

Variety of responses to the COVID-19 pandemic crisis among the OECD countries. Does it reproduce the old patterns?

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Abstract

Phenomenon of the COVID-19 pandemic affected global economy and societies in tremendous way – it rearranged our work routines and social interactions, it affected global value chains and business strategies. However, also response to the COVID-19 challenge provided by governments all over the world has no precedent. The main objective of the research is to verify the hypothesis about the existence of systemic differences between OECD countries in terms of their economic and political responses to the COVID-19 economic challenge. After identification of potential classification of approaches to the COVID-19 pandemic, new typology is compared with existing typologies of capitalism, business systems and welfare states. Research is conducted with application of few methods of cluster analysis. Preliminary results suggest that it is possible to distinguish various strategies of dealing with the COVID-19 economic consequences but demarcation lines significantly differ with previous studies of welfare states and capitalistic systems.

Keywords:

welfare state, corporate welfare, public policy, cluster analysis, COVID-19 pandemic

JEL:

C38, H12, H50, H84, I38

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1. Introduction

The first case of the COVID-19 disease in Europe was reported on 24 January 2020 in France, only few weeks after the first alarming information about the new pneumonia of unknown origins coming from China¹. Seventeen months later we have no doubts that current pandemic is an unprecedented event, not faced by the global society for decades. According to WHO, more than 150 million people worldwide have been infected and nearly 3.2 million people have died from the new disease caused by the SARS-CoV-2 virus².

Phenomenon of the COVID-19 pandemic affected global economy and societies in tremendous way – it completely rearranged our work routines and social interactions, it affected global value chains and business strategies. Finally, pandemic had important political implications. However, also response to the COVID-19 challenge provided by governments all over the world has no precedent – stimulus packages were extremely generous and granted without hesitation. Measures announced only during the first two months of the pandemic reached 10 trillion USD and were three times higher than response to the financial crisis from 2008 (Cassim *et al.*, 2020).

From the scientific point of view, the pandemic can be also considered as an interesting example of dilemma and potential trade-off between social and health policies on the one hand and economic measures supporting entrepreneurs on the other. Countries with well-organized and efficient health care systems and relatively healthier societies were presumably not affected by the COVID-19 so severely as countries with underfinanced and badly maintained health sector. In consequence, we can expect that limitation of the economic activities in these countries was also relatively less far-reaching and long-lasting. Therefore, we can assume that also supportive measures granted to entrepreneurs by governments of these countries could be less extensive. However, if this is true, it would be a natural result of high health and social spending from periods preceding an outbreak of the pandemic. If we define all benefits and services that directly, or indirectly, meet the needs of business as a corporate welfare (Farnsworth, 2013), then the COVID-19 pandemic can be analyzed as an example of dilemma between social and corporate welfare priorities.

¹ Access online at: <https://www.ecdc.europa.eu/en/covid-19/timeline-ecdc-response> on May 3, 2021.

² Numbers from May 2, 2021. Access online at: <https://covid19.who.int/> on May 3, 2021.

The main objective of the research is to verify the hypothesis about the existence of systemic differences between OECD countries in terms of their economic and political responses to the COVID-19 challenge. After identification of potential classification³ based on the variety of approaches to the COVID-19 pandemic, new typology is compared with existing typologies of capitalism, business systems and welfare states. Among others, also classification of corporate welfare states proposed by the author of the research⁴ is considered as a potential reference point. It allows to verify if counteracting strategies applied by the governments to prevent economic crunch are in line with institutional differences identified in past among the OECD countries. As it is suggested by the IMF (2020), the need for extraordinary governmental support during the COVID-19 crisis may partially depend on the existence of automatic stabilizers and social safety nets in pre-pandemic settings. This observation justifies hypothesis that the structure of the COVID-19 economic policy responses is linked to the welfare state or capitalism types identified in the given country.

Article is organized as follows. Second part is devoted for presentation of selected articles from the relevant literature concerning the COVID-19 pandemic. Third part is a theoretical introduction of various typologies of welfare states and varieties of capitalism – it can be treated as an extension of the literature view. Part number four consists of three subsections – they describe respectively data sources, clustering methods applied in the research and statistical indices used for comparison of various classification. Outcomes of the clustering are discussed in the chapter five. Last part is a summary.

2. Literature review

Literature concerning the COVID-19 pandemic and its implications is constantly growing because of the novelty of the phenomenon and its importance. Since we are still tackling with the pandemic, most of the studies is based on incomplete databases, has preliminary character or leads to at best only partial conclusions. However, number of available researches is enormous – there is plenty of questions worth to be asked and myriad of hypothesis deserving to be verified.

For example, Cantillon, Seeleib-Kaiser and van der Veen (2021) prepared a comparison of social policies applied by Germany, Belgium and the Netherlands in response to the COVID-19

³ For the purposes of this document terms such as “classification”, “typology”, “taxonomy” and “clustering” are used interchangeably.

⁴ Respective article is currently proceeded and prepared to publication.

pandemic. All three countries share the same Bismarckian roots but during the last decades they significantly deviated from these origins. The Netherlands has drifted towards the Anglo-Saxon and Nordic models, also Germany and Belgium have witnessed similar changes but in these countries they appeared later. Authors seems to suggest that propensity to use the existing social insurance schemes in order to counteract the pandemic was related to the degree of deviation from the Bismarckian roots. Belgium, currently probably the most Bismarckian welfare state among all considered countries, was also the most prone to base on the existing social systems. Germany, also considered as the Bismarckian welfare state, based supportive measures on the existing system but some improvements and adjustments were introduced. The Netherlands, as the least Bismarckian state, has introduced completely new system.

Demirgüç-Kunt *et al.* (2020a) studied importance of the reopening timing and trajectory for the economic revival and stability. Research concerned the countries from Europe and Central Asia and their reopening strategies after the first wave of pandemic. Interestingly, high-frequency data on electricity consumption was used as a proxy for the level of economic activity. Authors provided evidence that countries adopting a gradual and deliberate reopening policies experienced stronger economic recovery. Moreover, it seems that level of trust in government is also a significant determinant of successful reopening of the economy. Additionally, there are also reasons to believe that provision of the objective information and overall transparency reduce the fear and uncertainty, resulting in more robust and faster recovery.

Noteworthy, article prepared by Cassim *et al.* (2020) to some extent can be treated as a predecessor of my research. That study was intended not only to present variety of measures applied by governments to support citizens and business during the COVID-19 crisis, but also to assess how particular policies will affect welfare and economic development of particular countries. Authors distinguished groups of liberal-market economies, coordinated-market economies and emerging-market economies – they claimed that we can observe differences among policies and perspectives of countries representing each of these groups. For example, according to the findings, liberal-market economies spent much higher part of the total rescue packages in form of direct transfers and loans while coordinated-market economies were focused mostly on guarantees.

In a similar vein, Alon, Farrell and Li (2020) were interested in a dichotomy between democracy and authoritarianism – the goal of their article was to present differences between political responses to the pandemic challenge provided by governments representing these two major political systems. From the theoretical point of view such comparison does not have to be straightforward and obvious. Democracies are considered to be more transparent but their pluralistic nature result in slower decision-making processes. On the other hand, authoritarian regimes are characterized by hindered flow of information and untrustworthy public media but internal political processes are at the same time much faster because of absence of any checks and balances. Alon, Farrell and Li describes examples of China and Taiwan to conclude that in general democracies occurred to be superior to authoritarian regimes in dealing with the pandemic. However, they appreciate also other important factors differentiating countries such as cultural origins of the country.

