WISER CD: A dataset for analyses of the welfare state-growth nexus in OECD countries

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Abstract

This paper describes WISER CD (Welfare Intervention by the State and Economic Resilience - Comprehensive Dataset) a cross-country panel dataset that includes relevant indicators for the analyses of the relationship between the welfare state and aggregate macroeconomic performance, highlighting human capital and inequality as the channels of transmission. WISER CD covers 36 OECD countries over the period 1980-2017 resulting in 1085 variables from primary sources and five constructed variables for the measurement of human capital. We gathered data from a range of primary data sources that were grouped in six relevant dimensions: economic growth; welfare state; human capital; inequality; control variables; government size and financing. Two additional datasets were generated with no missing values, although at the cost of a shorter time coverage and more limited cross-country availability. The former broaden the options faced by researchers in terms of econometric methodologies (and others) for the investigation of the relationship under analysis.

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Contents

1. Introduction

WISER Portugal[1] is a research project led by a team of researchers from the Centre for Business and Economics Research (CeBER) University of Coimbra, including also researchers from NIPE – University of Minho and UECE – University of Lisbon, with expertise in the fields of economic growth, social policy, income inequality and human capital. The main goal of the project is to study the relationship between the welfare state and economic growth in Portugal.

Since 2014, the Portuguese economy has initiated a gradual recovery from the deep recession experienced in the aftermath of the 2007-08 crisis and the sovereign debt crisis that followed, but most of the recent evolution of the Portuguese economy has been strongly affected by the austerity policies recommended by the Troika and the need to reduce the deficit and public debt has brought the welfare state (WS) to the forefront of the debate on Government retrenchment. A fundamental issue is whether the associated rescaling and reorganization of the Portuguese WS will aggravate further the already dismal long run growth prospects in a country that ranks as one of the most unequal in Europe and presents still relatively low educational attainment levels. Understanding the different mechanisms that connect the two dimensions and the circumstances under which they operate is of crucial importance for social policy design and implementation allowing for a better understanding of how to target social support so that social policies not only improve social cohesion but also sustain long-term growth in Portugal. We aim at contributing to the debate on the welfare state-growth link by analysing this relationship for Portugal, a country that has gone through important transformations in the scale and structure of the respective social model but seems to be stuck in a high inequality and poverty, low-growth trap. First, however, we take on a comparative perspective with the OECD making use of methodological advances in the field of panel data econometrics to robustly identify the sign of the relationship under analysis and disentangle the different channels through which the WS influences growth. To accomplish this, the construction of a comprehensive dataset is a fundamental step.

Our cross-national assessment of the relationship between the welfare state and economic growth in a sample of OECD countries aims at identifying how and why the welfare state influences growth for which we will carry out three types of analysis: (i) identify the overall effect of the OECD economies welfare intervention on the respective growth performance; highlighting the potential different effects of specific welfare programs; (ii) investigate the inequality channel due to the increasing concerns about income distribution and social cohesion in OECD countries in the aftermath of the Great Recession. We investigate if the WS is fulfilling its role as equity enhancer and whether it is contributing indirectly to growth through the reduction in inequality; and (iii) investigate the human capital channel since in modern

[1] WISER Portugal – Welfare Intervention by the State and Economic Resilience in Portugal. For more information on this project, research team, work in progress, supplementary materials and outputs see: https://www.uc.pt/en/feuc/wiser-portugal

knowledge-based economies a fundamental channel through which the welfare state can exert a positive growth influence is human capital, through the design of educational and health programmes aimed at achieving equality of opportunities. We expect in this way to identify the relationship between the welfare state characterizing OECD economies and growth that will guide the investigation for Portugal; achieve a robust representation of the welfare state in OECD economies according to different regimes; assess the relative importance of the two channels.

To achieve the above-described goals we need data for the following 6 dimensions:

1. Economic growth;
2. The welfare state;
3. Human capital;
4. Inequality;
5. Indicators of government size and financing;
6. Control variables (other determinants of economic growth, human capital and inequality).

Our WISER CD for analyses of the welfare state-growth nexus in OECD countries thus includes variables and proxies that reflect these dimensions. There are different datasets available with information for each dimension, e.g. data on income inequality from Solt (2019) or UNU-Wider (2019)), for the welfare state from OECD Social Expenditure database (SOCX) and Scruggs et al. (2013), macroeconomic/economic growth data from Feenstra et al. (2015), human capital data from Barro & Lee (2013), and government size and financing data from OECD (2019). However, it is our opinion that the empirical approaches to the link between the welfare state and economic growth lack an encompassing dataset that undertakes a broader vision in terms of including information concerning all these dimensions in a single database readily available to researchers on the topic. There are advantages associated with the construction of datasets covering specific fields but gathering information from these different fields in an unique dataset may also bring gains to the research community, particularly in terms of reliability and time use efficiency. This is the gap we try to fill with our dataset. The aim of this paper is to briefly present the contents of the WISER CD based on a descriptive analysis of some of its key characteristics.

This paper is organized as follows. Section 2 presents an overview of the theoretical and empirical literature that frames our analysis of the relationship between the welfare state and economic growth. Section 3 provides details on the construction and the navigation of the dataset. On section 4 information on data coverage and indicators relating to the different dimensions is provided. Section 5 concludes.

2. Theoretical and empirical framework

Economists have been investigating the determinants of economic growth and development for a long time since the former are the main cause of improvements in living standards and promote social inclusion. The benchmark work of Solow (1956) suggested an important explanation for income differences across countries that ignited an extensive empirical literature aimed at identifying the main growth determinants, made possible mainly since the early 1990s by the wider availability of comparable data across countries and over time, pioneered by the Penn World Table (PWT) from Summers & Heston (1991), currently in its version 9.1 Feenstra et al. (2015). Empirical growth studies haven since then increased at what is probably an exponential rate , from the pioneering works of Robert Barro and co-authors (e.g. Barro (1991)), Mankiw et al. (1992) to the most recent concerns regarding the "open-endedness of growth theory" Brock and Durlauf (2001) and the need to identify the most robust growth determinants in a context of limited data availability since potential drivers of growth are probably limitless ((Sala-i-Martin *et al.* (2004); Jarociński (2010); Moral-Benito (2012); Moral-Benito (2016); Rockey & Temple (2016)).

Economic growth, the steady increase of output in the long run, is the immediate result of either higher accumulation of factors of production or improvements in efficiency/productivity of those factors or, more realistically, both. These direct sources of growth are in turn determined by more fundamental sources, those features that have an important influence on a country's ability to accumulate inputs and become more productive and efficient, such as the institutional arrangements that frame economic activity (Nakamura *et al.* (2019); Daude & Fernández-Arias (2010); Kim & Loayza (2017)). The welfare state comes under the classification of fundamental sources, in particular institutions. However, both at the theoretical and at the empirical level, the studies that investigate the impact of the welfare state on economic growth have reached no definite conclusions on the sign, transmission mechanisms and direction of causality of the relationship, e.g. Herce *et al.* (2001) and Hamerníková *et al.* (2009). The sign of the impact of the welfare state on economic growth is seen as depending on the dynamics between how the financial resources that support the welfare state are raised and how they are spent, namely in terms of their impact on inequality (see Bonnet & Viegelahn (2014); Mathers & Slater (2014)) and human capital accumulation (Haile & Niño-Zarazúa (2018)), potentially important drivers of economic growth.

