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European Social Citizenship

Changing social investment strategies in the European Union

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Abstract

Social investment has gained increasing attention in academic and policy arenas over the last decades. Its relevance for responding to social needs arising from key societal transformations has been maintained, despite ongoing debate about its social outcomes. This paper attempts to identify EU social investment strategies and explain their evolution over the period 2004-18, namely before, during and after the global financial crisis. By using cluster analysis on expenditure variables, the paper distinguishes different social investment strategies across groups of countries. It finds that strategies have diversified over time in a progressively complex way. After the crisis, three main social investment strategies emerged in Europe. They do not overlap with canonical welfare state models, nor have a clear-cut geographical connotation. The strategies are distinct because of their different levels of overall expenditure on social investment yet also their different life-course orientations and degrees of coverage. Such characterisation of social investment strategies provides a reference for further research on the differences in social investment outcomes, which will be particularly relevant in the aftermath of the Covid-19 pandemic.

Key words

Social investment, cluster analysis

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Web address	For more information about the EuSocialCit project, please visit www.eusocialcit.eu . EuSocialCit’s output can also be found in our community on Zenodo: https://zenodo.org/communities/eusocialcit .

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1. Introduction

Social investment encompasses policies to prepare and support individuals to face new risks in fast-changing economies and societies. Social investment policy areas include early childhood education and care, education and training during the entire life course, active labour market policies (ALMPs) and support for parents and the elderly. Interest in social investment started to develop in the late 1990s, in the quest for a sustainable welfare state and an “employment-friendly” shift in social policy and welfare provisions (Hemerijck, 2017: 6), to enhance the interaction between economic progress and social policy (Esping-Andersen et al., 2002; Hemerijck et al., 2016).

By focusing on enhancing people’s capabilities to participate in the labour market and be fully included in society, the social investment approach is associated with the concept of empowerment. In this context, empowerment can be described as the process of taking control of one’s life, gaining democratic participation and a critical understanding of the society to which an individual belongs (Perkins and Zimmerman, 1995; Rappaport, 1984). Yet, empowerment is not only a process, it is also the result of a process, which can only occur through access to resources and services (Perkins, 2010). Empowerment, as such, is linked to the notion of social rights as constituted by “a bundle of distinctive and guaranteed power resources” (Vandenbroucke et al., 2021: 2). Specifically, empowerment is linked to the right of citizens “to share to the full in the social heritage” (Marshall, 1950: 149). Social investment can drive empowerment and contribute to fulfilling the associated social rights, by capacitating individuals, enlarging human potential and creating opportunities.

The social investment approach is reflected in several principles of the European Pillar of Social Rights (EPSR),¹ adopted by the EU in 2017. Its first chapter on “Equal opportunities and access to the labour market” is strongly oriented towards capacitation and the creation of opportunities throughout the life course. Access to lifelong education, training and support to participate in the labour market correspond to two cornerstones of the social investment approach, or active social policy (Bonoli, 2013). The chapter also outlines principles that stress the rights of women and youth, as two social groups to target in the development of social policy and the welfare state towards a social investment approach. Investing in people and providing the conditions for them to achieve their potential also permeate other chapters. Mentions of work–life balance, healthcare and support for children as well as the elderly are all consistent with the attention of social investment on creating, mobilising and protecting human capital throughout the entire life course.

Already before the adoption of the EPSR, the EU had embraced the social investment approach in the Lisbon agenda. Investment in human capital as well as its mobilisation through labour market participation and social inclusion were considered instrumental to building an EU knowledge economy and to achieving

¹ See https://ec.europa.eu/commission/sites/beta-political/files/social-summit-european-pillar-social-rights-booklet_en.pdf.

sustainable growth and social cohesion². The policy debate on social investment continued for the next decade, leading to the adoption of the Social Investment Package for Growth and Cohesion (SIP)³ in 2013. The package represented an EU-level response to the recession following the 2008 financial crisis. Under the SIP umbrella, the European Commission aimed at supporting member states to reform social protection systems for their sustainability and to reinforce social policy for investing in people's capabilities.

Although the social investment approach has often been questioned (see for instance Bonoli et al., 2017; Cantillon, 2011; Nolan, 2013; Saraceno, 2015), both academics and policymakers agree on the importance of social investment to respond to labour market and, more generally, societal challenges. Universal access to up- and re-skilling opportunities to limit unemployment,⁴ improve work–life balance, reconcile work and family life for women to fight gender inequality,⁵ and provide quality care and early education for all children to ensure equal opportunities in later life (Frazer et al., 2020) are some examples of the social investment-type of policy responses that are being developed at the EU level. The role of social investment in anticipating social risks is likely to become particularly relevant in the post-Covid-19 recovery, when resilience at the individual and collective levels will determine the social impact of the crisis (Hemerijck and Huguenot-Noël, 2020).

An element of complexity around the conceptualisation of social investment relates to the extent to which compensatory social expenditure in response to risks, and not only capacitating expenditure, can be regarded as fostering social investment. Different authors (Vandenbroucke and Vleminckx 2011; Hemerijck, 2013) maintain that investing in human capital, per se, is not meant to respond to all new social risks, which still need some form of social protection. Moreover, investing in human capital and/or addressing new social risks can occur through in-cash transfers and in-kind services, which can represent two equally possible options to foster social investment.⁶ This points to the possibility of different degrees of recalibration between capacitating and compensatory social expenditure in the social investment approach. While this complexity is acknowledged, this paper investigates aspects and functions of social investment, as well as its evolution over time, focusing solely on social expenditure that aims at avoiding risks.

In reality, social investment is still seen as an emerging approach to social policy (Morel et al., 2012) and it is difficult to identify well-defined models with a link to pre-existing welfare state models. Overall, the EU and its member states show a tendency towards social investment, but without following a structural approach and, in practice, with different orientations (Hemerijck, 2013). As stressed by Kuitto (2016), the trajectories of social investment spending depend to some extent on welfare regimes, and EU member states are not

² European Council (2020)

³ See [COM\(2013\) 83 Final – Towards Social Investment for Growth and Cohesion – including implementing the European Social Fund 2014-2020](#).

⁴ See the [Communication on a European Skills Agenda for sustainable competitiveness, social fairness and resilience](#).

⁵ See [Directive \(EU\) 2019/1158 on work–life balance for parents and carers](#).

⁶ For example, paid parental leave and child allowances (i.e. in-cash benefits), as well as childcare facilities (i.e. in kind) respond to the new social risks of work–family reconciliation and invest in children's human capital. At the same time, the authors point out that social investment policies to address new social risks are not necessarily implemented all together, but could, for example, focus on social risks for children and families (i.e. parental leave or childcare services) rather than on youth or jobseekers (i.e. activation support).

equally placed with respect to the social investment orientation of their welfare systems (Nikolai, 2009). This does not imply, however, that a welfare state model defines one social investment strategy and a certain degree of orientation towards social investment. Indeed, there are differences in social investment across countries not only in terms of the uneven pace of reforms, but also in the direction of these reforms (Vandenbroucke and Vleminckx, 2011). Despite quite well-defined welfare state models in Europe (Esping-Andersen et al., 2002), the patterns in specific areas of social policy across countries do not necessarily match the classifications in canonical welfare state regimes (Thevenon, 2011).

According to Vandenbroucke et al. (2021), social investment refers to a set of social rights that empower individuals (rights-holders) to claim a certain benefit or service, in the field of childhood development, access to education and training, access to employment and work–life balance. Such rights are defined as a set of resources that provide individuals with the power to claim something (access to childcare facilities, along with training, education, etc.). Following Vandenbroucke et al. (2021), a key component of social rights is so-called *normative resources*, i.e. legislative (or collectively bargained) provisions, which specify who holds the rights, the content of the rights and the administrative framework for the provision of benefits. For social rights to be effective, it is necessary for an institutionalised legal framework to define the rights-holders, the benefit these individuals are entitled to and the way such benefits are to be provided. Normative resources thus provide individuals with the legal entitlement to claim certain social benefits.⁷

For rights-holders to benefit from their social rights, however, legal entitlement is not enough – especially in the case of social investment. Social investment rights need to be ‘constructed’ through an administrative and practical process that assembles various elements, specifically budgetary funds, physical infrastructure and staff. As an example, when it comes to rights related to access to childcare, a legal individual entitlement to childcare from a certain age may not be enough to actually enjoy it. Policy outputs (i.e. the actual expenditure, quality and coverage in kindergartens or employment policies) are needed to ensure that citizens assert their social rights. Both normative resources and outputs in the domain of social investment, therefore, can influence social outcomes related to the level of education and skills of the population in a country, its employment rate, income and wellbeing, and ultimately, poverty and inequalities in society.

Drawing on the framework of EUSOCIALCIT (see Vandenbroucke et al., 2021), the main objective of this paper is to identify types of social investment strategies applied by EU-27 member states over the period 2004-18, based on policy output measures, namely expenditure and coverage, and to describe how these strategies have changed throughout this period. The period is selected to consider social investment strategies before, during and after the financial crisis in 2008. The latter is an important point of demarcation for public finances (Ronchi, 2018) and at the same time, the start of renewed attention to the shock-resilience of socioeconomic systems (Hemerijck, 2013). For the most recent years considered (i.e. 2014-18), the paper also provides an overview of the main institutional features (what Vandenbroucke et al. 2021 call *normative resources*) that

⁷ Vandenbroucke et al. identify two additional sets of resources, beyond the normative ones: enforcement and instrumental. For the purpose of this paper, we focus on the normative resources and especially on a subset called legal resources. The latter consist of enforcement resources, defined as guaranteed powers that address a third party (typically a court of law) to seek enforcement in case of disputes. Instrumental resources are defined as a set of targeted or universal support channels that make eligible rights-holders aware of entitlements and capable of claiming them.

characterised social investment strategies across the EU in the areas of childhood, families, education and employment. Although the analysis is constrained to the period before the Covid-19 crisis (due to data availability), it will be informative for comparing social outcomes linked to these areas of social investment both during and after Covid-19 and assessing member states' ability to respond in relation to their orientation towards social investment in the previous decades.

Against this background, this paper attempts to contribute to the debate on social investment and fill the gaps in the literature in three ways. First, through a data-driven approach, it clusters countries that are similar in terms of social investment policy outputs, namely expenditure and coverage. The approach does not rely on any presumption about the existence of a social investment strategy closely associated with rigid welfare models, but it allows empirical verification of the degree of path dependency between welfare regimes and the social investment strategies adopted. This is a choice that corresponds to the objective of the paper, namely to analyse how EU countries' approach to social investment has evolved over time.

Second, the analysis intentionally concentrates on (multiple) social investment policy areas, excluding other welfare functions. In this way, the level of detail of the data enables different areas of social investment to be distinguished, in order to better qualify the investment strategies that develop over time. The analysis covers policy areas for investment at early ages, at school age and later education, and during working life.⁸ This granularity allows identification of specific characteristics of countries' social investment strategies, rather than just the overall social investment orientation of the welfare state (Bakker and van Vliet, 2019). Moreover, the variables used for the cluster analysis involve more than a purely expenditure-based approach to describe social investment strategies (Ronchi, 2016; Nolan, 2013; De Deken, 2014). The selected variables include the coverage of social policies in the areas considered, to assess the outreach of expenditure on social investment.

Third, the quantitative analysis of social investment policy outputs (i.e. expenditure and coverage) is complemented by a qualitative analysis of institutional design features of the policy. As the institutional design contributes to defining the social investment strategy of a country (Bonoli, 2013), the ultimate objective is to explore the potential relationship between institutional design features and policy outputs, thus bringing together two strands of literature that have examined these two aspects separately.

The rest of the paper is organised as follows. Section 2 reviews the literature on social investment and takes stock of the empirical analyses that can inform the clustering exercise to identify social investment strategies and their evolution over time. Section **Error! Reference source not found.**3 illustrates the data and the methodology used for the analysis. Section 4 presents the findings of the cluster analysis and complements it with an assessment of the institutional design features in each cluster. Section 5 discusses the overall results and concludes.

⁸ Social investment for elderly care is excluded.

2. Literature review

2.1 Social investment strategies and their varieties

Social investment is an approach to welfare provisions following a twofold rationale. On the one hand, welfare states, under the pressure of long-term trends like demographic change and de-industrialisation as well as multiple shocks like the financial crisis in 2008, have been confronted with the challenge of long-term sustainability. This has required finding a solid justification for social expenditure in economic terms but also to increase its efficiency in terms of social returns (i.e. social policy as a productive factor). On the other hand, welfare states have been called upon to adapt to the ‘new’ risks to which individuals have been increasingly exposed by key societal transformations, such as demographic and technological change (Esping-Andersen et al., 2002). Unlike the ‘old’ risks (e.g. unemployment, illness and old age) traditionally addressed by the welfare state, the new social risks (Bonoli, 2006; Vandenbroucke and Vleminckx, 2011) include inter alia single parenthood, work and family life reconciliation, a lack of the right skills to participate in the labour market, the changing nature of employment relationships and fragmented careers. These new social risks have arisen in the post-industrial era, resulting in unmet social needs and new challenges for social policies.

Following this rationale, the literature has stressed the ‘capacitating’ or ‘preventative’ nature of social investment policies, in an analytical dichotomy with ‘compensatory’ social policies⁹ (Esping-Andersen et al., 2002; Hemerijck, 2013; Hemerijck et al. 2016; Ronchi, 2018). Social investment policies, such as childcare, education and labour market activation policies, invest in human capital throughout the life course to prepare individuals to face social risks before they manifest. Yet, as different schools maintain (Vandenbroucke and Vleminckx, 2011; Hemerijck, 2013), investing in human capital per se is not necessarily expected to be sufficient to respond to all new social risks, which still call for some form of social protection. This points to the possibility of different degrees of recalibration between capacitating and compensatory social expenditure in the social investment approach.

