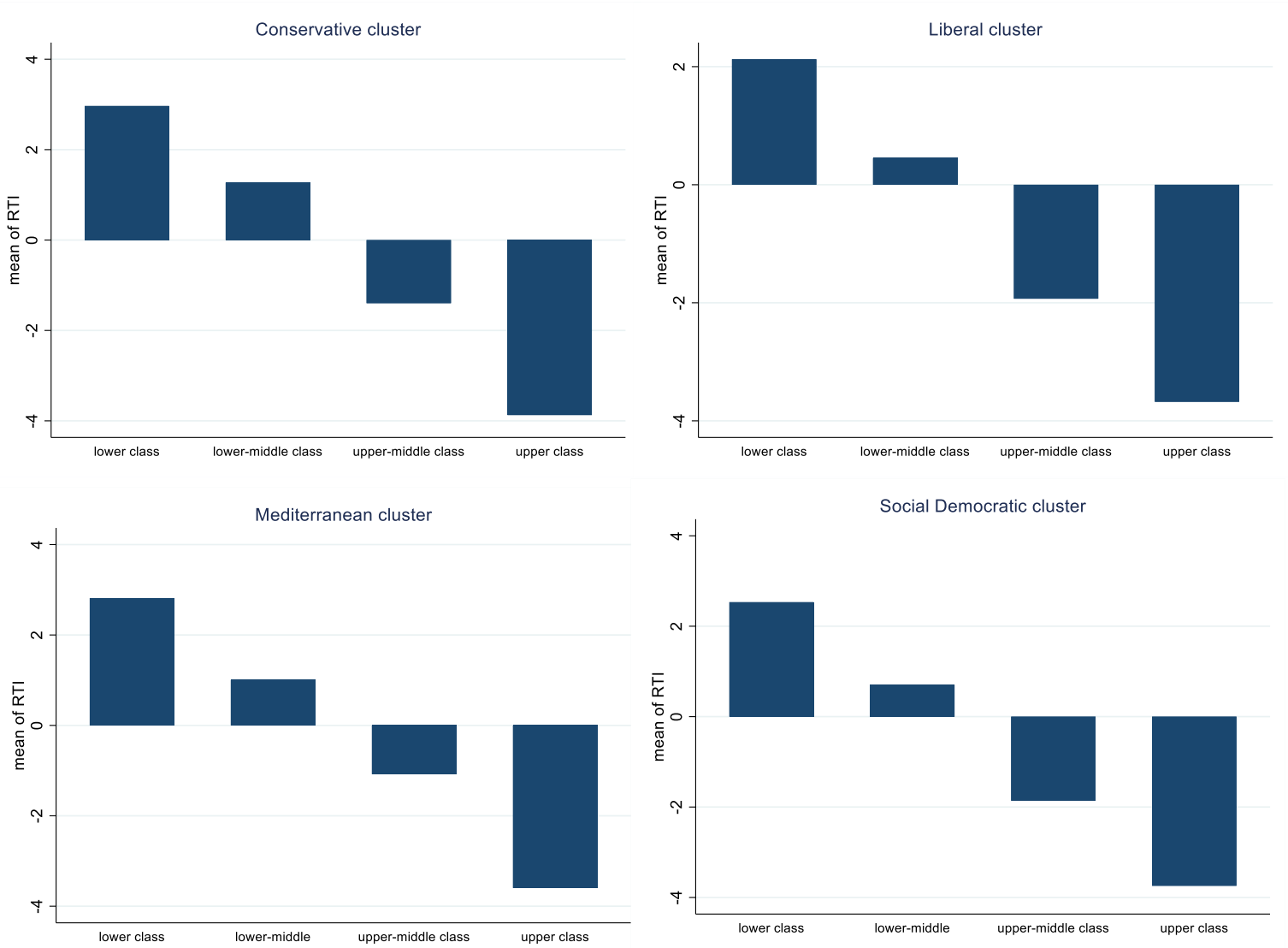


Figure 37: The distribution of the mean of RTI in the four "macro-classes". Source: ESS.

These graphs clearly display the polarization of the automation risk, assigning the lowest RTI score to the upper "macro-class" and the highest one to the lower counterpart. Moreover, the expected cleavage results to divide the "upper-middle macro-class", which appears more resilient to automation, from the so-called "lower-middle class", that looks more prone to be replaced by machines. Furthermore, it should be underlined that the Scandinavian and the Anglo-Saxon "upper-middle macro-classes" show comparatively lower RTI scores, whereas the "lower-middle macro-

class" in Central-Southern Europe results to be more likely to be replaced. As regards the first two clusters, the significant sizes of the Nordic socio-cultural semi-professionals and the Anglo-Saxon low-grade managers seem to strengthen their own "macro-class" against automation, while the large shares of clerks in the Conservative cluster and production workers in the Mediterranean group appear to make their "lower-middle class" more vulnerable.

All in all, the RBTC hypothesis appears only partially confirmed and the framing role of class structure looks crucial to determine its validity. In fact, the inverted-U-shaped distribution of RTI only makes its apparition when the groups of occupations are collapsed to the 8-class version. Anyway, the service workers do not show the expected resilience to automation, hence undermining the job polarization hypothesis. As regards the impact of the ICT diffusion on welfare clusters, the Mediterranean regime turns out to be the most affected, mainly due to its remarkable share of low-skilled manual and service workers. On the contrary, the Social Democratic and the Liberal clusters are likely to be hit more softly by the spread of new technologies. While the former seems to provide the least educated workers with the skills needed to be sheltered from automation, the latter has strongly reduced the labor force in the traditional routine economic sectors. Finally, the future of the Conservative class structure appears less predictable, since its proneness to automation is strongly linked to the degree of routine assigned to its numerous white-collar workers.

3.3. Preliminary conclusions on the European class structure: between RBTC and SBTC.

The main aim of this chapter is to assess the impact of automation on the middle class. Unfortunately, a straight answer cannot be provided. Indeed, the descriptive analyses performed on the European class structure using the "Routine Task Index" do not release a clear picture.

What could be conceivably asserted is that welfare regimes matter when it comes to social classes. In fact, the societal arrangements in the four welfare clusters present significant differences. While the Conservative group results to be committed in preserving its traditional clerical and industrial workforce, the Liberal countries turns out to be more interested in supporting the managerial and entrepreneurial occupations without hampering the rise of low-paid interpersonal service jobs. The Social Democratic regime instead appears to be engaged in upskilling workers, without substantially altering the market outcomes. Finally, the Mediterranean countries result to be more effective in preserving the traditional working class, despite being not as capable in sheltering its labor force from automation risk.

As regards the proneness to be replaced by new technologies, the educational attainment turns out to be of great importance. Indeed, a quite linear polarization occurs in the distribution of RTI along the skills continuum. Although the traditional middle-skilled occupations present the highest

RTI scores, the least educated social classes seem to be characterized by a remarkable automation risk too. The middle class looks split in half, with its most skilled workers resulting less automatable and its least educated members hit harder by replacement. Performing correlations between the educational attainment and RTI, a mild negative relation emerges in all clusters. Namely, the Conservative group presents a coefficient r equal to -0,48, the Liberal regime -0,45, the Mediterranean countries -0,47, and the Scandinavian cluster -0,44.

Therefore, the complex societal picture drawn seems to stand in the middle between the skill- and the routine-biased technical change. Indeed, the role of competences looks to matter more than in the RBTC, despite the middle-skilled occupations are confirmed to be the most affected by automation. In the end, what emerges is an uneven distribution of the replacement risk towards the least educated occupations, breaking the "large" middle class in two subclasses in accordance with the workers' educational requirement. Looking at the bar charts referring to the "macro-classes", the dimension and the replaceability of the lower-middle class appear to be the main determinants of the resilience of the "large" middle class.

Some noticeable differences in the proneness of middle class to automation emerge among welfare regimes. In order to better understand these variations, it should be look at the longitudinal analysis performed above. The Scandinavian and the Anglo-Saxon "large" middle classes appear the most resilient to automation, showing a decrease in the size of the lower-middle class. Nonetheless, the reasons are different. In the Nordic case, many of the workers included in the lower-middle class have been successfully retrained, hence reducing their replaceability. Indeed, the relative size of the lower and the lower-middle class has been partially brought down. On the contrary, the Liberal countries have consistently reduced their traditional low-skill workforce (i.e. production workers and clerks), showing an overall constrained RTI score. However, the significant dimension of the lower class might account for the downgrading of the former lower-middle workers. Finally, both the Conservative and the Mediterranean middle classes result to be more likely to be automized. In the Central European countries, the large share of clerks seems to justify that observation, whereas the relevant number of production workers and the general low education of the Southern labor force push many people in the higher RTI quintiles. Once again, the main difference between these two cluster could be led back to the dimension of the lower class. In fact, its larger relative size in the Mediterranean group, compared to the Conservative regime, envisages a worse impact of automation on the former.

Therefore, the welfare regimes most committed in providing the required competences, as well as sheltering the labor force with encompassing compensation policies, will enable workers to face painlessly the challenge of the ICT revolution.

CHAPTER IV

The framing role of the welfare institutions: "in-work" and "out-of-market" protection.

In this chapter I will empirically analyze the framing influence of the welfare institutions on the automation and de-industrialization processes affecting the labor market. As repeatedly argued in the previous chapters, the type of intervention of welfare regimes aimed at molding the current economic transition is two-fold: on the one hand, they can directly influence the occupational distribution, possibly softening the job polarization process; on the other hand, social protection systems can compensate those workers who are expelled from the labor market. In other words, the welfare institutions can both provide "in-work" protection and "out-of-market" compensation.

Using the terminology of Häusermann and Schwander (2012), the middle-class workers might be classified as "insiders". Hence, they are supposed to benefit from insurance-based protection and strict regulation of the open-ended employment. However, the shift of these workers to the new service occupations is likely to stimulate the surge of "new social risks", which may affect the former "insiders". More specifically, the precarious careers and the obsolescence of their skills force those people to rely on social assistance and training. Therefore, the protection for fixed-term employees, the income-support measures and the training system appear to be crucial in facing the challenges posed by automation and de-industrialization.

In the third chapter I have already outlined the differences in terms of occupations and class structure which distinguish the welfare clusters. However, those findings are based on survey data, hence not entirely reliable to describe the effort and capability of welfare state in exerting its shaping influence on market. Instead, the analyses presented above can be considered as the "demand-side" investigation of the welfare state's influence, since they are focused on the societal outcomes rather than on the social policies provided (both for "in-work" and "out-of-market" protection).

Therefore, in this chapter I will use macro indicators which measure the "supply" of social provisions offered by each welfare regime. The analytical intent is to describe the various types of social protection guaranteed by each welfare cluster, finding which institutional configurations are most suitable to manage this momentous economic transition, both in terms of protection for incumbent workers and compensation policies. Thus, I will divide the fourth chapter in two sections dedicated to each dimension of welfare state's intervention.

I would expect to further confirm the hypotheses proven in the third chapter. However, this two-fold analysis would also enable to distinguish between the types of actions put in place by each welfare regime, and their adequacy, inside and outside the employment relationship. Namely, I suppose to find a sound intervention of Conservative welfare states with reference to the "in-work"

protection, due to their rigid collective bargaining system (Wren, 2013), whereas the compensation policies provided by those countries would be less effective in facing the "new social risks" (Ferrera, 2019), because of the predominance of insurance-based programs (Palier, 2019). On the contrary, the Liberal cluster might be more able to support the people excluded from the market than the incumbent workers who are threatened by automation, despite its typical means-tested assistance does not seem to significantly alter the market's societal arrangements. Instead, the Social Democratic regime would be the best equipped to face this economic transition due to its generous and universal system of income support and training and to the centralized collective bargaining system (Wren, 2013; Palier, 2019). Finally, the Mediterranean cluster is likely to present an intermediate outcome both on the compensation and on the "in-work" protection sides. Indeed, its collective bargaining model has always been very robust, despite being undermined by the recent austerity-driven interventions (Picot and Tassinari, 2016). Moreover, the Southern compensation policies are supposed to be quite generous, but unevenly distributed among the population due their particularistic organization (Ferrera, 2019), especially lacking in terms of training (Pinelli et al., 2017).

4.1. Data and methodology.

The quantitative analyses realized in this chapter are based on the OECD datasets, collected in the online platform OECD.Stat[5]. The indicators chosen both refer to the wage-setting institutions and the compensation policies. In order to outline the differences among welfare regimes, I will pick some countries as representative of each cluster. Namely, the countries selected are the following: Sweden for the Social Democratic group, Germany for the Conservative group, the United Kingdom for the Liberal group, and Italy for the Mediterranean group. Those nations are often mentioned in the scientific literature as the most representative of their respective welfare regimes. Nevertheless, I will often make comparisons with their "cluster-mates" in order to check the regimes' internal consistency.

4.2. Wage-setting institutions and "in-work" protection.

In the literature review I have mentioned different scholars who argue that the wage-setting institutions can deeply influence the occupational distribution. Theo Papadopoulos (2005) asserts that the labor market configurations are not neutral, being the result of socio-political struggles. Indeed, the author states that the "analytical division between labour market policies and social policies is

[5] Available at https://stats.oecd.org/.

artificial and to large extent unhelpful", since the social protection both lies inside and outside of paid employment (Papadopoulos, 2005, p. 3).

Referring to the automation process, the typical U-shaped trend of job distribution's curve, which characterizes the RBTC hypothesis, has resulted less widespread than expected. In this regard, Oesch and Rodrìguez-Menés (2011) assert that the changeable rigidity of wage-setting institutions may hamper the polarization of occupations along the skills continuum, providing different societal outcomes. Namely, the creation of low-paid service jobs appears to be the main criterion to differentiate the impacts of welfare regimes. In fact, the Conservative cluster is supposed to be the least service-friendly political economy, whereas the Liberal countries are expected to largely facilitate the creation of jobs in the non-tradable service sector. The Scandinavian countries instead would not hamper the expansion of this service branch, despite shielding those workers in the public sector (Wren, 2013).

These expectations have been mostly corroborated by the class analysis performed in the third chapter. As a matter of fact, the Anglo-Saxon countries present the most polarized class structure, being particularly advanced in terms of service transition. On the contrary, the Christian Democratic group appears to be able to prevent the rise of low-paid service jobs, despite losing part of its traditionally relevant industrial workforce. The Social Democratic cluster shows both a remarkable share of high-skill professionals and low-skill workers in the tertiary sector. Moreover, within the least educated category of the interpersonal service dimension (Oesch, 2006), the Scandinavians turn out to be the only cluster counting more skilled than unskilled workers. Finally, the Mediterranean regime, added to the traditional Esping-Andersen's classification (1990), presents a sort of hybrid labor market arrangement. Although the Southern countries are characterized by the largest low-skilled "macro-class" (v. Chapter III), their class structure shows a converging trend. Besides, I have found that the Southerners are the most able to retain their traditional industrial unskilled workforce, despite decreasing over time.

As already said, in this paragraph I would expect to find further confirmation of the hypotheses relative to the different strength of "in-work" protection among welfare regimes. Before moving to the indicators measuring the robustness of incumbent workers' shelter, I will analyze the features of different collective bargaining systems in each selected country.

4.2.1. The collective bargaining systems in Europe: a brief overview.

The organization of collective bargaining system and the workers' representation lie at the foundation of the "in-work" social protection. Hence, in order to assess the strength and coverage of

this type of welfare guarantees, I will briefly present the arrangements of collective bargaining in each of the countries selected to represent their welfare regime.

Starting with Germany, it should be noted that the main arena to set pay and working conditions is the industry-level bargaining (46% of employees covered in 2018, according to IAB)[6]. Indeed, the national trade unions do not usually receive a mandate to start a negotiation aimed at covering the whole economy. Moreover, separate company-based agreements are generally not so frequent (8% of employees in 2018). The negotiations usually take place at the regional level, whose actors are trade unions and the employers' associations, while at the company level the works' councils, which are not legally able to negotiate a collective agreement, can integrate the latter on a range of topics (e.g. employment security, working time, etc.).

On the contrary, in the United Kingdom the pay and working conditions for the majority of employees are not subjected to negotiation between social partners (71%)[7]. Besides, the residual coverage of collective agreements is unevenly distributed between the public and private sectors (respectively 63,7% and 16%, according to the British Department for Business, Innovation and Skills). Notably, in the latter most of the negotiations takes place at the company- or individual workplace-level, whereas the industry-based agreements are still employed in the public sector. Moreover, it should be underlined that neither the employers have any obligation to bargain with trade unions, unless the latter are recognized by the employers themselves, nor they need to respect the industry-level agreements, which are not legally binding for the signatory parties.

The Swedish main arena of collective bargaining is the industrial level, despite almost the entire workforce is also covered by local-level agreements (overall 90%)[8]. Although between the 1950s and 1980s the national-level negotiations used to be the main determinant of the working conditions, they were abandoned in favor of industry-based agreements in the private sector. Moreover, the extent to which the local collective bargaining can intervene on the pay conditions fixed by the higher-levels negotiations varies substantially on a case by case basis. Finally, the collective agreements, signed by trade unions and employers' associations at both industry- and local levels, are generally binding.

Lastly, the Italian collective bargaining system shows an arrangement divided in two levels, the industry- and the company-based agreements, whereas the national deals implement the EU

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[6] European Trade Union Institute, available at https://www.worker-participation.eu/National-Industrial-Relations/Countries/Germany/Collective-Bargaining.

[7] European Trade Union Institute, available at https://www.worker-participation.eu/National-Industrial-Relations/Countries/United-Kingdom/Collective-Bargaining.

[8] European Trade Union Institute, available at https://www.worker-participation.eu/National-Industrial-Relations/Countries/Sweden/Collective-Bargaining.

directives[9]. However, it should be pointed out that the emergency austerity budget passed by the Decree-Law 148/2011 deeply reformed the collective bargaining system, allowing companies to significantly diverge from both sectoral agreements and legislation on several issue (e.g. dismissals). Nevertheless, a joint declaration signed by unions and *Confindustria* in the same year engaged the social partners to exclude lower employment and pay standards from the domain of plant-level negotiations. Hence, the "Interconfederal Agreement on Representativeness" of June 2011 has been reinstated, which allows the company-level agreements to depart from industry-based deals only when signed by unions representing more than 50% of employees, safeguarding the industry-based bargaining model (Tassinari and Sacchi, 2019).

4.2.2. The trade unions density and the coverage of collective bargaining.

In this section I investigate the inclusiveness of wage-setting institutions using some data taken from the OECD datasets, in order to empirically strengthen the description portrayed above.

First of all, I will plot a time series outlining the evolution of trade unions density in the four countries sampled, which is measured by the ratio between the members of trade unions and the total number of employees.

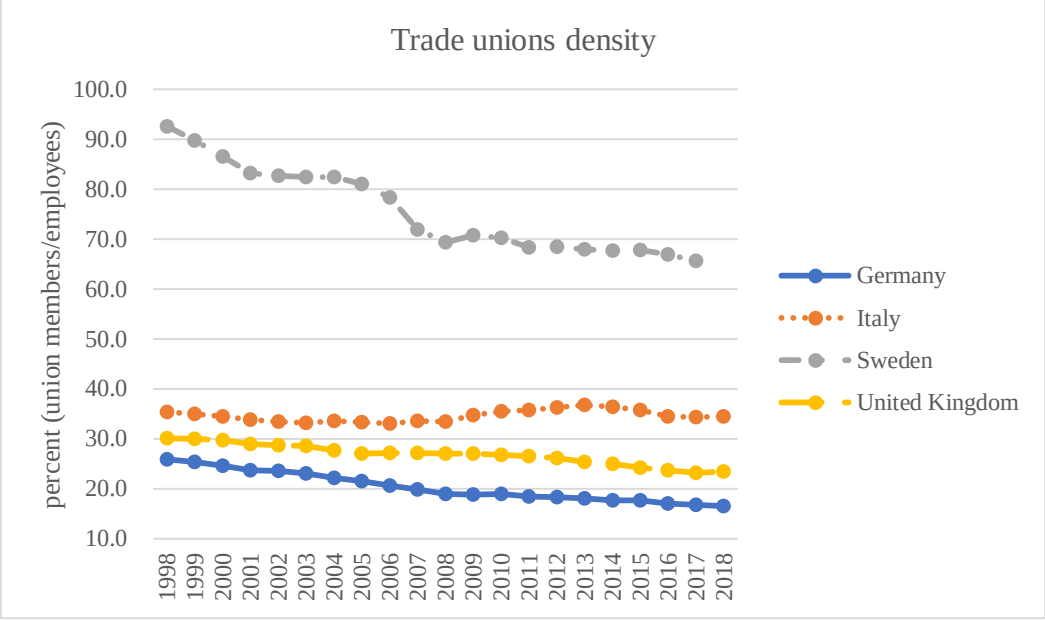


Figure 38: Trade union density. Source: OECD.