Indeed, the main goals of the welfare state are to increase income equality and equality of opportunities Van Lancker & Van den Heede (2019). Thus, the welfare state has the ability to influence economic growth Atkinson (1996) and, in turn, economic growth may help the welfare state pursue its objectives Tridico & Paternesi Meloni (2018). According to the 2019 Human Development Report from the United Nations (2019), income inequality is getting wider and its impact on society should be contained as it may have important negative consequences at the social, political and economic levels. Since the 1990s a renewed interest on the relationship between inequality and economic growth emerged due to the widespread concern with

increasing income inequality in many countries since the 1980s-90s and particular attention has been given to its economic growth effects as noted by Castelló-Climent (2010) and Halter et al. (2014). However, the impact of greater inequality on growth remains an unresolved issue in both the theoretical and the empirical literature. Aghion et al. (1999) and Barro (2000) contain a review of this literature suggesting that less inequality can be either beneficial or damaging for growth depending, for instance, on the particular stage of development an economy is in or the specific part of the income distribution that is targeted. Recent empirical studies have also failed to reach a consensus on the sign of the effect of inequality upon growth, arriving at varied and sometimes conflicting results (see Dominicis et al. (2008); Neves, Afonso and Silva (2016); Gründler and Scheuermeyer (2018); Brueckner & Lederman (2018)). The welfare state might thus play an important role in terms of guaranteeing economic and social stability and prosperity (see e.g. Tridico & Paternesi (2018), Dabla-Norris et al. (2015) and Li (2012).

Human capital is seen as fundamental ingredient to increase economic growth both as an input into final goods production, but mostly, in modern knowledge based economies, as an essential input in the creation of new ideas and as a facilitator of technology absorption Mankiw et al. (1992); Romer (1990); Jones (1995); Jones (2005), Nelson and Phelps (1966). For instance, according to Glaeser et al. (2004) human capital is a more important source of growth than institutions. Other empirical studies also confirm the positive relationship between human capital and GDP, for example Fleisher et al. (2010) for the cross-provincial China, or Hanushek & Woessmann (2012) using measures of human capital quality. By financing, among others, education and health, the welfare state leads to faster human capital accumulation and in this way promotes growth, according to both exogenous and endogenous growth models (Nelson & Phelps (1966); Mankiw, Romer & Weil (1992); Romer (1990); Jones (2005)), and supported by many empirical studies as reviewed by Benos & Zotou (2014) for the case of education and by Bloom, Kuhn & Prettner (2018) for the case of health. Besides increasing the quantity of human capital, social transfers can also increase the quality of human capital, which has been found to have an even bigger impact on growth Hanushek and Woessman (2012). This is especially important when capital markets are imperfect and it is expensive to finance health and education: without the welfare state society would not be able to benefit from its full human capital potential.

Considering all the above reasons and given the remaining disagreements, it is important to continue research that enables a better understanding of the relationship between the welfare state and aggregate macroeconomic performance, resulting in the design of more adequate policies. In order to achieve this it is essential the use of more encompassing datasets.

3. Database construction and navigation guide

The main goal guiding the construction of the WISER CD dataset was to include in a single database the variables and indicators needed for a comprehensive empirical analysis of the welfare state-growth nexus highlighting two mechanisms of transmission, inequality and human capital. The variables and respective indicators were grouped in six dimensions: Economic Growth, Welfare State, Human Capital, Inequality, Government Size and Financing and Control Variables. Table 1 provides an overview of the structure of the dataset defined according to the former dimensions, associated indicators and respective sources.

Table 1 – The structure of WISER CD: dimensions, indicators and sources

Given the number of dimensions and indicators included, there is the possibility that users feel confused or lost during their experience of navigation through this dataset. In order to decrease the probability of occurrence of these problems we followed some specific rules during the construction of the dataset, which we describe below.

Before arriving at the final dataset, the main steps taken can be summarized as follows:

1. Collecting the data from the original datasets;
2. Renaming, labelling and matching;
3. Merging all variables into a single dataset.

3.1 Data collection

Table 1 served as our guide in the process of data collection; most of the variables were successfully obtained in the same order as presented there. Each variable was retrieved from the original dataset made available at the website provided by the respective authors/institution. We carefully recorded the entire URL for the websites accessed to retrieve the data (see table 2 for more information). The databases were accessed on 15 May and 23 August 2019 (the latter date only for the variables: fimsma, pirlsre, timssma, timsssc, piaacre, piaacma, naepma, naepre, naepsc; for more details, see table 2). We are aware that in the meantime and in the future our original sources will probably update the respective information and thus we will also try to incorporate those updates in our database.

Additionally, some basic data for the identification of the time series dimension and the cross-section units was generated with Stata software, resulting in 3 variables: (i) ”Country” that contains the full names of the 36 OECD countries; (ii) ”LOCATION” concerning the 36 countries but identified according to the OECD Statistics notation/country code; (iii) ”Year” covering the years from 1980 to 2017, the maximum time coverage of the data. This basic data has an important role in the merging of the different original datasets, which we explain in more detail in the merging section below.

The underlying idea while collecting all data was to capture a wide variety/alternatives of indicators/proxies for most variables. Overall, we aimed at giving a range of options for those who are interested in using this dataset since the same concept/variable can usually be measured in different ways, each with associated vantages and disadvantages (e.g. data availability across countries and/or over time; measurement error).

3.2 Renaming, labelling and matching

After gathering the data from the different original sources, we applied the following rules in order to get a clearer and user-friendly dataset:

1. All variables are named in lowercase letters;
2. All the spaces or underscores were removed from the original variables' names (underscores have a different meaning in our dataset, which we explain below);
3. Some variables names were simplified or shortened every time they seemed too long;
4. For all the variables the original labels and names were maintained when they respected the above criteria;
5. All variables are labelled according to their short definition, if not originally labelled from the source.

To make the search for variables in the dataset simpler and the experience more comfortable to the user, we additionally changed the variables names according to two different features. Firstly, we added an uppercase prefix that identifies the dimension (one of the six defined before) to which the variable belongs, and secondly an uppercase suffix was added to identify the original dataset from which the variable was retrieved. Both of these features are separated from the original variable name with an underscore, e.g. if a variable named "avh" belongs to the Economic Growth (EG) dimension and was retrieved from the Penn World Tables (PWT) dataset then the final variable name should be EG_avh_PWT. All the prefix and suffix abbreviations are described in table 3.

Table 2 – WISER CD: variables and sources

Countries nomenclatures change across databases. We thus had to match the countries in each original database consulted with those included in the basic data. This process was done manually using the variable "Country" from the basic data and the variable used in each original database to identify the countries included in our basic dataset. The variable "LOCATION" (basic data) facilitates the matching process for the variables originally from OECD Statistics that use a different country code (3 letter).