Considering the three features (i.e. capacitating investment, new risks and service orientation), their different potential combinations and the possible alternative policy options to pursue social investment, Vandenbroucke and Vleminckx (2011) acknowledge the lack of a clear single strategy of social investment and the possibility of “varieties of social investment” as introduced by Bonoli (2009). Such an acknowledgment opens the door to further empirical investigation to help define these “varieties” of social investment. Ultimately, the types of social investment strategies identified from such an empirical investigation can inform assessment of the social investment outcomes.

⁹ Compensatory policies are associated with expenditure on social protection, such as minimum income or unemployment benefits, which mitigate social risks like poverty or unemployment after they have manifested in an individual’s life. By contrast, social investment policies, such as childcare, are meant to avoid social risks like children’s disadvantages or the inactivity of parents before these risks manifest, especially in situations of vulnerability (e.g. lone parenthood).

2.2 Welfare state models and developments

Given that social investments have evolved from pre-existing welfare provisions, an empirical investigation of social investment strategies cannot disregard the long-standing tradition of comparative welfare studies (Esping-Andersen, 1990; Esping-Andersen et al., 2002; Ferrera, 1996; Hemerijck, 2013). In practice, social investment developments across countries are to some extent embedded in welfare regimes (Kuitto, 2016), though they do not necessarily match the welfare regimes.

A substantial strand of qualitative studies has documented a widespread yet differentiated social investment trend in European countries, falling into Nordic, continental, southern and liberal welfare regimes. Differences in the social investment orientation are observed not only across but also within traditional welfare regimes. For instance, scholars agree that Nordic social-democratic welfare states (Denmark, Sweden and Finland) have been forerunners of social investment. These countries offer a wide array of public social services beyond health and education, which, together with active labour market programmes, encourage and sustain high levels of both male and female participation in the labour market (Bonoli, 2013; Hemerijck, 2013). By contrast, the continental or conservative welfare states have followed different paths. The Netherlands, for instance, was the first country in the group of conservative welfare regimes to jump on the social investment wagon (Visser and Hemerijck, 1997; Hemerijck and Marx, 2010). But it was also the first one to shirk social investment policies after the financial crisis. Germany was considered a latecomer to social investment developments in the early 2000s, but it then invested in childcare policies in the late 2000s (Seeleib-Kaiser, 2016). Southern member states, Italy in particular, are traditionally considered laggards in social investment recalibration (Kazepov and Ranci, 2017). The only exception is Spain, which after the financial crisis, embarked on social investment with family policies (León and Pavolini, 2014) and labour activation measures (Guillén and León, 2011). Liberal welfare states undertook social investment policies earlier in the 1990s, initially with the introduction of activation measures and, in a second stage, investment in early childhood care, education and parental leave (Morgan, 2013). As in the case of the Netherlands, however, after the outbreak of the Great Recession liberal welfare states (and especially Ireland) experienced a significant reduction of social investment.

Finally, south-eastern and Central European countries (basically new EU member states) can represent one welfare model, despite significant internal variations in terms of welfare provisions. If any, an old common trait of the welfare state in these countries was their generous family and childcare policies, inherited from the previous socialist model to promote female participation in the workforce, while ALMPs were not traditionally well developed (Hemerijck, 2013). Yet, over time public expenditure cuts led to a process of re-familisation (Szelewa and Polakowski, 2008) and different paths across countries.

The review of these studies highlights some path dependency between welfare regimes and the social investment evolution. Nonetheless, the latter appears to differ not only across canonical welfare regimes but also within the same welfare regime. This could be explained by changes in national social preferences, countries experiencing idiosyncratic shocks and binding budget constraints, among others. Such a diversity of social investment deserves further empirical investigation, which can contribute to defining types of strategies and to understanding their evolution.

2.3 Empirical literature on social investment

The discussion above provides a qualitative overview of how institutional and social policy features have moved towards a social investment orientation of the welfare state across countries, but those studies do not identify social investment models nor attempt to categorise countries according to their social investment orientation.

Bouget et al. (2015) represents the first attempt to group EU countries according to the degree of implementation of social investment reforms. The study uses both quantitative and qualitative evidence, relying on experts' assessment. The result is a "qualitative-institutional analysis", as Hemerijck et al. (2016: 43) calls it, which still lacks a systematic quantitative methodology for measuring the changes.

Quantitative attempts to assess social investment, instead, have proceeded through measurements of expenditure on new *versus* old social risks (Vandenbroucke and Vleminckx, 2011), on services for social investment as opposed to cash benefits for social protection (Ronchi, 2016), on social investment policies targeted at different age groups of the population and serving different social functions (Bakker and van Vliet, 2019). Often, the measurement of social investment through expenditure patterns has been associated with a quantitative analysis of the outcomes expected from the adoption of a social investment strategy (e.g. Bakker and van Vliet, 2019; Cantillon and Vandenbroucke, 2014; Hemerijck et al., 2016; Nikolai, 2009; Vandenbroucke and Vleminckx, 2011). In all, quantitative studies focus on either investigating the recalibration of welfare expenditure or measuring the link between social investment expenditure and social outcomes. By contrast, no attention has been paid to the identification of potential types of social investment strategies common across countries and their development over time.

Empirical research delving into specific areas of social policies that relate to social investment provide a useful background and reference for a methodology to identify common features and capture variety across countries. Most of these existing analyses concern family policies. For example, Thevenon (2011) runs a principal component analysis (PCA) to cluster 28 OECD countries with broadly comparable packages of family policies. The results of this analysis distinguish clusters of countries according to the generosity and the relative importance of different types of support (e.g. leave, childcare facilities or cash benefits). Pezer (2018) employs a clustering methodology combined with PCA to identify groups of EU countries with similar maternity-support measures. The results highlight a striking, yet incomplete, overlap of the clusters in terms of EU regions as well as cultural and welfare models. Using a similar cluster approach, Mishke (2011) identifies five types of family support in the EU, with results that partially contradict previous classifications and depart from the traditional welfare state classification.

Despite these examples, a comprehensive, rigorous measurement and classification of social investment still poses challenges (Bakker and van Vliet, 2019; Hemerijck et al., 2016; Ronchi, 2016), and cluster analysis is still underused to study welfare and social policy (Gough, 2001; Sharkh and Gough, 2010).

3. Data and methodology

Following the literature, in order to capture the social investment orientation of the welfare state, the analysis covers different areas of social investment that pertain to different stages of life. It also includes various components of expenditure in the same policy area to better distinguish social investment strategies (e.g. childcare services and parental leave under family policies). Furthermore, it accounts not only for the expenditure dimension but also for the coverage dimension of social investment models. Although the concept of coverage can take several meanings and its measurements can present some limitations, this analysis considers coverage “as actual recipients” (Nelson and Nieuwenhuis, 2021: 3) of social policy benefits or services over the relevant target group of the population. Finally, it looks at institutional design features of the social investment policy areas considered, in a qualitative and comparative way.

3.1 Data

Different datasets and series have been used to achieve good coverage across the three main dimensions of the analysis: geographical, temporal and, most importantly, areas of social investment. Eurostat is the main data source used for both the social investment-related variables and background variables for the EU-27 countries.

The pillar of social investment in families and children is captured by the indicators on expenditure under the family and children function of the European system of integrated social protection statistics (ESSPROS). Besides overall expenditure on the family and children function, the subcomponents of childcare and parental leave are included. Finally, pre-primary education is included in the family and children pillar, considering both expenditure and coverage (captured by the enrolment rate), but are sourced from the education and training section (of Eurostat).

The education and training section of Eurostat is also the main data source for the pillar covering social investment in education, for both expenditure and coverage statistics. The pillar differentiates between the school level, encompassing primary and secondary education, and the university level, namely tertiary education.

Finally, the European Commission is the main data source for the pillar of social investment during working age, providing overall expenditure on ALMPs as well as on public employment services (PES), and on the subcomponent of training. The coverage dimension for ALMPs is proxied by adult participation in training, sourced from the education and training section of Eurostat.

The selection of variables is based not only on their relevance in capturing social investment, but also on their coverage in terms of countries and years (i.e. EU-27 countries, from 2004 to 2018). Unfortunately, information was not always available for all the country–year combinations within the scope or for the different items of expenditure (e.g. for each of the components of expenditure on the ALMP), or across

further dimensions (e.g. activation of the registered unemployed by age and gender).¹⁰ The final selection includes 13 indicators (Table 1).

Table 1. Overview of the social investment functions analysed: pillar of investment, target population and type

Pillar of SI	Policy area	Target population	Expenditure/coverage
Family & Children	Families	0-19	Expenditure
	Child-day care	0-4	Expenditure
	Parental leave	0-4	Expenditure
	Pre-primary	0-4	Expenditure
	Pre-primary (enrolment rate)	0-4	Coverage
Education	School	5-19	Expenditure
	School (enrolment rate)	5-19	Coverage
	University	20-34	Expenditure
	University (enrolment rate)	20-34	Coverage
Work-age	ALMP	20-64 (unemployed)	Expenditure
	PES	20-64 (unemployed)	Expenditure
	Training	20-64 (unemployed)	Expenditure
	Adult learning participation (rate)	25-64	Coverage

Note: SI = social investment

Source: Authors' own compilation

The analysis uses budgetary effort as the main indicator to compare social investments among countries. This means that each item of expenditure is expressed in *per capita* terms, scaled down to the target population of each social investment policy. In other words, budgetary effort is the spending *per* possible beneficiary of a given area of social investment. Compared with overall expenditure as a percentage of GDP, budgetary effort should better capture the focus of government spending in specific policy areas as it is less affected by changes in the economic cycle and differences in demographic structure (Ronchi, 2016). Each item of expenditure is expressed in 2005 constant prices and converted into purchasing power standard (PPS) for the EU-27, to ensure comparability among countries and across time by discounting for differences in price levels and price fluctuations over time.¹¹

¹⁰ For a detailed overview of data sources and series used for each dimension, see the methodological note in Annex 1.

¹¹ Both price and PPP indexes use the government rather than the overall economy as an analytical category. For a detailed overview of the data sources and series used for each dimension, see the methodological note in Annex 1.

The target population, i.e. the number of possible beneficiaries, is defined for each pillar and for its subcomponents when there are different target populations within the same pillar. For instance, within the pillar of families and children, while the overall expenditure on family policy includes programmes that target potential beneficiaries up to 19 years old, the subcomponents of childcare and parental leave have a smaller target group, up to 4 years old.¹² Finally, the target populations used for the budgetary efforts on different levels of education have also been used to calculate gross enrolment rates, i.e. dividing the enrolled or participating population by the target population for each level of education or for adult learning (see details about the target populations in Table 1).

For the qualitative analysis of institutional design features, which accompanies the cluster analysis, indicators have been collected by merging data extracted from the OECD Starting Strong, MISSOC database and qualitative comparative reports (e.g. Eurydice for early childhood education and care (ECEC) and for education, OECD for ALMPs). In the newly created dataset, information is classified by policy area (i.e. families and children, education and working age) and pertains to specific subcomponents of each pillar of social investment, namely childcare, parental leave, paternity/maternity leave, school, university and ALMPs. The information covers eligibility criteria, entitlement conditions, duration, material conditions and the content of certain in-kind or cash benefits.¹³

3.2 Methodology

Most empirical literature on countries' classifications based on their welfare states and social policies relies on some form of cluster analysis (sometimes in combination with principal component analysis; see among others Pezer, 2018)). Gough (2001) and Sharkh and Gough (2010) apply clustering to identify social assistance or welfare regimes worldwide and study their evolution over time. Similarly, Danforth (2010) uses cluster analysis on data for each five-year interval between 1950 and 1995 to test the emergence of Esping-Andersen's three welfare regimes. Bambra (2007) undertakes a cluster analysis to account for the gender dimension and investigate the de-familisation component of welfare regimes. Relying on variables for policy design, expenditure and outcomes, she finds a fivefold typology of welfare regimes that somehow differs from existing classifications. Other clustering exercises applied to welfare regimes or specific policy areas focus on socioeconomic indicators (e.g. for employment, poverty and inequality) and group countries according to their social outcomes (Anderson, 2007; Ferragina et al., 2015; Paniscu et al., 2014).

In order to capture differences in EU countries' social investment strategies, the analysis needs to rely on a set of variables wide enough to cover all policy areas within the scope and their main elements. It is important, however, to monitor the ratio between the number of variables and number of observations available when performing a cluster analysis. As the number of variables grows, observations become more and more scattered across different dimensions and, therefore, the structure of clusters becomes increasingly less clear. There is not a distinct rule, but only indications on the ratio of observations and

¹² There are differences among countries in eligibility criteria based on age, but looking at the MISSOC database, these are minor and concern only a few countries.

¹³ For a detailed overview of indicators and data sources, see the indicators for the qualitative analysis in Annex 3.

variables to keep when performing a cluster analysis.¹⁴ Given the structural limitation to 27 observations (i.e. EU countries), PCA is used to eliminate redundant information on correlated variables in a high dimensional dataset (Bartholomew et al., 2008). The PCA returns restructured data in the form of components that contain most of the information on the variance among individuals for the different variables. The number of components to retain is determined based on the components' weight in explaining the entire variance of the dataset and their eigenvalues. There are not specific rules and thresholds to apply for the selection of components; yet usually, only those with an eigenvalue of at least one are retained.¹⁵

The PCA is run on the five-year averages of the 13 variables selected (Table 1) across the three main periods identified for the analysis – i.e. before the financial crisis (2004-08), during the crisis (2009-13) and after the crisis (2014-18). It uses the standardised form in z-scores of the original variables to eliminate differences in measurement scales and thus ensure a similar contribution to the total variance explained by each variable.¹⁶ By applying the one threshold to the eigenvalues, three main components are retained, which explain 74% of the entire variance in the dataset (see Table 2 in the next section). This allows a high degree of the variance across countries and years to be captured while keeping the dimensionality of the dataset low, and hence suitable for the cluster analysis.