The result might be quite surprising. Indeed, the size of German workers' associations turn out to be smaller than the British trade unions (about seven percentage points less), while the Italian membership overtakes the UK unions' basis by ten percentage points. As regards the Conservative

[9] European Trade Union Institute, available at https://www.worker-participation.eu/National-Industrial-Relations/Countries/Italy/Collective-Bargaining.

cluster, a significant heterogeneity has been detected among its components, showing its highest result in Belgium (50% in 2018) and the lowest in France (8,8% in 2018). Moreover, a declining trend characterizes all the countries except for Italy, which has slightly increased its trade unions' members during the economic crisis, then returning to the late 1990s figures. Undoubtedly, the Swedish unions' basis has experienced the most remarkable contraction, losing almost a third of its members in two decades (from 92,6% in 1998 to 65,6% in 2018). The largest drop occurred between 2006 and 2007, when the center-right government pulled down the intra-fund solidarity mechanism characterizing the unemployment insurance. Indeed, the Swedish trade unions has managed the unemployment funds for decades, asking the same membership fees to all the workers. Most of the costs of those funds were supported by government grants, until 2006 when the conservative cabinet reduced the state support. Consequently, the rise of individual fees made the trade union membership less appealing. Nevertheless, Sweden still retains its first position in the sample considered. It should be also noted that a declining trend has been characterizing all the Scandinavian cluster, despite Sweden shows the worst fall (Denmark -10, Finland -18, Norway -4 percentage points). On the contrary, Italy presents significantly higher figures than Portugal and Spain, doubling its "cluster-mates".

In order to draw some conclusions on the robustness of collective negotiations' systems in each welfare cluster, I will couple these data with the figures concerning the coverage of collective bargaining in 2016. Notably, the OECD measures the extension of the latter in terms of employees with the right to bargain.

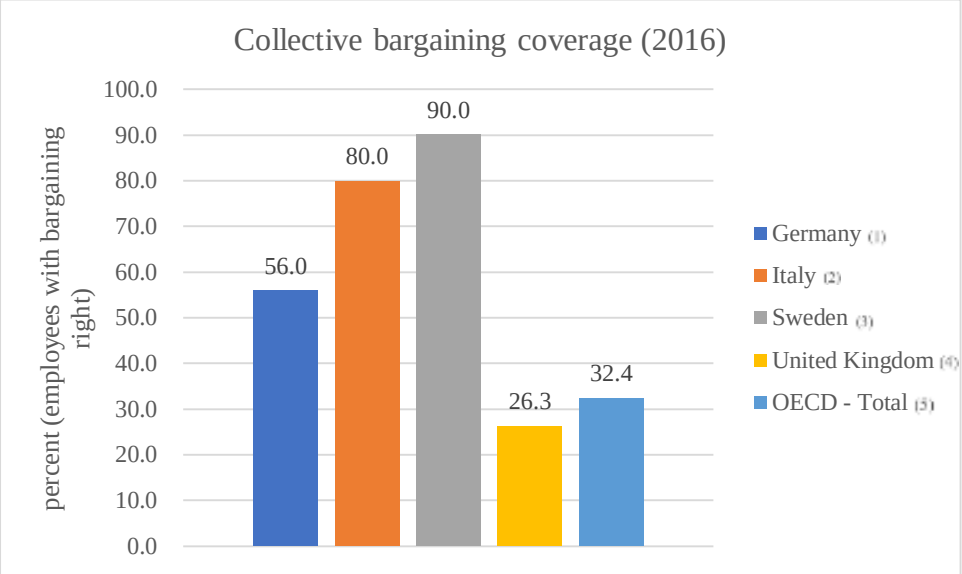


Figure 39: Coverage of collective bargaining. Source: OECD.

These figures appear to be in line with those relative to the trade unions density. Indeed, Sweden places first, with almost the entire dependent workforce having the right to be guaranteed by a collective agreement, closely followed by Italy. Moreover, half of the German employees can be included in collective bargaining, whereas only a quarter of their British colleagues gets this right,

being the only country below the OECD average. However, it should be noted that a problem of representativeness within the Conservative cluster emerges. In fact, the other three Christian Democratic countries (i.e. France, Austria and Belgium) show significantly higher percentages than Germany, much closer to the Nordics (around 90%). Instead, issues of consistency are not detected in the other welfare regimes.

Here, some preliminary conclusions can be drawn, despite the problems of clusters' representativeness found. The Liberal regime shows the least inclusive wage-setting institutions, with the lowest level of collective agreements' coverage. The Conservative cluster turns out to be most heterogenous in terms of trade unions density, while Germany stands out as an outlier in the extension of collective bargaining. Nevertheless, the Christian Democratic labor market institutions result more inclusive than the Anglo-Saxon ones. Undoubtedly, Sweden stands out as the most encompassing case, despite partially losing ground relative to its "cluster-mates". Finally, the Mediterranean group presents a level of bargaining coverage similar to the Nordic countries, whereas their trade union membership falls closer to the Conservative cluster.

4.2.3. "In-work" protection in data.

After the description of the main features of the collective bargaining systems in the four countries selected, I will outline the labor market outcomes produced by those institutions using some OECD indictors.

Firstly, I will plot a time series referring to the evolution of the Employment Protection Legislation Index (EPL). This synthetic indicator measures the strictness of regulation on dismissals, ranging between the values 0 and 6, and it is calculated both for open-ended and for fixed-term workers. The graphs below refer to the individual and collective dismissals' rules together.

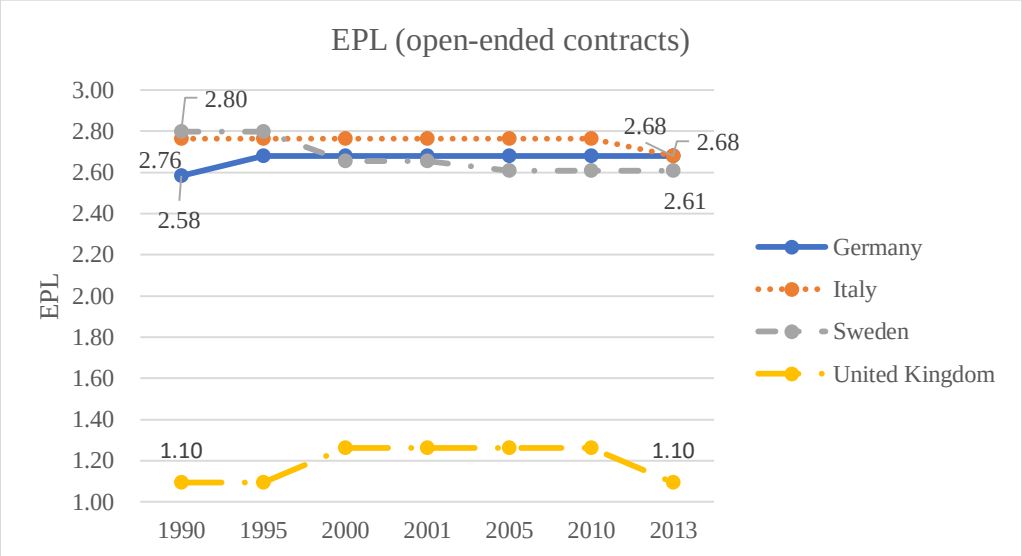


Figure 40: Employment Protection Legislation for open-ended contracts. Source: OECD.

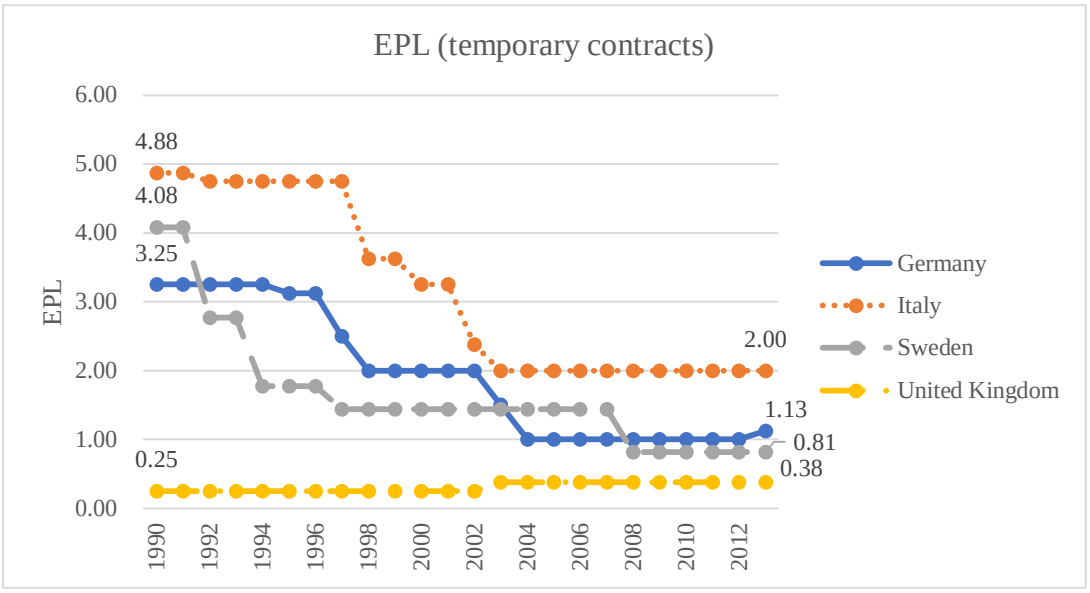


Figure 41: Employment Protection Legislation for temporary contracts. Source: OECD.

Starting from the open-ended contracts, what immediately stands out is the stark difference between the United Kingdom and the rest of the sample. Indeed, the British EPL remains stably around the value one, whereas the others swing between 2,58 and 2,80. At the end of the period considered, Sweden has lost its primacy, while Germany and Italy have converged on the figure 2,68. As regards the fixed-term contracts, a decreasing trend characterizes all the countries except for Britain, where the EPL substantially retains its value. The country which has experienced the most significant EPL contraction is Sweden, becoming the second least protective welfare regime for fixed-term workers in the sample. Although Italy also shows a remarkable decrease, it continues to be the most protective country for fixed-term workers. Finally, Germany achieves the second place in the standings, despite losing more than two points in twenty-three years.

It should be noted that no relevant problem of internal consistency has been detected with regards to these two indexes, except for the stronger commitment of Norway and Belgium to shield fixed-term workers relative to their "cluster-mates". I need also to point out that the reference period does not include one of the major labor market reform which has considerably risen the open-ended contracts' flexibility in Italy, named "Jobs Act". As a matter of fact, the Legislative Decree 23/2015 completely ruled out the reinstatement principle for the economic dismissals judged as unlawful by the court, replacing it with a monetary compensation (Ferrera, 2019).

Although some differences can be already detected among welfare regimes, I will present the figures concerning the relative size of open-ended and fixed-term employment in the four countries, in order provide a clearer picture.

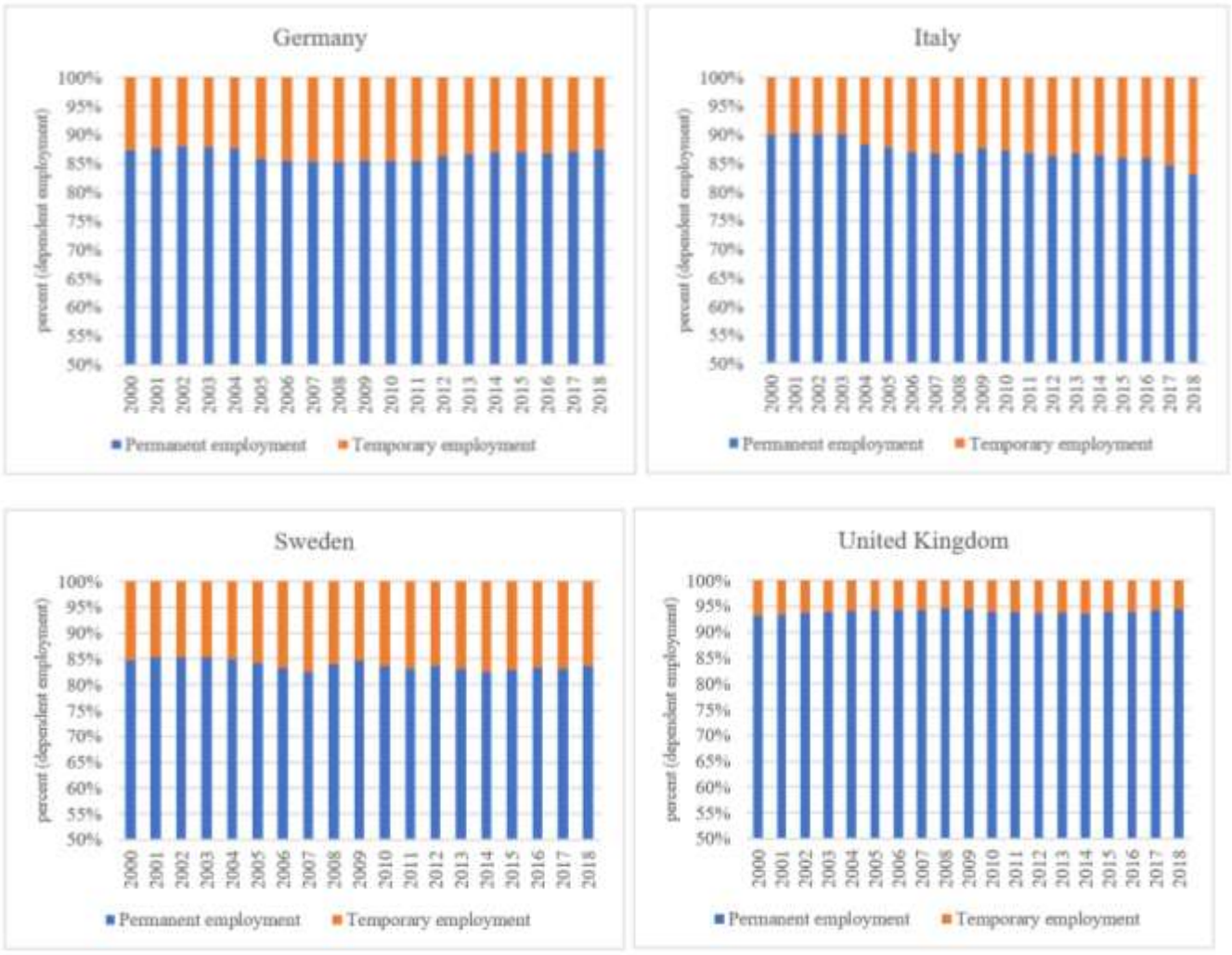


Figure 42: Incidence of permanent and temporary contract on the total employment. Source: OECD.

The results plotted above may look quite surprising. The United Kingdom shows the smallest size of fixed-term employment across all the reference period, despite having the most flexible wage-setting institutions. On the contrary, Sweden presents the largest share of fixed-term workers of the sample. While Germany lies stably in the middle between the countries previously mentioned, Italy shows an increasing number of fixed-term contracts, peaking in 2018. The reason for this steady rise could be traced back to the deregulation process which has affected the Italian fixed-term contracts since the early 2000s. Indeed, a series of labor market reforms, namely the Legislative Decree 368/2001, the Law 92/2012, and the Decree-Law 34/2014, have facilitated the use of this kind of contract (Ferrera, 2019).

As regards the internal consistency of welfare clusters, it can be underlined a slight polarization between Norway and Denmark, which seem fewer fixed-term workers-friendly, and Sweden and Finland, showing more flexible forms of employment. Moreover, Spain overtakes Italy in terms of fixed-term contracts thanks to the rampant deregulation which has hit this type of

employment relation, peaked in 2010 following the *Real Decreto Ley* 10/2010 (Picot and Tassinari, 2016).

Looking at those data, it could be argued that the more flexible labor market institutions in Britain might account for its reduced size of fixed-term workers, whereas the rigid regulations characterizing the other countries could have made open-ended contracts less appealing for the employers. However, the analysis conducted by Centra and Gualtieri (2018) on the Italian "Jobs Act" proves that the stark increase of open-ended contracts, detected after the introduction of that labor market reform, ceased when the social contributions' exemption ended. Therefore, the authors suggest that the contractual deregulation alone shows a weaker explanatory power than the reduced labor cost with regard to the increase of open-ended employment relations. However, this finding can be relied upon only with regard to the short-term. Indeed, in the long-run the flexibilization of employment regulations is likely to foster the rise of open-ended contracts.

Another variable that should be taken into account when describing the labor market's outcomes produced by the "in-work" protection is the distribution of full-timers and part-timers. Hence, I will plot their respective incidence in the four countries sampled in 2018.

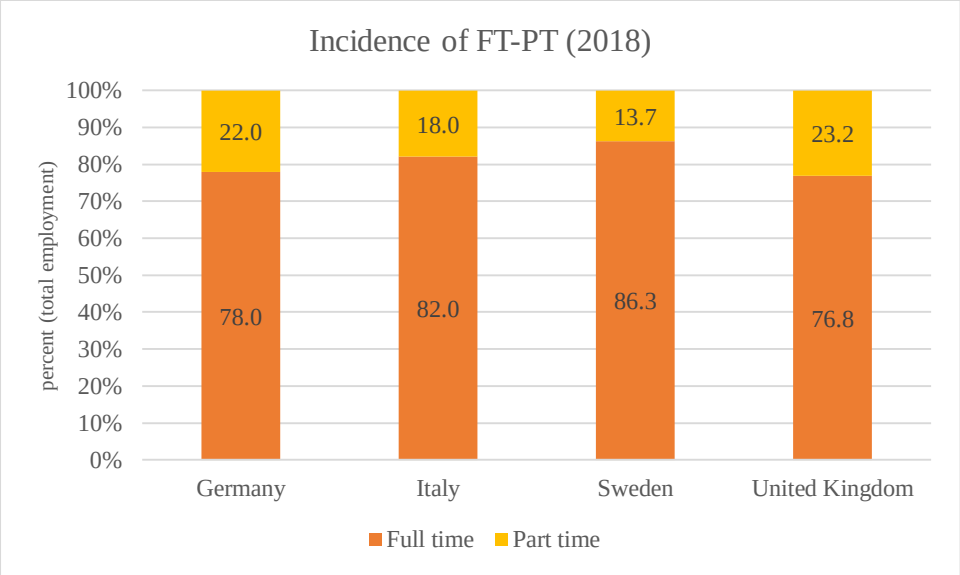


Figure 43: Incidence of part-timers and full-timers on the total employment. Source: OECD.

This bar chart does not show remarkable differences among welfare regimes. However, it may be noted that Germany and Britain present similar figures, resulting the countries with the largest group of part-timers. On the contrary, the Swedish labor market institutions turn out to be particularly committed in hampering the rise of the part-time employment. Nevertheless, a deeper investigation is needed to better understand those data. Notably, the share of involuntary part time is considered as a key criterion to evaluate the quality of the labor market institutions. Thus, I will represent the data referring to the incidence of involuntary part-timers on the overall part-time employment in the same year in the four countries selected.

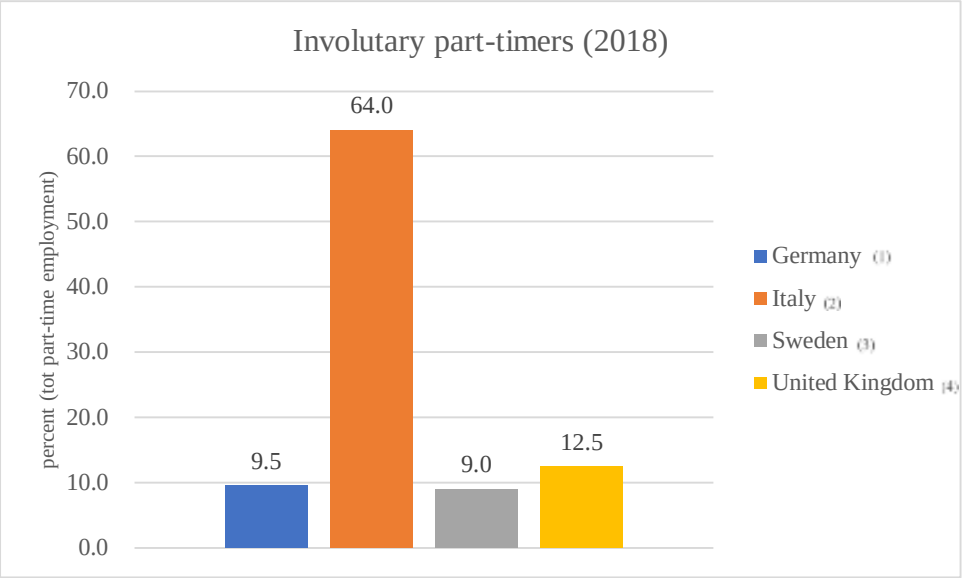


Figure 44: Incidence of involuntary part-timers on the total part-time employment. Source: OECD.

What immediately stands out is the astonishing number of involuntary part-timers in Italy, accounting for more than the half of the whole part-time employment. Moreover, issues of representativeness are not found with regard to part-timers' analysis. Despite the Mediterranean cluster shows a lower share of part-timers than the Conservative and the Liberal groups, its part-time employment is characterized by a lower quality, since the Southern those contracts are mainly imposed by the employers rather than freely chosen by the workers.

Bringing these data together, it could be asserted that the Liberal regime, represented by the UK, does not appear to be interested in curbing job polarization, due to its weak collective bargaining system and employment regulations. However, the United Kingdom shows a non-fragmentated arrangement of employment guarantees, whereas the other three countries place most of their commitment in sheltering the open-ended workers rather than the fixed-term employees. Moreover, despite the Southern and the Central European clusters present similar figures in terms of employment protections' strictness, the former is characterized by a larger share of fixed-term workers and a definitely higher number of involuntary part-timers. Lastly, Sweden shows less rigid wage-setting institutions relative to the Continental Europe, although more inclusive, performing slightly worse in terms of the open-ended workers' share and EPL than both the Conservative and the Southern groups.