Taking into account goal of my research, it is also worth to mention recent report prepared by authors connected with the Polish Economic Institute (Błoński *et al.*, 2021). Important part of that study concerns classification of the European countries according to the severity of the pandemic and severity of the restrictions imposed by particular governments in 2020 in response to the pandemic. In order to capture volatility in these two dimensions, authors use four variables and apply hierarchical cluster analysis. In consequence, they identify four clusters of countries: “hard-hit, hard-locked”, “from bad to worse”, “lucky losers” and group of outliers (it consists of two countries – Sweden and Luxembourg). Report includes also few other interesting elements, most notably examples of measures applied to combat COVID-19 crisis and three potential scenarios for the future. However, these parts are less relevant for my research.

Aforementioned articles provide a justified conjectures that strategies applied by particular governments to deal with the COVID-19 crisis are not uniform. On the basis of those studies we can expect that institutions and overall political culture are differentiating responses provided to the pandemic challenge by particular countries. It directly corresponds to the main goal of my research.

3. Worlds of welfare states and variety of capitalistic systems

Objectives of my research make it also necessary to refer to the literature concerning welfare states typologies and variety of capitalistic systems. Esping-Andersen (1990) has unleashed the debate regarding the types of welfare states when he distinguished three words of the welfare capitalism. During the next decades there emerged numerous studies that were challenging or developing classification proposed by Esping-Andersen (e.g. Leibfried, 1993; Ferrera, 1996; Bonoli, 1997; Korpi & Palme, 1998; or Bambra, 2007a).

Esping-Andersen (1990) in his seminal work has proposed a typology composed of three ideal types of welfare states – although it was not the first attempt to classify existing types of welfare states, his tripartite classification became a crucial reference point for any study in the field of research focused on social policies (Powell, Yörük, Bargu, 2020). Original classification proposed by Esping-Andersen was based on the concept of decommodification, social stratification and welfare mix. According to Esping-Andersen we can distinguish liberal, conservative and social-democratic welfare states.

Shortly after the publication of Esping-Andersen's work in 1990, there appeared numerous papers testing the proposed typology – summaries prepared by Bambra (2007b), Isakjee (2017) or Powell, Yörük and Bargu, (2020) are examples of comprehensive literature reviews of these studies. The first strand of critique undermines the validity and completeness of the group of countries analyzed by Esping-Andersen. He did not consider post-socialist countries, similarly as the Mediterranean countries and countries representing potential Confucian model of the welfare state. Other authors were criticizing Esping-Andersen's typology because of understatement of the gender importance (Bambra, 2007a) or omission of the health and education issues (Bambra, 2007b). What is important, classification proposed by Esping-Andersen was also criticized from the methodological perspective – conclusions regarding the countries' classification were drawn from the comparison of means and standard deviations of the decommodification index, which was a serious limitation of the Esping-Andersen's research.

Article written by Leibfried (1993) shortly after the signing of the Maastricht treaty is often enumerated among the first studies in the strand of the literature commenced by Esping-Andersen. The main goal of the Leibfried's paper was to consider perspectives of the further

integration of the European Union into uniform European welfare state. As an important part of his study, Leibfried discussed four welfare regimes that he identified in Europe: the Scandinavian countries were called by Leibfried a modern welfare state, the “Bismarck” countries such as Germany and Austria were described as an institutional welfare state, the Anglo-Saxon countries exemplified a residual welfare state and finally the “Latin rim” countries represented a rudimentary welfare state. Leibfried was skeptic about the perspectives of the unite European welfare state. He concluded that in his opinion all welfare and poverty policies will be maintained at the local or state (sub-European) level. However, he believed that Europeanization of health systems and work safety nets might be slightly easier.

The main goal of the article written by Ferrera (1996) was to highlight specificity of the southern welfare states and to identify typical characteristics of countries accounted to this group. Ferrera did not form southern welfare regime in any formal way, he simply claimed that countries such as Greece, Portugal, Italy and Spain significantly differ in many aspects from United Kingdom, Germany, Sweden and all other countries present in traditional classifications. He claimed that southern system is characterized by highly fragmented (polarized) system of income maintenance, more universalistic approach to the health care, limited presence of the state in the welfare area and persistence of the clientelism.

Bonoli (1997) pointed out that previous attempts to classify welfare states were mostly single-dimensional – literature of the Anglo-Saxon tradition was focused on the quantitative dimension of welfare policies while European authors provided models more concentrated on the structure of welfare provision. However, according to Bonoli both dimensions are important – level of expenditures on the one hand and the way of financing and delivering social services on the other. Therefore, Bonoli combined two classical approaches and proposed a two-dimensional classification of the welfare states. It was the main value added of his article. Two-dimensional approach allows to control developments in social policy in two different dimension – firstly, it gives an opportunity to track potential convergence of welfare states towards a median model of social protection and secondly, it allows to observe expansion and contraction of welfare provisions. As a result of the two-dimensional classification, Bonoli obtained four groups of welfare states (British, Nordic, Southern and Continental). His results correspond with previous researches.

Classification proposed by Korpi and Palme (1998) is rather single-dimensional in the meaning of approach defined by Bonoli. Authors have thoroughly analyzed the institutional structure of old-age pension schemes and sickness cash benefits in eighteen countries. Analysis was focused on three aspects of two selected social institutions – the definition of entitlement, the principle of determination of benefit levels and the forms of governing of given social programs. In result they established five ideal-types of welfare states: targeted model, voluntary state-subsidized model, corporatist model, basic security model and encompassing model. However, when Korpi and Palme have confronted their ideal-types with empirical data, it occurred that only four types are present in reality – they do not identify any real-life example of the voluntary state-subsidized model of welfare states. Interestingly, as a result of their considerations, Korpi and Palme proposed the paradox of redistribution – they claimed that encompassing model providing earning-related benefits also for high-income earners can reduce inequality and poverty much better than targeted or basic security model. This conclusion is based on observation that welfare institutions reflect conflicts of interest among various interest groups but they are also able to shape interests and attitudes of particular social groups. It means that more universal provisions are usually accepted by more citizens, which allows to create bigger supporting coalitions. In result, social policies with broader acceptance are more stable and more generous.

Finally, study by Bambra (2007a) can serve as another example of the research referring to the classical classification proposed by Esping-Andersen. Bambra underscores the importance of the strand of critique of Esping-Andersen masterpiece based on the feministic perspective. She claims that tripartite classification proposed by Esping-Andersen and most of successive classifications of welfare states omit the analysis of the role of gender. In order to fill this gap Bambra applies a concept of defamilisation, which should be understood as the extent to which the welfare state enables women to survive as independent worker and decreases her reliance on the family. In the study defamilisation is approximated by three variables – relative female labour participation, maternity leave compensation and compensated maternity leave duration. What is important, hierarchical cluster analysis and *k*-means method are applied to identify clusters of welfare states differentiated with their approach to defamilisation. Outcomes obtained by Bambra suggest existence of five clusters. Moreover, because of mixed results obtained with various modeling specifications, Bambra decided to treat four countries as unclear cases (Denmark, Ireland, Greece, Spain).

On the other hand there is also a vast strand of the literature concerning the business systems and types of the capitalism (first and foremost Hall & Soskice, 2001 but also Amable, 2003, Witt *et al.*, 2018 or Rapacki & Czerniak, 2018).