Consistent with the approach to the PCA, the cluster analysis is run for each of the three periods separately using the scoring of the main components obtained from the PCA for each observation, i.e. for each country in each period. A hierarchical clustering using Ward's linkage method based on Euclidean distance is applied. The choice of a hierarchical over a k-mean clustering for two main reasons: first, the number of clusters is not known and it must be specified *ex ante* when using k-means; and, second, hierarchical cluster analysis returns structured results in the form of dendrograms, which facilitate interpretation of the results. The dendrograms enable assessment of the clusters for each period and a reasoned choice on the number of clusters, in order to achieve meaningful and distinct groups.¹⁷ Ward's linkage method aims at reducing the within-group variance at each stage of its algorithm and it is usually used in the literature for this kind of analysis (e.g. Anderson, 2007; Danforth, 2010; Pezer, 2018).¹⁸

¹⁴ A first suggestion comes from an application of latent class analysis, where a minimal sample size of at least 2^k observations (where k is the number of variables) is suggested (Formann, 1984). Another example is given by a simulation study on data-driven market segmentation in the tourism sector, where a sample size of 70 times the number of variables seems adequate under all simulations tested (Dolnicar et al., 2013).

¹⁵ This is because one is usually the value at which an 'elbow' is visible in the scree plot of the eigenvalues, followed by a plateau, which shows diminishing returns in terms of additional variance explained by adding other components.

¹⁶ Since the PCA process is based on distances between observations across several dimensions and aims at transforming the data into a new coordinate system, the different scales for the measurement of variables might distort results and assign a disproportional weight to one variable with respect to another.

¹⁷ The objective is to strike a balance between having distinct clusters in terms of characteristics while keeping a homogenous distribution of countries among clusters. The visual inspection of the dendrograms allow a quick assessment of the degree of dissimilarity between clusters and identification of outliers, in order to recalibrate clusters if necessary and avoid cases of single-country clusters. For more details on the methodological approach, see Annex 1.

¹⁸ The method was proposed to overcome the single and average methods by accounting for the similarity of observations with respect to different variables instead of a single one when assigning them to groups (Ward, 1963).

A robustness check is performed using the k-means clustering method by assigning *ex ante* the number of clusters identified with the hierarchical method. The k-means method also requires specifying the starting points (i.e. centroids) for assigning observations to different clusters. A first check is performed using the centroids obtained from the hierarchical analysis. A second check is performed leaving the choice of the centroids to be random and performing 1,000 iterations to find the best-performing cluster solutions regarding both the number of times they converged and overall fit in terms of variance as indicated by the Calinski-Harabasz test.¹⁹ The composition of clusters and the overall fit are then compared between hierarchical and k-means outcomes to assess the robustness of the results for different specifications.²⁰

Once the clusters have been identified for the three periods based on the PCA, the social investment expenditure variables driving the PCA (see Table 1) are analysed for each cluster, to better identify characteristics of the social investment strategies. Lastly, the qualitative comparative analysis of institutional design features is applied to each cluster based on the indicators mentioned above.²¹

¹⁹ The Calinski-Harabasz index is the ratio of the sum of the between-cluster variance and within-cluster variance: the higher the score, the better the overall performance.

²⁰ For the results of robustness checks, see the detailed results in Annex 2.

²¹ See the indicators for the qualitative analysis in Annex 3.

4. The results of the cluster analysis

As a first step, the PCA is run to summarise the information and variance of the entire dataset into newly created variables (i.e. components) and capture the main distinctive characteristics of different social investment strategies in the EU-27 between 2004 and 2018. According to the PCA, the overall variance in the dataset can be largely explained (i.e. 74%) by three components, which will serve to cluster countries. The correlation between each component and the original variables shows which part of the variance in the dataset each component captures, helping the interpretation of each component. The loadings of each variable for each component show these relationships (Table 2).

Component 1 captures the majority of the variance in the dataset (i.e. 51%). This component is mainly driven (i.e. loading >0.3) by variables on expenditure on all policy areas of social investment and for adult learning participation. It is tagged as 'expenditure' because it can be interpreted as the 'money' effort in social investment. The fact that all main policy areas, such as families and children, education and labour market policy, move together in this component (i.e. have the same sign and are all driving component 1 with similar loadings) shows that expenditure on these policy areas is consistent in social investment strategies characterised by high values of this component. Altogether, these policy areas are constitutive of a holistic approach to social investment. The only exception in the expenditure variables defining this component is expenditure on parental leave, which is instead negatively correlated with this component.

Expenditure on parental leave, however, together with almost all variables of expenditure on social investment early in life, mainly drive component 2, which captures 12% of the variance of the dataset. This component is labelled 'life course' to capture the orientation of the social investment strategy towards the early life phase, rather than towards later stages in life. Variables related to social investment later in life are all negatively correlated with this component. The fact that policy areas for early and older ages in life have opposite signs in this component mirrors the trade-off that may exist between spending on one or the other in certain social investment strategies. The high loading of the variable for expenditure on parental leave suggests that social investment expenditure on life course is characterised mostly by parental leave in this component. This is a cash type of expenditure, which pays attention to work–life balance but also to labour market participation, especially across genders. The expenditure on childcare is positively correlated with component 2, in line with its interpretation as a component that captures social investment aimed at early life stages. However, its loading is higher in component 1, probably because this variable tends to be positively, rather than negatively, correlated with expenditures on social investment at later life stages (e.g. education). The variable also seems to be negatively correlated with expenditure on parental leave,²² representing an alternative type of social investment (i.e. in-kind) at early ages. This contributes to explaining the moderate loading of childcare expenditure in component 2 that, even if capturing investment geared towards early ages, is mainly driven by expenditure on parental leave.

²² See section 4.2 for more details on the negative correlation between childcare and parental leave expenditures.

Component 3 accounts for another, smaller, part of the variance in the dataset (11%). It is named ‘coverage’ because it is driven mainly by enrolment rates, particularly enrolment rates in non-compulsory education, such as pre-primary and tertiary education. By contrast, enrolment in school is spread across all three components and it is not decisive in the identification of the clusters. Although it mainly drives the first component, adult learning participation is also positively correlated with the coverage component, indicating that this variable tends to co-move with levels of participation in earlier education and training.

Table 2. Principle Component analysis

Pillar of SI	Policy area	Loadings of variables on the components		
		Component 1	Component 2	Component 3
		Expenditure	Life course	Coverage
Family & Children	Family	0.2973	0.3132	-0.253
	Child-day care	0.3377	0.1603	0.0832
	Parental leave	-0.1119	0.5218	0.1197
	Pre-primary	0.2478	0.4598	0.0877
	Pre-primary (enrolment rate)	0.1317	0.3973	0.5196
Education	School	0.3316	-0.0901	-0.2379
	School (enrolment rate)	0.2253	-0.1841	0.1736
	University	0.3507	-0.216	0.1003
	University (enrolment rate)	0.0577	-0.3438	0.6645
Work-age	ALMP	0.3519	-0.0121	-0.1427
	PES	0.2975	-0.0653	-0.108
	Training	0.3081	-0.1377	-0.1592
	Adult learning participation (rate)	0.3347	-0.0657	0.2035

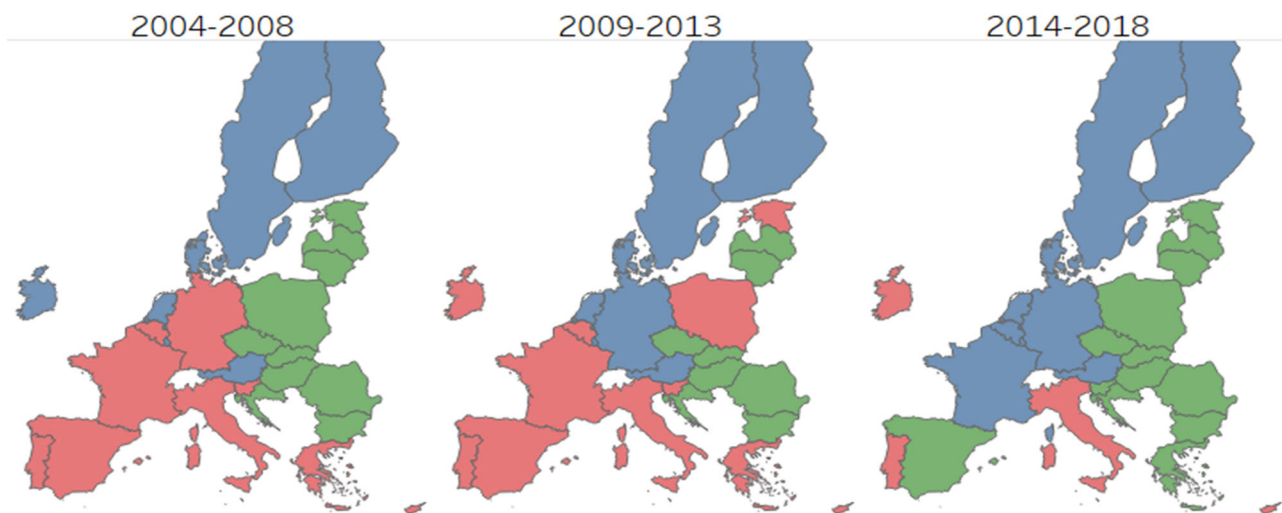
*Note: Overall KMO test = 0.81; Overall variance explained = 74%; 51% variance explained by Component 1; 12% variance explained by Component 2; 11% variance explained by Component 3.
Source: Authors’ own compilation*

The scores of these components for each country in the three periods considered determine the clusters that will be identified in the following step of the analysis. Thereby, the clusters will be characterised by different levels of expenditure, life course orientation and coverage of social investment. These three characteristics are the backbone of the strategies of social investment to identify.

4.1 Country clusters and their time evolution

Following the approach detailed above, the hierarchical clustering based on the principal components leads to three clusters of countries in each of the three periods considered (as in Figure 1). Among the three components, expenditure always distinguishes the clusters the most, being the component that captures most of the variance in the dataset. As result, the clusters appear stratified according to the expenditure component, which therefore emerges as a key characteristic of the social investment strategies. The life-course and coverage components also contribute to distinguishing clusters, yet to a somewhat lesser extent. Interestingly, the role of the latter components in defining clusters seems more pronounced over time. Figure 1 depicts changes in the country composition of the three clusters.

Figure 1. Clusters of EU member states over the three periods



Source: authors' own data.

As argued in a more detailed fashion in sections 4.2 and 4.3, specific country reforms as well as the impact of the financial crisis help to explain why some countries have changed their cluster.

The scatterplots in Figure 2, Figure 3 and Figure 4 show the characteristics of each of the clusters in terms of the three components for the three periods.

Figure 2, which illustrates the strategies before the crisis (2004-08), shows that the three clusters identified differ mainly in terms of overall expenditure dedicated to social investment, as they appear clearly stratified according to the component for expenditure. The clusters are less clearly distinguished by the life-course and coverage components.

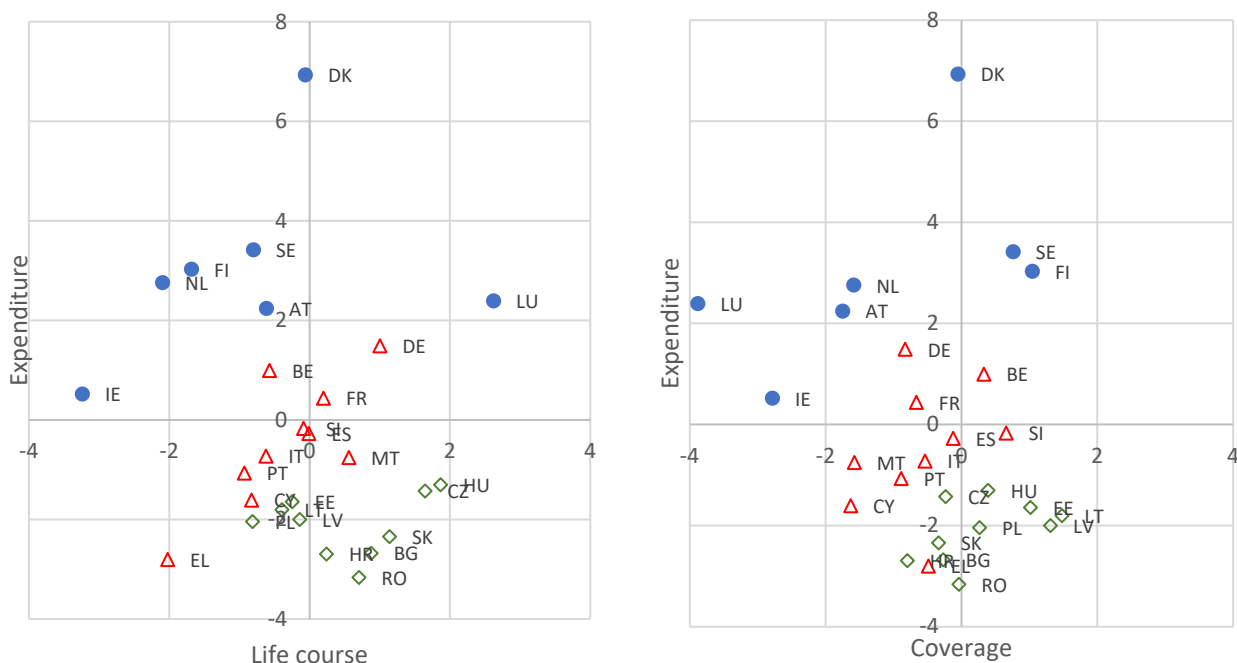
The blue cluster includes the three Scandinavian countries, some northern European ones traditionally associated with the continental welfare regime (i.e. the Netherlands, Luxembourg and Austria) and Ireland, with a liberal welfare regime. This cluster's key feature is high overall expenditure on social investment. Denmark is an outlier, plotted much higher than the other countries on the axis for the expenditure

component. This cluster also shows a low-to-average propensity for social investment in early ages, through the life-course component. Nevertheless, countries are quite dispersed and Luxembourg appears to be an outlier for this component. Similarly, this cluster is not characterised by the coverage of social investment, as its members are very heterogeneous in terms of scores for the coverage component.