More specifically, the incidence of low-paid workers on the total employment might be a very important indicator to estimate the commitment of welfare regimes to hinder the rise of non-tradable service jobs. The OECD defines this index as the share of full-time workers earning less than two-thirds of the gross median earnings of all full-time workers. Unfortunately, I need to point out that the data relative to many countries are missing in this dataset (e.g. Norway, France), hence

undermining the validity of this comparison. Given that neither the data concerning Sweden are provided, I replace it with Denmark in order to include the Social Democratic regime in the analysis.

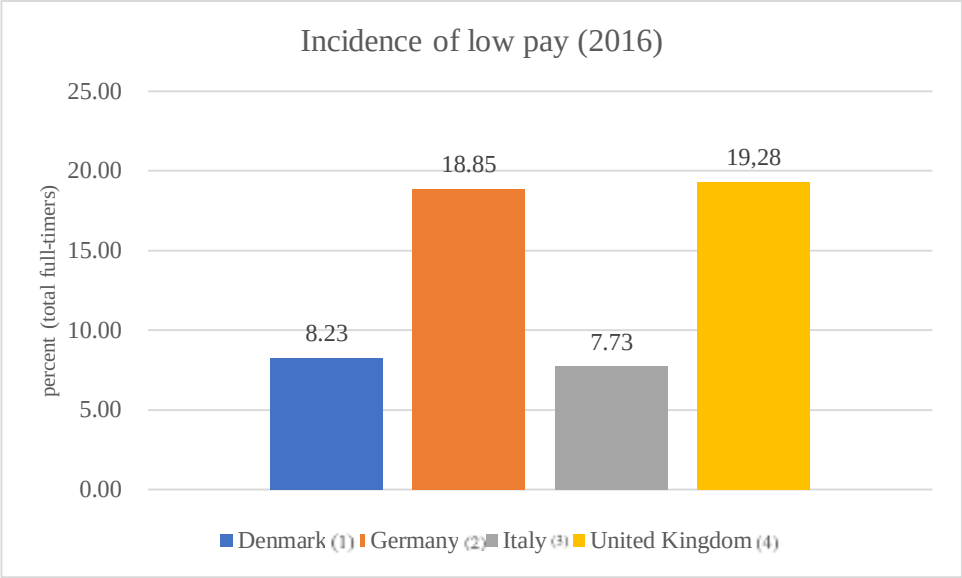


Figure 45: Incidence of low-paid jobs on the total employment. Source: OECD.

Unexpectedly, the incidence of low-paid workers in Germany comes very close to the British figure. Moreover, both result to be much higher than the incidence detected in Denmark and Italy, whose figures turn out to be less than the half of the other two countries. However, it should be noted that the internal consistency of the Conservative cluster is undermined by the Belgian result, performing better than Denmark and Italy (4,1%). Furthermore, Italy does not appear very representative of the Mediterranean group, since the Spanish low-paid workers amount to almost 15% of the total full-timers.

Overall, these data demonstrate that the strictness of the German labor market institutions does not automatically imply the contraction of less-remunerated jobs. Although the class analysis in the third chapter shows that the Central European low-skill service workforce is significantly smaller than in the other clusters, the macro data reported here suggest that the Conservative welfare regime is not very capable in shielding those workers with rewarding working conditions. This observation corroborates the argument of Kathleen Thelen (2014) who argues that the service transition in Germany has been accompanied by the emergence of a secondary labor market, where non-unionized workers enjoy worse economic conditions. Likewise, given the low quality of part-time employment and the noticeable number of fixed-term contracts (especially in Spain), the Southern countries also struggle to effectively shelter the most precarious workers. Nevertheless, the Christian Democratic cluster appears more able than the Southerners to protect the incumbent middle-class workers thanks to the limited recourse to fixed-term contracts and involuntary part time. This finding could be

strengthened by the fact that Germany usually performs worse than its "cluster-mates" in terms of both collective agreements' coverage and trade union density.

Therefore, before moving to the analysis of compensation policies, some brief conclusions could be drawn on the "in-work" protection. The Scandinavian wage-setting institutions seem to succeed in balancing the inclusiveness of the collective bargaining system, the egalitarianism of wage distribution and the moderate flexibility of employment regulations. This mixture allows the creation of low-skill jobs, which benefit from relatively higher wages and a reduced RTI than their European colleagues. Unlike the Nordics, the Central European countries have been more committed in retain their traditional industrial workforce, as its RTI score show, which is protected by formally rigid labor market institutions. However, the class analysis demonstrates that the Conservative cluster is now struggling to hold its production workers. Indeed, this trend is mirrored in the macro data reported in this chapter, which show a rising share of low-paid workers. As regards the Mediterranean cluster, despite sharing similar figures relative to the formal strictness of employment regulation, it presents a larger share of flexible and low-quality forms of employment than the Central Europe. These observations corroborate the findings of the preceding chapter describing the remarkable size of the Southern low-skill service occupations. Finally, the Anglo-Saxon countries provide both middle- and low-skilled workers with a minimal level of "in-work" protection, a limited collective agreements' coverage and the most unequal earnings distribution.

4.3. The compensation policies and the "out-of-market" protection.

I have already mentioned the contribution of Manow, van Kersbergen and Schumacher (2013), who argue that the compensation policies played a much more important role during de-industrialization rather than during the "de-ruralization" process. Notably, the transferability of skills resulted easier between agriculture and industry than in the service transition. Consequently, the authors detected a more significant increase in welfare transfers during 1970s and 1980s than the rise recorded in the two preceding decades.

In this paragraph I will outline the different types of compensation policies in the welfare regimes, in order to find which cluster is best suited to face job polarization. I will first analyze the level of expenditure related to various kinds of welfare policies, particularly underlying the different commitments devoted to the "old" and "new social risks" (Ferrera, 2019). As regards the latter, I will especially focus on training, since the capability to upskill formerly routine workers appears crucial. In the second section I will investigate the "de-commodifying" power of social policies in terms of benefits' replacement rate and adequacy.

Looking at the literature, I would expect to find a strong commitment of the Conservative regime in providing a specialized workplace training (Anderson and Hassel, 2013) and a generous insurance-based social protection, while lacking in terms of assistance (Palier, 2019). I expect a similar policy outcome in the Southern and Central European countries, despite releasing fewer resources to services and Active Labor Market Policies (ALMP). On the contrary, the Social Democratic cluster is supposed to be characterized by a universal and "de-commodifying" welfare system, which devotes more resources to protect citizens from "new social risks" (Bonoli, 2007), particularly providing a general skills-oriented education (Anderson and Hassel, 2013). Finally, the Liberal countries are expected to show meagre social provisions, which are mostly linked to the means test.

4.3.1. Welfare expenditure: the "old" and the "new social risks".

The first indicator usually referenced to describe the size of welfare state is the ratio of GDP devoted to social benefits. It could be immediately noted that the dimension of social expenditure in Italy has experienced a steep rise, overtaking the incidence of the welfare state's cost on the Swedish GDP, which peaked in 1995. The United Kingdom retains the last position in terms of social expenditure, despite having increased the amount of resources devoted to social protection particularly during the Great Recession. Germany instead arrives third in the standings, spending a quarter of its gross product to support the welfare system.

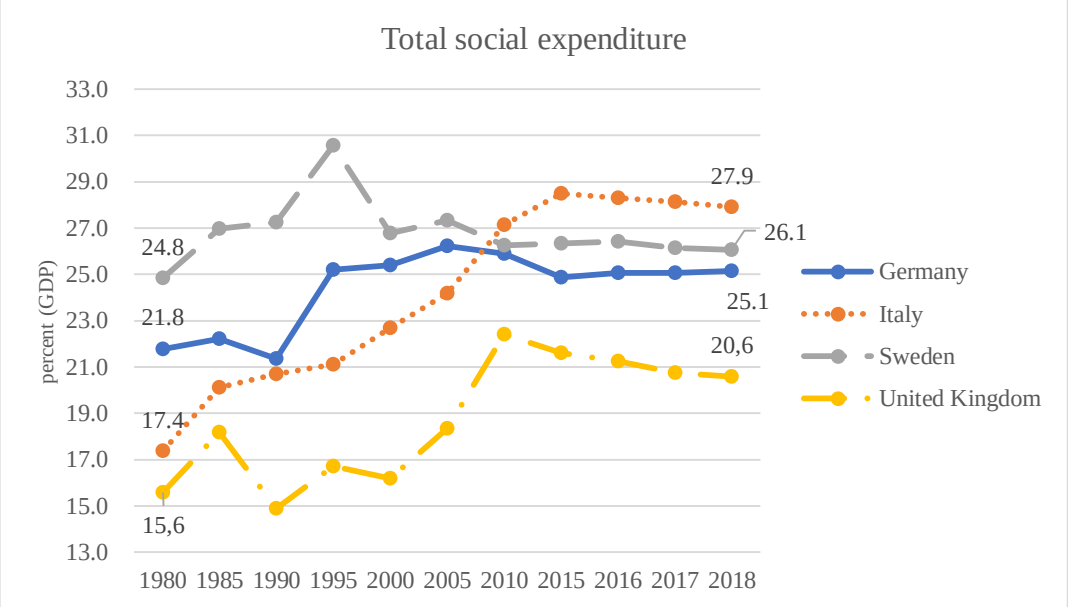


Figure 46: Totale social expenditure in terms of GDP. Source: OECD.

However, the level of global social expenditure is largely insufficient to evaluate the capability of welfare regimes to face social needs. Indeed, Carl Jensen (2008) underlines that the public commitment to support the welfare state should be measured distinguishing between cash and in-kind

benefits. Indeed, the size of services might be useful to investigate the effort of institutions to face the "new social risks", which are often linked to de-familization (e.g. work-life balance).

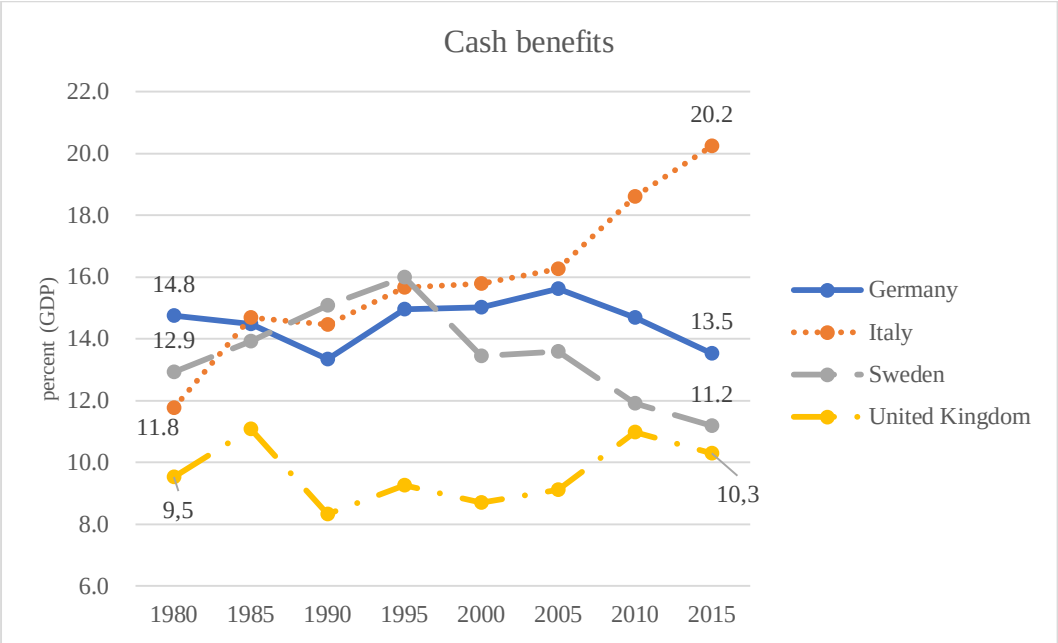


Figure 47: Expenditure for cash benefits in terms of GDP. Source: OECD.

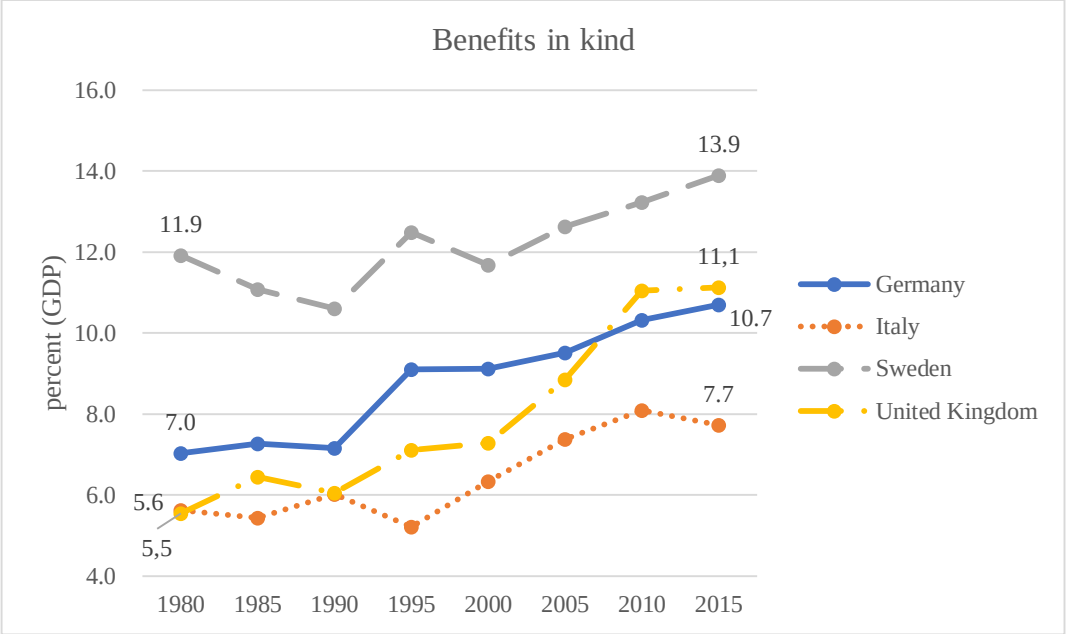


Figure 48: Expenditure for in-kind benefits in terms of GDP. Source: OECD.

These graphs show the evolution of welfare expenditures of the last three decades in the four countries selected. It could be immediately detected an overall increasing trend for the benefits in kind, whereas the cash provisions have been generally reduced (except for Italy). As regards the first graph, Italy turns out to be the country which spends the most for cash benefits (20,2% of its GDP), whereas the other three nations swing between 10,3% and 13,5%. Germany has lost its primacy compared to the standings of 1980 and it is currently followed by Sweden, which has markedly

reduced its expenses relative to the 1990s. The United Kingdom instead presents a stark increase in terms of resources devoted to in-kind benefits (from 5,5% in 1980 to 11,1% in 2015), while retaining a stable trend in terms of cash transfers. Moreover, Sweden results the country most committed in financing services, despite Germany and Italy both show a significant increase in the reference period.

Given that no relevant issue of clusters' internal consistency is found (except for the typical German parsimony with respect to the other Conservative countries), it could be asserted that the data confirm the expectations previously mentioned. As a matter of fact, the Mediterranean hostility to benefits in kind clearly emerges (Ferrera et al., 2012), traced back to the key role of family relations as safety net. On the other hand, the significant dimension of the Scandinavian in-kind provisions is confirmed, despite gaining weight in all countries due to the expansion of new social needs. Finally, the Liberal countries outperform the Continental Europe in terms of service, while confirming the scanty dimension of their cash transfers.

Once the levels of general expenditure are described, we can move on to a more specific investigation of the different branches of social benefits. As said above, I will distinguish between the "old" and the "new social risks", starting from the former.

The very first social need getting the attention of policy-makers is the old age, whose primal public insurance scheme appeared in the late 1880s in Germany (Ferrera, 2019). All the pension systems are composed by different pillars. Generally, a minimum benefit is guaranteed to elderly people who have not been able to pay the social contributions required for the insurance-based scheme. This provision use to be more inclusive in the Social Democratic and Liberal regimes (e.g. "New State Pension" in the UK[10], the guaranteed pension in Sweden[11]) than in the other two clusters, where this provision is based on the means test (Ferrera, 2019). A second insurance-based scheme provides the earnings-related pensions, usually mandatory and brought under public control in the Bismarckian and Social Democratic welfare systems, while in the Liberal countries are mostly voluntary and sponsored by private actors (e.g. multi-employer or industry-wide schemes). Finally, a third pillar composed by individual private insurance, always characterized by voluntary subscription, is present in every regimes.

Unfortunately, the OECD data do not provide distinct figures for each type of pension pillars, hence I will only plot the evolution of total social expenditure related to the old age. Nonetheless, this indicator is a valid tool to estimate the commitment of welfare regimes in sheltering a traditional social risks.

[10] Pension Funds online, available at https://www.pensionfundsonline.co.uk/content/country-profiles/uk.
[11] Pension Funds online, available at https://www.pensionfundsonline.co.uk/content/country-profiles/sweden.

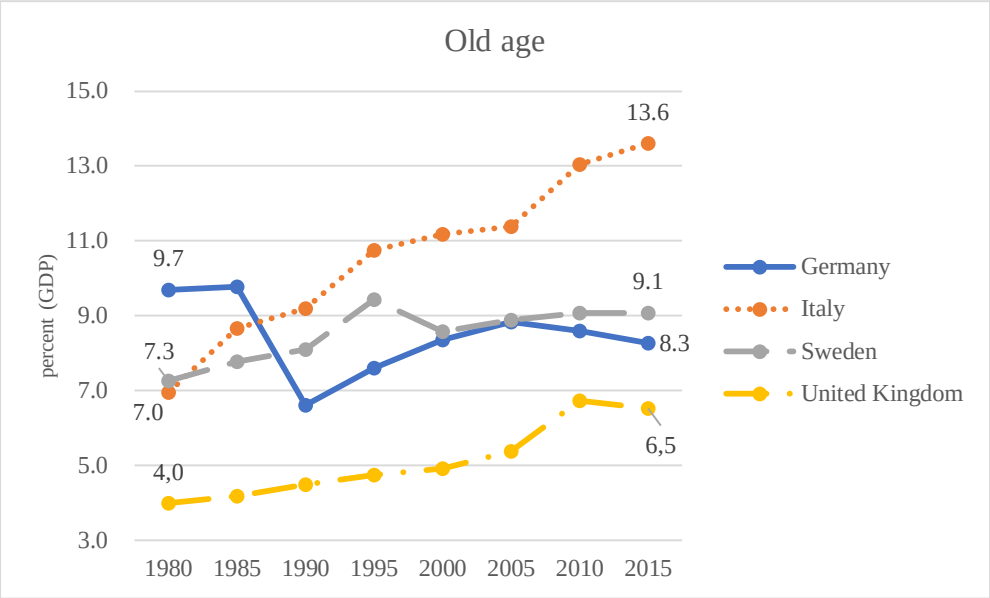


Figure 49: Total expenditure devoted to the old age risk in terms of GDP. Source. OECD.

First of all, the increase of the Italian pension expenditure looks noticeable, reaching the highest result of the sample (13,6% of its GDP in 2015). This figure corroborates the so-called "double distortion" theory presented by Ferrera et al. (2012), who identify the gigantic dimension of pension spending as one the distinguishing feature of the Italian welfare system. On the contrary, the engagement of Britain in facing this social risk appears to be the least significant, despite the two and a half percentage points' rise reported in the last three decades (overall 6,5% of its GDP in 2015). Germany and Sweden stand in the middle of the graph, but it should be noted that those countries show different trends. Indeed, the German pension expenses dropped between 1980s and 1990s, while Sweden presents a steady rise across the reference period.

Another social provision which might be analyzed in order to estimate the commitment of welfare institutions to face traditional social risks is the unemployment benefit (UB). However, it should be underlined that, thanks to the OECD dataset, we can isolate the figures related to unemployment insurance, allowing to better investigate the capability of welfare systems to protect from "old social risks". Indeed, the insurance scheme mainly benefits the workers who show an uninterrupted career, since a sizeable amount of social contributions is usually required to get a rewarding earnings-related benefit.

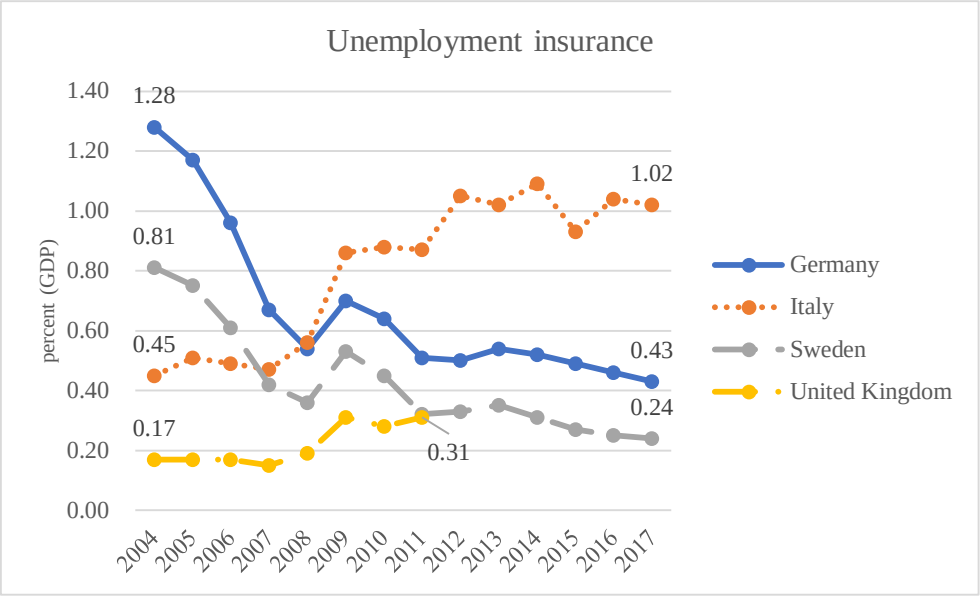


Figure 50: Total expenditure for the unemployment insurance in terms of GDP. Source: OECD.