Book written by Hall and Soskice (2010) is perceived to be one of the most influential work in the field of comparative institutional analysis of capitalistic systems and industrial organizations of modern states. Authors distinguished two basic types of economies: liberal market economies and coordinated market economies. Liberal market economies are strongly linked to the price mechanism, competitive markets and competitive arrangements between economic agents – these institutions are crucial for successful coordination of entrepreneurs. In liberal market economies we deal with relatively dispersed ownership and flexible labor markets. Hall and Soskice exemplify this group with countries such as the United States, the United Kingdom, Australia, Canada, New Zealand and Ireland. On the other hand, coordinated market economies consist of firms that rely more on non-market relationships and institutions to solve coordination problems. Countries such as Germany, Japan, Switzerland, the Netherlands, Belgium, Sweden, Norway, Denmark, Finland and Austria are proposed as the examples of coordinated market economies. In these cases we face more incomplete contraction and networks based on the exchange of private information. In coordinated market economies equilibrium is defined by strategic interactions among economic actors, while in case of liberal market economies the equilibrium outcomes stem from the balancing of demand and supply.

Another important work in the field of comparative institutional analysis of capitalism was proposed by Amable in 2003. Amable analyzed existing institutional systems from the point of view of institutional complementarities understood as a mutual reinforcement of efficiency of particular institutions. In such case presence of one solution increases efficiency of another. Amable argued that capitalistic systems should be studied not only as mixtures of various institutions but also taking into account relationships between them. He grouped institutions in five major groups and identified numerous indicators that can serve as reliable proxies of particular institutional dimensions. Finally, he applied principal component analysis and clustering to distinguish five basic models of capitalism existing among the developed countries: the Anglo-Saxon model, the social-democratic model, continental European model, south European model and Asian model. What is interesting, his classification highly overlaps with

those welfare state typologies that included southern type of countries, e.g. Ferrera (1996) or Bonoli (1997).

Paper written by Rapacki and Czerniak (2018) is an example of more recent approach to the classification of capitalistic systems in the European Union. Authors built their study on the framework proposed by Amable (2003) but their main aim was to compare institutional framework of post-communist countries with their Western counterparts. Method of subspace clustering applied in the study is an important and interesting improvement in comparison to the predecessors – it allows to deal with large datasets and multiple institutional dimensions. In consequence, Rapacki and Czerniak were able to consider 132 institutional measures. They grouped these measures into six institutional areas – original list of dimensions analyzed by Amable has been extended by “housing market” area. What is more, Rapacki and Czerniak analyzed changes of institutional frameworks in the European Union between 2005 and 2014 in order to capture potential convergence of the Central and Eastern Europe to other core models observed in the European Union. Depending on the considered dimension, approach applied by Rapacki and Czerniak led to identification of 2-4 clusters that significantly differ from the Amable’s proposition. However, countries of the Central and Eastern Europe seem not to recall their Western counterparts, thus they can be classified as a distinct model of capitalism. Due to the fact that they are a mixture of features that characterize all other models, they can be dubbed a patchwork capitalism model.

Finally, research conducted by Witt and his coauthors (Witt *et al.*, 2018) refers to the seminal book written by Hall and Soskice (2001) as well as to Whitley’s (1999) classification of business systems. While both reference studies are geographically constrained to the most developed countries, Witt *et al.* attempted to classify 61 major economies accounting for almost 94% of global GDP. On the basis of previous literature, authors have selected a set of 48 indicators grouped into eight dimensions. Witt and his coauthors decided to apply hierarchical cluster analysis with average link method to derive clusters of various business architectures. Great diversity of considered countries allowed authors to identify nine distinct types of business systems: highly coordinated, coordinated market, liberal market, European peripheral, advanced emerging, advanced city, Arab oil-based, emerging and socialist economies.

All ten classifications of welfare states and business systems described above are used in this research as a reference point for the typology determined with respect to the differentiation of the responses to the COVID-19 challenge⁵.

Additionally, novel typology of the economic responses to the COVID-19 pandemic is compared with the corporate welfare states classification proposed by the author of this article in his previous study⁶. Preliminary version of the corporate welfare states classification is based on four dimensions. In short, the first dimension differentiates countries with respect to the role of the government, while the second refers to the group of potential beneficiaries of the state support. Third dimension tends to capture structural relations between support provided to business and society. Last dimension is intended to distinguish *de jure* and *de facto* corporate welfare states. Application of cluster analysis allowed to identify four types of the corporate welfare states: liberal advanced, statist advanced, isolated and supportive, and finally emerging corporate welfare states.

4. Methodology

Data sources

Differentiation of the governments' approaches towards the COVID-19 economic crisis has been assessed with application of few variables taken from several databases.

The first database used in the research is Fiscal Monitor Database of Country Fiscal Measures in Response to the COVID-19 Pandemic provided and maintained by IMF Fiscal Affairs Department. Version applied in the research is from April 2021 and it reflects situation as of March 17, 2021. It is probably the best known and complete database that contains data about the structure and the scope of the fiscal stimulus introduced by particular governments. It provides information about the fiscal interventions disaggregated to categories such as additional spending and foregone revenues, accelerated spending and deferred revenue (denoted together as above-the-line measures) as well as liquidity support divided into below-the-line measures (i.e. equity injections, loans, asset purchase or debt assumptions) and contingent liabilities (mostly guarantees). According to IMF (2021) category of the above-the-line measures consists of instruments affecting the fiscal balance of the government – they increase borrowing needs and

⁵ Assignment of particular countries to subsequent types of welfare states is based on Bambra (2007b).

⁶ Forthcoming – paper is currently prepared to publication.

government debt. On the other hand, below-the-line measures allow for creation of assets such as loans or equity. In general they do not entail an immediate budgetary cost and they do not affect fiscal deficit. However, possible defaults of loans or loss in equity may reduce the government's assets in future. Similarly, potential future calls on guarantees may increase public debt.

Additionally, database known as the COVID-19 Economic Stimulus Index was also used as a source of relevant data. This database is provided by the Centre for Economic Policy Research (Elgin *et al.*, 2020) and it comprises data about the economic policy measures adopted by more than 150 countries. What is important, it includes not only fiscal but also monetary and exchange rate measures. Precisely, in the database we can find variables such as a fiscal support (as a percentage of the GDP), interest rate cut (in comparison to the rate valid on the 1st February 2020), the size of the macro-financial package (as a percentage of the GDP), other policy measures (dummy variable that takes value 1 if such measures are present), balance of payment specific measures (as a percentage of the GDP) and other measures of the balance and payment category (dummy variable). On the basis of the collected data authors have constructed a COVID-19 Economic Stimulus Index that occurs to be relatively well associated with the statistics describing median age of the population, the number of hospital beds, GDP *per capita* and the number of total cases. Version of the database used for the clustering is from the 14th February 2021.

In order to capture also regulatory measures applied by particular governments to combat the COVID-19 pandemic, stringency index from the COVID-19 Government Response Tracker was employed. This source is provided by the joint effort of the Blavatnik School of Government and University of Oxford. Entire dataset includes public information on twenty indicators that describe general policies applied by governments (e.g. school closures and restrictions in movements), economic measures (e.g. income support to citizens) and policies from the field of health system. On the basis of these indicators four general indices were created – an overall government response index, a containment and health index, an economic support index and the original stringency index (Hale *et al.*, 2021). For the purposes of my research only original stringency index is used – it allows to capture strictness of restrictions introduced by particular governments in the given moment.