3.3 Merging into a single dataset

The process of merging is a simple one but, before it can be done, every dataset collected went through a process of "cleaning": some original variables were dropped because not relevant for our dataset, e.g. variables defined for different classifications (e.g. country codes) or variables containing information on data sources or data evaluation. In addition, the variables related to the identification of countries or years should have the same notation as the correspondent variables in our basic data. For the merging process to perform well the software needs to understand what are the key variables for this purpose. In this case, the variables are country and year that should be named as "Country" and "Year", respectively (except for OECD data, for which the country identification variable is "LOCATION").

3.4 Solving the problem of missing values

The greatest problem of gathering data from a wide variety of countries/years is the lack of information that sometimes may persist in time or in some regions. This may be a problem is because it results in unbalanced panel datasets that, therefore, limit the choice of estimation methodologies, statistical power and inference (e.g. prevents the use of some tests). Since one of our goals in building this database is to allow researchers to access information that enables the use of a broader set of empirical methodologies namely those only possible to apply with balanced panel datasets, we decided to solve missingness by filling the gaps with imputed data.

Dempster, Laird, and Rubin (1977) and Rubin (1987) were the first to implement multiple imputation methods with the EM (Expectation-Maximization) algorithm. Since then this approach became more common and more sophisticated. Nowadays, one of the most sound imputation approaches is that proposed by Honaker, King, and Blackwell (2011) also known as Amelia II which, essentially, assumes a missingness matrix where every single variable included is linearly estimated extracting information from all the other variables in the dataset. This method uses the same classical EM algorithm but with the additional feature of bootstrapping known as EMB (Expectation-Maximization with Bootstrapping). Furthermore, this new algorithm brought several advantages relative to its most direct competitors, including the former version of Amelia II in Honaker, Joseph, King, Scheve, and Singh (2002), in particular: (i) simplicity and power – Amelia II can impute many more variables, more observations, in less time and with less crashes; and (ii) features to guarantee precision – contains features that produce more accurate imputations for cross-sectional, time-series and time-series-cross-section data.

Despite the above mentioned advantages, Amelia II is only able to perform well when the set of variables included in the dataset are uncorrelated, in other words, when there is no evidence of collinearity. This is especially true when treating a variable from a rich dataset because there is a higher chance to obtain highly correlated variables. In order to construct a new dataset with imputed values we had to accept this trade-off, transforming the original WISER-CD in order to include a smaller number of variables and split it into 2 new sub-datasets. First, we restricted the WISER-CD to the strictly necessary variables for every dimension; the

reason to do so was to ensure no presence of collinearity. Secondly, we subdivided WISER-CD into "Non-Eastern European countries" and "Eastern European countries" since we had a big difference in the number of observations for these different groups of countries, with the latter only recording observations since the 1990's. In the end, besides WISER-CD, we additionally have two reduced and imputed datasets – "WISER-Non-Eastern European" and "WISER-Eastern European".[2]

4. Data overview according to the 6 dimensions

The information gathered resulted in a main dataset comprising 36 OECD countries with data ranging from 1980 to 2017 at a yearly frequency, corresponding to a total of 1085 variables and 1368 observations. Table 3 provides information on these variables, grouped into the six dimensions defined, with the corresponding definition and sources. Table 4 contains some descriptive statistics.

Table 3 – Abbreviations used for the variables in the WISER CD according to dimensions and original datasets

Table 4 – Descriptive statistics

Table 5 – Correlations

The main purpose of this section is to clarify the construction process of the data included in each of the 6 dimensions, give a summary of their main attributes and describe some of the main challenges faced. It is important to mention that some variables, although more useful for specific dimensions, could be included in other dimensions as well. When the variable is relevant for different dimensions we usually kept it in the dimension to which the original dataset it was retrieved from belongs to. This was the case, for instance, for the variables that measure the population of a country. To recap the rules applied to assemble the variables according to the six dimensions grouping please check Table 1.

[2] All Datasets are available at: https://www.uc.pt/en/feuc/wiser-portugal/Research/Data/

4.1 An overview of the dimension 'Economic Growth'

We are interested in the study of economic growth, the steady increase of output/income in the long run. As previously stated, economic growth is the immediate result of either higher accumulation of inputs or improvements in the efficiency/productivity in the use of those inputs or both. For our sample of OECD countries, classified by the World Bank as high-income countries, productivity is seen as the most important proximate source of growth. To measure these phenomena, we thus collected information on these economic features, taking also into account the need to control for country size, i.e. we will focus on intensive not extensive growth since the former is the relevant concept when thinking about standards of living.

The economic growth dimension of the WISER CD thus includes mainly National Accounts information on output/income, efficiency/productivity such as GDP (real and nominal), total factor productivity (TFP), population, and hours worked, among others.

In this particular dimension, it is clear that the most important indicator is gross domestic product (GDP). Therefore, all measures for this indicator are in US dollars from three different sources: PWT, the World Bank and CPD. PWT measures real GDP according to three different measures: expenditure side (chained Purchasing Power Parity (PPP) or at current PPP), output side (also chained PPP or at current PPP) and GDP in constant PPP in 2005 USD but whose growth rate is taken from the National Accounts of each country. The World Bank measure GDP at constant 2010 prices, current and per capita. Variables from CPD include real GDP growth and nominal GDP growth.

According to the descriptive statistics presented in Table 4, column "obs", variables retrieved from the PWT include more information (1308 observations) followed by variables from the World Bank and finally variables from CPD (Comparative Political Data Set).

A closer look at the WISER CD shows that the real GDP variable with more observations goes from 1980 to 2017 and covers most years for most countries. Nevertheless, for a reasonable analysis across countries, we should proceed with an indicator in per capita terms but, to do so, there is a loss on period coverage in order to comprise all countries with no missing values. Real GDP per capita reaches its maximum value in 2007 for Norway and its minimum value in 1993 for Latvia. Figure 1 presents the OECD countries real GDP per capita. It is clear that, in general, all countries recorded an increase in real GDP per capita with Ireland tripling its initial value. Figure 2 presents the evolution of real GDP per capita for the OECD average. There is a clear positive trend, but the decrease associated with the recent subprime crisis in 2008 is also quite visible.

Table 5 contains simple correlation coefficients between most of the variables in our database[3]. When analysing the correlation coefficients with real GDP per capita, overall there is a positive correlation with most of the components of public social spending (family benefits, health, incapacity, labour, social, housing and others), a positive correlation with human

[3] The reader should keep in mind that this is a very preliminary and tentative analysis. Robust conclusions on the relationship between variables imply considering other determinants and statistical procedures.

capital (human capital index, learning, years of schooling and adult/children survival) and a negative correlation with income inequality, using different proxies (Gini coefficient, Theil T statistics and Atkinson's index).