Therefore, the trends of the unemployment insurance's expenditures could be useful to understand the engagement of welfare regimes in protecting from traditional hazards. Once again, Italy shows a starkly increasing trend. A profound reform process has changed the Italian unemployment insurance, particularly from 2013, which led to a more encompassing and generous system of social protection, peaking with the establishment of a unique unemployment scheme involving almost all the employees named *NaSpI* in 2015 (Pinelli et al., 2017). It should be noted that the rise of UB expenditure started in 2008, when the unemployment rate dramatically increased due to the economic crisis. Moreover, the employability of the short-term work protection (*Cassa Integrazione Guardagni Straordinaria*) was reduced, drawing out many workers who were only formally employed. On the other hand, Sweden and Germany have experienced a remarkable drop in expenditures related to unemployment insurance. It should be noted that the German labor market policy underwent a deep change in the early 2000s. Namely, the Hartz IV reform restricted the duration of the full unemployment benefit (*Arbeitslosengeld I*), hence reducing the spending for the insurance-based benefit. Finally, the United Kingdom newly results to be the country releasing fewest resources to unemployment provisions.

Considering that no particular problem of clusters' representativeness emerges with regard to these types of benefits, I would present some findings related to protection from "old social risks". The Mediterranean cluster confirms to be the most committed in sheltering workers from traditional social hazards with cash transfers. At the other end, the Liberal group reaffirms its scant interest in providing a large "out-of-market" protection, on par with low "in-work" guarantees as demonstrated by the EPL figures. Lastly, the Social Democratic and the Conservative regimes stand in the middle

of the ranking, with the latter presenting a slightly more generous insurance-based protection for unemployed workers.

As mentioned before, it could be expected that the workers who mainly benefit from this type of compensation policies are those performing middle-class occupations, i.e. the former "insiders" (Häusermann and Schwander, 2012). However, the slippage of some of those workers towards new service occupations might foster the rise of new social needs linked to their precarious careers (Palier, 2019). Thus, the analysis of the expenditure devoted to the social and labor policies aimed at tackling this new kind of necessities turns out to be crucial in order to evaluate the shaping role of welfare institutions during the current transition.

One of the main budget item, comprised in the ALMP, is training. As repeatedly argued, the need of workers' upskilling has become widespread due to automation (Brynjolfsson and McAfee, 2014). In this regard Anderson and Hassel (2013) argue that the Conservative cluster is less suitable to provide the skills needed to face the service transition, being focused on the specialized training. Meanwhile, the authors claim that the Social Democratic regime appears more competitive due to its school-based training system. The OECD dataset distinguishes the training expenditure between the workplace and the institutional models. It should be pointed out that the institutional training also includes the apprenticeship. Thus, the argument of Anderson and Hassel (2013) can be only partially checked, referring to the on-the-job training expenditure, which is expected to be higher in Germany than in the other clusters. Moreover, the British data are not available, hence I will replace the UK with Ireland.

Unexpectedly, the German expenses for workplace training is not the most significant, rather spending the same low amount of Sweden (0,01% of their GDP in 2015). Moreover, Italy and Ireland turn out to be the most committed in supporting the on-the-job education, devoting respectively 0,04% and 0,03% of their GDP to it. As regards the institutional training, Germany shows the highest relative size of expenditure in terms of GDP, despite a remarkable decline is recorded between 2004 and 2017 (from 0,40% to 0,13%). On the contrary, Sweden has always presented a much lower effort in supporting this type of training, reaching almost the same relative size of the German institutional education in the recent years only after the drop reported by the latter. Finally, Italy shows the lowest commitment in institutional training (0,02% of its GDP in 2015), whereas Ireland is characterized by a remarkable increase in the resources dedicated to general education during the economic crisis, then returning to modest figures (0,08%).

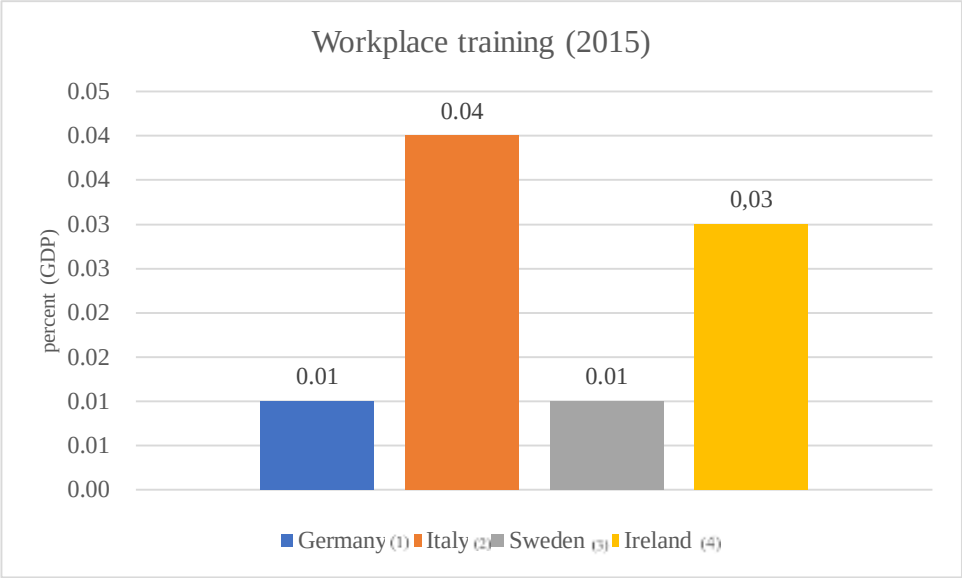


Figure 51: Expenditure for workplace training in terms of GDP. Source: OECD.

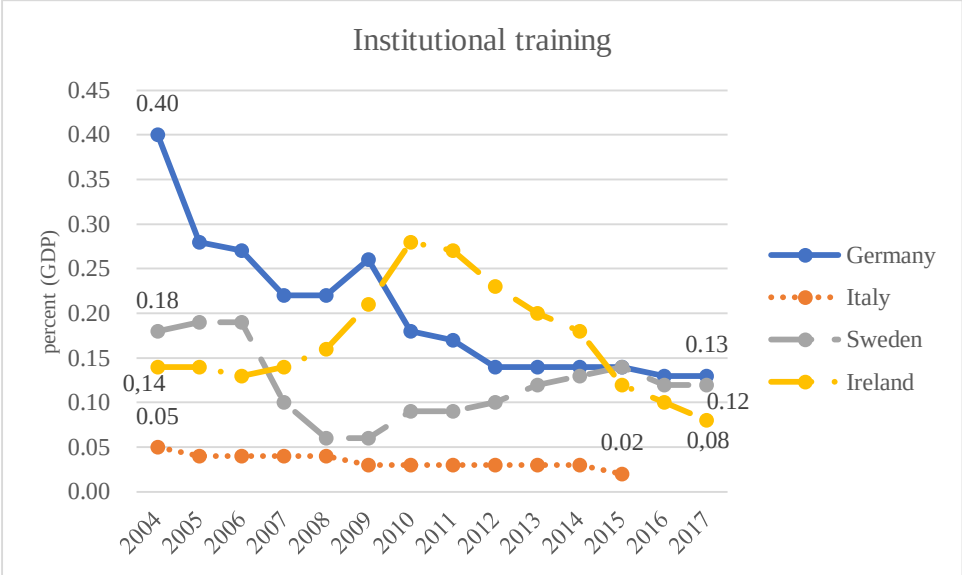


Figure 52: Expenditure for institutional training in terms of GDP. Source: OECD.

Therefore, these findings partially contrast with the argument exposed by Anderson and Hassel (2013), since Germany does not result to be the most relevant supporter of workplace training. Nonetheless, it shows the highest value for institutional training, equaling Sweden. However, it should be underlined that Sweden is not very representative of its "cluster-mates" since both Finland and Denmark show much higher figures (respectively 0,38% and 0,48%). Moreover, the relevant amount of resources provided by the Christian Democratic countries to support institutional training seems to justify the remarkable number of highly educated service professionals in their cluster (v. Chapter III), comparable to the Scandinavian result. Nevertheless, it should be recalled that the apprenticeship is included in that budget item, thus also referring to specialized education. Finally, the Southern meagre budget invested in institutional education is in line with the weak relative size of the Mediterranean socio-cultural professionals.

Another branch of the labor policies which is particularly relevant for redundant workers is the Public Employment Service (PES). The PES is composed by the authorities aimed at matching jobseekers with employers, hence their facilitating role might be very important to help reintegrate former routine workers in the labor market.

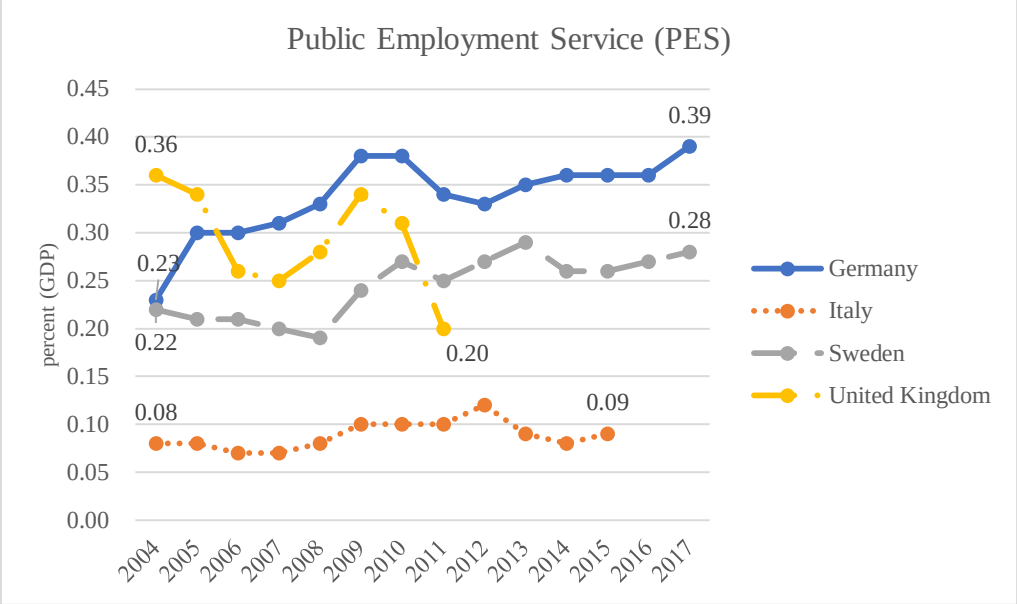


Figure 53: Expenditure for PES in terms of GDP. Source: OECD.

Germany newly shows the highest values in terms of resources provided (almost 0,40% of its GDP in 2017), while Italy shows again the lowest result (only 0,09% of its GDP in 2015). Sweden presents an increasing trend, slower than Germany, and it places second (0,28% in 2017). The United Kingdom instead is the only country showing a decreasing trend, despite its data only cover the period up to 2011 (0,20% of its GDP). This evidence further denies the inadequacy of the Conservative regime in facing the challenge of the service transition, despite Germany shows the highest result within its cluster, while confirming the difficulty of the Mediterranean countries in the same field.

The last sector of compensation policies I want to test in terms of expenditure is family-friendly policy. As mentioned above, the work-life balance represents another social need that has emerged when service transition took place. Indeed, the largest share of service workers is composed by women (Iversen and Rosenbluth, 2013), who have been traditionally charged with the care duties. In this regard, Bonoli (2007) argues that the Nordic welfare system is the best equipped to deal with this issue due to the early start of de-industrialization in those countries, which were followed by the Anglo-Saxons. On the contrary, the consolidation of the industrial welfare state in Central Europe hampered a smooth shift towards the dual-earners model. The difficulty of this change is expected to be much harder in the Southern welfare regime, where the Catholic legacy has played a key role in preventing the outsource of care service to the welfare institutions (Ascoli, 1991).

In order to empirically test the commitment of welfare regimes in financing this branch of social policies I will distinguish between cash and in-kind benefits.

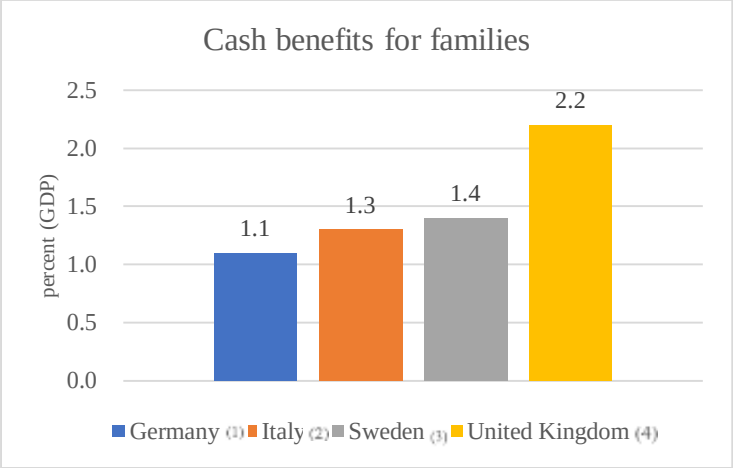


Figure 54: Expenditure for cash benefits for families in terms of GDP. Source: OECD.

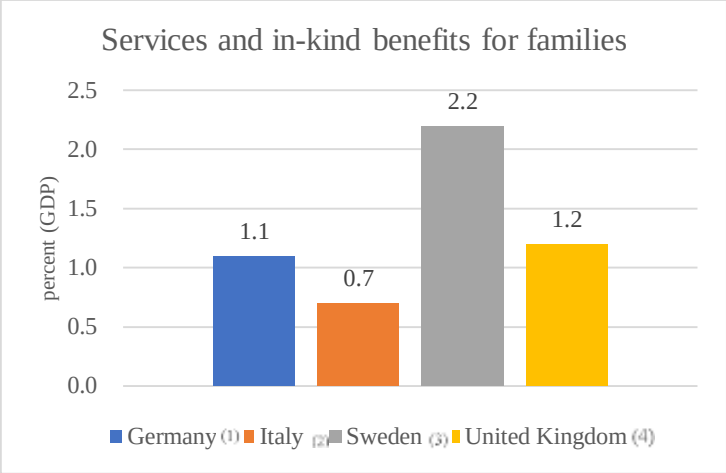


Figure 55: Expenditure for in-kind benefits for families in terms of GDP. Source: OECD.

Looking at the cash benefits, Britain is the only country showing a significantly different result from the other countries (2,2%), which almost doubles the percentage of GDP devoted by the other nations to this type of transfers (swinging between 1,1% and 1,4%). On the hand, Sweden results to be the best performer in terms of services and in-kind benefits (2,2%), while Italy presents the lowest figure (0,7%). It should be underlined that the welfare regimes show a significant level of internal consistency with regard to this type of compensation policies in the OECD dataset. Therefore, the expectations concerning the remarkable commitment of the Scandinavian countries in supporting family-friendly policies (especially in terms of services) are corroborated, as well as the scant resources devoted by the Mediterranean and the Conservative cluster to this aim. Moreover, the noticeable amount of resources released by the United Kingdom is in line with the Bonoli's hypothesis (2007), which argues that the Liberal welfare regime would rather deploy its "de-familization" intervention through incentives than services.

All in all, the analysis of compensation policies designed to face the "new social risks" confirms that the Southern welfare institutions are the least engaged in helping people to retrain and reconcile the working and care time. On the other hand, the Mediterranean group shows the highest share of social expenditure devoted to traditional social risks, especially through pensions, while struggling in all the social provisions that are crucial to face de-industrialization and automation. Furthermore, the Central European countries show a remarkable commitment in providing ALMP, despite lacking in terms of de-familization policies. The Scandinavian cluster instead releases a significant amount of resources to guarantee services and in-kind benefits to families, while

presenting a more meagre budget reserved to training and PES. Moreover, the evidence demonstrates that the Conservative and Social Democratic regimes display similar results concerning funds for traditional compensation policies. Finally, the Liberal countries are characterized by a widespread low level of social expenditure, particularly providing the fewest resources to protection against unemployment and old age.

4.3.2. The "de-commodifying" power of compensation policies.

The social expenditure might be considered as a good proxy to identify the levels of commitment characterizing the welfare regimes in facing a wide range of social needs. However, as Esping-Andersen (1990) argues, the share of expenses does not suffice to describe the quality of the welfare provided. As already mentioned in the second chapter, in his successful attempt to "sociologize" the welfare studies the Danish scholar proposes two indicators. Notably, the "de-commodification" index has triggered a broad scientific debate, being repeatedly criticized and revisited. Since the use of that indicator would need a deeper investigation of its composition, I will employ other indexes which similarly estimate the capability of welfare policies to emancipate the individuals from market dependence. It should be noted that two of the indexes employed in this work are part of the original "de-commodification" measurement.

First of all, I will graphically represent the replacement rates related to the social provisions first mentioned in the previous paragraph: the pension and unemployment benefits. Starting with pensions, I will plot separately their replacement rates based on gender and the wage received prior to the retirement (50%, 100% and 150% of the average wage). These distinctions would help to understand the level of gender and social equality characterizing the pension schemes in different welfare clusters. I will employ the net replacement rate, provided by the OECD dataset, defined as the individual net pension entitlement divided by net pre-retirement earnings, taking account of personal income taxes and social security contributions paid by workers and pensioners. These data are designed to show the future entitlements for workers who entered the labor market in 2012 and spend their entire working lives under the same set of rules. Moreover, their careers are not supposed to be fragmented and the dataset includes all types of retirement schemes.

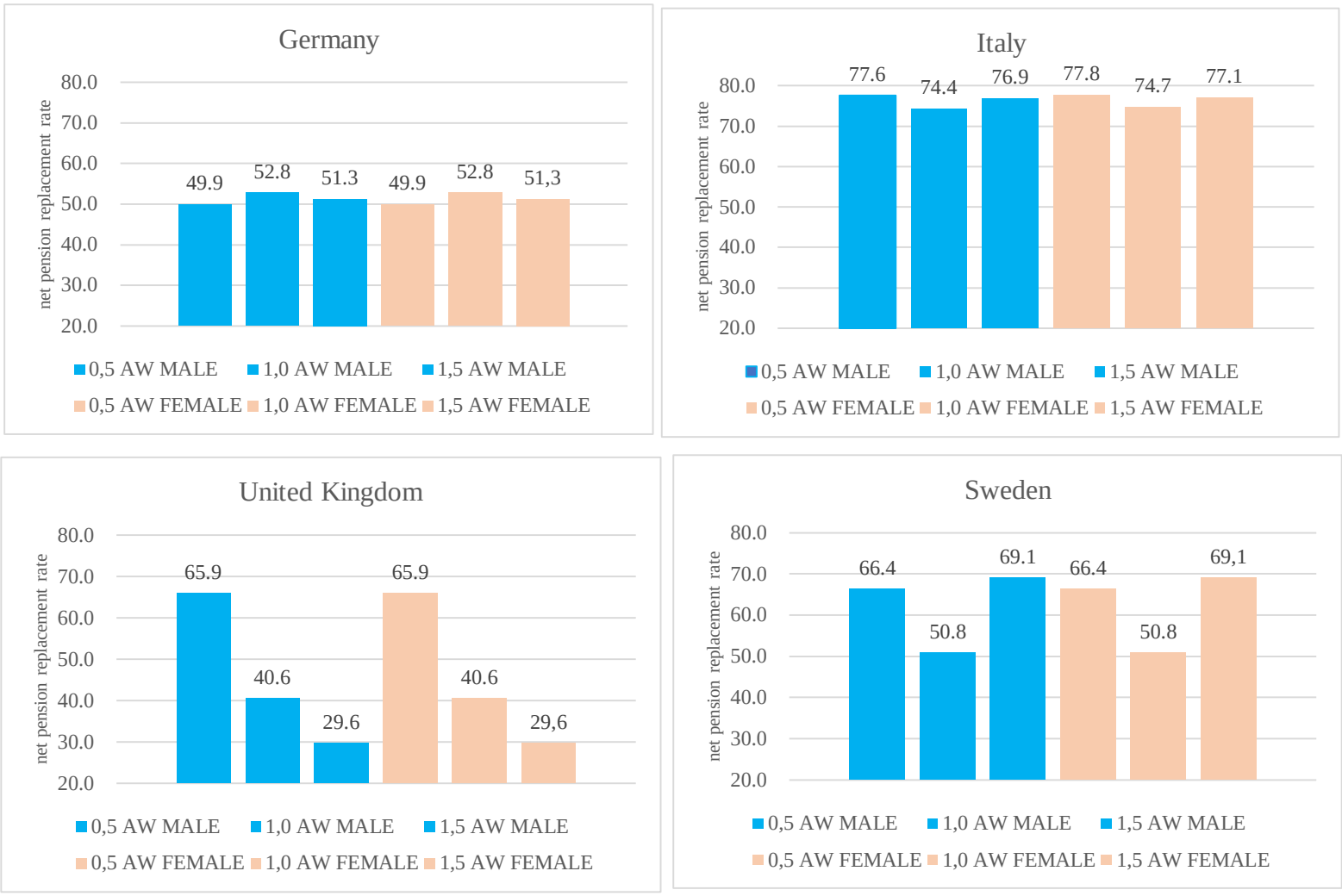
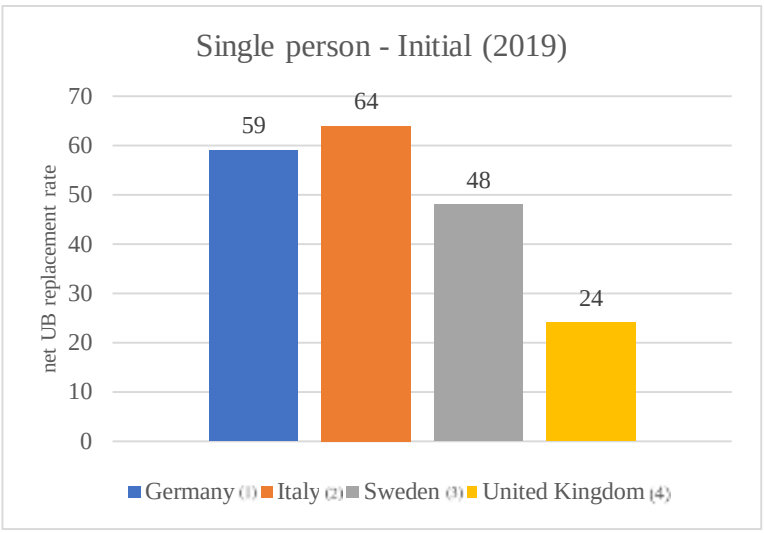


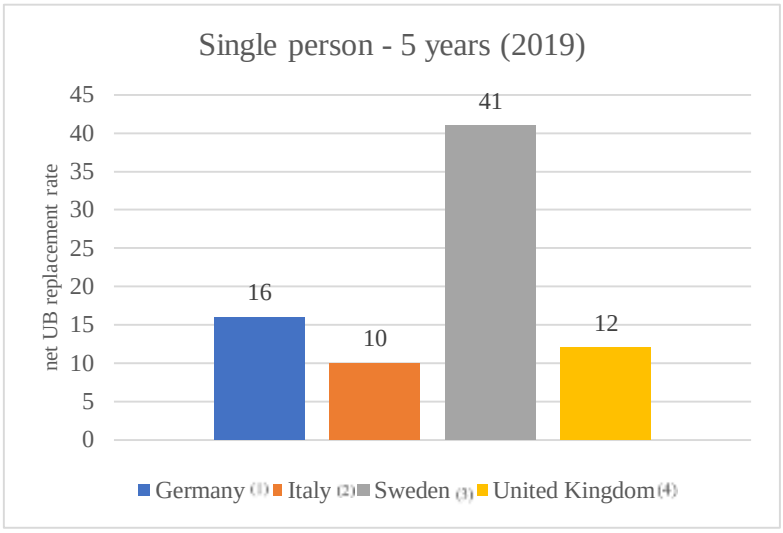
Figure 56: Pension net replacement rates. Source: OECD.