A red cluster includes continental countries, such as France, Germany and Belgium, and the southern European countries (i.e. Portugal, Spain, Italy, Greece, Malta and Cyprus) as well as Slovenia. This cluster is characterised by an intermediate level of expenditure on social investment, in comparison with the other two clusters. The life-course orientation of social investment in this cluster is not very clear. Still, if one excludes Greece, which appears to be an outlier on both the expenditure and life-course components, the cluster can exemplify an intermediate life-course orientation, at least in comparison with the other two clusters. Also, the coverage dimension does not appear to be a distinct feature of this cluster.

A green cluster is entirely composed of Central and Eastern European countries, which show on average a social investment strategy defined by low overall expenditure. Moreover, despite some internal variation, this strategy seems oriented towards early ages, at the expense of social investment later in life. This is the case especially for a subgroup of countries in this cluster (e.g. Hungary and the Czech Republic). The coverage dimension is similar to the red cluster, not featuring in this cluster either, although there are three exceptions with higher coverage than the rest of countries (i.e. Estonia, Latvia and Lithuania).

Figure 2. Clusters of countries across expenditure, life-course orientation and coverage of social investment before the financial crisis (2004-2008)



*Note: the scatterplots for component 2 and component 3 are in Annex 2.
Source: authors' own data.*

During the recession following the financial crisis, in the period 2009-13 (see Figure 3, p. 24), the clusters are still defined markedly by the level of overall expenditure on social investment. However, the life-course orientation becomes more prominent than in the previous period to define clusters.

The blue cluster includes the Scandinavian countries and most of the continental welfare regime countries (i.e. Austria, Germany, Luxembourg and the Netherlands). It is characterised by high expenditures on social investment, with no other notable features linked to the other two components, as in the previous period. Its members are quite widespread along the life-course and coverage components. The countries in this cluster are all characterised by high levels of expenditure on social investment overall, but they do not share common features in terms of life-course orientation or coverage of social investment. Denmark is still a positive outlier in terms of expenditure.

The red cluster is composed of a mix of southern countries (i.e. Portugal, Spain, Italy, Greece, Malta and Cyprus), some northern and continental countries (i.e. Ireland, Belgium and France) and some Central and Eastern European countries (Slovenia, Estonia and Poland). Low-to-medium expenditures on social investment and a low tendency to invest in early ages are features of this cluster, which is between the other two for the expenditure component, but the weakest in life-course orientation. The cluster is not set apart by coverage of social investment, which varies significantly within the cluster and is similar to other clusters. The green cluster, composed of several Central and Eastern European countries, has on average the lowest expenditure on social investment. Yet, it is distinct from the previous ones because it puts a greater emphasis on social investment in early life ages. The coverage component is on average higher than for the previous clusters but this plays a minor role in distinguishing them, given the high overall dispersion of the countries regarding this component. Despite their low effort on overall social investment expenditure, countries in this cluster show a good level of investment in early ages.

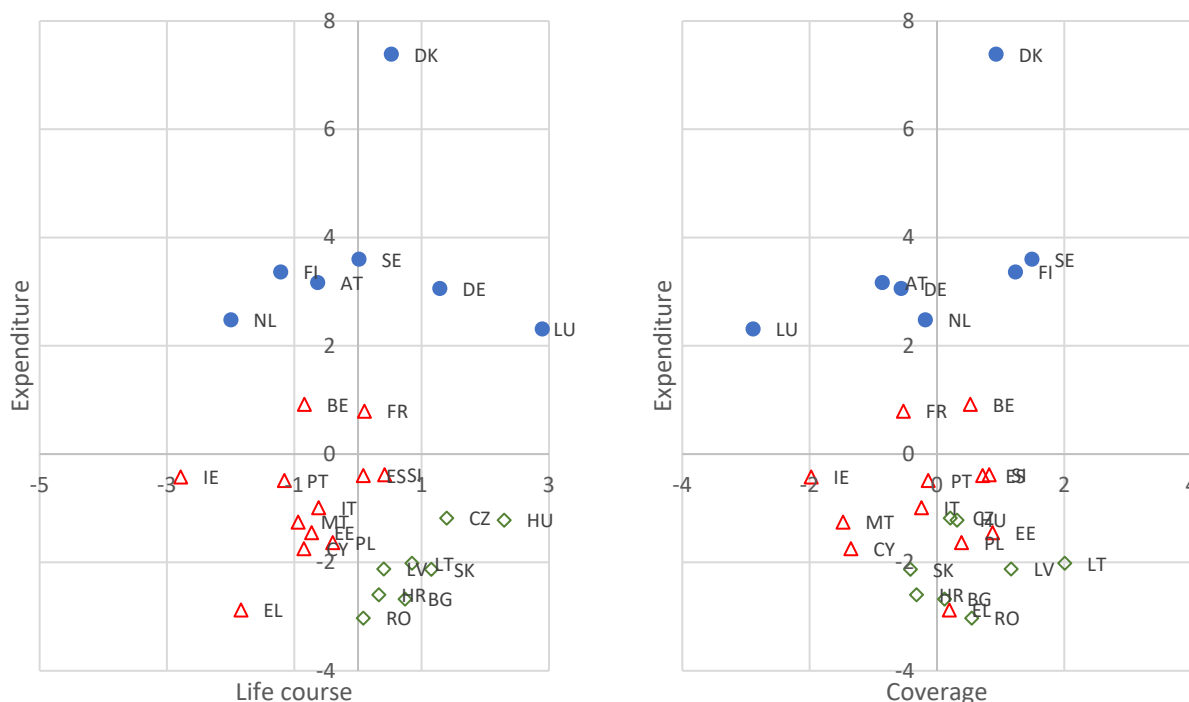
After the crisis (2014-18), the definition of the clusters based on life-course orientation, in addition to the overall expenditure, is more pronounced. Also, the coverage component becomes a more relevant feature of the clusters (see Figure 4). One cluster is again very different from the other two mainly because of the expenditure component. The other two clusters, however, are clearly distinguished in terms of life-course orientation and coverage in this period.

The three Scandinavian countries and those with a continental welfare regime (i.e. Austria, France, Germany, Belgium, the Netherlands and Luxembourg) belong to the first cluster (i.e. blue), which is characterised, as in the other periods, by a high level of expenditure on overall social investment. Countries in this cluster are homogeneous in terms of high expenditure, with Denmark still being an outlier.²³ By contrast, although it has on average an intermediate level in comparison with the other clusters, the life-course orientation of social investment does not clearly feature among the countries in this cluster. Some of the countries in this cluster show a life-course orientation towards early ages (i.e. Luxembourg, Germany and Sweden), but only moderately so in the other countries. In the Netherlands there is very little orientation towards early ages.

²³ If there is an outlier, it is assigned to the closest group to avoid a 'single-country' cluster and keep a balance between maximising the 'distinctiveness' of clusters in terms of their characteristics with the number of countries in each cluster. For more details, see the methodological note in Annex 1.

Meanwhile, the coverage dimension is a common feature of this cluster, because all countries show quite high/middle scores of the coverage component, with only one clear negative outlier (i.e. Luxembourg).

Figure 3: Clusters of countries across expenditure, life-course orientation and coverage of social investment during the crisis period (2009-2013)

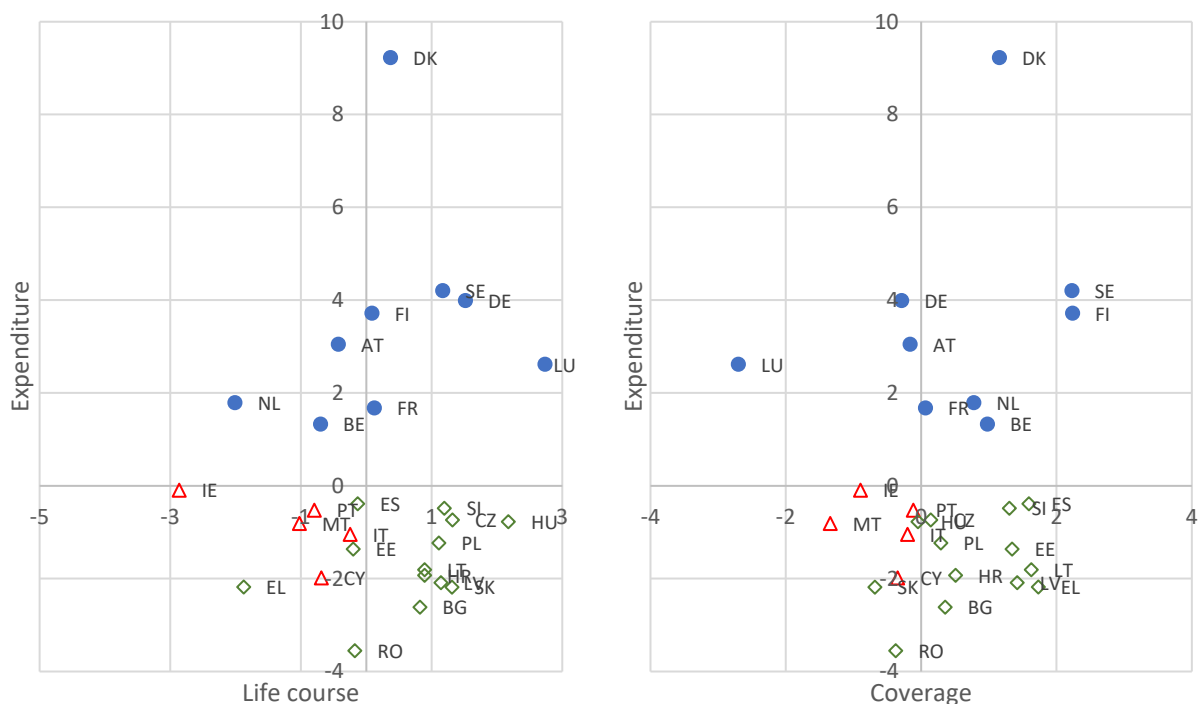


*Note: the scatterplots for component 2 and component 3 are in Annex 2.
Source: authors' own data.*

A second cluster, the red one, is characterised by low-to-medium expenditure on social investment overall and by a lack of life-course orientation towards early ages. Moreover, this cluster has sparse coverage of social investment, placing last for this component. It includes a mix of countries composed of some southern European countries (i.e. Italy, Portugal, Malta and Cyprus) and Ireland, which exhibits a limited approach to social investment in all its dimensions after the crisis.

The green cluster includes some southern countries (i.e. Spain and Greece) and all Central and south-eastern European countries (i.e. Croatia, Slovenia, the Czech Republic, Slovakia, Poland, Estonia, Lithuania, Latvia, Romania, Bulgaria and Hungary). It is characterised, even more markedly than the previous one, by low expenditure on social investment overall. However, its distinct feature is a stronger bent towards social investment in early ages rather than in later life, despite Greece being a negative outlier on this dimension. Furthermore, in comparison with the red cluster, this one shows wide coverage of social investment, with only two exceptions that have lower values on the coverage component (i.e. Slovakia and Romania).

Figure 4: Cluster of countries across expenditure, life-course orientation and coverage of social investment after the crisis (2014-2018)



Note: the scatterplots for component 2 and component 3 are in Annex 2.

Source: authors' own data.