Final database used for clustering includes variables such as stringency index, interest rate cut (as a percentage change from the February 1, 2020), additional spending (as a share of total fiscal response), accelerated spending and deferred revenue (as a share of total fiscal response), below the line measures (equity injections, loans, asset purchase as a share of total fiscal response), contingent liabilities (mostly guarantees as a share of total fiscal response). Variables applied in the research are summarized in the table 1 below. Before the final set of variables has been selected, numerous combinations based on available datasets were tested. Currently, each variable in the final database is intended to capture some dimension of countries' variation – structure of the fiscal package, size of the monetary response, stringency of the regulatory measures.

Unfortunately, databases used in the research do not reflect the state of affairs for the exactly same time – as we can read in the table 1, they reflect the situations from slightly different months. However, this issue should not be treated as a critical hindrance because of two reasons. Firstly, even if time distance between publication of particular databases equals few weeks, such differences are not substantial taking into account the fact that the purpose of my research is to capture some general patterns and trends. Moreover, governments do not announce their policies simultaneously, thus some time-inconsistencies are natural and inevitable. Secondly, minor time-inconsistencies should not be a problem as long as particular variables are measured for all countries in more or less the same time – it means that countries should be comparable in given dimension of (or at least as comparable as possible).

Although databases used in the research are quite comprehensive when it comes to their geographical coverage, for the purposes of this research only 35 old members of the OECD have been taken into account. This decision can be justified on theoretical and practical grounds. Firstly, group of the old OECD members consists of developed countries linked by similar quality of basic institutions, some basic features and attitudes towards legal systems, societies and economies. These patterns may not be so clear and well-established among the newest members of the OECD. Secondly, group of 35 old members of the OECD was also an initial sample used for the creation of corporate welfare states classification. For the sake of comparability of both researches, the same group is considered in this study.

Table 1. Characteristics of the databases

Database	Provider	Variables	Dimension	Version
Fiscal Monitor Database of Country Fiscal Measures in Response to the COVID-19 Pandemic	IMF	1) Additional spending 2) Accelerated spending and deferred revenue 3) Below the line measures (equity injections, loans, asset purchase or debt assumptions) 4) Guarantees and other liabilities (all aforementioned variables as a share of the total fiscal stimulus).	Structure of the fiscal stimulus	January 2021
Database of COVID-19 Economic Stimulus Index	Elgin C., Basbug G., Yalaman A. (2020)	5) Interest rate cut (as a percentage of the ongoing rate on February 1 st , 2020)	Scale of the monetary response	February 2021
COVID-19 Government Response Tracker	Blavatnik School of Government, University of Oxford	6) Stringency Index (average value)	Stringency of the regulatory response	April 2021

Source: Own elaboration

Cluster analysis

In order to achieve objectives of the research, analysis has been divided into two separate steps. First part of the procedure is based on the application of well-known methods of the cluster analysis. This step allowed to verify hypothesis of the existence of systemic differences between economic and political measures provided by the OECD countries as a response to the COVID-19 challenge. Second step of the analysis concerns comparison of the typology derived during the first stage with existing and well-established classifications of welfare states and types of capitalism. Additionally, typology determined as a result of the first step of the analysis was also compared with the novel classification of corporate welfare states proposed by the author of the research.

Cluster analysis is a group of statistical methods allowing to determine a sensible and informative classification of an unclassified data (Everitt & Skrondal, 2010). These methods are based on the analysis of the known parameters of objects included in the given dataset which allows to locate these objects in the multi-dimensional Euclidian space and measure distances between them. Information about the distances between particular objects is a basis to determine clusters.

Typically, we distinguish hierarchical and non-hierarchical methods of the cluster analysis. The former group includes the easiest and the most popular methods of clustering that perform well when datasets are not very large. They differ mostly with the method of measuring of distance between particular objects (e.g. the nearest neighbor method, the average linkage method or Ward's method). More sophisticated methods are known as non-hierarchical clustering and they are based on the unsupervised learning algorithms (e.g. *k*-means method or DBSCAN).

For the purposes of the first stage of the analysis, few subsequent methods of the clustering were applied. Analysis is begun from the simple Ward's method of the hierarchical clustering that allows to look through the basic structure of the data and determine expected number of clusters. This method is an example of agglomerative clustering procedures. It is based on iterative merging of the nearest objects into a new cluster. Initially all objects are treated as separate clusters. In each next stage two nearest objects (individual elements or clusters) are combined into new, larger cluster. Procedure is repeated as long as all objects are members of a single

cluster (Everitt & Skrondal, 2010). Agglomerative clustering requires a specific linkage function – Ward’s approach links objects in a way that minimize the total within-cluster variance. It means that Ward’s method defines the proximity as the increase in the squared error that results when two clusters are merged (Ward, 1963).

Subsequently, non-hierarchical k -means algorithm was applied to derive clusters from the data. This method randomly selects k points as the initial centroids of clusters and assigns each data point to its nearest centroid. In this way k clusters are formed. In the next step centroid of each initially defined cluster is recalculated and all data points are classified again. This procedure is repeated until centroids do not change and particular points do not switch its assignments. Unfortunately, k -means method does not perform well when clusters have non-globular shape or differ in size and density.

Therefore, due to potential atypical shape of clusters also DBSCAN algorithm was used for the purposes of the first stage of the research. Main advantage of this method is its relative resistance to noise and ability to handle with clusters of arbitrary shapes and sizes. DBSCAN is a density-based clustering procedure. In this method center-based approach is used to define density – it means that density is estimated for a particular point by counting all points located in the selected radius from the point of interest (Tan, Steinbach & Kumar, 2013).

Moreover, in order to deal with unclear cases when given object cannot be unambiguously assigned to a single cluster, fuzzy c -means method was applied. This approach is based on the theory of fuzzy sets and it is often presented as a fuzzy version of the k -means method. Fuzzy set theory assumes that each member of the given set has assigned a grade of its membership between 0 and 1 – it allows to deal with uncertainty in different way that the traditional probabilistic models (Everitt & Skrondal, 2010). Algorithm of the c -means method starts with the random assignment of weights to all clustered objects. Weights inform about the partial belonging of the particular observation to all subsequent clusters (they are grades of membership). After the initial assignment of weights a centroid of each cluster is determined and a fuzzy pseudo-partition is recalculated. It means that weights are assigned to all clustered objects again. This process is repeated as long as centroids do not change (Tan, Steinbach & Kumar, 2013).

Comparison of classifications

Second part of the research is focused on the comparison of clustering outcomes from the first stage with the typologies existing in the literature. Consistency of the particular classifications was verified with application of Rand index and Jaccard index.

Rand index is a popular and simple method of assessing similarity of two classifications. It allows to compare results of two clustering processes from the point of view of the consistency of assignment of particular elements from the set (Rand, 1971). In plain words, it can be used to verify if given points are clustered in the same groups in both considered classifications. In practice, it is based on comparison of assignment of all potential point-pairs from the given set. If given point-pair appears in the same group in the first classification and at the same time it is present in one group also in the second classification, we can treat that as a sign of a consistency between two considered classifications. The same is true if given point-pair is placed in different clusters in the first classification and also in the second classification. Inconsistent results include situations when given point-pair is observed in the same group in the first classification and in different groups in the second classification. Number of consistent occurrences determines the value of the Rand index. It can be defined as:

$$R(Y, Y') = \frac{\sum_{i < j}^N \gamma_{ij}}{\binom{N}{2}}$$

where N is a number of clustered data points X_1, X_2, \dots, X_N , while Y and Y' are two distinct clusterings of these data points. Statistics γ_{ij} is equal 1 if in classifications Y and Y' exist clusters k and k' such that both points X_i and X_j are assigned simultaneously to these clusters or if in classifications Y and Y' exist clusters k and k' such that X_i is present in both of them but X_j does not belong neither to k or k' . Otherwise γ_{ij} is equal 0.