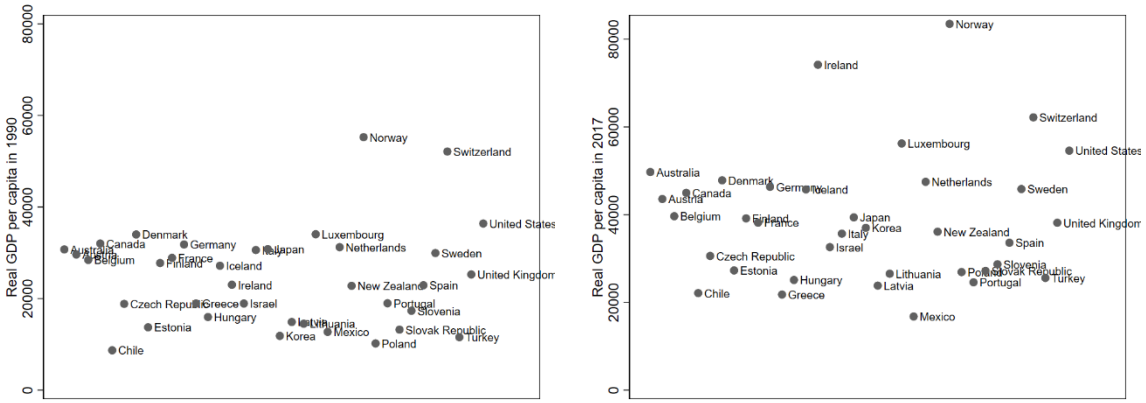

Figure 1 – Real GDP per capita for 36 OECD countries (1990 and 2017)

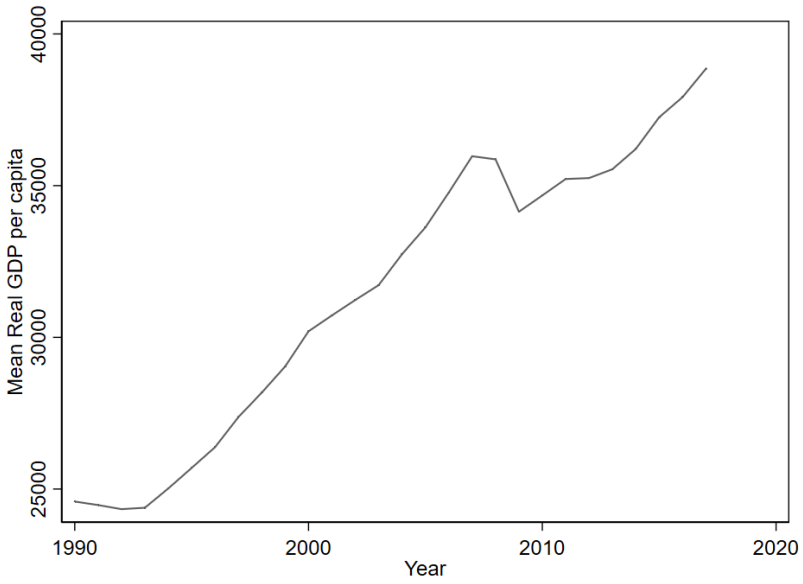

Figure 2 –Real GDP per capita, OECD average 1990-2017

4.2 An overview of the dimension 'Welfare State'

The direct or proximate sources of growth are in turn determined by more fundamental sources, such as the institutional arrangements that frame economic activity, as stated previously, the welfare state comes under the classification of fundamental sources, in particular institutions. In a welfare state, the government plays an important role in the protection and promotion of the economic and social wellbeing of its citizens. The main goals of the welfare state are to increase income equality and equality of opportunities. The welfare state has thus the ability to influence economic growth and, in turn, economic growth may help the welfare state pursue its objectives. Several types of welfare states coexist, differing in their historical evolution, organisation and reach, among other features, reflecting different degrees of welfare intervention by the state.

The welfare state dimension of the WISER CD thus includes variables that reflect not only welfare effort (social spending), but also constraints on welfare intervention by the state (taxes, social contributions) as well as the organizational structure of the welfare system. Our goal is to use more accurate measures of the different types of welfare state combining data that include not only elements of welfare state expenditures (the welfare state encompasses a large number of policies, reflected in different types of social expenditures), but also the use of the tax system for welfare purposes. Institutional indicators manifested in policy/social rights in the national legislation and regulations are also included in our dataset, in this way the penetration and dissemination of the welfare state can be more effectively studied.

Regardless of the diversity for welfare variables in WISER CD the most often used indicator of welfare intervention by the state is public social expenditure. In this database and for this dimension, the major source (in number of variables) of data is CPD (with 39 variables) followed by OECD SOCX (with 30 variables). Besides total public social expenditure, we also consider the 9 categories accounted for in OECD SOCX: old age, health, active labour market policies, incapacity, family benefits, unemployment, housing, and other social policies. Additionally, we also considered public expenditure on education.

Based on the information provided in Table 4, two indicators stand out as the ones with the highest number of observations available, health spending and total public spending both from OECD SOCX. Indicators with the lowest number of observations are from the European Social Statistics from Eurostat and Social Citizenship Indicator Program.

The data on social spending in WISER CD covers the maximum period 1980-2017 [most recent year in the CPD dataset is 2015], covering more than 35 years for most countries [30 or less observations in the CPD dataset]; the exceptions are Czech Republic, Iceland, Korea and Poland with 28 time observations and with less than 20 observations we have Estonia and Hungary [in CPD, exceptions with no observations are Chile, Israel, Korea, Mexico and Turkey]. Public social spending as a percentage of GDP recorded the maximum value at 34%. This is observed in Sweden in 1993 [the same in CPD dataset] and the minimum value is for Latvia in several years, 1994, 1995 and 1996 [Slovenia 1995]. Looking at the mean values, Sweden is still the country with the highest value [the same in CPD] and at the bottom we have Mexico [and

Latvia with CPD data]. Figure 3 summarizes this information. The highest mean spending value was recorded in the year 2009 and the lowest in the year 1980 [in CPD, 2009 for the highest value and 2015 for the lowest]. The average social spending as a percentage of GDP for the OECD shows a positive trend with an unexpected drop at the end of the period with CPD data. A closer look at the data made us realize that CPD, after the year 2010 records a big drop in the number of observations (that reached its peak in 2015) resulting in information for only two countries, which coincidentally are those that record the lowest mean values in figure 3, Lithuania and Latvia. This resulted in a sharp drop at the end of the period under analysis, as can be seen in figure 4. Nevertheless, both indicators (from OECD SOCX and from CPD) show a similar behaviour over time. In any case, for the SOCX data the changes over time are more pronounced than with the CPD dataset.

Correlation analysis (see table 5) shows a positive correlation between most variables of social spending and human capital measures, the exceptions are survivors pensions with a negative correlation. Moreover, measures related to total spending and health spending tend to have greater correlations with measures of human capital. When relating spending components with income inequality measures it is notorious an overall negative correlation; these effects are more intense for spending related to incapacity and total social spending.