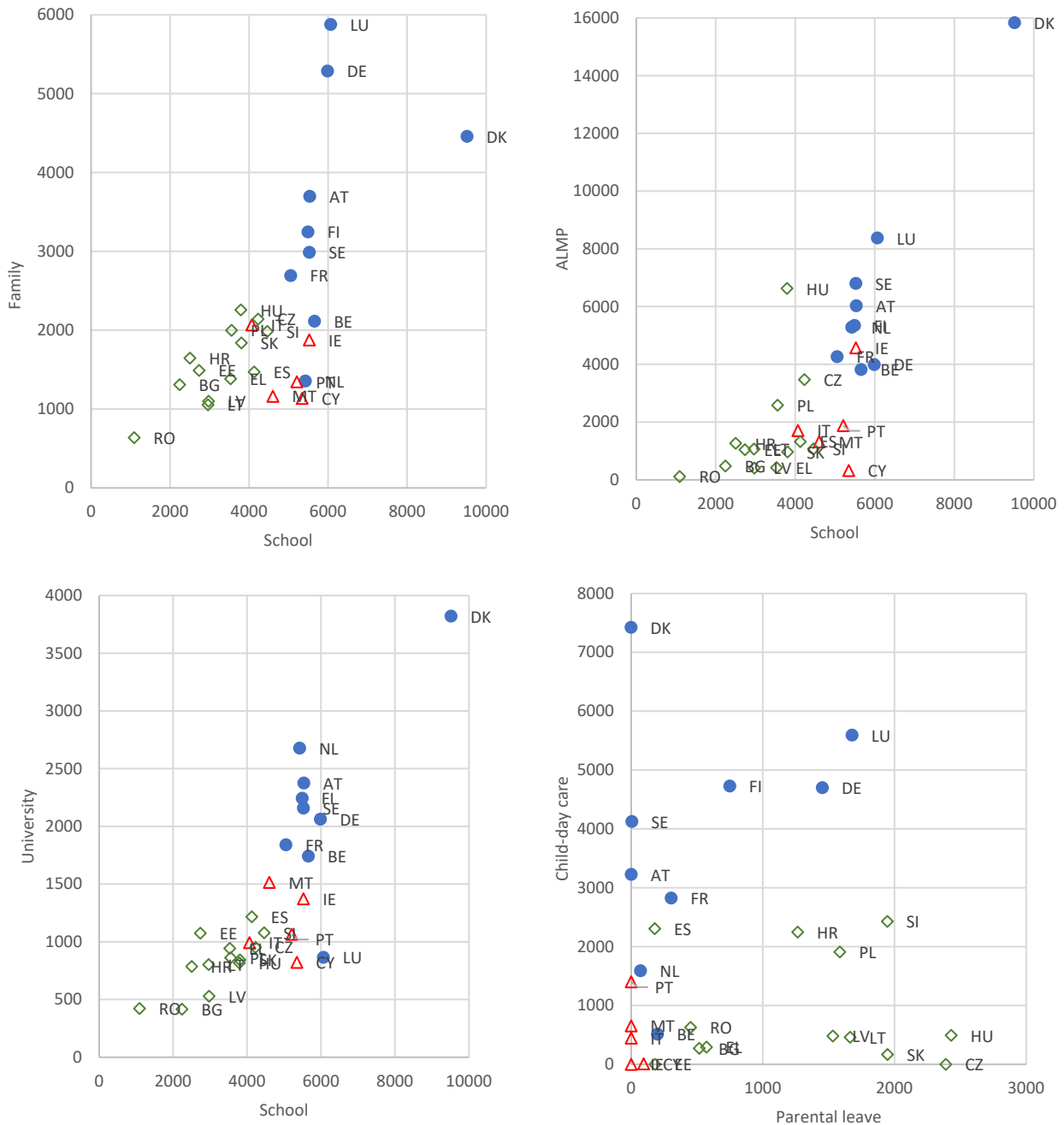
From the cluster analysis, it is apparent that the types of social investment strategies in the EU-27 member states evolved quite substantially over the 15-year period. Before the crisis, the three types of social investment strategies that had emerged were based uniquely on the level of overall expenditure on social investment. Then, during and after the crisis, two out of three clusters of countries gradually differentiate in terms of life-course orientation and coverage, which become marking features of social investment strategies, besides overall expenditure. During the crisis, one group of countries has a strategy that remains clearly characterised by high expenditure. Of the other two groups with lower expenditure, one is more oriented than the other towards investment in early ages. After the crisis, the blue cluster characterised by higher expenditure is also notable for the extensive coverage of social investment, whereas the red cluster, which exhibits relatively low overall expenditure and less orientation towards investment early in life also has a low level of coverage. The green cluster is characterised by even lower expenditure, but it is oriented towards early rather than later ages and has a high degree of coverage of social investment.

4.2 Social investment strategies after the crisis

To better characterise the clusters revealed in the analysis based on the principle components, it is useful to look at the behaviour of selected policy variables within and across clusters. These are the policy variables underlying the components, and they directly pertain to the social policy pillars (i.e. families and children,

education and working age). Focusing on the last period, after the crisis, this step of the analysis describes more in detail the social investment strategies adopted by countries in the three clusters (see Figure 5).

Figure 5. Trade-offs in social investment expenditure across different policy areas after the crisis (2014-2018)



Source: authors' own data.

The countries in the blue cluster are those that spend the most on all core areas of social investment, such as overall family policy, school and ALMPs. With the sole exception of Luxembourg, this cluster also shows the highest expenditure at the university level. Denmark is outstanding in almost all areas of social investment displayed by the variables considered in Figure 5. There is further internal variation in the cluster

regarding variables for the family and children pillar of social investment. Belgium and the Netherlands have moderate overall family expenditure, while Luxembourg, Germany and Denmark stand out in this area. This variation is specifically reflected in childcare and in parental leave expenditures. Belgium and the Netherlands have low levels of expenditure on both policy areas, while Luxembourg and Germany are distinguished for both. Despite these exceptions, the majority of countries in the blue cluster are characterised by high expenditure on childcare services but limited investment in cash benefits for parental leave.²⁴

The fact that almost all countries in the blue cluster appear to be the best performers in each of the individual areas of expenditure analysed (except for parental leave) contributes to explaining why this cluster is not characterised by a clear life-course orientation through the cluster analysis based on principle components. More specifically, the countries in this cluster, in spite of some exceptions, have a type of social investment strategy that seems balanced and well developed for all areas of social policy throughout the life course. Moreover, these countries tend to have strategies of social investment for early ages that is more oriented towards service provision, rather than parental leave, albeit with exceptions. Since it reflects a holistic approach, with high levels of coverage on average, the social investment strategy adopted by countries in this cluster can be labelled as 'all-in'.

The green and the red clusters appear to lag behind the all-in cluster in all scatterplots in Figure 5. Yet, these two clusters differ in several aspects. The countries in the red cluster have more or less the same level of overall family expenditure as the countries in the green cluster. However, and despite some exceptions, the red cluster has on average higher expenditure at the school and university levels than the green cluster. Four out of five countries (i.e. Ireland, Portugal, Italy and Malta) in this cluster also have slightly higher expenditure on ALMPs than the majority of the countries in the green cluster. Indeed, on average, the red cluster has higher expenditure on ALMPs. Nonetheless, expenditure on ALMPs is quite heterogeneous in both the red and green clusters. The majority of countries in the red and green clusters have low expenditure on this policy area, but there are a few outstanding exceptions in both clusters.

By contrast, the green and red clusters are clearly distinguished in terms of investment in childcare and parental leave. Countries in the red cluster have very limited expenditure on both cash benefits for parental leave and childcare services, while the green cluster is skewed towards high expenditure on parental leave. Several countries in the green cluster have high expenditure on parental leave and low expenditure on childcare services, and others have high expenditure on parental leave and intermediate levels on childcare. Spain is an exception: it has an intermediate level of expenditure on childcare and almost none on parental leave. Finally, a subgroup of countries in the green cluster has low expenditure on both areas and seems close to the countries in the red cluster.

The high expenditure on cash benefits for parental leave drives the life-course orientation towards early ages in the green cluster. The limited investment in both childcare services and parental leave in the countries belonging to the red cluster helps to explain why the social investment strategy in these countries is characterised by a life-course orientation of social investment at older ages, rather than early in life. This

²⁴ For detailed information about expenditure data for parental leave, see [chapter 6 of the ESSPROS 2019 manual](#).

attention on older ages is mostly supported by more expenditure on school and university, which is higher in this cluster than in the green one, and not by investment in the working-age population through ALMPs. The latter is similar in both the red and green clusters, and does not seem to be a feature for either of the two.

Given these features, the strategy for social investment adopted in the countries belonging to the red cluster can be labelled as ‘stripped down’. This tag does not necessarily refer to the overall level of expenditure on social investment, which is, on average, more or less intermediate vis-à-vis the other two clusters (Figure 4). It recalls, instead, the limited levels of coverage (Figure 4), on the one hand. On the other hand, it underlines the priority of expenditure on a traditional, consolidated, overall essential policy area characterising social investment in this cluster. Namely, the countries in this cluster distinguish themselves from the green ones because of their expenditure in education, which can be seen as the most well-established area of social investment (Figure 5). At the opposite end, these countries appear to put little effort into social investment policy areas addressing new social risks, like parental leave or childcare for work–life balance, child development or ALMPs to prevent long-term unemployment.

By contrast, the social investment strategy characterising countries in the green cluster can be labelled as the ‘sprouting-up’ approach. This refers to the increase of overall social investment expenditure by several countries in this cluster over the last two decades and the significant levels of coverage that this strategy reaches (Figure 2; Figure 3 and Figure 4). However, importantly, it also points to the prominent orientation of expenditures towards early ages, specifically through parental leave (Figure 5), rather than policies targeting older ages like education (especially university) and ALMPs.

4.2.1 Institutional design features and social investment strategies

To complete the identification of the social investment strategies, the cluster analysis is complemented by an account of the institutional design features of social investment policies in EU member states by cluster. The focus is on the last period under consideration. The indicators in Annex 3, describing the institutional features of social investment policies (i.e. for families and children, education and working age), are crossed with the attributes of each cluster in terms of expenditure, life-course orientation and coverage.

As explained more in detail below, while countries in the all-in cluster seem to share a number of similarities in institutional design, for the stripped-down and the sprouting-up clusters it is much more difficult to find common design features of social investment policies. This helps to understand the greater variation that the two clusters display in terms of expenditure and coverage variables.

All-in cluster

Within this cluster, two subgroups of countries can be identified when looking at the institutional design of the family and children pillar. On one side, Germany, Finland, Sweden, Denmark, France, Belgium and Luxembourg are characterised by universal access to childcare facilities from an early age, as well as generous leave policies. On the other side, Austria and the Netherlands do not guarantee universal access to childcare,

but have a generous leave system. Focusing on one of the cluster's key aspects, care services, Denmark, Finland, Germany and Sweden guarantee access as a legal entitlement to all children from the age of one, which explains the high enrolment rate in childcare services and the high expenditure on care. In Sweden and Finland, attendance is compulsory. France, Luxembourg and Belgium guarantee a place in childcare from the age of 3. Access to childcare is a legal entitlement and in France and Luxembourg it is also compulsory. In all countries, except for Finland, access to childcare is free of charge from the age of 3. By contrast, in Austria and the Netherlands there is no legal entitlement to ECEC but it is compulsory and free of charge for participation from the age of 5. This feature partially explains the lower expenditure on childcare, in comparison with other countries in the same cluster.

Differences in the two subgroups also concern leave policies, with Austria and the Netherlands having the most generous maternity leave with 16 weeks, followed by France and Germany (14 weeks), Finland (13 weeks) and Sweden, Denmark and Belgium (10 weeks). With respect to paternity leave, the first subgroup (except for Germany and Luxembourg) is characterised by longer (more than 10 days) and more generous (above sick-pay level) provisions. By contrast, Austria, the Netherlands, Germany and Luxembourg guarantee less than 10 days of paternity leave, which is paid less than sick-pay level (except for the Netherlands). Almost all countries in this cluster present gender-balanced (at least 2 months of non-transferable leave) and generous (above sick pay) parental leave.

Looking at the second pillar of social investment, education, in terms of free and compulsory education, this cluster is in line with the others. The duration of compulsory education varies between 8 years in Austria and Belgium, 9 years in Sweden, the Netherlands and Luxembourg, 10 years in Finland and Germany and 11 years in Denmark. Concerning non-compulsory tertiary education, a first group, composed of the Scandinavian countries plus Germany and – in part – Austria, is characterised by universal free access to tertiary education and extensive coverage of needs-based and universal grants to students enrolled in university. In the case of Denmark, Finland, Sweden and Germany, no tuition fee is paid, while only a marginal percentage of students (less than 25%) pay a fee in Austria. This explains the comparatively high degree of intervention of these countries in terms of budgetary effort on tertiary education. By contrast, in France, Belgium, Luxembourg and the Netherlands, access to tertiary education is not free, the majority of students pays a fee when enrolled and student grants are guaranteed to less than 50% of the students.

For the third social investment pillar, working age, the all-in cluster strictly requires strict availability to work as associated with activation measures, which indicates demanding and systematic activation of the unemployed. This is the case for all countries except Finland and Luxembourg. All countries also have severe sanctions for jobseekers repeatedly refusing a job offer (except for Germany and Austria).

Stripped-down cluster

For the first pillar on families and children, this cluster is characterised by no guaranteed access to childcare services for early ages (0-3), and no legal entitlement to access ECEC even at later ages, which explains the lowest budgetary effort in childcare and low enrolment rates. The only exception is represented by Portugal, which guarantees access to childcare facilities from the age of 3 as a legal entitlement. Also in terms of

parental-leave policy design, all countries are characterised by low replacement rates (less than 70% of previous earnings, i.e. below sick-pay level, in Italy and Portugal and 0% in Ireland, Malta and Cyprus) and short leave durations. Similarly, all countries in this cluster, with the exception of Portugal, are characterised by limited paternity leave. Indeed, all countries guarantee less than 10 working days of paternity leave, except Portugal (25 working days) and Cyprus (14 working days). In terms of maternity leave, countries in this cluster do not present common features. While Italy has one of the longest periods covered (17.4 weeks) across all EU member states, Portugal has one of the lowest (6 weeks).

Moving to the second pillar, education, the design features in this cluster are overall in line with the other two clusters. Indeed, Italy and Cyprus guarantee 8 years of free compulsory education, Cyprus and Malta guarantee 9 years and Ireland 11 years. Yet, with respect to tertiary education, we can identify two main subgroups. Cyprus and Malta do not have tuition-free access to university but guarantee wide coverage of both needs-based and universal grants. Meanwhile, Ireland, Italy and Portugal figure among the countries with the highest annual fees for tertiary education.

Finally, with respect to the third pillar of social investment, working age, there is not a coherent pattern across member states in this cluster. As an example, Italy and Malta have the strictest measures when it comes to job-seeker activation, monitoring during participation in ALMPs, and sanctions for those who refuse a job offer or training activities. Cyprus, Portugal and Ireland have far less strict activation measures.

Sprouting-up cluster

This cluster displays high internal variation in the institutional design of social investment policies, in almost all policy areas. In the first pillar on families and children, access to childcare services differs significantly across countries. For instance, Estonia, Latvia and Slovenia have a legal entitlement to access services free of charge when a child turns 1.5 years old (Estonia and Latvia) or 9 months old (Slovenia). Poland, Hungary, the Czech Republic and Spain guarantee a legal entitlement to free (except for the Czech Republic) access to pre-primary school at the age of 3. Access to ECEC is not guaranteed in Slovakia and only from the age of 4 in Greece and 5 in Bulgaria and Romania. Also with respect to leave policy, which becomes a key feature of this cluster, qualitative indicators reveal a significant variation across countries. Estonia, Slovenia, Poland, Lithuania and Latvia have generous paternity and parental leave and at the same time high replacement rates and long durations for maternity leave. Spain also has generous paternity and maternity leave policies but scant parental leave. The Czech Republic and Hungary provide for long, paid maternity and parental leave, but for short paternity leave. Slovakia, Croatia, Greece, Bulgaria and Romania have very generous maternity leave policies (with long durations and high replacement rates, except for Greece and Croatia), but very restricted paternity and parental leave.