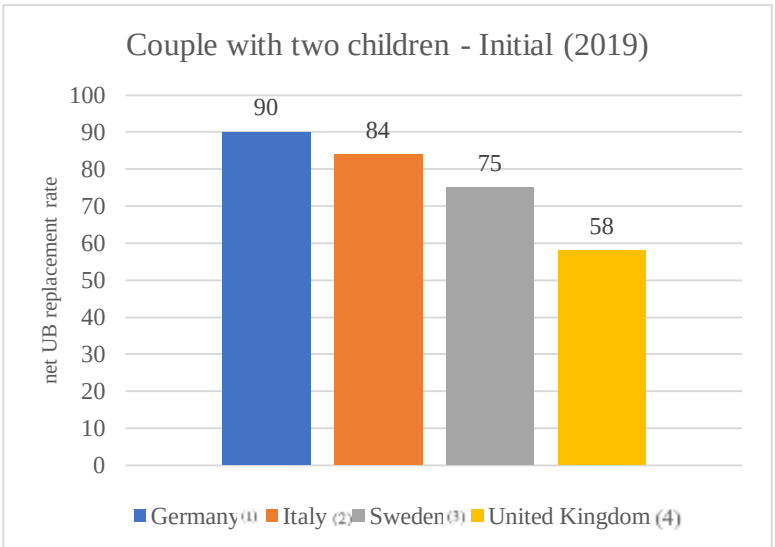
What is immediately evident is the perfect equality of the replacement rates guaranteed to men and women, except for Italy which shows a slight advantage for the female workers. As regards social equality, Britain shows the highest level of low-income targeting, since the replacement rate of the least remunerated workers more than doubles that one of the richest. On the contrary, both Italy and Germany present a homogenous level of replacement rate across the wage distribution. The reason for this difference could be traced back to the predominantly means-tested welfare state in the Liberal countries, which is mainly committed in providing social benefits to the neediest, pushing the others towards the private insurance schemes. Meanwhile, the Continental Europe unexpectedly appears to be more encompassing than the Scandinavian cluster, since Sweden shows a U-shaped distribution of replacement rate, peaking for the people earning 50% and 150% of the average wage. This unusual distribution shape may have its origins in the structure of the Swedish retirement schemes. Indeed, the workers gaining higher wages are those who benefit the most from the premium and the occupational pensions, whereas the least remunerated people show a remarkable replacement rate

thanks to the generous income-based provisions[12]. Finally, Italy confirms to be the most generous welfare regime in terms of pensions, in line with its "cluster-mates", while Germany shows the most constrained replacement rate.

Although these data cannot be fruitfully employed to evaluate the suitability of welfare regimes in facing the service transition, the balance between the level of inclusiveness and the generosity shown by the Mediterranean and the Nordic countries might be interpreted as a rewarding compensation for the lower-middle-class workers who retire, the most affected by automation. The OECD provides data related to the net replacement rates of UB broken down by the duration of unemployment. In fact, the long-term unemployment has been often defined as a "new social risk", affecting those people with irregular working careers, especially the workers with non-marketable obsolete skills. Moreover, I will distinguish the beneficiaries between single persons and couples (with two children), in order to detect the degree of "de-familization" of each welfare regime.







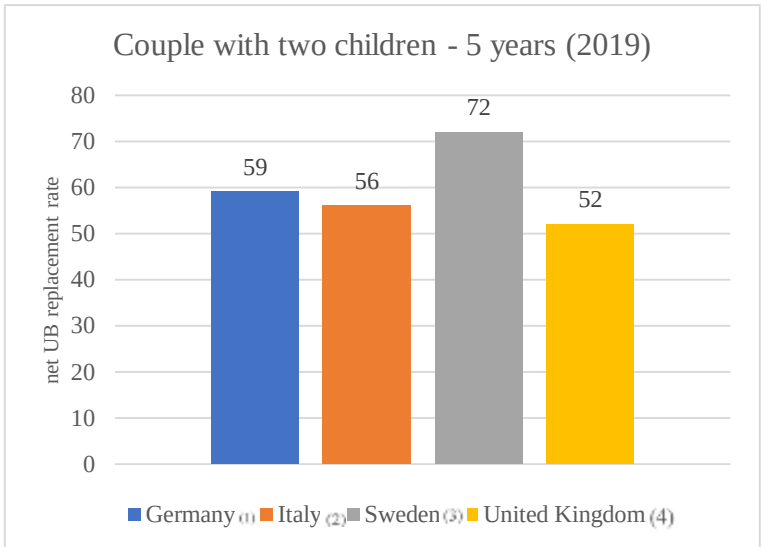


Figure 57: Net UB replacement rates. Source: OECD.

[12] Pension Funds online, available at https://www.pensionfundsonline.co.uk/content/country-profiles/sweden.

The net UB replacement rates displayed are measured as the proportion of previous in-work income that is maintained after one month and five years of unemployment.

The first element that should be noted is the cross-cluster higher level of replacement rate guaranteed to the couples compared to that one of single persons. This evidence underlines the stronger commitment of welfare regimes in sheltering large families rather than the one-person households. Nevertheless, this difference is more limited in the Social Democratic Sweden, especially in the long-term unemployment, which confirms to be the least familistic welfare regime. On the contrary, this gap reached a noticeable dimension in Germany. Given the increasing precarious nature of families which has accompanied the de-industrialization process (Ferrera, 2019), an individual-based arrangement is supposed to result more effective in supporting households' income.

Furthermore, Germany and Italy turn out to be the most protective with regard to short-term unemployment, both for single persons and couples, while Britain shows the lowest replacement rates in all graphs. On the other hand, Sweden present the most generous UB devoted to long-term unemployed beneficiaries. Moreover, it should be underlined that Sweden shows slightly smaller figures than the other Nordic countries. Therefore, the Social Democratic regime results to be the most protective for people suffering for prolonged exclusion from the labor market, e.g. routine low-skill workers, while the Continental European welfare system is more able to maintain the level of income in the short-term. Finally, the Liberal cluster looks under-equipped to shelter workers from the unemployment risk in any case.

Another indicator to evaluate the commitment of welfare institutions in sheltering people from long-term unemployment is represented by the adequacy of the guaranteed minimum income (GMI). As a matter of fact, the increasing fragmented careers, together with some remarkable social changes (e.g. ageing population, family instability), have deeply reshaped the concept of economic poverty, from a permanent condition of the few to an episode affecting a large group of people (Ferrera, 2019). In this context, a means-tested guarantee of income support becomes an essential compensation policies.

The OECD provides a detailed dataset regarding the adequacy of GMI in 2019, broken down by family types. I will newly refer to two kinds of households, i.e. single persons and couples with two children. The adequacy of GMI is intended as the income of selected jobless families claiming that benefit, and the values are expressed as the percentage of the median disposable income in the country. Although it refers to the same case of the long-term UB presented above, this indicator would enable to estimate the generosity of income support in terms of median national income, rather than referring to the previous household's revenue.

Once again all the welfare regimes present a larger protection for numerous families than for one-person households. Italy shows the least generous GMI in the sample, while both Germany and the United Kingdom present similar figures that place them at the very first positions in this ranking. Meanwhile, Sweden provides an intermediate level of protection to both the single and coupled neediest. Although the Italian GMI is comparatively lower than the other Southern countries, paying for its noticeable delay in the adoption of a universal measure against poverty (Ferrera, 2019), the whole Mediterranean cluster results to be the least suited to face this increasingly widespread social risk. Surprisingly, the Social Democratic regime does not result as the most committed in supporting the low-income jobless households, despite Sweden shows a lower GMI adequacy compared to its "cluster-mates". On the contrary, the Conservative and the Liberal welfare institutions turn out to be the most engaged in dealing with the rising economic poverty of families.

However, the German and British ways to release this kind of benefit are very different. Indeed, the UK has replaced a wide range of social provisions targeted to low-income people with the unique Universal Credit (UC)[13], a means-tested program aimed at both in-work and out-of-work claimants (Crepaldi et al., 2017). On the other hand, the German guaranteed minimum income benefits are based on a complex arrangement of categorical schemes (Crepaldi et al., 2017). Therefore, the British system appears to be the most homogeneous and encompassing arrangement, in line with the Liberal orientation towards means-tested assistance, whereas the Conservative model shows a fragmented distribution.

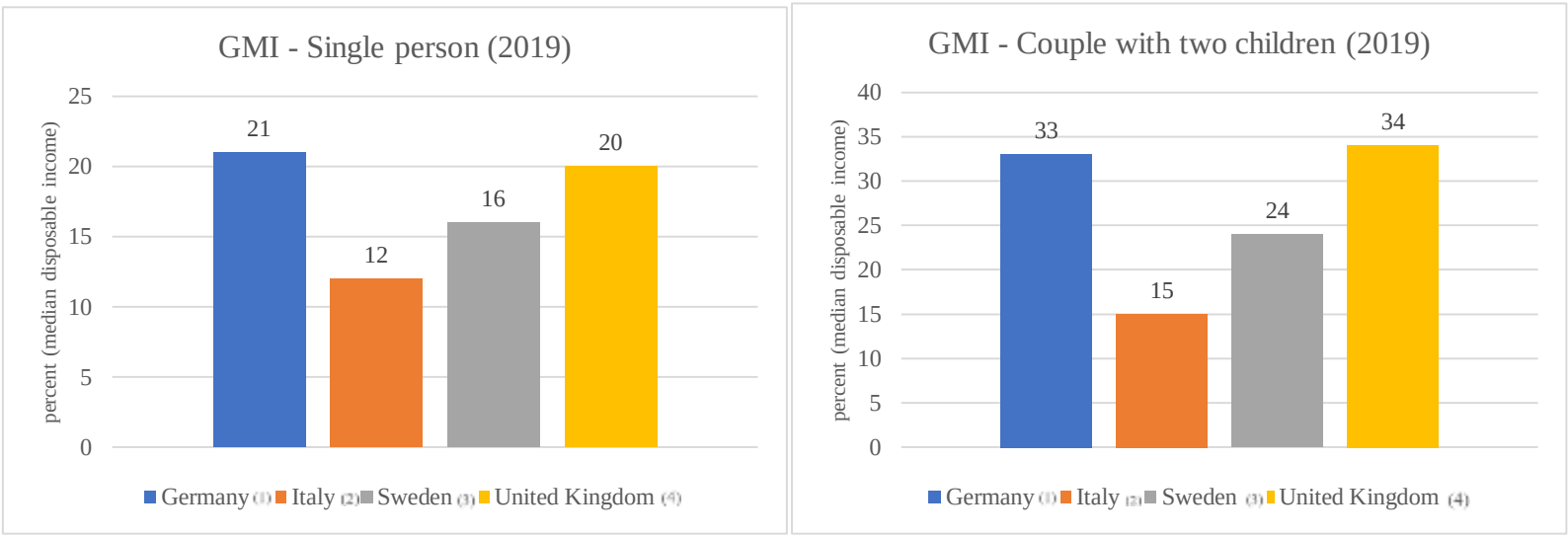


Figure 58: GMI adequacy in terms of median disposable income. Source: OECD.

The last social benefit I would like to mention in order to assess the suitability of welfare regimes in facing the transition-led social risks are maternity and parental leaves. In fact, the duration of leaves could substantially affect the work-life balance, providing parents with more time to devote

[13] UK Governement website, available at https://www.gov.uk/universal-credit.

to care duties. Moreover, the OECD Family Database distinguishes the beneficiaries between mothers and fathers, enabling to investigate de-familization in detail. This distinction would also be employed to draft a picture representing the division of parental duties within families, hence evaluating the degree of gender equality in the households. The data graphed below include both maternity/paternity and parental leaves, whose length is measured by the total number of weeks granted.

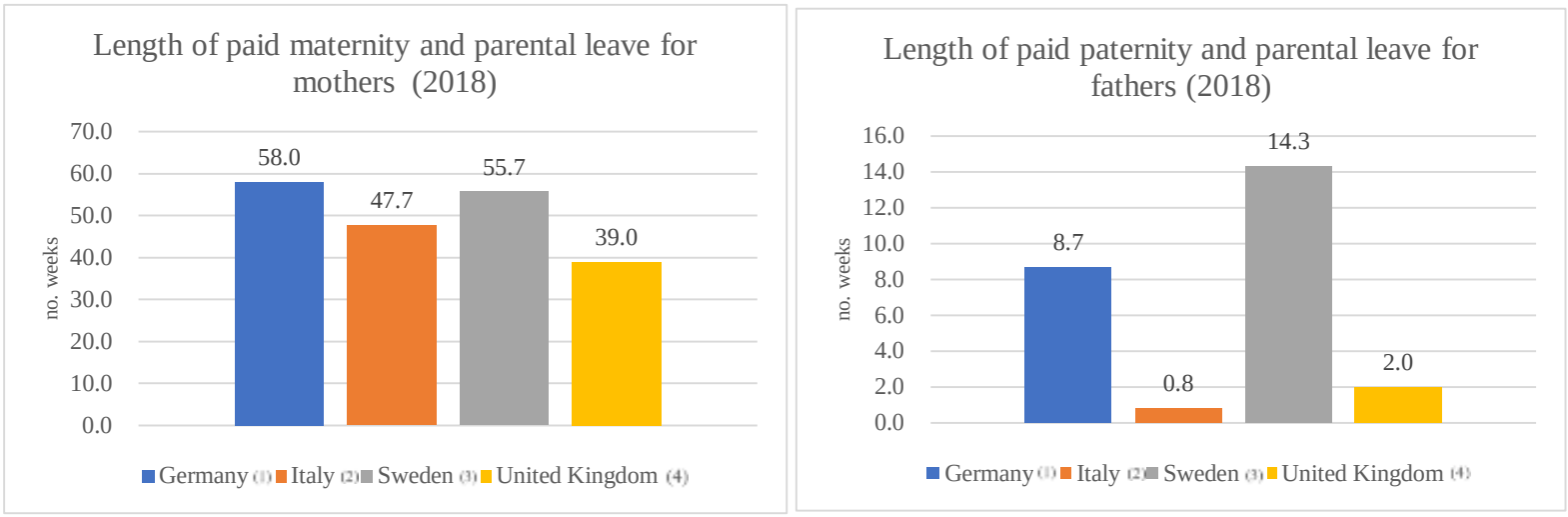


Figure 59: Lenght of maternity/paternity and parental leaves in weeks. Source: OECD.

Obviously, all the countries sampled grant longer leaves to mothers than fathers, since the data plotted here involve pregnancy leaves. Nevertheless, stark differences emerge within the distribution of paternity leaves. Namely, Italy and Britain show the shortest periods of leave, with the former granting less than one week for fathers. On the contrary, Sweden stands out as the most committed in reconciling the work and family activities of fathers, followed by Germany. As regards the leaves provided to mothers, Germany and Sweden peak with similar figures (respectively 58,0 and 55,7 weeks in 2018). In this graph the lowest result is presented by the UK, which guarantees to mothers less than 50 weeks of abstention from work for care duties.

As Iversen and Rosenbluth (2013) have demonstrated, the rise of female labor market participation has been strictly associated with the service transition. Therefore, the Scandinavian cluster results to be the best equipped to deal with the work-life balance issues, charging fathers with care duties too. However, it should be underlined that the Conservative group as a whole shows a pervasive public intervention in reconciling work and family duties, since both France and Belgium present much longer periods of abstention for fathers (respectively 28,0 and 19,3 weeks). At the other end, the Mediterranean welfare regime is characterized by the weakest engagement in granting leaves to fathers (Italy shows the lowest figure in its cluster), hence the most gender-biased welfare regime (Ferrera et al., 2019). Finally, the Liberal countries proves again to guarantee a limited protection from social risks, despite being less uneven in the degree of gender equality than the Southerners.

Overall, the Mediterranean countries confirm their strong commitment in terms of protection against traditional social risks (e.g. pension and short-term unemployment), while presenting the most unsuited welfare regime to face the new social needs (e.g. work-life balance, economic poverty). The Conservative group instead appears more capable to adjust their compensation policies on the "new social risks", showing a less familistic and workerist welfare arrangement. The Social Democratic cluster presents the most balanced distribution of welfare guarantees between traditional and transition-led social needs, except for GMI. Lastly, the Liberal compensation policies provide quite homogenous responses to traditional and new necessities, whereas the Anglo-Saxons confirm to be characterized by the lowest commitment in social protection.

4.4. Preliminary conclusions on the framing role of the welfare regimes.

At the end of this chapter, I will present some preliminary conclusions regarding the different shaping influences of each welfare regime on automation and de-industrialization.

The Mediterranean cluster shows very inclusive labor market institutions (e.g. collective bargaining coverage, trade unions) and a generous protection for traditional social risks. For instance, Italy displays the highest EPL for open-ended and fixed-term workers, together with the most sheltering pension and short-term unemployment schemes, both in terms of expenditure and replacement rate. However, the Southern welfare regime is the worst equipped to face the social needs fostered by the current economic transition. As a matter of fact, the Italian social spending lacks on training and its welfare institutions seem unable to deal with the issues of economic poverty and work-life balance. Moreover, the formal strict "in-work" protection guaranteed by the Southern welfare regime is not entirely mirrored in the quality of employment, since the share of fixed-term contracts and involuntary part-timers strongly overtakes the figures shown by the other countries.

Meanwhile, the Christian Democratic group seems to have partially embraced a process of change aimed at adjusting its welfare regime to the new social needs. Indeed, an increasing amount of resources have been devoted by those countries to PES and GMI. Moreover, Germany turns out to be the best supporter of institutional training in the sample considered. Nevertheless, the labor market in Central Europe appears fragmented, particularly in Germany where the participation of workers in the collective negotiation is limited. The relevant incidence of low pay, the decreasing EPL for fixed-term workers and the rising number of fixed-term contracts could be conceivably interpreted as indicators of this segmentation (Doeringer and Piore, 1971).

On the contrary, the Liberal countries do not appear to have changed their welfare arrangement. As expected, their labor market institutions result to be the most flexible (Wren, 2013), while their "in-work" protection has been maintained at the lowest level compared to the rest of the

sample. The means-tested assistance for the neediest has been confirmed as the main commitment of the Anglo-Saxon welfare regime (e.g. GMI and low-income pensions). However, it should be noted that no significant differentiation has been detected between the social protection provided for traditional and "new social risks", and the funds devoted to training (in Ireland) and family-friendly policies (mainly cash) are not so scant.