Unfortunately, the Rand index allows to determine similarity of classifications composed from the exactly same sets of elements. In case of existing classifications of welfare states and types of capitalism, groups of countries taken into account by their authors varied significantly. It means that the Rand index can be applied to assess similarity of classifications only within the subsamples of countries that are present in both compared assignments.

In order to capture differences between groups of countries considered in particular classifications, the well-known Jaccard index was applied (Jaccard, 1912). This statistics relates number of joint elements of two sets to the sum of these two sets. It can be described as:

$$J(A, B) = \frac{A \cap B}{A \cup B}$$

where A and B are two different sets.

5. Results

Clustering tendency and optimal number of clusters

In order to assess clustering tendency of the standardized data, Hopkins statistic is applied – it allows to verify spatial randomness of data used for the cluster analysis. Hopkins statistic is based on comparison of original data dispersion with sum of distances between random artificial data points. The null hypothesis of the Hopkins test assumes that the data set is uniformly distributed, which means that it does not include any meaningful clusters (distances between data points in the original data set are as large as in the randomly generated sample). Definition of Hopkins statistic applied in the research is as follows:

$$H = \frac{\sum_{i=1}^n x_i}{\sum_{i=1}^n x_i + \sum_{i=1}^n y_i}$$

where y_i is a distance of a given point from the original dataset to its nearest neighbor whereas x_i is a distance of the particular point from the artificially generated data to the nearest neighbor from the actual data. If the value of Hopkins statistic defined as above surpass the threshold of 0.5, we can reject the null and conclude that our database is clusterable. According to Hopkins statistic, standardized data applied for the purposes of the research is weakly clusterable – statistic defined as above hesitates around 0.64.

Also visual inspection of the ordered dissimilarity matrix confirms that data includes some significant clusters.

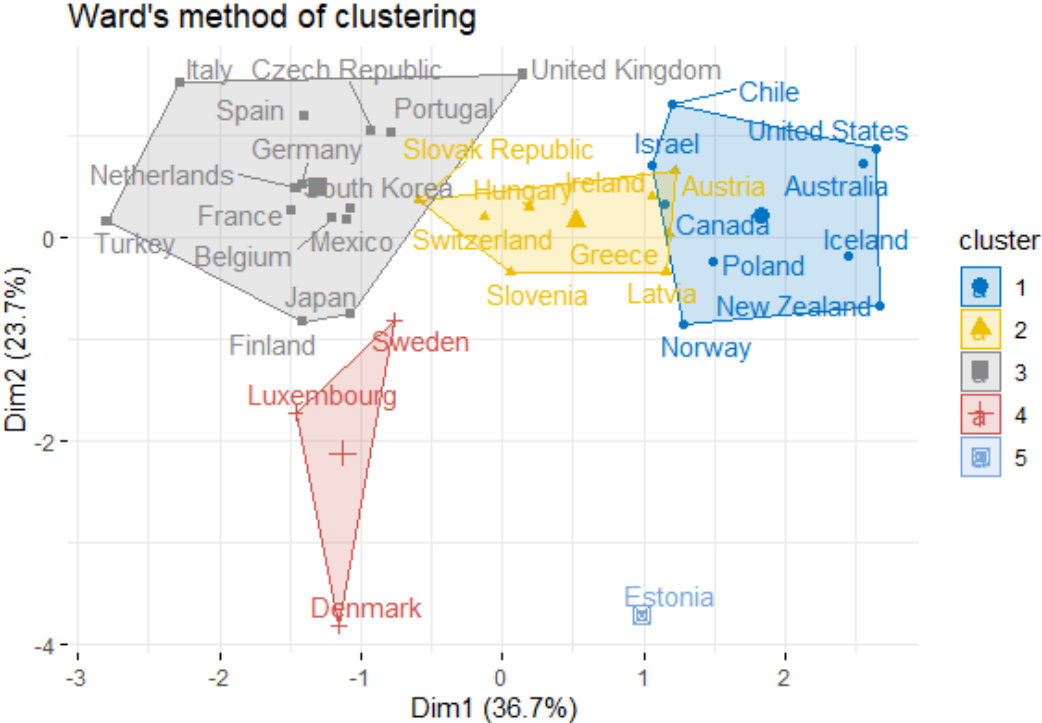
Optimal number of clusters has been selected on the basis of the silhouette graph and by observation of the subsequent decline of total within sum of squared errors derived with different number of clusters. Moreover, according to previous researches of welfare state regimes and

variety of capitalistic systems, it was assumed that optimal number of clusters should not exceed five or six. According to the silhouette graph the highest average silhouette width was obtained with eight, nine or ten clusters. However, comparable value was obtained when number of clusters was reduced to four. Analysis of the total within sum of squared error suggest that the optimal number of cluster is four or five. Therefore, both possibilities were tested. It occurred that optimal number of clusters set to five leads to more interpretable and more interesting results.

Discussion of results

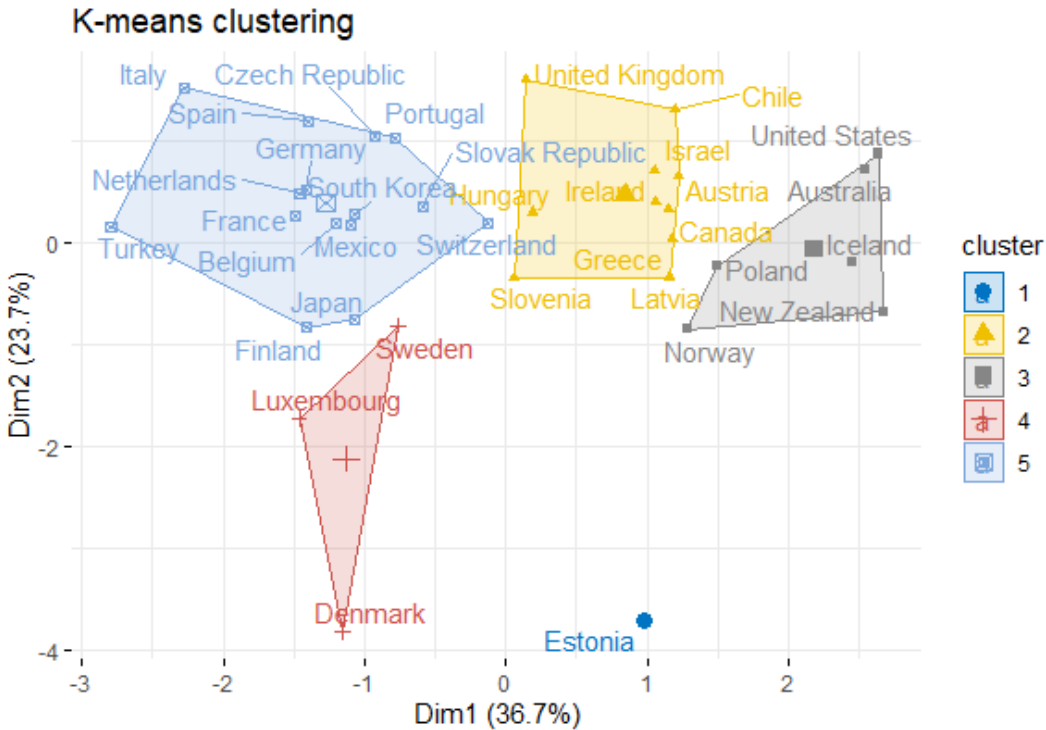
Distribution of particular countries revealed in result of the clustering does not clearly overlap with well-established classifications derived from the literature. It seems that it is possible to distinguish various strategies of dealing with the COVID-19 economic consequences but demarcation lines are not the same as in previous studies of welfare states and capitalistic systems. In other words, although clear patterns are not visible, some regularities in clusters membership can be noticed.