For the second pillar of social investment, namely education, the qualitative indicators on school show design features in line with the other countries. With the exception of Bulgaria, which guarantees the lowest number of years in compulsory education (7), and Lithuania (10), all other countries in this cluster guarantee between 8 and 9 years of compulsory education. There is more internal variation in relation to tertiary education. Greece is the only country guaranteeing free access to university, which also explains the high enrolment

rate and one of the highest expenditures on tertiary education within the cluster. Indicators for annual student fees show that these are average, with the majority of countries in this cluster having a high percentage of students (>50%) paying tuition fees, except for the Czech Republic, Estonia, Hungary, Latvia, Slovakia and Lithuania. With respect to needs-based grants, with the sole exception of Spain, none of the other countries covers a significant share of students.

Finally, a fragmented picture also appears in the third pillar of social investment, working age. Certain features of the institutional design of ALMPs appear to be very different in these countries. As an example, Estonia, Romania and the Czech Republic have in place established systems of such policies, with strong activation measures for jobseekers and sanctions for those refusing job offers or training opportunities. By contrast, countries like Bulgaria, Latvia, Hungary and Greece have loose activation measures.

5. Concluding remarks

To contribute to the debate on social investment and inform future policy developments, this paper identifies three types of social investment strategies that emerged in the EU-27 over a 15-year period, from 2004 to 2018. It documents their development, looking at expenditure and coverage in three policy areas: families and children, education and working age. In addition, the paper zooms in on the last period and characterises the social investment strategies through key policy variables and institutional design features that make up the normative resources in place to guarantee social rights for families and childcare, education and training, and ALMPs. Overall, five main messages can be drawn from the analysis.

First, study of the evolution of clusters before, during and after the crisis shows that in terms of policy outputs, over time social investment strategies differentiated in a progressively complex way. While in the first period the strategies differed mostly in terms of overall expenditure on social investment areas, additional features came to characterise the social investment strategies during and, more markedly, after the crisis. This may suggest that the attention given to social investment over the last decade is leading countries to reorient their welfare policies. And this is happening in a more complex fashion than simply shifting expenditure towards social investment areas *tout court*. This is consistent with the emergence of varieties of social investment strategies and confirms the importance of understanding their specificity and their outcomes.

Second, analysis of the clusters identified in the period after the crisis, points to three types of social investment strategies in the EU-27 (Figure 6, p. 34):

- 1) By looking at policy outputs, one social investment strategy (i.e. 'all-in'), adopted by countries with a Nordic and continental welfare state regime, has a holistic and inclusive approach to social investment. This strategy consists of investing in all policy areas of social investment targeting a broad range of new social risks, for both early and old ages, guaranteeing high coverage and focusing on service provision for childcare.
- 2) Another social investment strategy (i.e. 'stripped down'), identified by looking at policy outputs, was applied by several southern European countries and Ireland. It is characterised by a liberal welfare regime, but all four countries applying it were hit hard by the financial crisis. This strategy entails medium levels of overall expenditure on social investment and quite low coverage. Social investment is focused on traditional areas of public expenditure, such as education. Investment at early ages is low, in terms of childcare services and parental leave, and investment at the working-age stage of life is not remarkable either. This typifies a life-course orientation of this strategy towards older rather than early ages, where 'older ages' stands for those in schools and universities, rather than individuals already in the labour market.
- 3) Finally, another strategy of social investment in terms of policy outputs (i.e. 'sprouting up') was adopted by Central and Eastern European countries, together with Spain and Greece. This strategy

involves limited overall expenditure on social investment areas, but with broader coverage. Moreover, through high in-cash expenditures on parental leave, this strategy has a life-course orientation towards early ages to address specific, new social risks, such as work–life reconciliation.

These strategies all have different combinations and degrees of the three features of social investment identified by Vandenbroucke and Vleminckx (2011). Namely, the strategies display different levels of effort in capacitating expenditure; give attention to all, none or some specific new social risks; and show a preference for either services or in-cash benefits.

The third point refers to the cluster composition after the crisis vis-à-vis the traditional welfare regime classification (Figure 6). The analysis shows a convergence of Nordic and continental welfare states towards a similar, well-developed strategy of social investment considering the entire life course and focusing on service provision for early ages, despite some internal variation. Meanwhile, countries with southern welfare regimes diverge in their strategies. This group, together with Ireland (which has a liberal welfare regime), exhibits limited development in terms of social investment and a strategy based mainly on education. The other southern countries are clustered with Central and Eastern European countries in a strategy that, even if diversified, has limited overall expenditure on social investment and a marked orientation towards early ages, through expenditure on parental leave. This seems to point to an evolution in the welfare regimes. Further research in this area might lead to a reclassification of countries looking beyond a recalibration between social protection and social investment, and accounting for the specific measures of social investment and the risks targeted.

The fourth point emerging from the analysis is that there is significant internal variation within the clusters, and thus in the social investment strategies identified by looking at policy outputs. Throughout the analysis, outliers and subgroups of countries have been recognised, based on both quantitative and qualitative matrices. On the one hand, this indicates that fully-fledged homogenous strategies have not yet formed in well-defined groups of countries in the EU-27. On the other hand, it leaves room to further develop the empirical investigation of EU social investment strategies.

Finally, a fifth point relates to the institutional design features of the social investment strategies. Although countries adopting an all-in social investment strategy are frontrunners in policy design, there is significant heterogeneity in the institutional design features in several social investment policy areas within each of the clusters (Figure 6). Moreover, while there is often a correspondence between institutional design features in social investment policies and policy outputs, such as expenditure and coverage, that is not always the case. This translates into a heterogeneity of normative resources that constitute social rights related to families and childcare, education and training, and employment across the EU and even within groups of countries that display similar patterns of policy outputs. This suggests that in practice different policy designs, especially in terms of normative resources, can lead to the same policy output and *vice versa*. At the same time, it calls for further research in merging two streams of literature that focus respectively on comparative policy analysis and empirical investigation of policy output trends, to better understand how these two dimensions interact. Such investigation could benefit from the analysis of additional resources, like

instrumental and enforcement powers, if in place in the areas that pertain to social investment, as such resources could also have an impact on both the policy output patterns and overall social outcomes of social investment policies.

Figure 6. Summary of investment strategies after the crisis (period 2014-2018) and country clusters

All-in strategy	Stripped-down strategy	Sprouting-up strategy
- High expenditure in all main areas of social investment	- Medium overall expenditure in main areas of social investment	- Low/medium overall expenditure in main areas of social investment
- Medium/high coverage	- Low/medium coverage	- Medium/high coverage
- Best performers in all single areas of expenditure throughout the life course	- Social investment orientation towards later ages, especially through school and university	- Social investment orientation towards early ages rather than later in life
- On average, high expenditure for childcare services vs parental leaves	- Low expenditure for childcare services and parental leave benefits	- On average, higher parental leave in-cash expenditure vs childcare services
- Universal approach to Family & Children policies: free of charge access; legal entitlement; support for both single and dual-earner households	- Mean-tested approach to Family & Children policies: preference of family benefits over childcare and no legal entitlement to ECEC; support for single-earner household	- Mixed approach to Family & Children policies: preference of family benefits over childcare in majority of member states and no legal entitlement to ECEC (with exception of Baltic countries)
- Universal approach to Tertiary Education: tuition free; well-developed system to support students enrolled	- Mixed approach to Tertiary Education: tuition free in some member states; low support to students enrolled in tertiary education	- Means-tested approach to Tertiary Education: tuition fee and low support to students enrolled in tertiary education
- Universal approach to Work-age policies: ALMPs for both unemployed and employed; stringent activation policies	- Means-tested approach to Work-age policies and ALMP only for jobseekers	- Mixed approach to Work-age policies

Source: authors' own data.

Overall, this paper can provide a reference for further research aimed at explaining differences in outcomes of social investment across Europe, for example in terms of education, employment, skills, gender equality, poverty and inequalities. This is particularly relevant in the aftermath of the Covid-19 crisis. Acknowledging the differences in social investment strategies of European countries before the current crisis could prove helpful in explaining differences in the outcomes and assessing resilience.

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Annex 1. Methodological note

Data sources and specification

Eurostat and the Directorate-General for Employment, Social Affairs and Inclusion were the two data providers for the analysis. Table A1.1 reports the specific tables and variables used for each function as well as their specifications. As explained in the data and methodology section below, all the items of expenditure were used to calculate budgetary effort in terms of the target population of each area of social investment. Items of expenditure were accessed in national currency and then standardised to 2005 prices and harmonised with the purchasing power parities (PPPs) index. The final consumption expenditure of the general government was selected as a national account indicator for the 2005 price index, and government services as an analytical category for the PPP index. All budgetary efforts used general population statistics for the age category targets of specific policies, but for social investment under the working-age pillar, the unemployed population was used.

For expenditure on families and children, the subcomponents of childcare and parental leave were selected from the in-kind and in-cash benefit categories, respectively. In the case of parental leave, the sum of both periodic and lump-sum benefits was taken.²⁵ Turning to education statistics, all the indicators relied on two different series due to a break in statistics and a change in classification from the International Standard Classification of Education (ISCED) 1997 to ISCED 2011. The categories almost fully overlapped with a few additional breakdowns provided by the ISCED 2011 classification. For pre-primary education, category 02 in ISCED 2011 corresponded to category 0 in ISCED 1997, while for tertiary education, categories 5, 6 and 7 in ISCED 2011 corresponded to category 5 in ISCED 1997, and category 8 in 2011 to category 6 in 1997. For school, primary, secondary and upper-secondary were considered to be covered by ISCED categories from 1 to 4. Gross enrolment rates were calculated using the number of students in the same ISCED categories applied to expenditure, and with the same target population identified for the budgetary effort.

Finally, for the working-age pillar, the total expenditure on labour market policy (LMP) measures (i.e. active policies, categories from 2 to 7) was taken, together with the expenditure on LMP services (i.e. public employment services, category 1), and within LMP measures, the subcomponent of training (category 2).

The final indicators selected for the analysis (see Annex 2, Table A2.1) provided a good overall coverage with a few gaps for specific years, which were estimated with interpolation and extrapolation based on information available for the previous and following years. For country-specific cases with missing information for different years and where estimates based on interpolation and extrapolation were not reliable, values were estimated using a mixed approach relying on the previous literature on clusters of EU countries by social investment developments (Bouget et al., 2015).

²⁵ For detailed information, see chapter 6 of the ESSPROS 2019 manual <https://ec.europa.eu/eurostat/documents/3859598/10295301/KS-GQ-19-014-EN-N.pdf/e7c8c019-944c-1c71-ae5-1ffc8ce45200?t=1575969094000>.

Table A1.1. Detailed overview of data sources and data series specifications

Area	Function	Data Source	Table Code	Table Name	Last year available	Series name and specifications	Target Population of SI
Family & Children	Family	EUROSTAT – ESSPROS	spr_exp_ffa	Tables by benefits - family/children function	2017	Expenditure in social protection benefits	0-19
	Child-day care	EUROSTAT – ESSPROS	spr_exp_ffa	Tables by benefits - family/children function	2017	Expenditure in child day care	0-4
	Parental leave	EUROSTAT – ESSPROS	spr_exp_ffa	Tables by benefits - family/children function	2017	Expenditure in parental leave benefits (periodic and lump sum)	0-4
	Pre-primary	EUROSTAT – EDUC	educ_figdp	Expenditure on education as % of GDP or public expenditure ⁽¹⁾	2011	Expenditure in pre-primary education (ISCED 02) ⁽³⁾	0-4
			educ_uoe_fine02	Public educational expenditure by education level ⁽²⁾	2016		
	Pre-primary (enrolment rate)	EUROSTAT – EDUC	educ_enrl1tl	Students by ISCED level, age and sex	2012	Number of students in pre-primary education (ISCED 02) ⁽³⁾	0-4
educ_uoe_enra02			Pupils and students enrolled by education level, sex and age	2018			
Education	School	EUROSTAT – EDUC	educ_figdp	Expenditure on education as % of GDP or public expenditure ⁽¹⁾	2011	Expenditure in primary (ISCED 1), secondary (ISCED 2), and upper-secondary (ISCED 3-4) education	5-19
			educ_uoe_fine02	Public educational expenditure by education level ⁽²⁾	2016		
	School (enrolment rate)	EUROSTAT – EDUC	educ_enrl1tl	Students by ISCED level, age and sex	2012	Number of students in primary (ISCED 1), secondary (ISCED 2), and upper-secondary (ISCED 3-4) education	5-19
			educ_uoe_enra02	Pupils and students enrolled by education level, sex and age	2018		
	University	EUROSTAT – EDUC	educ_figdp	Expenditure on education as % of GDP or public expenditure ⁽¹⁾	2011	Expenditure in tertiary education (ISCED 5-8) ⁽⁴⁾	20-34

Area	Function	Data Source	Table Code	Table Name	Last year available	Series name and specifications	Target Population of SI
			educ_uoe_fine02	Public educational expenditure by education level ⁽²⁾	2016		
	University (enrolment rate)	EUROSTAT – EDUC	educ_enr1tl	Students by ISCED level, age and sex	2012	Number of students in tertiary education (ISCED 5-8) ⁽⁴⁾	20-34
			educ_uoe_enra02	Pupils and students enrolled by education level, sex and age	2018		
Work-age	ALMP	DG EMPL	Imp_expsumm	LMP Expenditure by type of action	2018	Expenditure in LMP measures (categories 2 to 7)	20-64 (unemployed)
	PES	DG EMPL	Imp_expsumm	LMP Expenditure by type of action	2018	Expenditure in LMP services (category 1)	20-64 (unemployed)
	Training	DG EMPL	Imp_expsumm	LMP Expenditure by type of action	2018	Expenditure in LMP measure: Training (category 2)	20-64 (unemployed)
	Adult learning participation to education and training (rate)	EUROSTAT – EDUC	trng_lfse_01	Participation rate in education and training (last 4 weeks) by sex and age	2018	Participation rate for age category 25-64	25-64
Background	Population	EUROSTAT – DEMO	demo_pjangroup	Population on 1 January by age group and sex	2018	Age categories for target populations of budgetary effort and enrolment rates	NA
	Unemployment	EUROSTAT – LABOUR	une_rt_a	Unemployment by sex and age	2018	Adjusted LFS series of unemployed population, age category 20-64	NA
	GDP at market prices	EUROSTAT	nama_10_gdp	GDP and main components (output, expenditure and income)	2018	GDP current prices Mio NAC	NA
	Price index 2005	EUROSTAT	nama_10_gdp	GDP and main components (output, expenditure and income)	2018	Price index 2005=100 NAC, National Account Indicator: Final consumption expenditure of general government	NA

Area	Function	Data Source	Table Code	Table Name	Last year available	Series name and specifications	Target Population of SI
	PPP Index EU27	EUROSTAT	prc_ppp_ind	Purchasing power parities (PPPs) ⁽⁵⁾	2018	Purchasing power parities (EU27_2020=1), Analytical categories for PPS: Government Services	NA

Notes: (1) Expenditure on education before 2012 was taken as a % of GDP and converted in levels using GDP at market prices.