Lastly, the Social Democratic regime is confirmed to be prepared the to face this economic and labor market transition (Wren, 2013). Namely, Sweden results to be the most committed country in reconciling work and care duties with generous and non-gender-biased parental leaves, and its social protection system provides the highest guarantees for the income maintenance of long-term unemployed people. However, the expected wide institutional training system is only found in Denmark and Finland. Overall, the Scandinavian cluster appears to have found a balanced compromise, involving social partners, between a moderate flexibility of labor market institutions and a strong engagement in facing the rising "new social risks".

CONCLUSION

The importance of skills: between RBTC and SBTC.

The challenges posed by automation to the welfare state are unprecedented and tricky. In this work, I have shown that the ICT revolution is likely to deeply concern the entire European class structure, hence putting a remarkable pressure on the social protection systems. The two research questions explicated in the introduction are aimed at providing some suggestions regarding the impact of this momentous transition on the social classes and the responses put in place by different institutional configurations of political economy. The answers released do not always comply with the analytical expectations, producing a compound picture.

The class analysis realized on the European Social Survey data, using the Oesch's scheme, provides a detailed description of the societal arrangements characterizing each welfare cluster. The hostility of the Conservative welfare regime against low-paid service jobs is confirmed, while presenting a significant number of high-skilled socio-cultural professionals. Moreover, the Central European countries result more able to retain their clerical occupations than the production workers, who on the contrary seem to be best sheltered in the Mediterranean cluster. As regards the Southern countries, they show the least educated workforce, with a noticeable share of low-skill service workers and a constrained number of technical experts. The Social Democratic group instead displays the most educated labor force, being both able to support the rise of the highly skilled service professionals and pull away many routine workers from the bottom of the skill continuum. The Liberal regime also presents a competitive labor market, having significantly reduced the most routine occupations in the traditional sectors and fostering the rise of interpersonal unskilled service jobs.

Looking at the individual features of classes, the labor market appears strictly gender-biased across all clusters, being divided between the predominantly female interpersonal service dimension and the male-based industrial sector. When looking at the educational attainment of workers, the skill criterion chosen by Oesch confirms to be a valid method to organize the societal hierarchy, since the distribution of classes along the ISCED classification accurately mirrors his scheme. Besides, the Mediterranean labor force is newly confirmed as the least educated of the sample.

The evolution of class structure appears to follow common cross-cluster trends, displaying the polarization of industrial workforce (Cirillo, 2018), between the decreasing production laborers and the rising technical professionals, while reporting the stability of the labor force's size in the tertiary sector. Moreover, the aggregation of occupations in four "macro-classes" shows a converging trend of the societal arrangement in the Scandinavian and the Mediterranean clusters, despite the latter still presents the largest low-skill "macro-class", whereas the Liberal and the Conservative groups are

characterized by an overall class polarization, more marked in the former. However, panel data are required to track labor mobility, which triggers changes in the class structure.

Furthermore, the welfare clusters appear to matter for the RTI distribution too. Although the expected division between the more routinized organizational and technical work logics and the less automatable independent and interpersonal service dimensions is confirmed, the different compositions of national workforces result in a variable proneness to automation. Indeed, the Mediterranean cluster turns out to be hit hardest by the ICT revolution due to its remarkable number of low-skill production and service workers. On the contrary, the limited size of traditional sectors in the Liberal countries guarantees the strongest resilience to replacement. The impact of new technologies is also supposed to be smooth in the Social Democratic regime, thanks to its upskilled workforce. Finally, the resilience of the Central European labor markets against automation results strictly linked to the degree of repetitiveness assigned to clerks, which is lower using the RTI measurement elaborated by Sacchi et al. (2019).

In the end of the third chapter I have found that the distribution of the automation risk is polarized along the skills continuum, hence not complying with the RBTC hypothesis. Instead a slightly inverted-U shape characterizes the RTI distribution when the societal structure is collapsed to the 8-class version. Nevertheless, the low-skill service occupations turn out to be much more routinized than the most educated jobs. Moreover, a cleavage is detected within the middle class, since the "upper-middle class" results more resilient to automation than the "lower-middle class". Therefore, the RBTC hypothesis looks only partially verified, since a high degree of routinarity both characterizes the middle-class and the low-educated service occupations. On the contrary, these observations place great importance on the skills level as a determinant of the automation risk. Consequently, the middle class results to be torn up into two subclasses, with the most skilled part being less automatable and the least educated one showing the highest risk to be replaced by new technologies.

Furthermore, the proneness to automation shown by the "large" middle class appears to vary among welfare clusters. The Anglo-Saxon middle class turns out to be the least replaceable due to the reduced number of occupations in the traditional economic sectors. The Scandinavian middle class looks resilient to automation too. However, the main reason of the Nordic resilience could be mainly found in the capability of the Social Democratic welfare regime to upskill workers. As a matter of fact, the occupations lying at the bottom of the skills distribution have proved to be the most routinized. On the contrary, the Conservative and the Mediterranean groups show the most automatable middle class. As regards the former, its remarkable share of clerks accounts for the high RTI scores of the Central European middle class. Instead, the noticeable number of production

workers, together with the cross-class low level of education, explain the high propensity of the Southern middle class to automation. Moreover, the larger relative size of the Mediterranean "lower macro-class" compared to the Central European counterpart justifies the higher concentration of the Southern workforce in the last RTI quintiles.

In the fourth chapter I answer to the second research question concerning the responses provided by the welfare states in facing the current labor market transition. I have relied on some macro indicators included in the OECD dataset. In the first section I have analyzed the protection guaranteed within the employment relationship, which is supposed to have a direct shaping influence on the occupational distribution. I have found that the collective bargaining system is largely encompassing in the Scandinavian and in the Mediterranean clusters, whereas the Conservative and the Liberal regimes looks more exclusive in terms of workers' participation to the labor market institutions.

Moreover, the OECD data describing the "in-work" protection, both referring to the strictness of labor market regulations and to the composition of employment, bring out some relevant differences among welfare regimes. The Liberal cluster guarantees a minimal and homogenous protection to all workers, hence not hampering the job distribution set by the market. The Conservative and the Mediterranean regimes result the most committed in providing strict employment regulations, nonetheless some differences emerge. Notably, the Central European tight regulations appear successful in preventing the rise of low-skill service jobs. However, the surge of a secondary labor market (Thelen, 2014) composed by a relatively sound number of low-paid workers is documented by the remarkable incidence of low wages on the full-timers' population. On the contrary, the Mediterranean countries present a more egalitarian wage distribution, despite its employment appears more flexible, due to the widespread use of fixed-term contracts, and qualitatively lower than the Conservative regime, certified by the outstanding share of involuntary part-timers. Finally, the Social Democratic regime seems to have successfully combined a moderate flexibility of the labor market institutions, an inclusive system of collective negotiation and an egalitarian distribution of wage.

The "out-of-market" social protection instead plays a key role in supporting and compensating workers during the service transition. A crucial distinction has been made between the "old" and the "new social risks", since the protection against the latter is fundamental to determine the commitment of welfare regimes in dealing with automation and de-industrialization.

In this regard, the investigation on the expenditure devoted to compensation policies provides interesting findings. The Mediterranean welfare spending turns out to be particularly low in sheltering from "new social risks" (e.g. family-friendly policies), while being the most generous when it comes

to traditional social needs (especially through pensions). On the contrary, the Scandinavian cluster results strongly engaged in providing resources to satisfy the new necessities (e.g. PES and family benefits), while more limited with regard to the traditional social provisions. The Conservative regime appears more committed in funding the institutional training system than the Scandinavians, despite being still quite familistic. Lastly, the Liberal group is characterized by a generally low level of social expenditure, particularly lacking on protection against the old age and the unemployment risks.

Finally, the analysis focused on the "de-commodifying" power of social policies has substantially confirmed the findings reported above. Indeed, the Southern countries guarantee generous replacement rates for both pensions and short-term UB, while failing on the provisions concerning the issues of work-life balance and prolonged unemployment. The Conservative regime instead confirms its commitment to adapt the welfare policies on the new social needs, as the adequacy of GMI appears to demonstrate. However, the Social Democratic cluster results to be the most able in sheltering workers during this transition, especially supporting the income of long-term unemployed people and reconciling the working and care time of laborers through parental leaves. Finally, the Liberal countries present again a minimal social protection, which is not biased towards traditional social risks, while performing particularly well in the low-income targeted compensation policies (e.g. GMI).

Overall, the analytical expectations seem mostly corroborated by the data. Therefore, the Scandinavian welfare state results the most prepared to face the automation and de-industrialization challenges, sheltering the workers from the "new social risks" while not particularly altering the market dynamics. On the contrary, the Conservative regime slightly diverges from the hypotheses posed in the introduction. Indeed, the Central European countries appears more committed in proving social guarantees against the post-industrial risks than expected, while not being particularly able in preventing the rise of a secondary labor market characterized by worse economic conditions. Nonetheless, the regime worst equipped to deal with this transition is the Mediterranean welfare state, especially in terms of compensation policies, resulting more familistic and workerist than the Conservative cluster. Lastly, the Liberal welfare regime confirms to be the least committed in providing social protection, despite not being biased towards the traditional social risks.

However, it should be noted that the policies and regulations presented so far cannot be clearly distinguished according to the beneficiaries. Therefore, in order to better evaluate the adequacy of welfare systems in facing the spread of ICT, further investigations should unveil the social classes (as groups of occupations) targeted by different social policies. Indeed, these analyses would enable to assess whether welfare policies benefit the workers who are more prone to automation. As

mentioned in the fourth chapter, the compensation for “new social risks” has been considered as a proxy, replacing the missing class-targeting.

In conclusion, this work shows that the RBTC hypothesis is only partially verified. Indeed, the skills level turns out to be crucial to determine the proneness of occupations to be replaced by new technologies. Although the 8-class scheme presents a slight inverted-U shape distribution of RTI, the low-skill interpersonal services look more routinary than hypothesized by the RBTC American scholars. Hence, the replacement risk is not homogeneously distributed on the middle-class occupations since it hits harder the “lower-middle” than the “upper-middle class”. Therefore, I find that the societal outcomes produced by the impact of the ICT revolution on labor market appear to stand in the middle between the SBTC and the RBTC scenarios.

Moreover, the influence of welfare regimes on labor market stands confirmed. In fact, the institutional configurations which more effectively shelters routine workers from automation, especially through training, turn out to be hit smoothly by the technical change, as the Scandinavian cluster demonstrates. On the other hand, the welfare regimes that do not upskill the routine workers are likely to face a harsher transition, as the RTI scores of the Mediterranean group show.

The intent of this work is to further highlight the importance of dealing with the labor market transition mainly triggered by the technical change. Regardless of the ambitious forecasts predicting the loss of millions of jobs in the future, the policy-makers should put in place the measures needed to soften the impact of ICT on employment, providing people with the skills required on the labor market and compensating those workers whose occupations are replaced by machines.

Flora and Heidenheimer (1981) argue that the growth of welfare state has entailed the emergence of a new system of power, which has changed the basis of the state’s legitimacy and functions. The pervasiveness of the change outlined so far appears remarkable, particularly with regard to the middle class. Bearing in mind its capacity of voice (Kurer and Palier, 2019) and its crucial role in welfare state building (Esping-Andersen, 1990), the hollowing out of the middle class could lead to serious political consequences, even questioning the foundations of the state. Nonetheless, policy-makers have the instruments needed to face this revolution.

APPENDIX

- *A1. The 8-class tables.*

Conservative cluster	5 quantiles of Autor					
	1	2	3	4	5	Total
	%	%	%	%	%	%
Self-employed professionals and large employers	61.49	32.47	3.58	0.00	2.46	100.00
Small business owners	20.62	24.65	36.02	12.27	6.44	100.00
Technical (semi-)professionals	38.54	52.73	0.76	7.97	0.00	100.00
Production workers	0.00	2.27	19.08	24.45	54.20	100.00
(Associate) managers	69.70	28.12	1.38	0.00	0.79	100.00
Clerks	7.68	26.86	49.83	7.68	7.95	100.00
Socio-cultural (semi-)professionals	95.19	4.62	0.00	0.14	0.04	100.00
Service workers	14.05	14.69	34.02	31.07	6.18	100.00
Total	32.53	19.27	21.06	13.44	13.71	100.00

Liberal cluster	5 quantiles of Autor					
	1	2	3	4	5	Total
	%	%	%	%	%	%
Self-employed professionals and large employers	70.51	28.98	0.13	0.26	0.13	100.00
Small business owners	16.70	38.02	26.10	6.74	12.44	100.00
Technical (semi-)professionals	38.17	52.17	0.32	9.35	0.00	100.00
Production workers	0.00	0.14	14.72	15.62	69.52	100.00
(Associate) managers	58.75	40.21	0.89	0.00	0.16	100.00
Clerks	0.32	23.10	55.93	11.22	9.43	100.00
Socio-cultural (semi-)professionals	97.81	2.19	0.00	0.00	0.00	100.00
Service workers	11.32	17.54	40.20	16.84	14.09	100.00
Total	31.26	23.98	22.24	8.77	13.74	100.00

Mediterranean cluster	5 quantiles of Autor					
	1	2	3	4	5	Total
	%	%	%	%	%	%
Self-employed professionals and large employers	48.89	46.22	1.73	0.96	2.20	100.00
Small business owners	12.49	21.44	35.86	19.50	10.70	100.00
Technical (semi-)professionals	19.82	58.11	4.70	17.36	0.00	100.00
Production workers	0.00	1.15	11.65	34.06	53.14	100.00
(Associate) managers	45.10	52.11	1.86	0.00	0.94	100.00
Clerks	5.22	26.78	52.82	6.62	8.56	100.00
Socio-cultural (semi-)professionals	94.84	3.60	0.41	0.74	0.40	100.00
Service workers	9.09	11.54	33.11	39.68	6.59	100.00
Total	18.92	19.00	21.92	22.27	17.89	100.00

Social Democratic cluster	5 quantiles of Autor					
	1	2	3	4	5	Total
	%	%	%	%	%	%
Self-employed professionals and large employers	70.11	26.51	2.79	0.60	0.00	100.00
Small business owners	16.64	24.05	33.68	12.60	13.03	100.00
Technical (semi-)professionals	23.68	63.65	2.51	10.15	0.00	100.00
Production workers	0.00	2.80	18.55	23.80	54.85	100.00
(Associate) managers	66.21	33.21	0.13	0.00	0.45	100.00
Clerks	7.95	28.53	48.73	4.76	10.02	100.00
Socio-cultural (semi-)professionals	93.65	6.20	0.00	0.07	0.08	100.00
Service workers	15.77	6.63	48.15	22.27	7.19	100.00
Total	31.05	16.74	25.14	12.82	14.26	100.00

- *A2. The 16-class tables (only low-skilled classes).*

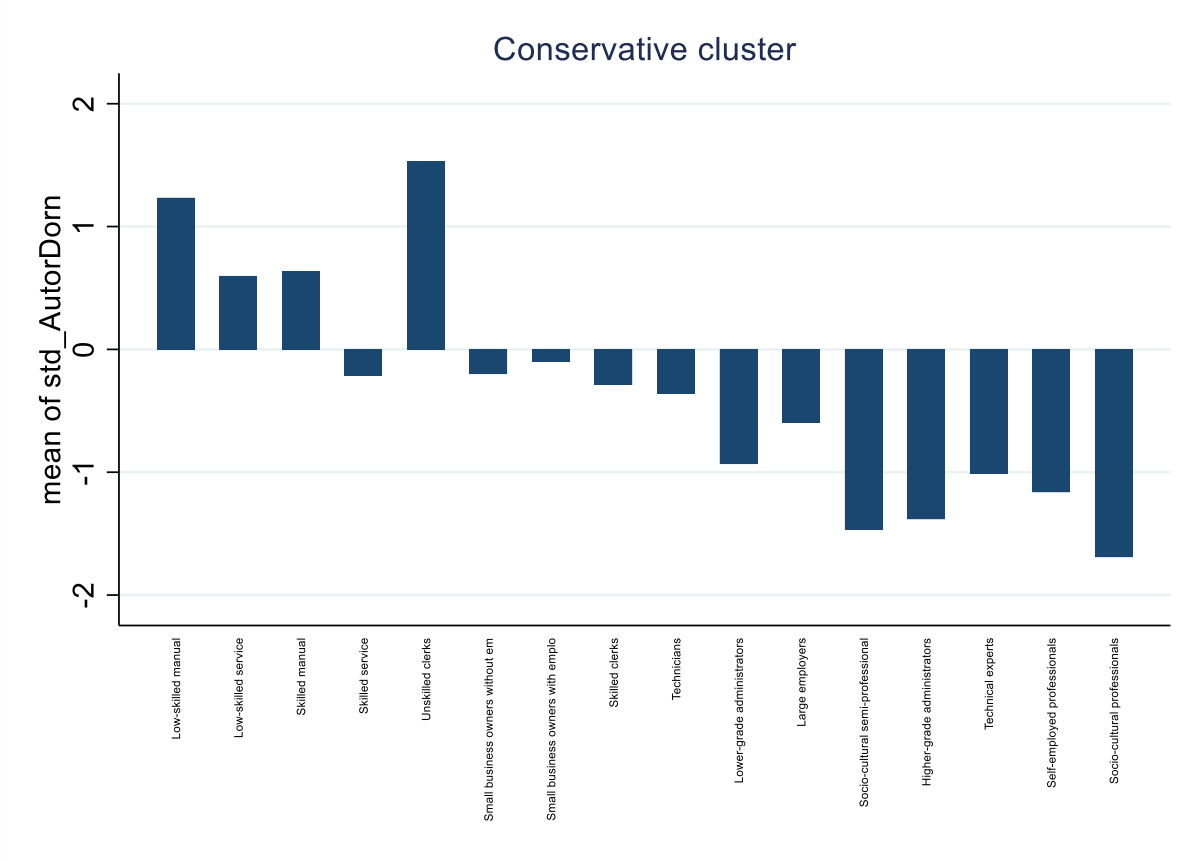
Conservative cluster	5 quantiles of Autor					
	1	2	3	4	5	Total
	%	%	%	%	%	%
Skilled manual	0.00	3.83	28.00	36.57	31.60	100.00
Low-skilled manual	0.00	0.00	6.11	6.83	87.07	100.00
Skilled clerks	8.70	30.41	53.77	7.08	0.04	100.00
Unskilled clerks	0.00	0.00	19.98	12.19	67.83	100.00
Skilled service	22.60	12.98	61.57	0.00	2.85	100.00
Low-skilled service	4.36	16.62	2.84	66.23	9.94	100.00

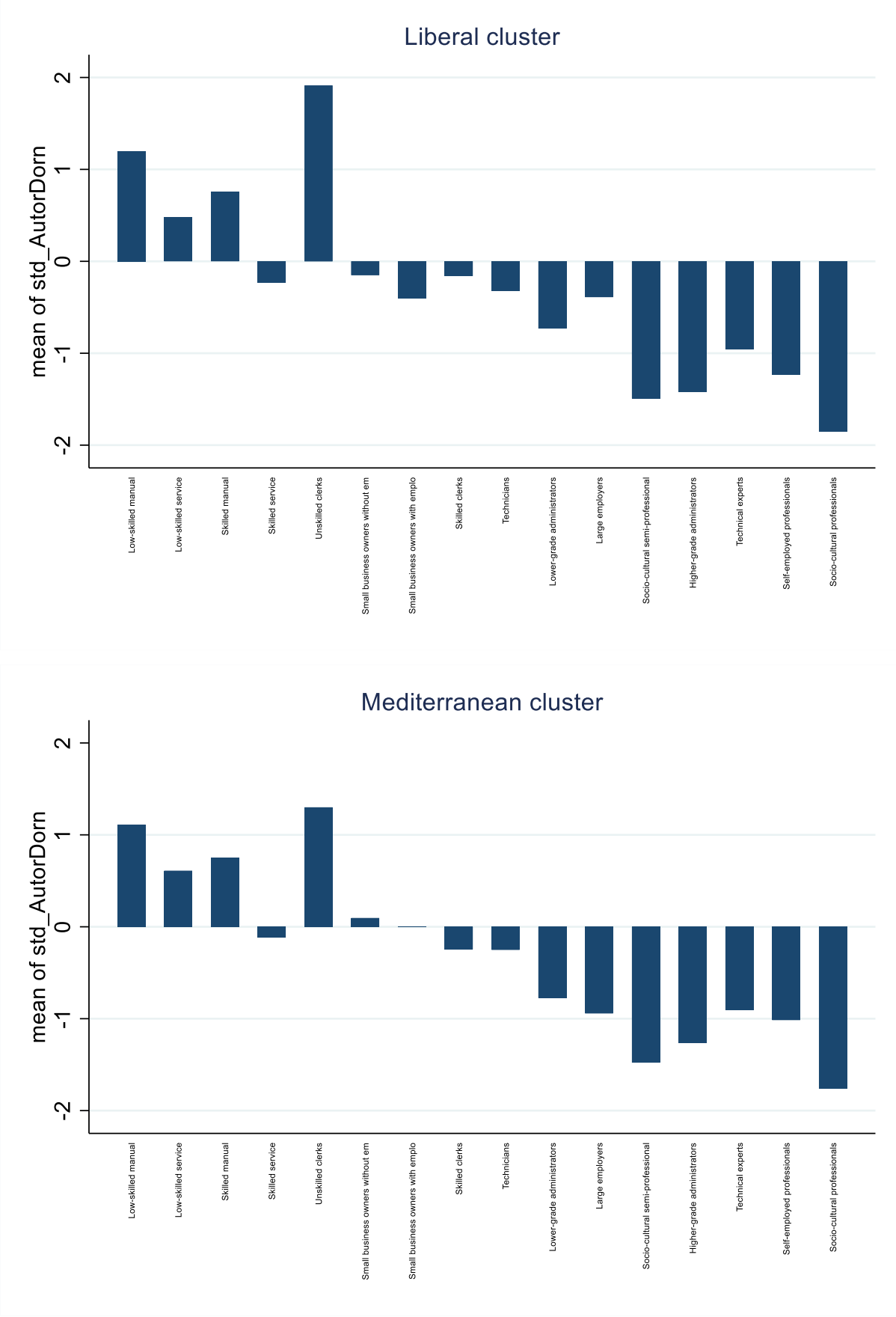
Liberal cluster	5 quantiles of Autor					
	1	2	3	4	5	Total
	%	%	%	%	%	%
Skilled manual	0.00	0.36	18.09	38.39	43.16	100.00
Low-skilled manual	0.00	0.00	12.49	0.65	86.86	100.00
Skilled clerks	0.35	25.65	61.67	12.33	0.00	100.00
Unskilled clerks	0.00	0.00	3.90	1.19	94.92	100.00
Skilled service	22.48	16.30	55.64	0.00	5.57	100.00
Low-skilled service	2.60	18.51	28.13	30.01	20.75	100.00