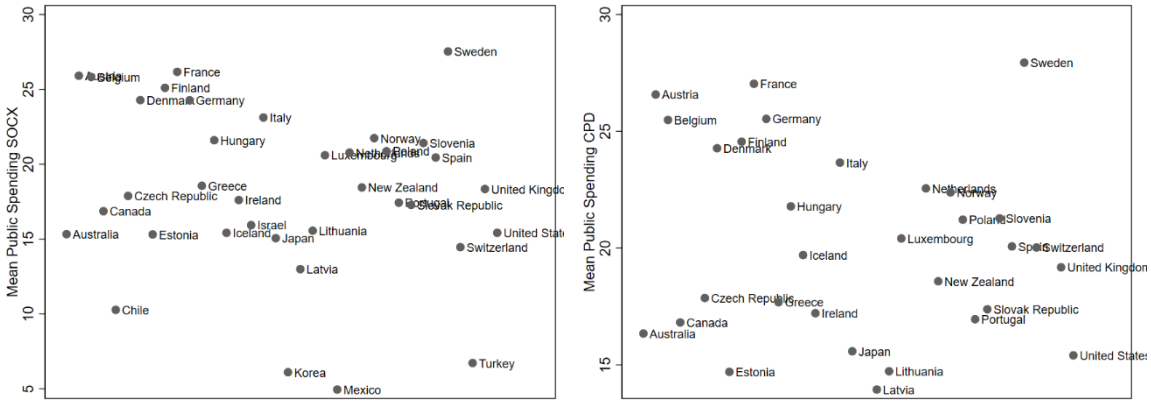

Figure 3 – Time average Public Social Spending (% GDP) by country

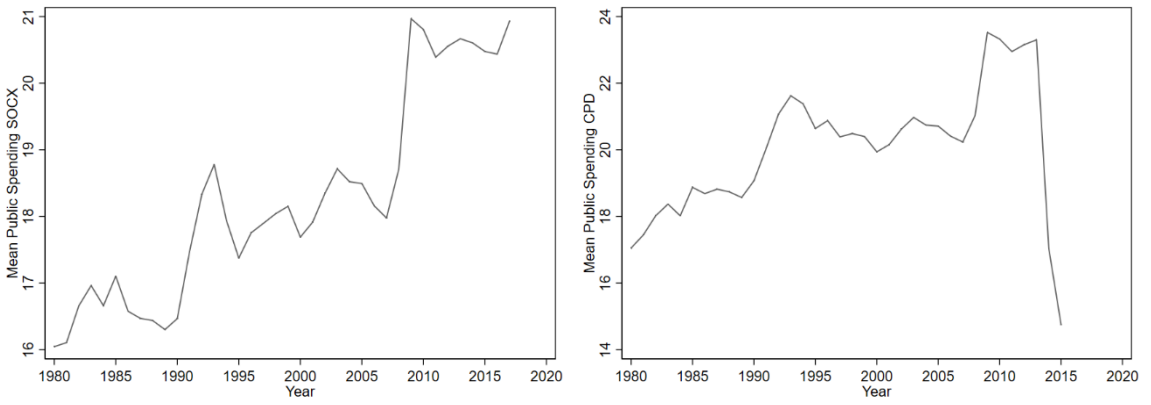

Figure 4 – Average Public Social Spending (% GDP), OECD 1980-2017

This aggregate look at public social spending is useful but some authors argue that it is too general overlooking specificities of certain groups of countries as far as the welfare state is concerned Offe (1991) or Hicks (1991). Following the work of Esping-Andersen (1990), a significant number of studies highlights that countries put in place different welfare state models or regimes. The pooled analysis may thus masks the situation of certain countries or groups of countries since it treats all countries as equal not taking into account cross-national differences in welfare state arrangements since different countries "(…) owe their origins to different historical forces, and they follow qualitatively different developmental trajectories" Esping-Andersen (1990), p.3. Esping-Andersen (1990) suggested clustering countries taking into account the respective welfare state organization, stratification and social integration attributes. Based on this approach, the author classifies welfare states into three different regime/types based on data for 18 affluent countries: Liberal, Conservative and Social-democratic regimes.

Other studies followed using different classifications, such as those by Leibfried (1992), Castles & Mitchell (1993) and Siaroff (1994). More recently, Hein et al. (2020) and Hay & Wincott (2012) suggest an adapted and extended classification of regimes into 5 categories based on data for a set of 30 OECD countries:

1. **Anglo-Saxon/Liberal** - Australia; Canada; Ireland; New Zealand; United Kingdom; United States.
2. **Continental European/Corporative/Conservative** - Austria; Belgium; France; Japan; Korea; Netherlands; Germany; Switzerland; Luxembourg.
3. **Scandinavian/Norway** – Denmark; Finland; Iceland; Norway; Sweden.
4. **Central and Eastern European** - Czech Rep.; Estonia; Hungary; Poland; Slovak Rep.; Slovenia.
5. **Mediterranean/Southern European** - Greece; Italy; Portugal; Spain.

Figure 5 contains data on average public social spending as a percentage of GDP for each of the form 5 welfare regimes over the period 1980-2017. As expected the Scandinavian or Nordic welfare state regime records the highest levels of social spending (% GDP) while the Liberal or Anglo-Saxon regime records the lowest values over the years. Over time, the different welfare state regimes maintain the respective relative position in terms of social spending. The exception is the Mediterranean or Southern European regime that starts the period with the lowest share of social spending as a percentage of GDP, close to Liberal regime but from the beginning of the 1990's starts to converge to the higher social spending ratios of the Scandinavian regime and even overcome the latter from 2007 onwards. It is also important to note that all the regimes record an increase in social spending on the early stages of the subprime crisis (2007) that levelled out soon after 2009.

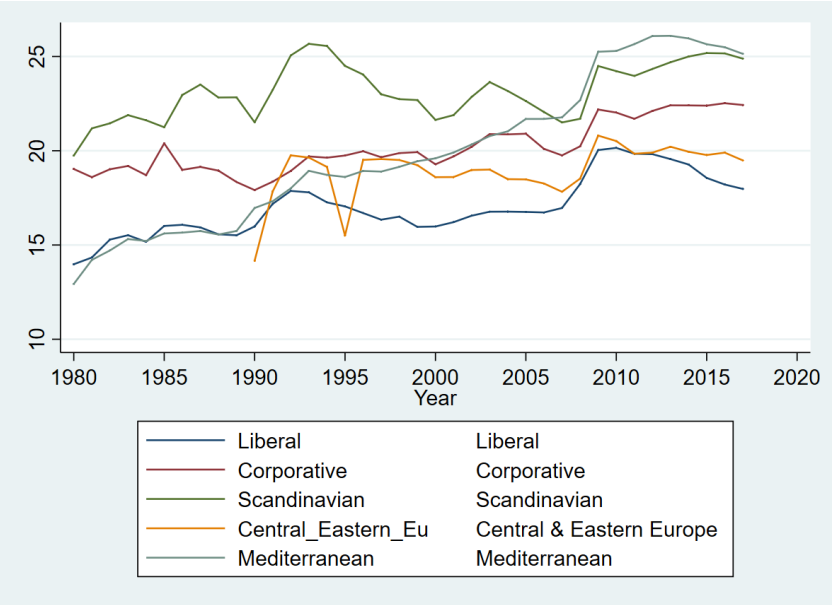

Figure 5 - Mean Social Spending (GDP %) for five different welfare state regimes, 1980-2017

4.3 An overview of the dimension 'Human Capital'

The way in which the welfare state affects growth depends on many factors, namely the different possible transmission mechanisms, so it is necessary to take into account direct and indirect effects. For instance, public expenditures on education and health lead to the accumulation of human capital, an important source of growth in modern knowledge-based economies such as the ones included in the sample of OECD countries, which are the focus of our dataset.