(2) Full name: public educational expenditure by education level, programme orientation, type of source and expenditure category.

(3) Category 0 under the ISCED 1997 classification corresponds to category 02 under the ISCED 2011 classification.

(4) Category 5 under the ISCED 1997 classification corresponds to categories 5, 6 and 7 under the ISCED 2011 classification, while category 6 in 1997 corresponds to category 8 in 2011.

(5) Full name: purchasing power parities (PPPs) price level indices and real expenditures for ESA 2010 aggregates.

Source: authors own compilation

Estimation

Interpolation and extrapolation were used to estimate missing years for those data series not covering the entire timeframe under analysis, as well as for country–year specific gaps. If available, also information between 2000 and 2003, and therefore previous to the starting date of the analysis (i.e. 2004), was used to rely on a longer time series and better estimate countries' trends.

For some specific country-indicator situations, where several years were missing and the estimation was based on interpolation and extrapolation and thus was not reliable, values were estimated using a mixed approach relying on the previous literature on clusters of EU countries by social investment developments (Bouget et al., 2015). First, the clusters identified in Bouget et al. (2015) were considered; second, for all the available years, the country's values were compared with the average of its cluster; and third, missing years were estimated by applying the differential between the country vis-à-vis its cluster calculated for the available years to the average of the cluster for the missing years. This approach was applied to Denmark for expenditure on pre-primary education for the years 2012-18; to Luxembourg for expenditure on university education for the period 2004-11, for 2013 and for 2017-18; and to Croatia for expenditure on pre-primary, school and university education for the years 2012-18.

Clusters assessment

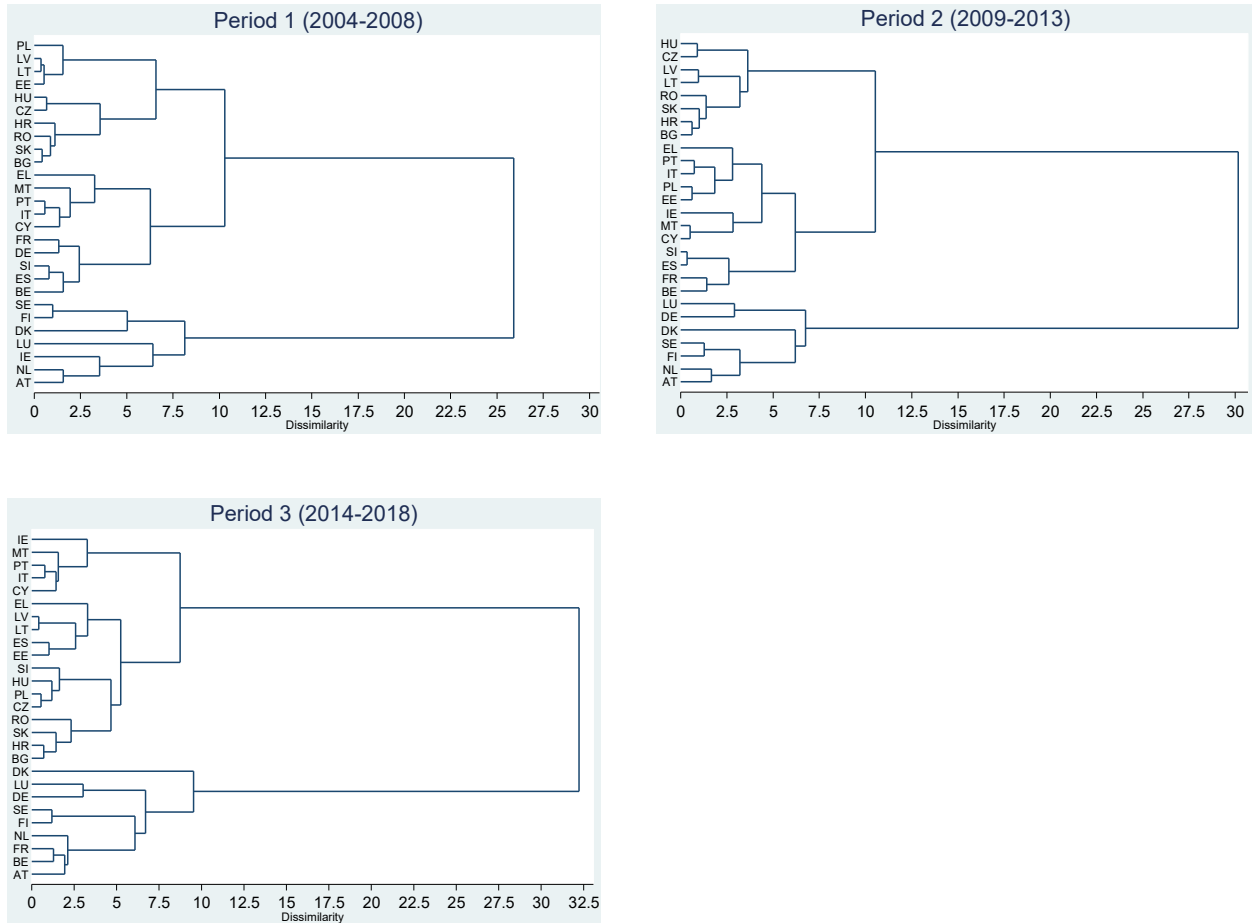
After running the hierarchical cluster using Ward's linkage method, dendrograms were analysed to assess the most suitable number of clusters in each period, their relative distance to each other in terms of characteristics, and the possible presence of outliers. The end goal, in fact, was to strike a balance between the distinctiveness of clusters in terms of characteristics vis-à-vis the number of countries belonging to each cluster, to avoid a possible comparison between a 'single-country' cluster and a wide cluster with more than half of the countries under analysis.

In other words, since the main aim of clustering algorithms is to maximise the distinctiveness of the cluster solution, independent of the types of data or scope of the research, the presence of an outlier would lead the algorithm to assign the first cluster to that observation, and therefore force large groups of countries together that would otherwise be distinct enough to create separate clusters in the other periods analysed.

This is the case of Denmark in the third period (Figure A1.1). Looking at the three dendrograms, it is clear that the first split down the tree takes place at a dissimilarity of approximately 10 in each period (the red dashed line), which assigns countries to three main clusters. However, in the last period, Denmark becomes a clear outlier, and this time its node (the black dashed line) slightly overcomes the main one used in the other two periods (red dashed line). Moreover, Denmark is still clearly closer to

the same cluster identified in the previous two periods than to the rest; therefore, it makes sense to assign it to the same cluster again and keep the overall three-cluster structure.

Figure A1.1. Dendrograms and clusters by period



Source: authors' own compilation.

Annex 2. Detailed results

Table A2.1. Components' eigenvalues and share of variance explained

	Eigenvalue	Variance explained
1	6.604	50.8%
2	1.622	12.5%
3	1.411	10.9%
4	.806	6.2%
5	.696	5.4%
6	.527	4.1%
7	.391	3.0%
8	.271	2.1%
9	.209	1.6%
10	.186	1.4%
11	.142	1.1%
12	.072	0.6%
13	.063	0.5%

Source: authors' own calculations

Table A2.2. Kaiser-Meyer-Olkin (KMO) test of sampling adequacy for each variable and overall

Variable	KMO test
Families	0.72
Child-day care	0.85
Parental leave	0.46
Pre-primary	0.82
Pre-primary (enrolment rate)	0.61
School	0.82
School (enrolment rate)	0.88
University	0.83
University (enrolment rate)	0.41
ALMP	0.91

PES	0.82
Training	0.84
Adult learning participation	0.84
Overall	0.81

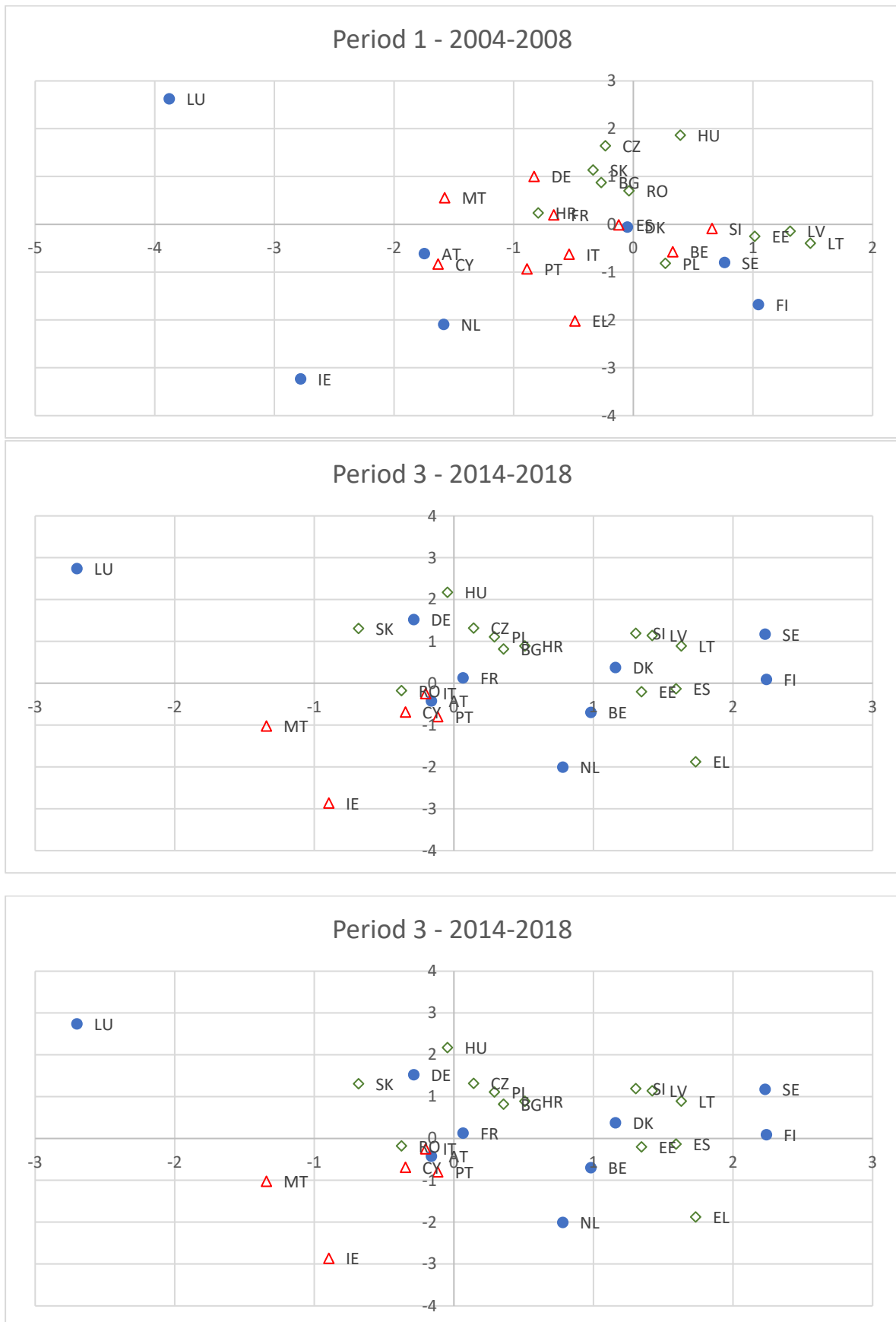
Source: authors' own calculations

Table A2.3. Mean and standard deviation of each component by period and cluster

Period	Cluster	Component 1		Component 2		Component 3	
		Mean	sd	Mean	sd	Mean	sd
2004 - 2008	1	3.04	1.95	-0.84	1.86	-1.18	1.84
	2	-0.45	1.25	-0.33	0.86	-0.58	0.73
	3	-2.11	0.60	0.49	0.90	0.28	0.76
2009 - 2013	1	3.62	1.72	0.13	1.64	-0.12	1.52
	2	-0.83	1.07	-0.80	0.88	-0.18	0.97
	3	-2.12	0.66	0.91	0.71	0.45	0.80
2014 - 2018	1	3.51	2.39	0.32	1.37	0.48	1.51
	2	-0.89	0.71	-1.12	1.01	-0.58	0.52
	3	-1.64	0.92	0.65	1.02	0.71	0.83

Source: authors' own calculations

Figure A2.1. Scatterplots for component2 (y-axis) and component 3 (x-axis) in the three periods



Source: authors' own calculations.