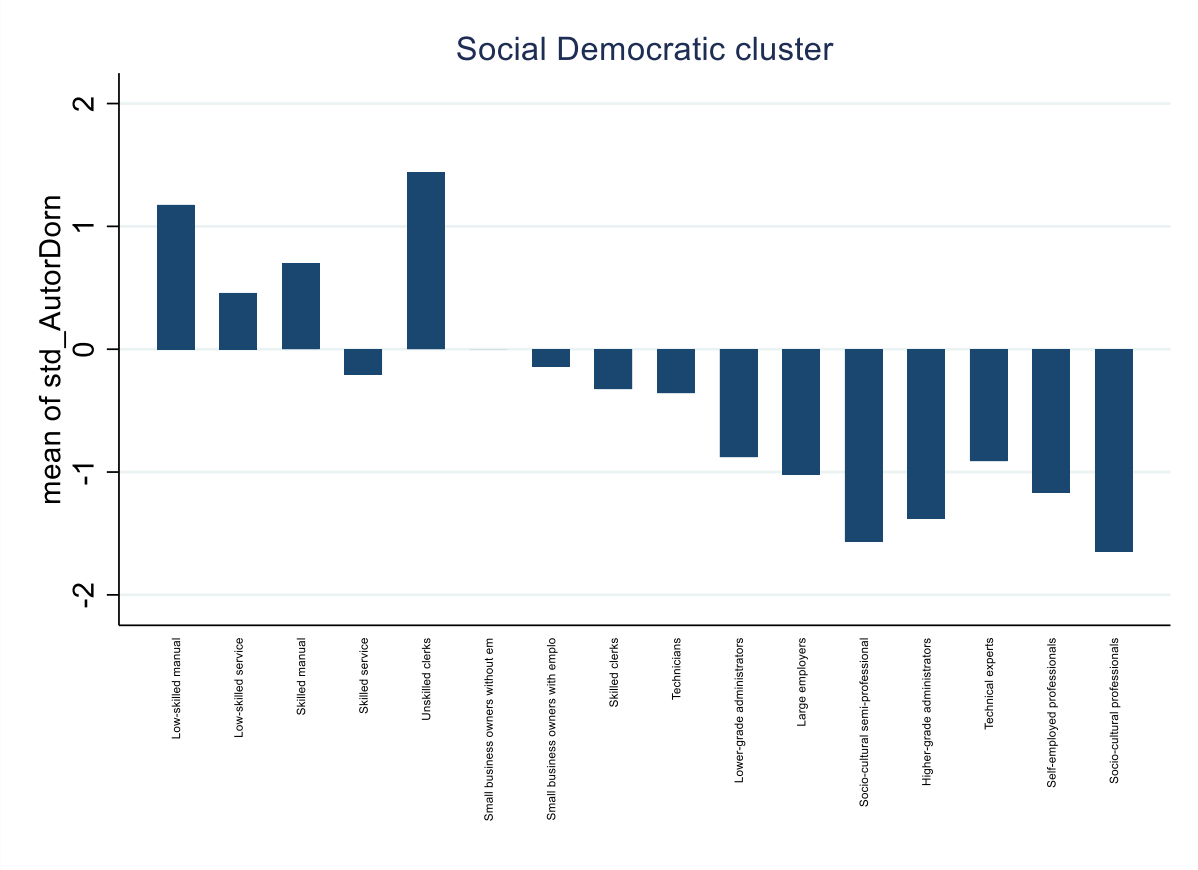
Mediterranean cluster	5 quantiles of Autor					
	1	2	3	4	5	Total
	%	%	%	%	%	%
Skilled manual	0.00	2.15	20.69	38.74	38.43	100.00
Low-skilled manual	0.00	0.00	1.32	28.71	69.97	100.00
Skilled clerks	6.06	31.13	55.17	7.64	0.00	100.00
Unskilled clerks	0.00	0.00	38.37	0.34	61.29	100.00
Skilled service	16.38	16.72	64.11	0.00	2.79	100.00
Low-skilled service	3.95	7.88	11.23	67.67	9.26	100.00

Social Democratic cluster	5 quantiles of Autor					
	1	2	3	4	5	Total
	%	%	%	%	%	%
Skilled manual	0.00	4.31	25.83	28.95	40.91	100.00
Low-skilled manual	0.00	0.00	5.08	14.28	80.64	100.00
Skilled clerks	9.40	33.72	51.70	5.18	0.00	100.00
Unskilled clerks	0.00	0.00	32.35	2.49	65.16	100.00
Skilled service	19.99	6.06	70.05	0.32	3.58	100.00
Low-skilled service	10.33	7.36	19.98	50.51	11.83	100.00

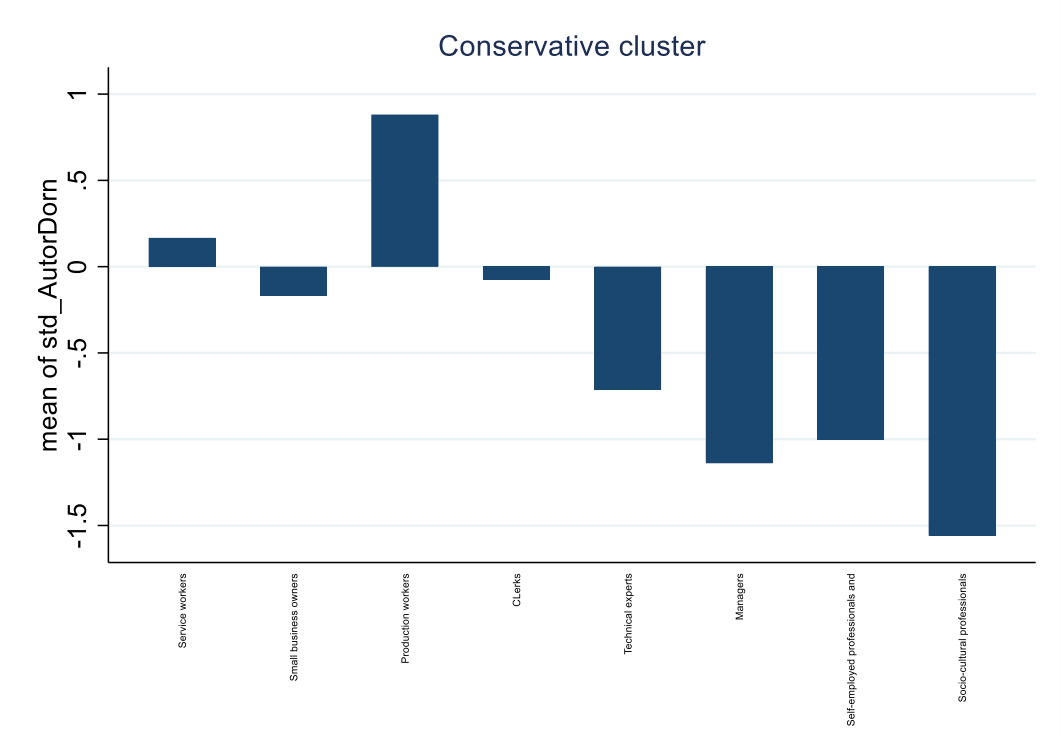
➢ *A3. RTI distribution on the 16-class scheme (ordered by educational attainment)*

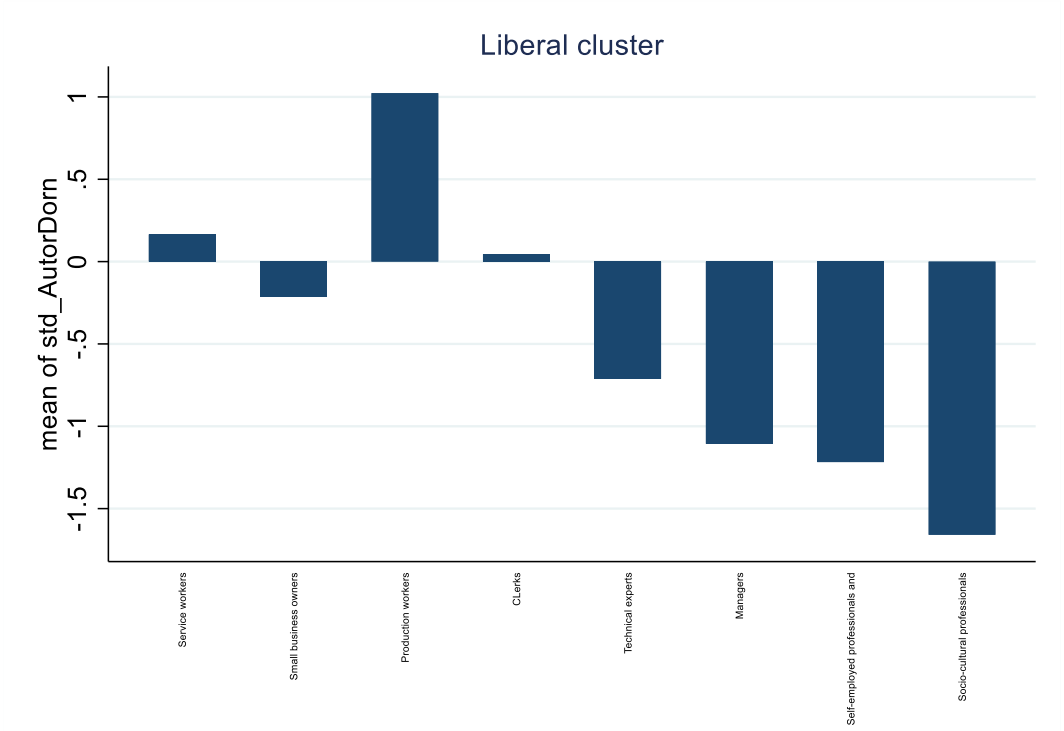


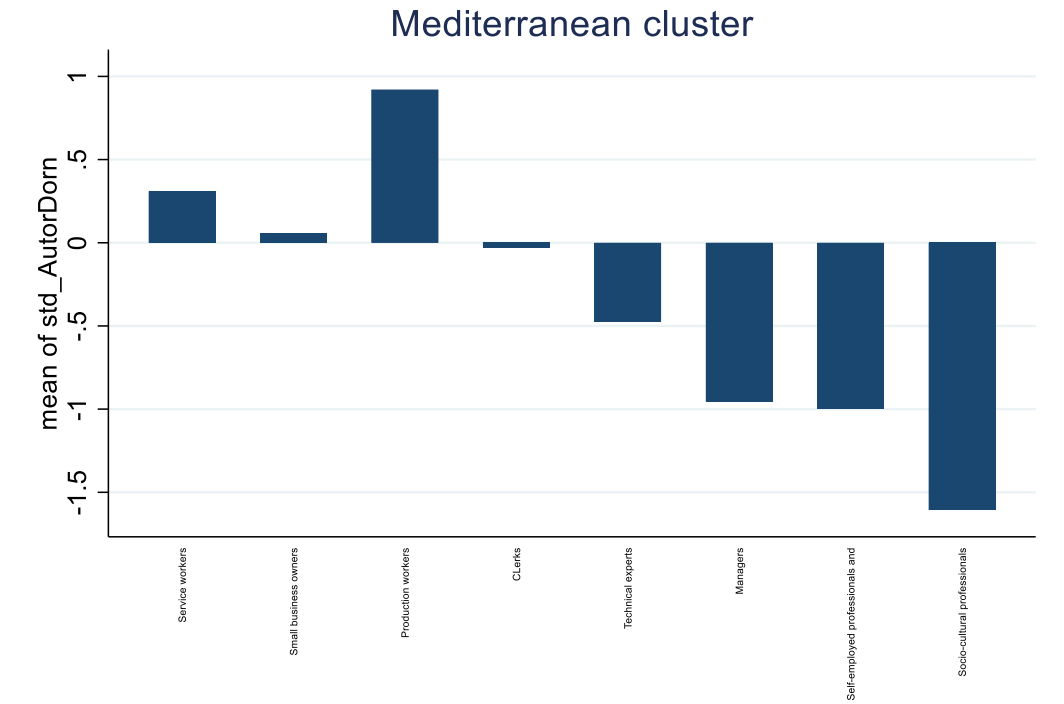

Liberal cluster
mean of std_AutorDorn
2
1
0
-1
-2
Low-skilled manual
Low-skilled service
Skilled manual
Skilled service
Unskilled clerks
Small business owners without em
Small business owners with emplo
Skilled clerks
Technicians
Lower-grade administrators
Large employers
Socio-cultural semi-professional
Higher-grade administrators
Technical experts
Self-employed professionals
Socio-cultural professionals
Mediterranean cluster
mean of std_AutorDorn
2
1
0
-1
-2
Low-skilled manual
Low-skilled service
Skilled manual
Skilled service
Unskilled clerks
Small business owners without em
Small business owners with emplo
Skilled clerks
Technicians
Lower-grade administrators
Large employers
Socio-cultural semi-professional
Higher-grade administrators
Technical experts
Self-employed professionals
Socio-cultural professionals

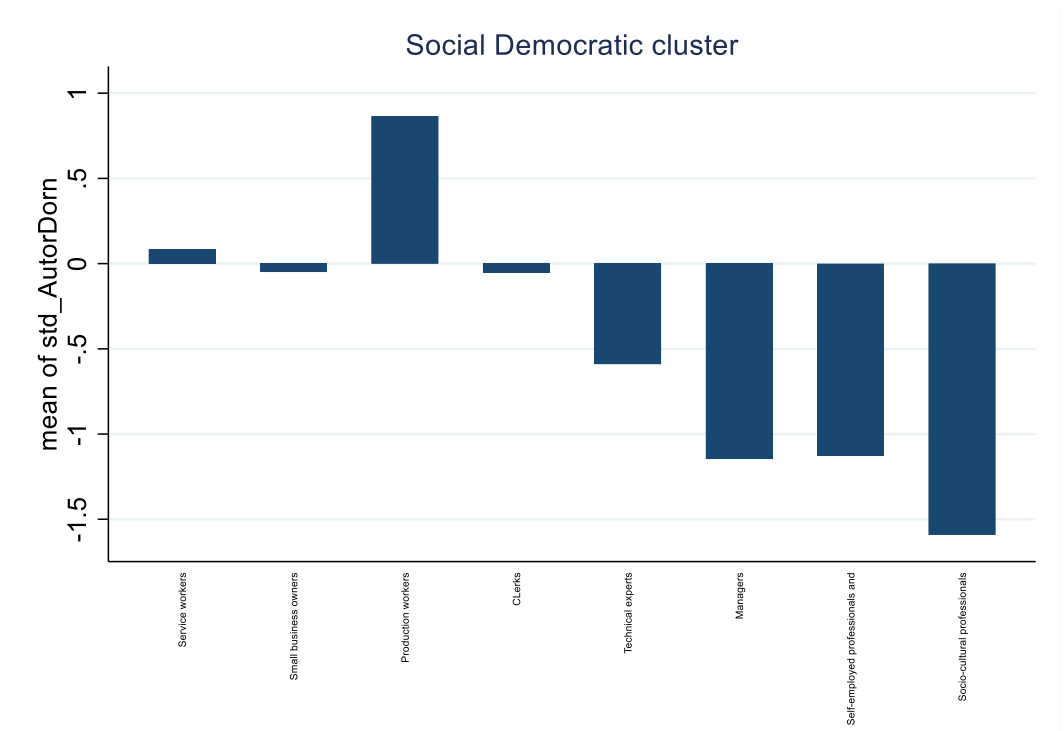


➢ *A4. RTI distribution on the 8-class scheme (ordered by educational attainment)*

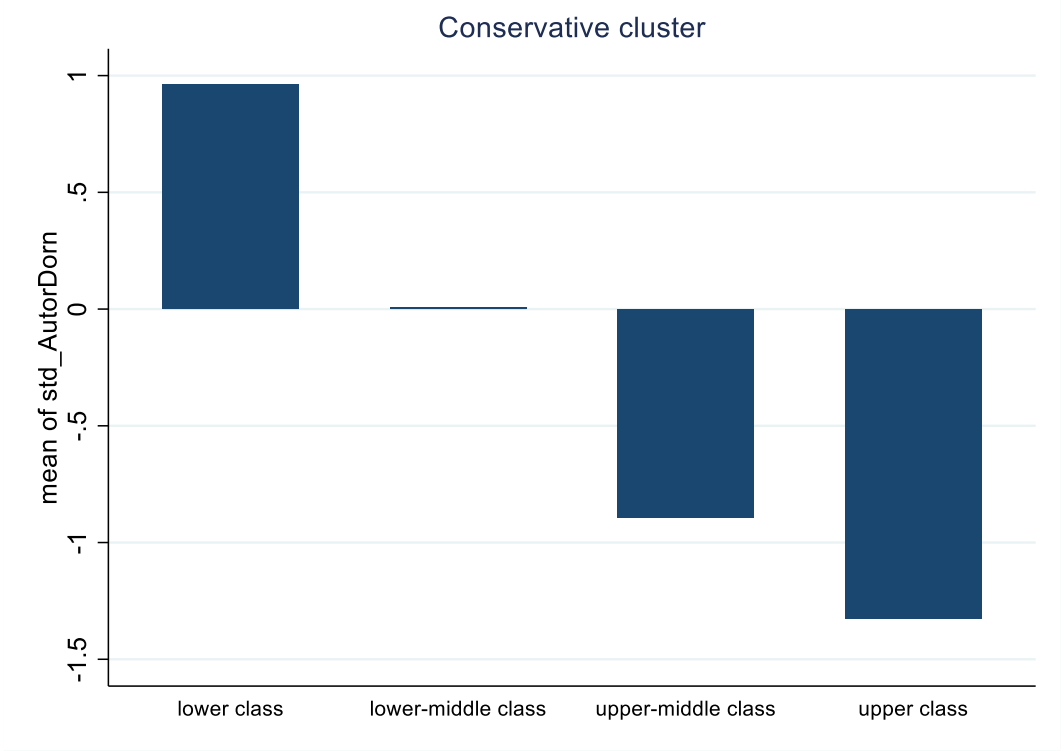


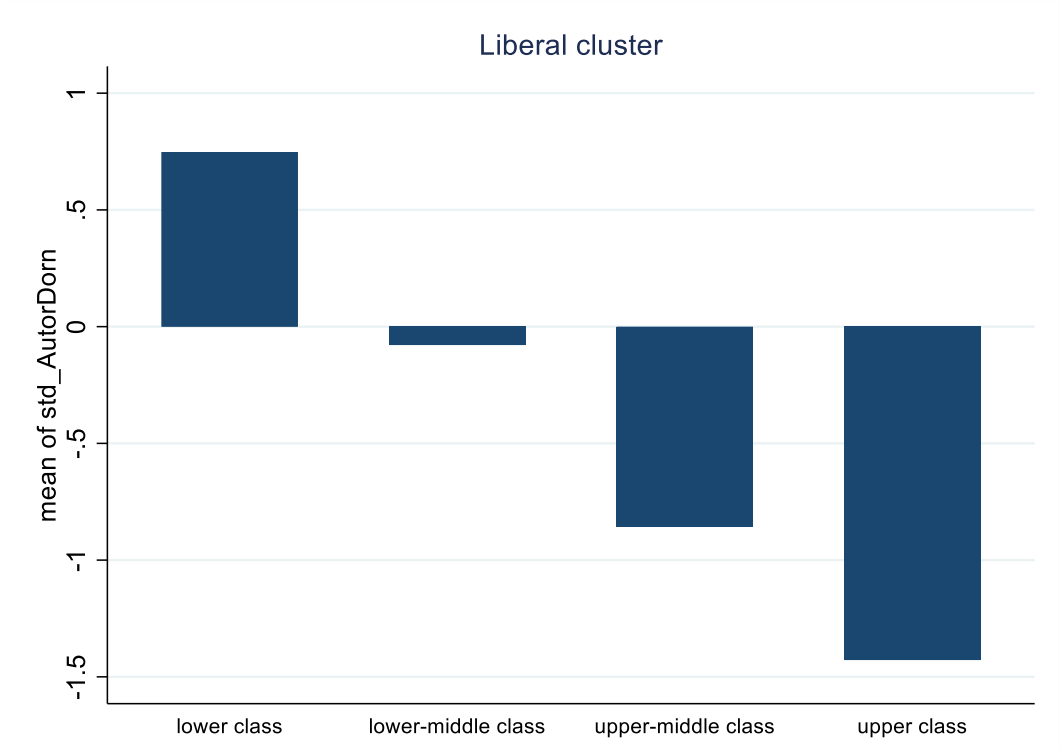

Liberal cluster
mean of std_AutorDorn
-1.5
-1
-.5
0
.5
1
Service workers
Small business owners
Production workers
CLerks
Technical experts
Managers
Self-employed professionals and
Socio-cultural professionals