Although the concept of human capital has been analysed as far back as 1776 by Adam Smith, human capital theory developed from the work of Theodore Schultz (1961) and Gary Becker (1964) in the 1960s that show that investing in human capital can have powerful implications at the economic level. As far as growth theory is concerned, the main contribution of human capital theory has been to highlight investing in human capital as essential to improve long-run macroeconomic performance. Moreover, such investment comes from different sources, for example, health, experience, or training but its measurement presents some challenges and so empirical studies often use health and education indicators as proxies for human capital.

According to Grossman (1972), health can increase or decrease over time and it differs across individuals. In fact, healthier populations think better and focus more on the tasks performed improving performance levels and productivity. Moreover, healthier workers are less likely to miss work due to sickness, Bloom & Canning (2000). Health also plays an important role at school decreasing school absence and enhancing students' learning ability, in particular, children's nourishment contributes to better cognitive skills Alderman et al. (2006). Additionally longevity, linked to lower mortality, can act as an incentive for investing in

education and additional qualifications with a positive impact on economic growth. This health-education nexus is tested by e.g Miguel & Kremer (2004).

At the empirical level, the pioneer work of Preston (1975) found a positive relation between health and economic growth. However, studies that are more recent also find a negative relationship, e.g. Lewis & Jack (2009). Results appear to be sensitive to the health proxies used or the countries' income level. Bloom et al (2004) argued that health affects economic growth through its impact on labour productivity, using life expectancy as a proxy for health. For Lorentzen et al. (2008) the positive relationship between health and growth was obtained using fertility rates as a proxy, however for OECD countries this correlation is only confirmed when using mortality rate below age forty. Cooray (2013) used adult survival rates and found a positive relation with growth but only for upper middle and high income countries. Another interesting point of view is that faster health accumulation does not bring benefits for economic growth, Acemoglu & Johnson (2007). From the point of view of Bhargava et al. (2001) the impact of health on growth is significant until it reaches a certain threshold beyond which the impact becomes insignificant.

Nevertheless, the main source of human capital considered in empirical analyses is education based on the idea that higher levels of educational attainment results in more skilled and more productive individuals. Education also plays a fundamental role in the production of new ideas and facilitates the incorporation of technology developed abroad (De la Fuente and Ciccone (2002); Sianesi & van Reenen (2003); Benos, & Zotou (2014)). Due to data reliability issues and limited historic/country coverage, the empirical analysis of the relationship between educational human capital and growth developed more recently, based on data from Barro & Lee (2013) or Cohen & Soto (2007). In spite of these advances in data coverage, the lack of information still generates important gaps in the data, which is still mostly limited to indicators related to the quantity of education such as years of schooling or enrolment rates. Caselli (2005) developed a new concept for educational human capital assessment: the notion of quality. In fact, having more years of education does not mean that students are learning/acquiring more knowledge. Angrist et. al (2019) and other recent studies have shown that empirical analyses of the growth impact of human capital are more robust when indicators of quality/learning outcomes are considered instead of educational attainment Hanushek & Woessmann (2008); Hanushek & Woessmann (2012).

Another possible approach to the measurement of educational human capital is combining information on schooling levels (quantity) with information on learning outcomes (quality). Although a variable that combines both quantity and quality of education improves the robustness for empirical studies, the difficulties associated with getting access to appropriate measures of quality, especially for developing countries, are still a major issue in the literature, see example.g. Hanushek and Woessmann (2012). Recently Angrist et al. (2019), Filmer et al. (2018) and Kraay (2018) suggested new measures of human capital that include the quality of schooling. Moreover, they contribute with data with wider coverage, in terms of countries and time, openning up new avenues of research on this topic. Unfortunately, this data is not fully

available yet which leaves us with no option in terms of including it in our dataset. Trying to get around this problem, we decided to build measures that combine the former main characteristics. We describe all the steps taken for its construction in the “

An alternative human ” section.

In summary, the human capital dimension of the WISER CD includes variables related to the health status of the population (e.g. life expectancy, mortality/survival rates) and the formal education sector (e.g. enrolment rates and years of schooling). As far as the quality of education is concerned WISER CD compiles a set of variables for learning outcomes from several international assessment agencies and for three different subjects: Mathematics, Sciences and Reading.

Based on the inspection of Table 4, as far as human capital variables are concerned, we conclude that health human capital variables have more observations than educational human capital variables (nearly 1300 for the first and around 1000 for the latter). Nevertheless, the human capital index from Penn World Tables (PWT) includes more than 1300 observations, the exception in terms of number of observations for educational human capital. On the other hand, for health human capital, under 5-years old survival rate provides 1365 observations. The infant mortality rate data covers the period 1980 to 2017 with around 38 observations for most countries; exceptions are Czech Republic, Slovak Republic and Slovenia with 37. As for education human capital from PWT, the data covers the period from 1980 to 2017 and most countries have around 38 observations; exceptions are Czech Republic, Estonia, Latvia, Lithuania, Slovak Republic and Slovenia with 28.

In WISER CD, Finland in 2017 records the highest 5-year survival rate and Turkey in 1980 the lowest. Israel in 2017 records the highest human capital index (from PWT) and the lowest value is recorded by Turkey in 1980. In terms of mean values, Iceland also records the highest mean for 5-year survival rate and Turkey the lowest; for educational human capital the United States records the highest value and Turkey the lowest. Figure 6 contains the mean values for the 5-year survival rate. The right-hand side of Figure 6 contains the evolution of the mean 5-year survival rate for a sample of 36 OECD countries showing a positive trend.

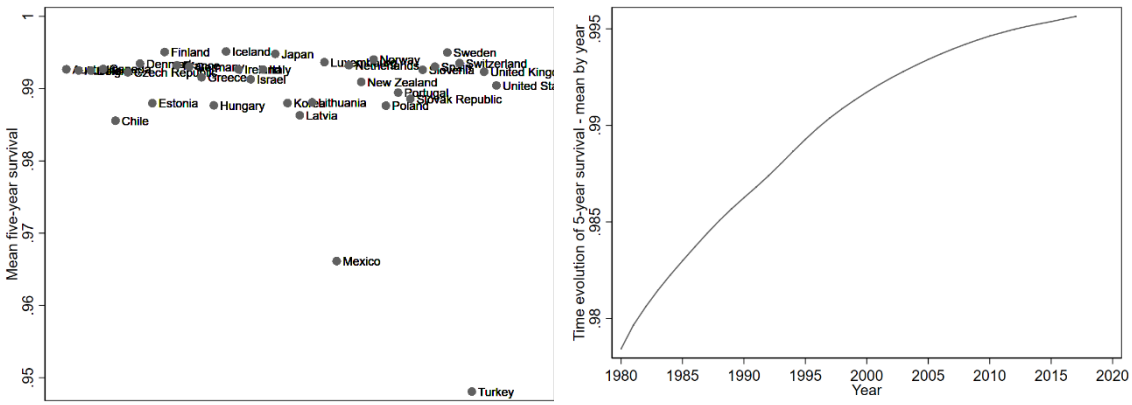

Figure 6 - 5-year survival rate: cross-country analysis and trend (36 OECD, 1980-2017)

Figure 7 contains information on the behaviour of the mean (36 OECD) of human capital index from PWT over the period 1980 to 2017. As expected, it shows a positive.