Table A2.4. Mean and standard deviation of each variable by cluster - Pre-crisis Period 2004-2008

Pillar	Variable	Clusters				
		1	2	3		
Family & Children	Families	Mean	3398	1739	1236	
		sd	1543	903	520	
	Childcare	Mean	3017	1051	366	
		sd	2245	1050	405	
	Parental leave	Mean	326	395	1267	
		sd	507	570	690	
	Pre-primary	Mean	2340	2436	2302	
		sd	1336	1149	557	
	Pre-primary (enrolment rate)	Mean	50.6	53.7	59.6	
		sd	21.1	14.0	9.2	
	Education	School	Mean	6229	4758	3044
			sd	888	605	775
School (enrolment rate)		Mean	93.5	89.1	85.2	
		sd	6.0	8.6	5.4	
University		Mean	2169	1260	749	
		sd	837	334	167	
University (enrolment rate)		Mean	19.2	17.9	19.9	
		sd	8.8	4.9	5.4	
Work-age	ALMP	Mean	8659	2473	788	
		sd	3607	1458	489	
	PES	Mean	2294	807	393	
		sd	1468	563	238	
	Training	Mean	2920	1022	196	
		sd	1386	698	150	
	Adult learning participation (rate)	Mean	16.4	7.3	4.5	
		sd	7.7	3.5	2.2	

Source: authors' own calculations

Table A2.5. Mean and standard deviation of each variable by cluster - Crisis Period 2009-2013

Pillar	Variable	Clusters			
		1	2	3	
Families and children	Family	Mean	3795	1591	1542
		sd	1493	509	640
	Child-day care	Mean	4037	844	411
		sd	1647	923	352
	Parental leave	Mean	469	369	1762
		sd	577	602	960
	Pre-primary	Mean	3524	1799	2356
		sd	1332	761	588
	Pre-primary (enrolment rate)	Mean	64.6	53.4	61.1
		sd	11.0	16.5	7.6
Education	School	Mean	6137	4715	3017
		sd	587	852	917
	School (enrolment rate)	Mean	94.0	90.3	84.8
		sd	6.0	8.8	4.4
	University	Mean	2342	1208	792
		sd	774	315	247
	University (enrolment rate)	Mean	21.5	20.4	20.7
		sd	8.1	4.4	4.4
Work-age	ALMP	Mean	7004	1744	801
		sd	2153	1142	782
	PES	Mean	2343	541	278
		sd	1373	503	214
	Training	Mean	2397	675	111
		sd	1667	606	88
	Adult learning participation (rate)	Mean	19.2	8.1	4.2
		sd	8.3	3.2	2.6

Source: authors' on calculations

Table A2.6. Mean and standard deviation of each variable by cluster – post-crisis period, 2014-18

Pillar	Variable	Clusters				
		1	2	3		
Family & Children	Family	Mean	3524	1518	1563	
		sd	1470	428	475	
	Child-day care	Mean	3857	503	899	
		sd	2093	577	943	
	Parental leave	Mean	496	19	1282	
		sd	653	43	813	
	Pre-primary	Mean	3428	1547	1989	
		sd	1173	763	738	
	Pre-primary (enrolment rate)	Mean	77.7	51.2	71.3	
		sd	17.2	13.4	13.6	
	Education	School	Mean	6030	4949	3231
			sd	1342	603	941
School (enrolment rate)		Mean	95.1	88.8	85.3	
		sd	9.3	9.1	4.3	
University		Mean	2198	1154	827	
		sd	793	284	247	
University (enrolment rate)		Mean	22.4	19.1	21.0	
		sd	7.0	3.5	6.2	
Work-age	ALMP	Mean	6637	1960	1603	
		sd	3743	1581	1768	
	PES	Mean	2484	588	431	
		sd	1826	817	459	
	Training	Mean	2273	790	212	
		sd	1300	759	155	
	Adult learning participation (rate)	Mean	18.9	8.4	6.3	
		sd	8.2	1.0	4.2	

Source: authors' own calculation

Robustness checks

As explained in the methodology, the choice of hierarchical over k-means clustering was taken based on two main reasons: first, the number of clusters was not known while it must be specified *ex ante* when using k-means; and second, hierarchical clustering returns structured results (in the form of a dendrogram), which enable a better interpretation of the results.

The analysis carried out on hierarchical clustering identified three clusters in each of the periods within the scope. Thanks to the structured form of the results, it has allowed identification of one outlier in the last period. A robustness check comparing unstructured results from a k-means clustering can therefore be run by indicating three as the *ex ante* number of clusters.

The k-means method, however, also requires specifying the starting points (i.e. centroids) for assigning observations to different clusters. A first check is performed using the centroids obtained from the hierarchical analysis, therefore taking a hybrid approach. The idea is in fact to overcome the two main limitations posed by the k-means (i.e. *ex ante* specification of the number of clusters and sensitivity of the results to an initial random selection of centroids) while also improving computation speed and possibly enhancing the partitioning defined by the hierarchical clustering.²⁶ In this analysis, computation speed does not represent a significant problem given the very low number of observations, but the sensitivity of k-means results to initial centroids is always present.

Assigning the centroids obtained from the hierarchical clustering leads to very similar results in each period. In the first period, Ireland is placed in the red cluster and Greece in the green cluster when using the k-means. The results are identical for the second period, while in the third period Greece is placed in the red cluster in the k-means clusters. In brief, the differences concern only two countries and two periods. Moreover, these differences reflect similar changes across periods reported by the hierarchical clustering. Ireland, for instance, is placed in the red cluster in the second period in the hierarchical, while it is in the red cluster from the first period in the k-means. In both hierarchical and k-means, Ireland belongs to the red cluster in the third period.

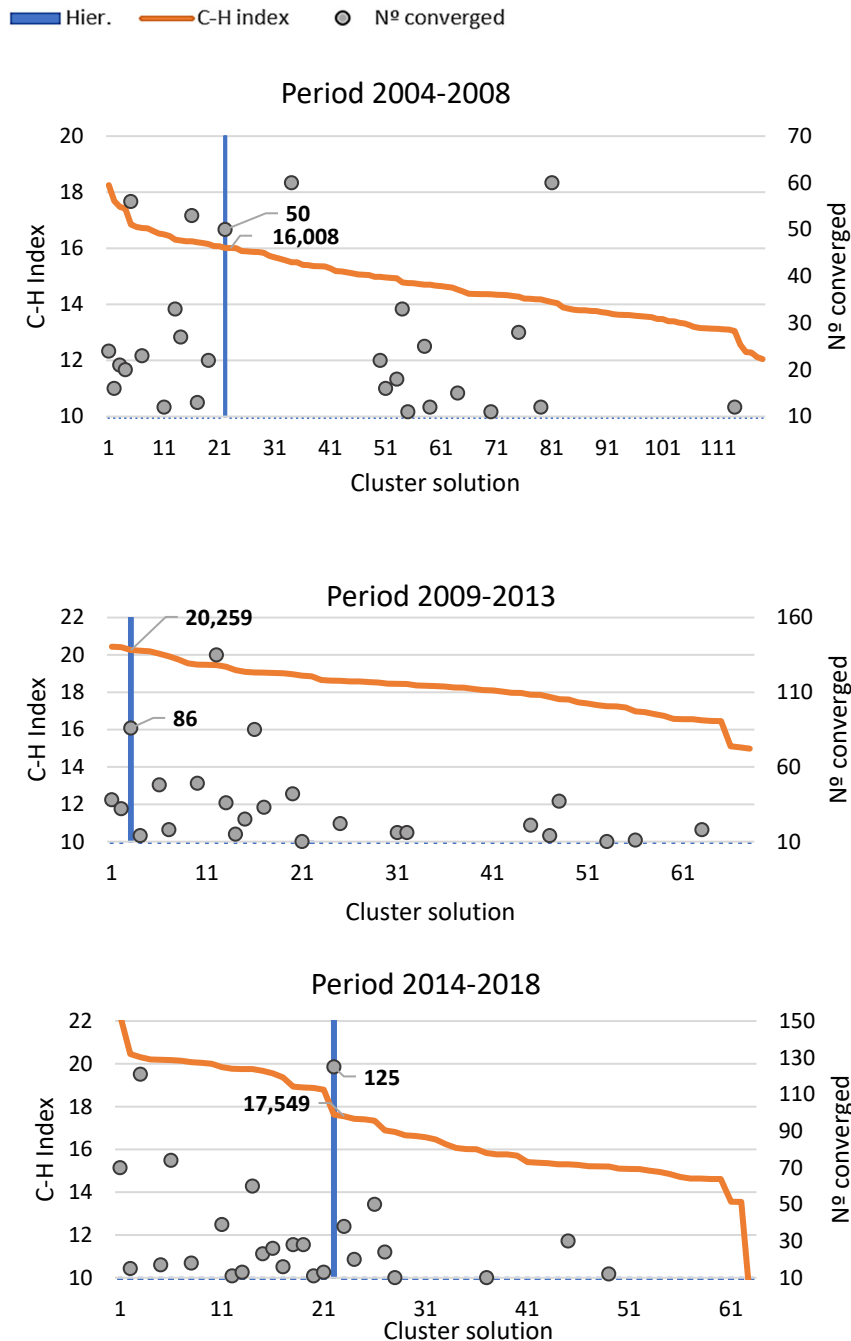
Finally, a further check is run leaving the choice of the centroids to be random and testing for 1,000 iterations to compare different cluster solutions at different starting points with those obtained from both the hierarchical clustering and the hybrid solution tested using the centroids of the hierarchical clustering. Results from the random k-means are then assessed in terms of both the number of times a specific cluster solution converged and its overall fit as indicated by the Calinski-Harabasz test.²⁷ The solutions obtained with the random k-means that reflect the hierarchical grouping are always in those that converged the most out of the 1,000 iterations tested, being in the top five for each period (Figure

²⁶ See <https://www.datanovia.com/en/lessons/hierarchical-k-means-clustering-optimize-clusters/>; see also <https://www.rdocumentation.org/packages/factoextra/versions/1.0.7/topics/hkmeans>.

²⁷ The Calinski-Harabasz index is the ratio of the sum of the between-cluster variance and within-cluster variance: the higher the score, the better the overall performance.

A2.2). In terms of the Calinski-Harabasz test, they never perform more than 20% worse than the first solution, with the second period being the closest. For the third period,²⁸ instead, the best-performing solution found in the random k-means is the one creating a single-country cluster with Denmark, which confirms the difficulty of controlling for outliers with unstructured cluster results provided by the k-means method.

Figure A2.2. Robustness check with k-means random centroids



Source: authors' own calculations.

²⁸ The solution most similar to the one identified in the hierarchical cluster differs only with regard to Greece and Romania being allocated to the second red cluster instead of to the third green cluster.

Annex 3. Indicators for the qualitative analysis

Table 1. Detailed overview of data sources and data series specifications

Area	Function	Data Source	Indicator name	Values	Last year available
Family & Children	Childday care/Pre-primary	EURYDICE	Age from which a place in ECEC is guaranteed (either legal entitlement or compulsory enrolment)	Early age (0-3); Around 3-4; Last two years (5-6); No guaranteed place	2017
	Child-day care	EURYDICE	Weekly ECEC hours, by type of guarantee	Part-time (up to 20 h/week); School-time (20-29 h/weeks); Full-time (> 30 h/weeks)	2018 -2019
	Child-day care	EURYDICE	Childcare free of charge	Paid provision; Provision free of charge	2018 -2019
	Child-day care	EURYDICE	Average monthly fees for ECEC for children under 3 years old	High (more than 500 PPS); Medium (between 250 and 500 PPS); Low (between 100 and 250 PPS); Very low (less than 100 PPS); No data available	2018 -2019
	Child-day care	EURYDICE	Range of criteria used when offering fee reductions or priority admission in centre-based settings for children under age 3	Values from 1 (low targeted policy) to 9 (highly targeted policy)	2018 -2019
	Pre-primary school (3-5)	EURYDICE	Pre-primary free of charge	Paid provision; Provision free of charge	2018 -2019
	Parental leave	MISSOC/ Leave Network	Replacement rate	0 – 100% based on previous earnings; flat rate	2019

Area	Function	Data Source	Indicator name	Values	Last year available
	Parental leave	MISSOC/ Leave Network	Duration	Number of paid months	2019
	Maternity Leave	MISSOC/ Leave Network	Replacement rate	0 – 100% based on previous earnings; flat rate	2019
	Maternity Leave	MISSOC/ Leave Network	Duration	Number of paid weeks	2019
	Paternity Leave	MISSOC/ Leave Network	Replacement rate	0 – 100% based on previous earnings; flat rate	2019
	Paternity Leave	MISSOC/ Leave Network	Duration	Number of paid days	2019
Education	School	EURYDICE	Duration of compulsory ISCED 1-2	Number of years of free of charge compulsory education	2019
	University	EURYDICE	Tuition fees vs free access	Percentage of first-cycle full-time home students paying annual fees above EUR 100	2018/2019
	University	EURYDICE	Coverage of need based or universal grants	Most common annual fees in first-cycle higher education, among full-time home fee-paying students progressing normally <i>through</i> their studies	2018/2019
Work-age	ALMP	OECD	Availability for work during participation in ALMPs	Value from 1 (no strictness) to 5 (very strict)	2017
	ALMP	OECD	Job-search requirements and monitoring during participation to ALMPs	Value from 1 (no strictness) to 5 (very strict)	2017

Source: authors' own compilation