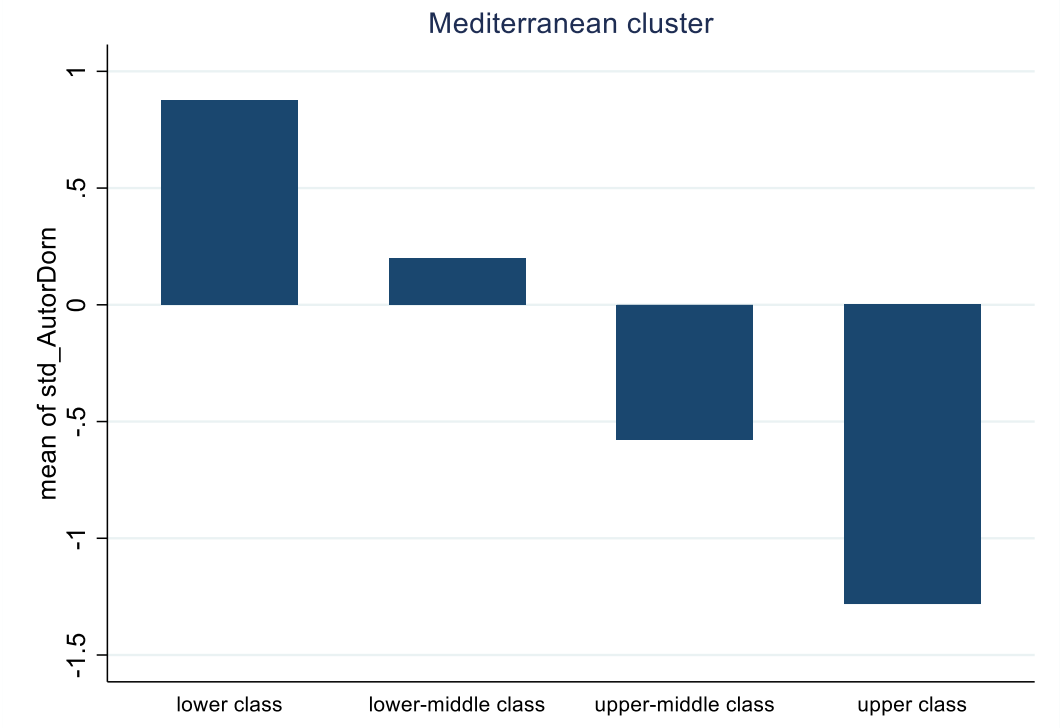

Mediterranean cluster
mean of std_AutorDorn
-1.5
-1
-.5
0
.5
1
Service workers
Small business owners
Production workers
CLerks
Technical experts
Managers
Self-employed professionals and
Socio-cultural professionals

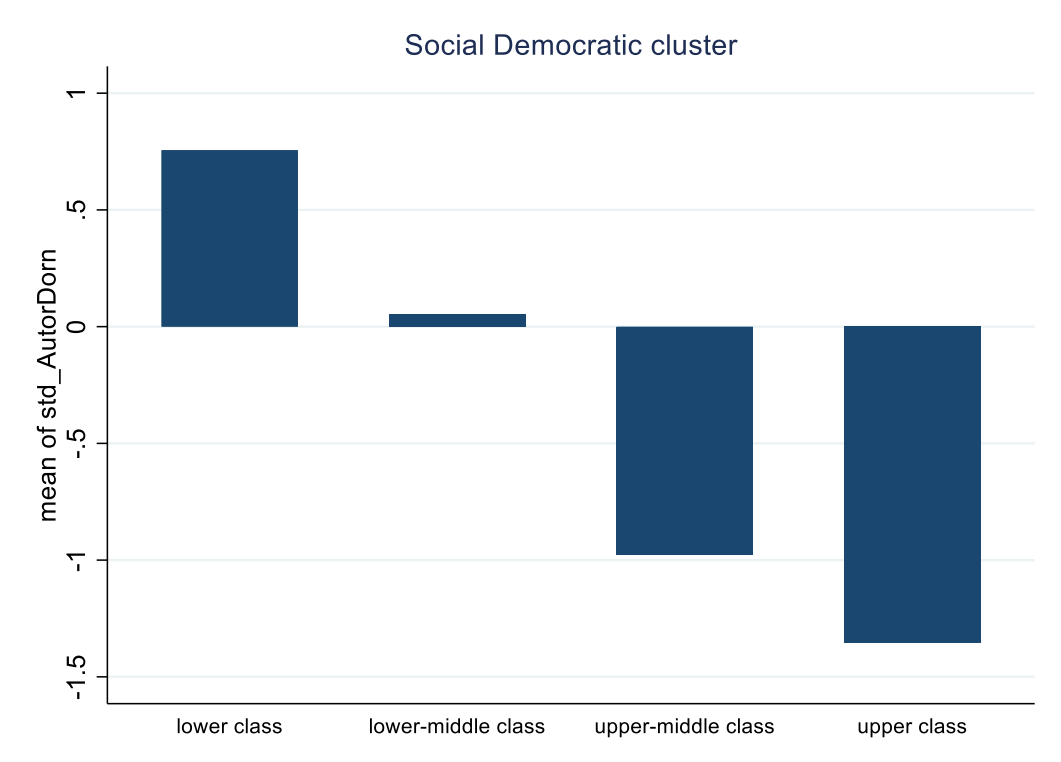


➢ A5. RTI distribution on the four "macro-classes"




Liberal cluster
mean of std_AutorDorn
1
.5
0
-.5
-1
-1.5
lower class
lower-middle class
upper-middle class
upper class


Mediterranean cluster
mean of std_AutorDorn
1
.5
0
-.5
-1
-1.5
lower class
lower-middle class
upper-middle class
upper class


Social Democratic cluster
mean of std_AutorDorn
1
.5
0
-.5
-1
-1.5
lower class
lower-middle class
upper-middle class
upper class

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SUMMARY OF THE THESIS

In this work I answer to two research questions. The first question refers to the impact of the spread of ICT on the middle-class occupations. The second one regards the different types of intervention put in place by the welfare regimes to soften the impact of automation on the labor market and to compensate the workers more likely to be replaced by new technologies.

The thesis is divided into four chapters. The first two sections are devoted to the literature review. More specifically, the first chapter resumes the main contributions to the research on the automation and de-industrialization processes, whereas the second one provides with an overview of the class analysis and welfare studies. The last two sections instead are dedicated to the operationalization of the analytical premises. Indeed, in the third chapter I outline the class structure of some European countries grouped in four welfare regimes, then presenting the proneness of social classes to automation. Finally, in the fourth chapter I present some macro indicators aimed at identifying the strictness and coverage of the wage-setting institutions, together with the adequacy of the compensation policies, in the four welfare clusters.

First chapter.

I first provide a brief historical overview of the industrial revolutions, particularly focusing on the political reactions following the latter technical change. Then, I introduce the two main approaches employed by the scholars to study the impact of ICT on the labor market, i.e. the skill- and the routine-biased technical change. I shortly discuss on the failings of the economic "canonical model" in order to corroborate the RBTC hypothesis, then presenting the key "Polanyi's paradox". Moreover, I report some challenges to the RBTC posed by the Artificial Intelligence and the countervailing forces of replacement (Acemoglu and Restrepo, 2018).

Furthermore, I present the composition of the "Routine Task Index" and its expected distribution along the skills continuum. Then, I discuss the employment polarization and the wage upward trend as described by Autor (2015). I close the paragraph devoted to automation with the main criticism of the RBTC, particularly focusing on the research which detect different occupational distributions in the European labor markets.

In the following paragraph I present some studies addressing the causes of de-industrialization, finding that the institutional configurations are crucial to determine the structure of the post-industrial labor market (Iversen and Wren, 1998). Based on Wren (2013), I argue that the ICT revolution has played a key role in the expansion of the service sector. More specifically, a polarization is detected between the tradable high-skilled services and the non-dynamic low-skilled services, incorporating the routine occupations in accordance with the educational attainment of the dismissed workers (Groes et al., 2008; Matias Cortes, 2016). Finally, I present the jobless recovery

option, which traces most of the loss of routine occupations back to the periods of economic crisis (Jaimovich and Siu, 2018).

Second chapter.

At the beginning of the second chapter, I compare two approaches aimed at framing the evolution of employment relations, namely the "dualization" (Häusermann and Schwander, 2012) and the "segmentation" (Doeringer and Piore, 1971) hypotheses, arguing that the latter is more in line with the RBTC. Then, I find that the increasing employment polarization could be conceivably linked to the rising inequality, which in turn might be explained by class differences (Weeden et al., 2007). In the following subparagraph I give a brief overview of the evolution of class analysis, starting from Weber and Marx. The main criticism of the concept of classes are reported, together with four recent classifications elaborated by contemporary authors: Bourdieu (1984), Wright (2000), Goldthorpe and Erikson (1993), and Oesch (2006). I decide to rely on the latter, due to Oesch's minimalist work hypothesis (inherited from Goldthorpe) and its clear linkage to labor market positions.

Then, I present the scenario of the "shrinking middle class". Namely, given the relation found in the literature on the electoral behavior between the rising of populism and the labor market uncertainty (Halikiopoulou and Vlandas, 2016), I suggest a turn of the automatable middle class towards the far right. Nevertheless, I show the difficulties encountered in finding an operational definition of middle class. Once the "economic" income-based definitions are rejected, I confirm my choice in favor of the Oesch's class scheme, presenting the table for the operationalization and the two middle "macro-classes" on which I will apply the RTI.

I devote the last paragraph to the welfare regimes and their shaping influence on the labor market. I first describe the well-known Esping-Andersen's classification (1990) and the underlying sociological theory, i.e. the Power Resources Theory. I have decided to refer to the Manow's papers too, since he grasps the key role played by electoral systems (2009) and religion (2015) in the consolidation of the welfare institutions. Then, I report the main criticism of the three-fold Esping-Andersen's categorization, which can be resumed in four branches: the feminist (Art and Gelissen, 200), the misclassification (Ferrera, 2019), the operationalization (Bambra, 2006; Scruggs and Allan, 2006; Pintelon, 2012), and the social care/healthcare critiques (Jensen, 2008; Wendt, 2013). Nonetheless, I have decided to use that classification, adding the Mediterranean cluster which I consider clearly distinguishable.

In the following subparagraph, I analyze the impact of automation on the different welfare regimes, especially in terms of expenditure and coverage. I find that the Nordic and the Continental welfare regimes are the most concerned with regard to budget, and the Bismarkian model results the

worst equipped to face “new social risks”. Then, I briefly discuss on the welfare class coalitions, reporting some contributions from the literature aimed at drawing the future societal alliances supporting the welfare state (Oesch, 2006; Gingrich and Häusermann, 2015; Iversen and Soskice,2019).

Before discussing the molding influence of welfare institutions on automation, I present the “agentic” historical institutionalism as the theoretical framework underlying the latter (Pierson, cited in Lynch and Rhodes, 2016). I argue that the impact of institutional configurations on automation can be distinguished into two lines of action: the first referring to the direct influence of government on the innovation speed (Atkinson, 2015), while the second one regards the capability of certain wage-setting institutions to prevent the rise of low-paid service jobs, preserving traditional economic sectors (Oesch and Rodrìguez-Menés, 2011; Wren, 2013). In this regard, the Conservative regime results the most committed in preserving routine workers, whereas the Scandinavians opt for retraining and sheltering those people in the public sector. On the contrary, both the Liberal and the Mediterranean clusters appear less capable in altering the job polarization.

In conclusion, I discussed on the compensation policies, which result crucial during the service transition (Manow et al., cited in Wren, 2013). I find that the Liberal regime is more committed in providing means-tested assistance and an adequate, despite quite exclusive, training system (Wren, 2013). The Christian Democratic cluster instead does not look capable to provide a comprehensive protection against “new social risks”, releasing an industry-based training and lacking in terms of long-term income support (Palier, 2019). The Southern group results to be the worst equipped to compensate routine workers, guaranteeing insufficient resources for training, measures against poverty, and family-friendly policies (Ferrera et al., 2012). Finally, the Social Democratic regime appears the most prepared to face the service transition due to its de-familized and universal provision of social rights (Palier, 2019).

Third chapter.

The third chapter is divided into two main paragraphs. In the first paragraph I present the class structure of some European countries grouped in four clusters using the Oesch’s scheme, while in the second one I apply the RTI to social classes in order to show their propensity to be automated. The datasets employed to perform these analyses are collected by the European Social Survey and they are processes through the do-file elaborated by Tawfik and Oesch, which enables to apply the Oesch’s class scheme to the ESS data. The clusters represent four welfare regimes, that are composed by the following countries: Austria, France, Germany and Belgium for the Conservative group; Ireland and

the United Kingdom for the Liberal cluster; Sweden, Norway, Finland and Denmark for the Social Democratic regime; Italy, Spain and Portugal for the Mediterranean group.

At the beginning of the first paragraph, I tabulate the figures referring to the work logics, the 8- and the 16-class schemes for each cluster. I find that the Liberal regime presents a remarkable share of service workers and managers, while showing a constrained number of production laborers. The Social Democratic cluster appears the most able to foster the expansion of the whole interpersonal service dimension, whereas the Conservative countries show the smallest share of low-skill service workers. Nonetheless, the number of socio-cultural professionals in Central Europe turns out to be significant, distinguishing it from the Southern countries which present the most constrained share of high-skill service workers. Moreover, the latter show the highest relative size of production laborers and a remarkable number of low-skill service employees.

In the following subparagraphs I describe the distribution of two individual features within the class structure. I first present the distribution of gender, finding that the labor market is clearly divided between a female-led service sector and a predominantly male industrial workforce, without any significant difference among clusters. The analysis of the educational attainment, using the ISCED classification, shows that the skills are a valid criterion to organize the societal hierarchy, since the distribution of classes mirrors the Oesch's scheme. Besides, the Southern workforce results the least skilled of the sample.

Then, I plot the evolution of the class structure in each welfare regime using the ESS Cumulative Data Wizard, both referring to the 8-class scheme and the four "macro-classes". I find a cross-cluster polarization of the industrial workforce, with the most skilled professionals growing at the expense of the least educated colleagues, whereas the service sector retains its relative size during the reference period. As regards the "macro-classes", grouped in four categories according to the Oesch's model, a converging trend between the upper and the lower classes is detected in the Social Democratic and the Mediterranean regimes, whereas the Liberal and the Conservative clusters tend towards a more polarized societal arrangement.

In the second paragraph I apply the RTI to the European 8- and 16-class structure. Two measurements are available for this indicator, which are calculated with the same methodology: the first RTI is based on the O*NET dataset, while the second one is calculated on two Italian datasets (*Indagine Campionaria sulle Professioni* and *Rilevazione Continua sulle Forze di Lavoro*). I decide to rely on the former, presenting the figures elaborated with the second measurement in the appendix. I first find that the organizational and technical work logics are more routinized, whereas the independent and interpersonal service dimensions result less automatable. Moreover, the Southern cluster turns out to be hit hardest by automation due to its remarkable share of low-skilled service and

production workers. The Scandinavian and the Anglo-Saxon labor forces instead look less prone to be replaced. The former benefits from upskilling, while the latter shows the most constrained shares of workers in the traditional sectors. Finally, the routinization of the Central European workforce heavily depends on the measurement used. Indeed, the O*NET-based RTI distribution draws a darker scenario for the Conservative countries since it places most of their clerks in the last RTI quintile.

In the last subparagraph, I apply the RTI to the 16-class scheme sorted by the ISCED level, finding that skills play a key role in routinization. In fact, the automation risk appears polarized along the skills continuum, undermining the RBTC hypothesis. The main reason lies in the unexpected positive RTI score of the low-skill service occupations. On the contrary, a slightly inverted-U shape is detected with regard to the 8-class structure. Finally, the "upper-middle" and the "lower-middle class" present diverging RTI figures, with the latter more likely to be replaced by machines. Therefore, the impact of ICT on the labor market results to stand in the middle between the RBTC and the SBTC hypotheses. Indeed, the middle-skilled occupations are confirmed to be the most automatable, despite the level of competences turns out to be more relevant than the RBTC scholars would have expected.

Fourth chapter.

I have divided the fourth chapter in two paragraphs, devoting the first section to the "in-work" protection and the second one to the "out-of-market" compensation. The adequacy, coverage and strictness of social protection is evaluated using some indicators taken from OECD.Stat. The analyses refer to four selected countries which are representative of their respective welfare cluster: Italy for the Mediterranean group, Sweden for the Social Democratic regime, the United Kingdom for the Liberal cluster, and Germany for the Conservative group. Nevertheless, I always compare their figures with the results of their "cluster-mates" in order to check the regimes' internal consistency.

At the beginning of the first paragraph I give a brief overview of the collective bargaining systems of the four countries sampled, finding that the Scandinavian and the Mediterranean regimes are the most inclusive in terms of workers' participation. Then I report three time series which provide with a picture of the strictness of labor market institutions, i.e. the Employment Protection Legislation indexes, both for open-ended and fixed-term workers, and the incidence of open-ended and fixed-term contracts on the whole workforce. I find that the rigidity of the German and Italian labor market regulations does not imply a limited use of fixed-term contracts, whereas the flexibility shown by Britain and Sweden results in different patterns, with the incidence of fixed-term contracts in the latter outnumbering the one in the UK. Moreover, the share of part-timers peaks in the Conservative and the Liberal clusters, despite Italy shows the highest incidence of involuntary part-timers, indicating a

lower quality of the Southern labor market. Lastly, the relatively high share of low-paid workers in Germany, pretty close to the UK, further demonstrates that the formal rigidity of the Conservative welfare institutions does not always prevent the rise of a secondary labor force enjoying worse economic conditions. On the contrary, Italy and Sweden present a more egalitarian distribution of wages.

I devote the second paragraph to the compensation policies released by the welfare states to support workers through the service transition. I mainly focus on the distinction between "old" and "new social risks", since the protection against the latter is considered crucial to evaluate the adequacy of welfare institutions in dealing with automation and de-industrialization.

I first analyze the welfare expenditure, starting with the total social expenses, then divided between cash and in-kind benefits. Moreover, I report two time series referring to the public spending devoted to the old age and the unemployment risks. I find that the Mediterranean cluster is the most committed in sheltering from these traditional risks, while the Liberal group provides the fewest resources. Furthermore, the data concerning the training expenditure place Germany at the first position, whereas Italy results to be the least engaged in upskilling its workers. Similar results are presented with regard to the Public Employment Service (PES). Lastly, the investigation of the expenditure dedicated to family friendly policies shows that the UK is the most committed in providing cash provisions, whereas Sweden ranks first in the in-kind benefits. On the contrary, both Germany and Italy present lower scores.

In the following subparagraph, I investigate the "de-commodifying" power of compensation policies through some indexes which estimate the capabilities of welfare provisions to emancipate the individuals from market dependence. The data referring to the pensions' replacement rates confirm the special engagement of Italy in sheltering from this traditional hazard, together with the low income-biased protection guaranteed by the UK. Furthermore, I plot the replacement rates of unemployment benefits, distinguishing the beneficiaries in terms of households' composition (single persons and couples with two children) and duration of unemployment (one month and five years). While Britain shows homogenous and low replacement rates, Italy and Germany results to shelter more effectively the short-term unemployed. On the contrary, Sweden provides the best protection against prolonged exclusion from labor market. The analysis of the adequacy of Guaranteed Minimum Income (GMI), separating the beneficiaries with the same criteria previously exposed, further demonstrates the difficulty of the Southern regime in guaranteeing protection against "new social risks". On the contrary, the UK shows the best result in this type of means-tested assistance. Finally, I graphically represent the length of maternity/paternity and parental leaves, distinguished by gender. The Social Democratic cluster proves to be the best equipped in reconciling the working and

care time, while the familistic nature of the Continental regimes hamper the inclusion of fathers in care activities.

All in all, the Scandinavian cluster turns out to be the most prepared in facing the rise of "new social risks", while not hampering the market dynamics. The Conservative regime results more committed in sheltering from skills' obsolescence than expected, whereas it is not particularly able in preventing the rise of the low-paid jobs. The Mediterranean group appears the least committed to face the service transition, especially with reference to compensation policies, being the most familistic and workerist. Finally, the Liberal countries confirm to be the least committed in providing social protection, except for the means-tested provisions.

In conclusion, I find that the societal outcomes produced by the impact of the ICT revolution on labor market appears to stand in the middle between the SBTC and the RBTC scenarios. The main reason lies in the routinarity of the low-skill interpersonal service occupations, which is higher than expected. Consequently, the skills level results to play a more important role in determining the distribution of the automation risk than the RBTC scholars would have hypothesized. Moreover, the influence of the welfare institutions on the labor market is confirmed. Indeed, the welfare clusters which shelter workers from automation, particularly through training, as the Scandinavian countries, present a less automatable workforce. On the contrary, the welfare regimes that are not committed in upskilling routine workers, as the Mediterranean group, result to be hit harder by the technical change.