Graph 1. Results of the clustering with Ward’s method



Source: Own elaboration

Graph 2. Results of the clustering with *k*-means method



Source: Own elaboration

Since hierarchical methods are sometimes conceived to be better suited to small samples, further interpretation will be concentrated mostly on the outcomes of the Ward's procedure⁷. Discussion of outcomes of other methods will be used as the side notes to the main results.

Firstly, cluster number 1 mostly consists of countries that do not belong to the European Union. However, most of these countries are relatively powerful in economic and geopolitical terms. Moreover, most of countries traditionally classified as liberal are gathered in this cluster. Countries such as Israel, Iceland, New Zealand and Australia can be also described as geographically isolated. To some extent it is true also for the United States and Canada. What is interesting, these countries are characterized by the highest average share of GDP spent on health financing and relatively highly developed sense of entrepreneurship among their citizens. Taking into account characteristics of the prevailing part of the cluster, these countries can be dubbed as liberal non-European economies. Response provided by these governments is characterized by

⁷ Also statistical tools applied to identify the best clustering strategy for the purposes of this research indicate on hierarchical clustering superiority.

very high interest rate cut (on average 83%) and fiscal support strongly based on additional spending.

Clusters 2 and 3 include mostly members of the European Union but cluster 2 contains countries that are relatively smaller in terms of their geographical surface. Almost all countries from the Central and Eastern Europe are also present in this cluster. However, we do not have here any G20 members. Countries from this cluster are characterized by the low average share of GDP spend on health with relatively low government contribution. On the other hand, economies of these countries are based on industry – value added to GDP by industry is the highest in this group. This cluster can be called small European economies. What is interesting, in this cluster we almost did not observe an interest rate cut. However, it is actually not surprising since almost all countries from this cluster are members of the Eurozone. Fiscal support provided in response to the COVID-19 crisis was based on the additional spending.

Among members of the cluster 3 there is many countries counted to the G20 and many members of the European Union (in fact only EU-15 countries) – although there are also countries such as Mexico, South Korea and Turkey, prevailing part of the group consist of developed European states. Thus this group can be described as advanced European economies. According to survey data, entrepreneurial attitudes are not popular among citizens of these countries. Governments from this group applied moderate interest rate cut and based their fiscal support on guarantees and other contingent liabilities. This cluster is also characterized by the highest value of the stringency index which is a sign of relatively restrictive regulations introduced by the members of the cluster 3.

Clusters 4 and 5 can be treated as a group of outliers. Countries such as Estonia, Sweden, Luxembourg and Denmark will be denoted as the European individuals (outliers). When it comes to Sweden, Luxembourg and Denmark, trust in government observed in this group is significantly higher than in all other clusters. Moreover, also role of the governments in financing health expenditures in this group exceeds average values for other groups. Sweden, Luxembourg and Denmark applied moderate interest rate cut and pursued mixed fiscal support with dominance of accelerated spending and deferred revenues. According to data, Estonia did not cut interest rates. Fiscal support proposed by Estonian government was mixed with similar

importance of additional spending and below-the-line measures. What is interesting, Estonia introduced less stringent regulatory measures than average policies of all other groups.

Table 2. Mean statistics for clusters determined with Ward's method

	(1)	(2)	(3)	(4)	(5)
	Liberal non-European economies	Small European economies	Advanced European economies	European individuals (outliers)	
Number of countries	9	8	14	3	1
Stringency index	51,67	53,90	54,86	49,94	39,92
Interest rate cut	0,83	0,02	0,15	0,22	0
Additional spending (share)	0,74	0,65	0,30	0,22	0,42
Accelerated spending and deferred revenue (share)	0,04	0,04	0,08	0,42	0
Below the line measures (share)	0,06	0,05	0,02	0,12	0,43
Guarantees etc. (share)	0,16	0,26	0,60	0,25	0,15

Source: Own elaboration

Composition of all clusters was considered with respect to few other political variables as well. For example, Desson *et al.* (2020b) suggested that federal structure of the state may affect the effectiveness and timing of the decision-making process. However, none of identified clusters can be interpreted as exceptional in this dimension – almost the same number of federal countries appear in clusters 1, 2 and 3. Similarly, clusters are also more or less uniform when it comes to indices measuring presence of women in authorities – they are more numerous in cluster 4 and less visible in cluster 2 but differences are rather not significant. Alon, Farrell and Li (2020) described differences in reactions to the pandemic observed between democratic and authoritarian countries. However, since the sample used in this research consists only of the OECD members, it was not possible to capture any variability in this dimension among identified clusters.

Table 3. Selected variables – means for clusters determined with Ward’s method

	(1)	(2)	(3)	(4)	(5)
	Liberal non-European economies	Small European economies	Advanced European economies	European individuals (outliers)	
EU members	0,11	0,88	0,64	1,00	1,00
G20 members	0,33	0,00	0,57	0,00	0,00
Eurozone members	0,00	0,75	0,57	0,33	1,00
Trust in government	48,84	49,43	49,07	69,34	46,48
Health financing (% of GDP)	9,82	8,12	9,03	8,77	6,79
Health financing – governmental contribution	0,75	0,69	0,76	0,85	0,74
Perceived capabilities	54,17	51,71	48,84	49,59	
Total early-stage Entrepreneurial Activity (TEA)	15,61	11,16	9,16	9,23	
Industry value added (% of GDP)	23,74	25,34	23,89	18,21	22,04
Services value added(% of GDP)	65,04	61,82	64,46	69,72	62,48

Source: Own elaboration

Application of the *k*-means method produces similar outcomes. However, there are some minor discrepancies – Canada, Israel, Chile, Slovak Republic, Switzerland and United Kingdom are classified differently. Canada, Israel and Chile are classified by Ward’s clustering method to the group 1 while on the basis of the *k*-means they are included in the group 2. Slovak Republic and Switzerland are members of group 2 when we apply Ward’s method but when we use *k*-means they are assigned to the group 3. When it comes to the United Kingdom, change is in opposite direction.

Interestingly, some countries appear together almost always, irrespective of the applied method and variables used for clustering. Countries such as the United States, Australia, Iceland, Poland and New Zealand are usually present in the same cluster. Germany, France, Belgium, the

Netherlands and South Korea usually create a core surrounded by few other countries. Sweden, Luxembourg, Denmark and Estonia are most often gathered in one or two groups of outliers.