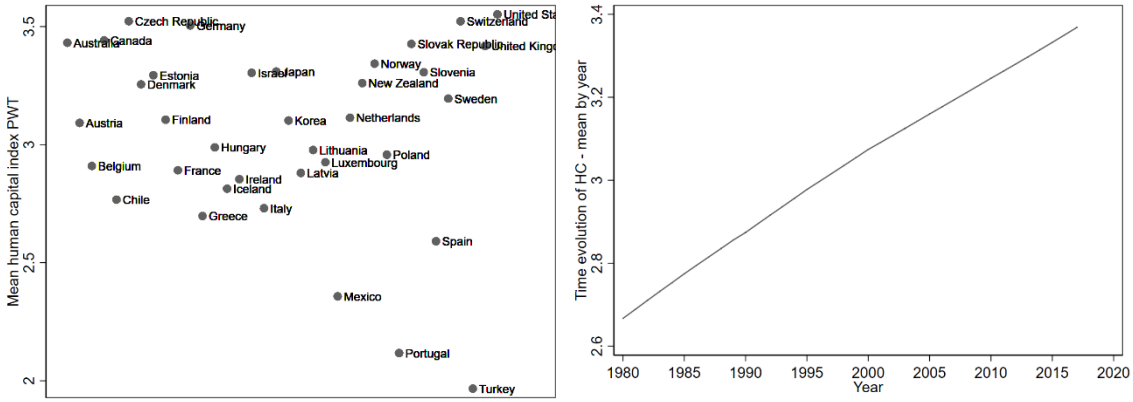

Figure 7 – Human capital index: cross-country analysis and trend (36 OECD, 1980-2017)

4.3.1 Measuring learning outcomes

Regarding the issue of the quality of education, we constructed a new variable that measures the quality of education obtained by the population based on learning outcomes.

There are a few international agencies, such as the IEA (International Association for the Evaluation of Educational Achievement) or the OECD, that provide information on learning outcomes worldwide but not for all countries or for many years and usually the assessment years do not coincide across agencies. Another problem associated with measuring learning outcomes is the fact that agencies may use a different measurement scales. These problems were corrected following some of the rules of thumb suggested by Altinok et al. (2012). Firstly, we collected as many information from assessment programs as possible to reduce yearly data gaps, and secondly harmonized the different scales used by applying the anchoring method. Concerning the first rule, we gathered information on education learning outcomes assessment programs from two organizations – the OECD and the IEA - which includes the results fo the tests to assess students learning outcomes in Mathematics, Science and Reading provided by PISA, PIRLS (Progress in International Reading Literacy Study), TIMSS (Trends in International Mathematics and Science Study) and PIAAC (Programme for the International Assessment of Adult Competencies). Table 6 provides the necessary information on harmonizing the different scales.

Table 6 – Harmonizing scales using the NAEP

4.3.2 An alternative human capital index

As indicators of human capital that simultaneously include information on the quantity and quality of schooling are scarce or have limited country/time coverage we decided to add a new variable to our dataset the construction of which followed the "World Bank Human Capital Index" methodology described in Kraay (2018). The main goal of this new measure of the World Bank is to illustrate the fundamental human capital formation stages of a child from birth to adulthood and capture its consequences for productivity. This is accomplished through the consideration of three different components:

1. Survival;
2. Learning-adjusted years of schooling;
3. Health.

Survival is measured using of the inverse of the under-5 mortality rates from UN Child Mortality and World Development Indicators. Learning-adjusted years of school is the combination of enrolment rates from UNESCO and learning outcomes from the different sources described in the previous section. Health includes of the inverse of the adult mortality rate from the World Development Indicators and from the United Nations[4].

In the end, we constructed four different variables: adult survival (HC_adsurvival_WISER), expected years of schooling (HC_yschool_WISER), under-5 survival (HC_surv5und_WISER) and the human capital index (HC_hci_WISER).

4.4 An overview of the dimension 'Inequality'

Widening income inequality in many countries since the 1980s-90s resulted in a resurgence of interest on the role of the welfare state and its consequences for economic performance since a main objective of the welfare state is reducing income inequality and enhance equality of opportunities by allowing for a more equal distribution of income. The impact of inequality on economic performance, and in particular growth, remains however an unresolved issue in both the theoretical and the empirical literature, see e. g. Furceri & Ostry (2019), Förster & Tóth (2015), Castelló-Climent (2010), Dabla-Norris (2015), Halter *et al.* (2014), Ostry *et al.* (2014), Neves *et al.* (2016) and Aghion *et al.* (1999).

The inequality dimension of the WISER CD includes variables that reflect inequality of opportunities and in particular related to the income distribution, including indicators such as the poverty gap, income ratios and several types of indexes that measure inequality in the distribution of personal income. The most popular measure of income inequality is the Gini coefficient. It derives from the Lorenz Curve (see Lorenz (1905)) which compares the cumulative percentage of a population against the cumulative percentage of income. This measure' main advantages are the easy computation, interpretation and cross-national comparability, while the main disadvantage is the sensitivity to middle class income instead of the extreme classes. WISER CD contains Gini indexes

[4] More details can be accessed on sections 2 and appendix of Kraay (2018).

from different sources, all covering the distribution of household income but with different approaches namely: after taxes and transfers (disposable/net), before taxes and transfers (market/gross) and after taxes but before transfers (pre-transfer). Another income inequality measure is the Theil statistic from Theil (1967), known as an entropy measure that decomposes inequality in two parts, within groups and between groups. Theil statistics are an adequate measure of inequality and has less rigid data requirements but, on the other hand, the values are not easily interpreted and are not always comparable across countries. The Atkinson's index, Atkinson (1970), measures the distribution of income giving more importance for those in the upper or lower end of the distribution, and presents several interesting properties such as the possibility to include the level of inequality aversion of society (mathematically identified by epsilon[5]). It is a suitable measure for income inequality since it has subgroup consistency and sensitivity adjustment despite giving more importance to the lower end of the income distribution. In WISER CD users may find the Atkinson's index calculated in two ways, with an epsilon of 0.5 (society less sensitive to inequality) and with an epsilon of 1 (higher aversion to inequality).