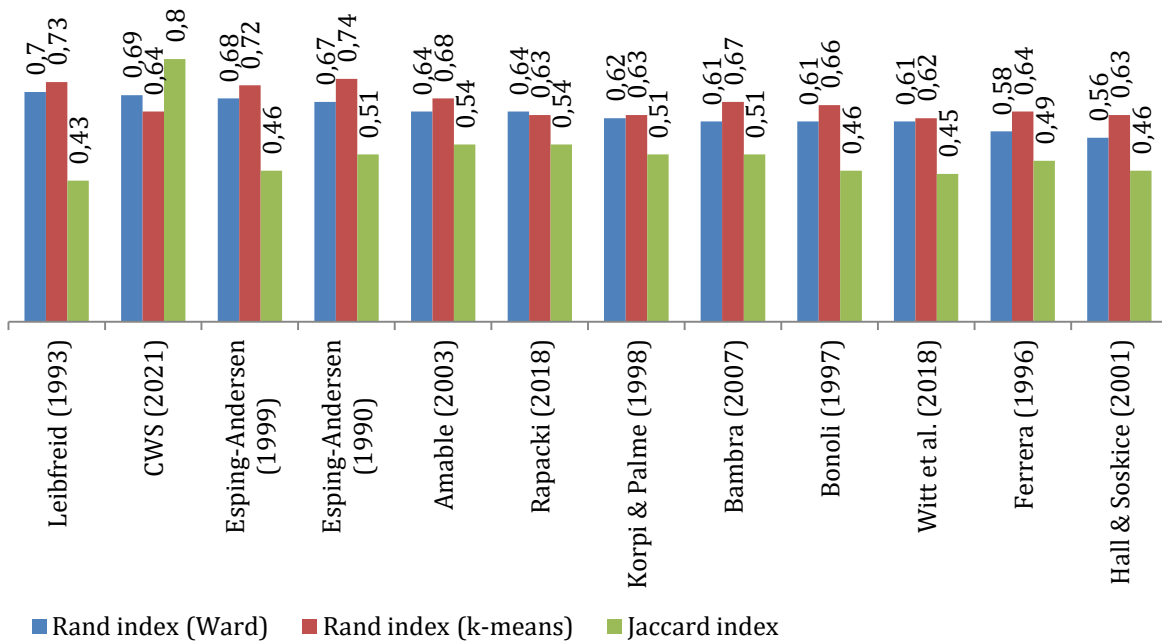
Application of the fuzzy c -means method confirms that most of these countries are relatively unambiguously classified to the single cluster. Australia, Iceland, New Zealand and the United States are classified to the first cluster with weights exceeding 0.5. When it comes to the cluster number 2 threshold of 0.5 is surpassed in case of Greece and Ireland, also Austria has a high value of membership degree. Belgium, France, Germany, the Netherlands and Spain are firmly assigned to the cluster 3. Similarly as Italy, Portugal and Turkey, weights of these three countries do not exceed 0.5 though. Although, situation of all other countries is less clear, many of them are still classified to the same clusters as in case of Ward's method.

DBSCAN method did not produce any significant outcomes – all observations were grouped in one cluster. Only Sweden, Luxembourg, Denmark and Estonia were exceptions – these countries were again identified as outliers. It corroborate their exceptional nature suggested on the basis of Ward's method and k -means.

Comparison of classifications

When it comes to the Ward's method of clustering, it occurs that classification of welfare states proposed by Leibfried (1993) and classification of corporate welfare states are characterized by the highest values of the Rand index (respectively 0.7 and 0.69). Also classical typology of the welfare states in version revised by Esping-Andersen in 1999 was comparably well fitted to the COVID-19 classification. However, group of countries taken into account by Leibfried and Esping-Andersen significantly differ from the countries considered in this research (values of the Jaccard index equal respectively 0.43 and 0.46). In case of the corporate welfare states classification the Jaccard index is equal 0.8 which means that groups of countries analyzed in both studies are similar.

Figure 1. Similarity between the COVID-19 classification and selected classifications from the literature



Source: Own elaboration

Outcomes are slightly different when we apply *k*-means method. In this case the best fit is observed in case of the classical Esping-Andersen classification from 1990, Leibfried classification and typology revised by Esping-Andersen in 1999. However, all these studies concern groups of countries significantly different from the group used to prepare the COVID-19 classification.

There are few potential explanations of results obtained in this study. We can presume that particular countries were not completely ready for the sudden overwhelming crisis of their health systems and economies – although outbreak of the pandemic was not an unexpected event, the scale, dynamics and severity of this phenomenon could be surprising. In result, reactions of governments were rather chaotic than organized in line with their deep intrinsic characteristics. However, it might be also a case that governments' reactions were not entirely chaotic or not in all cases. First of all, when we analyze results of clustering, we observe some fundamental regularities that were expected – Germany, the United States and Sweden are not clustered together and these countries are usually indeed used as the core countries of separate clusters.

Thus, we can claim that reactions of these leading countries were coherent with their nature but the rest of countries behaved more chaotic – they followed one of the core countries but not necessarily the one that is usually associated with their type of the welfare state or capitalistic system (or they applied mixture of policies introduced by these leading countries).

Second explanation abstracts from the welfare state typologies and varieties of capitalism. It is possible that particular countries did not react in line with their institutional characteristics simply because there was a more-or-less clear consensus regarding the measures that should be applied and policies that should be implemented to overcome the economic consequences of the pandemic. In such circumstances, differences between economic responses to the crisis stemmed probably from the capabilities of particular countries to bring these guidance into force – not all countries had the same fiscal space and not all could response using traditional monetary instruments. It seems that this hypothesis is near to the opinion of experts from the Polish Economic Institute, who claim that there was a consensus regarding the measures that should be applied in short-run but it is more disputable how countries should behave in longer time perspective (Grzeszak *et al.*, 2020).

Third hypothesis refers to the methodological issues. We cannot exclude the possibility that more systemic differences between countries would be revealed if we had more detailed data on the structure of the fiscal packages and other features of the economic responses. For example, it might be a case that it is not sufficient to disaggregate fiscal packages into above-the-line measures, below-the-line measures and contingent liabilities – maybe we should consider also variability within these three groups of instruments. Another explanation that also refers to the accessibility and structure of data used in the research is potential importance of the time dimension. It might be a case that initial reactions of particular countries for the first wave of the pandemic was less organized since it was the most surprising moment of the pandemic. However, time between the first and all next waves was used by most of governments to reconsider their approach and prepare more adequate measures. It might be a case that more systemic differences between particular countries were revealed during the next phases of the crisis. When we analyze all data together, the picture may be blurred.

6. Conclusions

Results of the research indicate that the OECD countries significantly differ with respect to their strategies applied to combat the COVID-19 crisis. We can distinguish liberal non-European economies, small European economies and advanced European economies. Fourth and fifth groups consist of countries that can be treated as outliers. What is interesting, Poland seems to converge to the group of liberal non-European economies.

However, clusters identified on the basis of variation of measures applied by governments to support their economies and societies in general do not overlap with welfare state regimes and typologies of capitalism known from the literature. Newly established classification is relatively close to the welfare state typology proposed by Leibfreid (1993) but not all countries reproduce their traditional patterns, thus matching is at least partial. Also corporate welfare state classification is relatively well-fitted to the newly established classification of the economic responses to the COVID-19 crisis. As it is pointed out in the literature, even the main typologies of the welfare state usually do not agree with each other – only few countries are almost always classified similarly, while the rest is more tentative and volatile (Bambra, 2007a). Therefore, limited comparability with previously defined classifications does not have to be anything unexpected and disturbing. Noteworthy, countries usually interpreted as cores of subsequent clusters (Germany, the United States, Sweden) are clustered in separate groups also in this research – it means that some fundamental connection with the literature is maintained.

It has to be highlighted that outcomes of this research should be treated as preliminary assessment and they should be interpreted with cautious because the phenomenon of pandemic still can be developmental and most of the projects of data gathering is ongoing.

There are numerous possibilities to extent or improve this research, especially when more detailed data will be available. Firstly, it might be a good idea to put more focus on the time dimension of the analysis – awareness and readiness of governments to counteract the COVID-19 crisis was not the same at the earliest stages of the pandemic and during the next waves of disease. Secondly, it might be also an important improvement to use more precise data concerning the structure of the fiscal stimulus when such data will be available.

Hopefully, with growing number of vaccinated people all over the world, we are slowly approaching the dusk of the COVID-19 pandemic. However, it will be only the end of some stage of analysis of this phenomenon. We can be sure that upcoming years will bring us plenty of papers analyzing the origins of the pandemic, its economic impact and effectiveness of economic responses of governments.

References

- Alon Ilan, Matthew Farrell, Shaomin Li. Regime Type and COVID-19 Response. *FIIB Business Review*. Vol 9, No 3, 2020, p. 152-160.
- Amable Bruno. *The Diversity of Modern Capitalism*. Oxford University Press, Oxford, 2003.
- Bambra Clare. Defamilisation and welfare state regimes: a cluster analysis. *International Journal of Social Welfare*. Vol. 16, 2007, p. 326-338.
- Bambra Clare. Going beyond The three worlds of welfare capitalism: regime theory and public health research. *Journal of Epidemiology & Community Health*. Vol. 61, 2007, p. 1098-1102.
- Błoński Łukasz, Katarzyna Dębikowska, Andrzej Kubisiak, Filip Leśniewicz, Anna Szymańska, Paweł Śliwowski, Ignacy Święcicki, Katarzyna Zybertowicz. *Pandemics 2.0. How countries faced the second wave of pandemic and the second dip of the recession*. Polish Economic Institute. Warsaw, 2021.
- Bonoli Giuliano. Classifying Welfare States: a Two-dimensional Approach. *Journal of Social Policy*. Vol. 26, No 3, p. 351-372.
- Cantillon Bea, Martin Seeleib-Kaiser, Romke van der Veen. The COVID-19 crisis and policy responses by continental European welfare states. *Social Policy Administration*. Vol. 55, No 2, 2021, p. 326-338.
- Cassim Ziyad, Borko Handjiski, Jorg Schubert, Yassir Zouaoui. *The \$10 trillion rescue: How governments can deliver impact*. McKinsey & Company, 2020.
- Demirgüç-Kunt Asli, Michael Lokshin, Iván Torre. Opening-up Trajectories and Economic Recovery. Lessons after the First Wave of the COVID-19 Pandemic. *World Bank Policy Research Working Paper*. No 9480, 2020.
- Demirgüç-Kunt Asli, Michael Lokshin, Iván Torre. The Sooner, the Better. The Early Economic Impact of Non-Pharmaceutical Interventions during the COVID-19 Pandemic. *World Bank Policy Research Working Paper*. No 9257, 2020.
- Desson Zachary, Emmi Weller, Peter McMeekin, Mehdi Ammi. An analysis of the policy responses to the COVID-19 pandemic in France, Belgium, and Canada. *Health Policy and Technology*. Vol. 9, 2020, p. 430-446.
- Desson Zachary, Lisa Lambertz, Jan Willem Peters, Michelle Falkenbach, Lukas Kauer. Europe's Covid-19 outliers: German, Austrian and Swiss policy responses during the early stages of the 2020 pandemic. *Health Policy and Technology*. Vol. 9, 2020, p. 405-418.

- Ebeke Christian, Nemanja Jovanovic, Laura Valderrama, Jing Zhou. Corporate Liquidity and Solvency in Europe during COVID-19: The Role of Policies. *IMF Working Papers*. No WP/21/56, 2021.
- Elgin Ceyhun, Gokce Basbug, Abdullah Yalaman. Economic policy responses to a pandemic: Developing the Covid-19 economic stimulus index. *COVID Economics Vetted and Real-Time Papers*. No 3, 2020.
- Esping-Andersen Gøsta. *Trzy światy kapitalistycznego państwa dobrobytu*. Difin, Warsaw, 2010.
- Everitt, Skrondal. *The Cambridge Dictionary of Statistics*. Cambridge University Press, 2010.
- Farnsworth Kevin. *Social versus corporate welfare*. Palgrave Macmillan, London 2012.
- Farnsworth Kevin. Bringing Corporate Welfare In. *Journal of Social Policy*. Vol. 42, No 1, 2013, p. 1-22.
- Ferrera Maurizio. The Southern Model of Welfare In Social Europe. *Journal of European Social Policy*. Vol. 6, No 1, 1996, p. 17-37.
- Grzeszak Jacek, Filip Leśniewicz, Paweł Śliwowski, Ignacy Święcicki. *Pandenomics. Zestaw narzędzi fiskalnych i monetarnych w dobie kryzysów*. Polish Economic Institute, Warsaw, 2020.
- Hale Thomas, Noam Angrist, Thomas Boby, Emily Cameron-Blake, Laura Hallas, Beatriz Kira, Saptarshi Majumdar, Anna Petherick, Toby Phillips, Helen Tatlow, Samuel Webster. Variation in Government Responses to COVID-19. *Blavatnik School of Government Working Paper*. No. BSG-WP-2020/032, 2020.
- Hall Peter, David Soskice. *Varieties of Capitalism. The Institutional Foundations of Comparative Advantage*. Oxford University Press, New York, 2001.
- Isakjee Arshad. Welfare State Regimes: a Literature Review. *IRS Working Paper Series*. No 18, 2017.
- IMF. Policies to Support People During the COVID-10 Pandemic. In: *IMF Fiscal Monitor*. Vol. 2, 2020.
- IMF. Tailoring Fiscal Responses. In: *IMF Fiscal Monitor*. Vol. 2, 2021.
- Jaccard Paul. The Distribution of the Flora in the Alpine Zone. *The New Phytologist*. Vol. 11, No 2, 1912, p. 37-50.
- Korpi Walter, Joakim Palme. The Paradox of Redistribution and Strategies of Equality: Welfare State Institutions, Inequality, and Poverty in the Western Countries. *American Sociological Review*. Vol. 63, No 5, 1998, p. 661-687.

- Leibfried Stephan. Towards a European welfare states? In: Catherine Jones (ed.). *New Perspectives on the Welfare State in Europe*. Routledge, London, 1993.
- Mok Ka Ho, Yeun-Wen Ku, Tauchid Komara Yuda. Managing the COVID-19 pandemic crisis and changing welfare regimes. *Journal of Asian Public Policy*. Vol. 14, No 1, 2021, p. 1-12.
- Powell Martin, Erdem Yörük, Ali Bargu. Thirty years of the Three Worlds of Welfare Capitalism: A review of reviews. *Social Policy Administration*. Vol. 54, No 1, 2020, p. 60-87.
- Rand William. Objective Criteria for the Evaluation of Clustering Methods. *Journal of the American Statistical Association*. Vol. 66, No 336, 1971, p. 846-850.
- Rapacki Ryszard, Adam Czerniak. Emerging models of patchwork capitalism in Central and Eastern Europe: empirical results of subspace clustering. *International Journal of Management and Economics*. Vol. 54, No 4, 2018, p. 251-268.
- Tan Pang-Ning, Michael Steinbach, Vipin Kumar. *Introduction to Data Mining*. Pearson, 2014.
- Ward Joe. Hierarchical Grouping to Optimize an Objective Function. *Journal of the American Statistical Association*. Vol. 58, No 301, 1963, p. 236-244.
- Witt Michael, Luiz Ricardo Kabbach de Castro, Kenneth Amaeshi, Sami Mahroum, Dorothee Bohle, Lawrence Saez. Mapping the Business Systems of 61 Major Economies: A Taxonomy and Implications for Varieties of Capitalism and Business Systems Research. *Socio-Economic Review*. Vol. 16, No 1, 2018, p. 5-38.