According to the data presented in table 4, and based on the highest number of observations available, the inequality variables selected for further analysis are the Gini coefficient from the Standardized World Income Inequality Database (SWIID) and the Theil statistics from the Estimated Household Income Inequality Data Set - University of Texas (TEX). Gini coefficient data covers the period 1980 to 2017 and includes observations for all countries where, most with 30 or more observations; exceptions are the Czech Republic, Estonia, Iceland, Lithuania and Slovak Republic with 29 or less observations. The Theil statistic covers the period from 1963 to 2015 and has observations for all countries in our database. In this case, an important number of countries have more than 30 observations and a few have less than 20 observations, including Iceland and Switzerland.

A more in depth analysis revealed that, for the Gini coefficient, Chile between 1998-2000 is the most unequal country with a Gini of 48.5%, and the Slovak Republic 1989-1990 is the most equal country with a Gini of 17.4%. On the other hand, for the Theil statistic, Estonia in 1997 records the highest value (0.1248) while the Czech Republic in 1990 records the lowest value (0.0024). After controlling for the lack of observations in certain periods/countries for appropriate examination in terms of observations consistency, the analysis of country means reveals that: Chile has the greatest mean Gini coefficient and Finland the lowest (47.08% vs 23.21%); Theil statistics reveals Chile as the top country in term of income inequality and Sweden is located at the bottom (0.074 vs 0.0069). The position of the remaining countries is patent in figure 11.

The analysis of the behaviour of the mean OECD Gini coefficient over time (1980-2016) presented in Figure 12 reveals a positive trend with a very steep increase during 1990's and again a steady increase until 2016. Curiously, the same analysis for Theil statistics reveals a different story: the positive trend is only visible until the mid-2000's, and from then onwards there is a decreasing pattern until 2015. It is important to highlight that these different measures of inequality reveal different

[5] Further explanations for the Atkinson's methodology and other measures of income inequality are available at the supplementary materials section.

patterns of behaviour over time with the Gini coefficient showing a more stable behaviour while the Theil statistic seems to be more volatile.

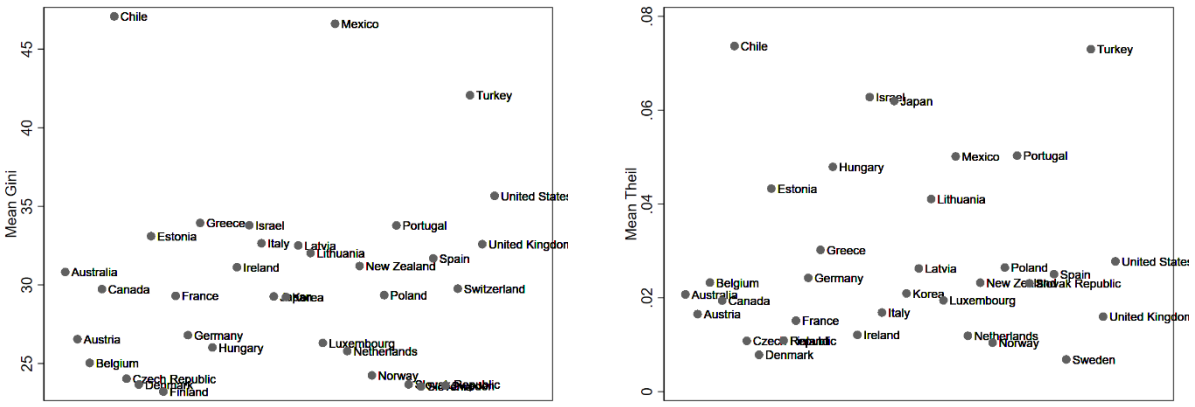

Figure 11: Mean income inequality by country (35 OECD for Gini and 33 OECD for Theil)

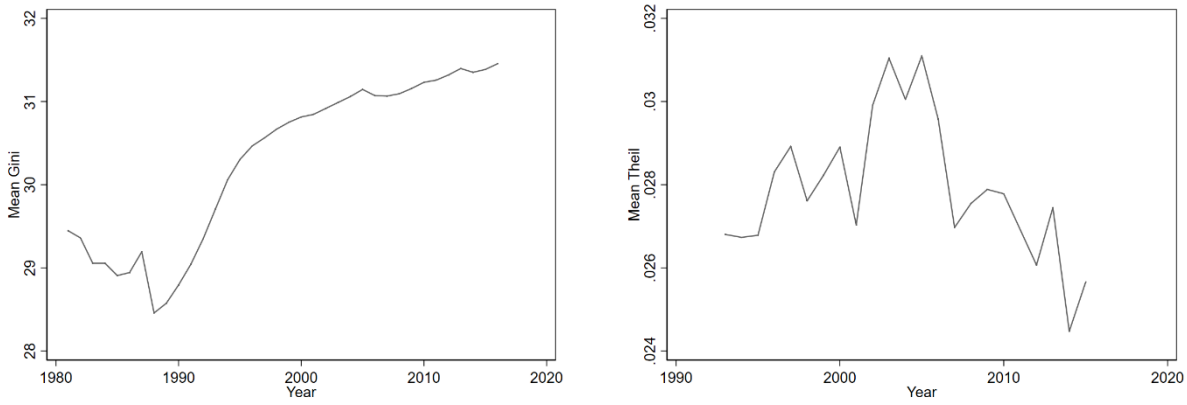

Figure 12: Mean OECD income inequality, 1980-2016 for Gini & 1993-2015 for Theil

4.5 An overview of the dimension 'Government Size and Financing'

The most widely used measures of the welfare state relate to social spending but the impact of the welfare state on economic growth also depends on its financing, namely on the dynamics between how the financial resources that support the welfare state are raised and how they are spent. The financing and institutional mechanisms put in place for obtaining welfare funding and the constraints resulting from the budget balance and past governments' debt are therefore relevant dimensions in the analysis of the relationship between the welfare state and economic growth.

The government size and financing dimension of the WISER CD thus includes variables that account for the dimension of the government/public sector and its fiscal budget and budget balances, such as government consumption, the tax burden, or the public deficit, among others.

A first look at data highlights three different variables due to the higher number of available observations: tax revenue (% GDP), government debt (% GDP) and the fiscal balance (% GDP).

Furthermore, all countries have more than 23 observations for the indicator of tax revenue, and more than 22 observations for the other variables, with the exception of Chile, Israel, Korea, Mexico and Turkey with no observations. Additionally, concerning tax revenue, Israel in 1982 recorder the highest value (almost 39%) and Switzerland in 1993 the lowest (7,39%); for government debt, Japan recorded the highest value (222% in 2016) and Luxembourg the lowest (4.65% in 1991); fiscal balance has Norway in 2008 as the top performer (18.7%) and Ireland 2010 at the bottom (-32%). Further analysis based on mean values are available in figures 13 and 14. To guarantee more reliable results some countries/years had to be excluded from the calculations of the mean because of inconsistencies regarding the respective observations that bias our analysis. It is interesting to note that the group of Nordic countries are among those with better performances for the variables under analysis. Over time, it is possible to detect a positive trend from the 2008 subprime crisis onwards, especially for government debt and public deficits.

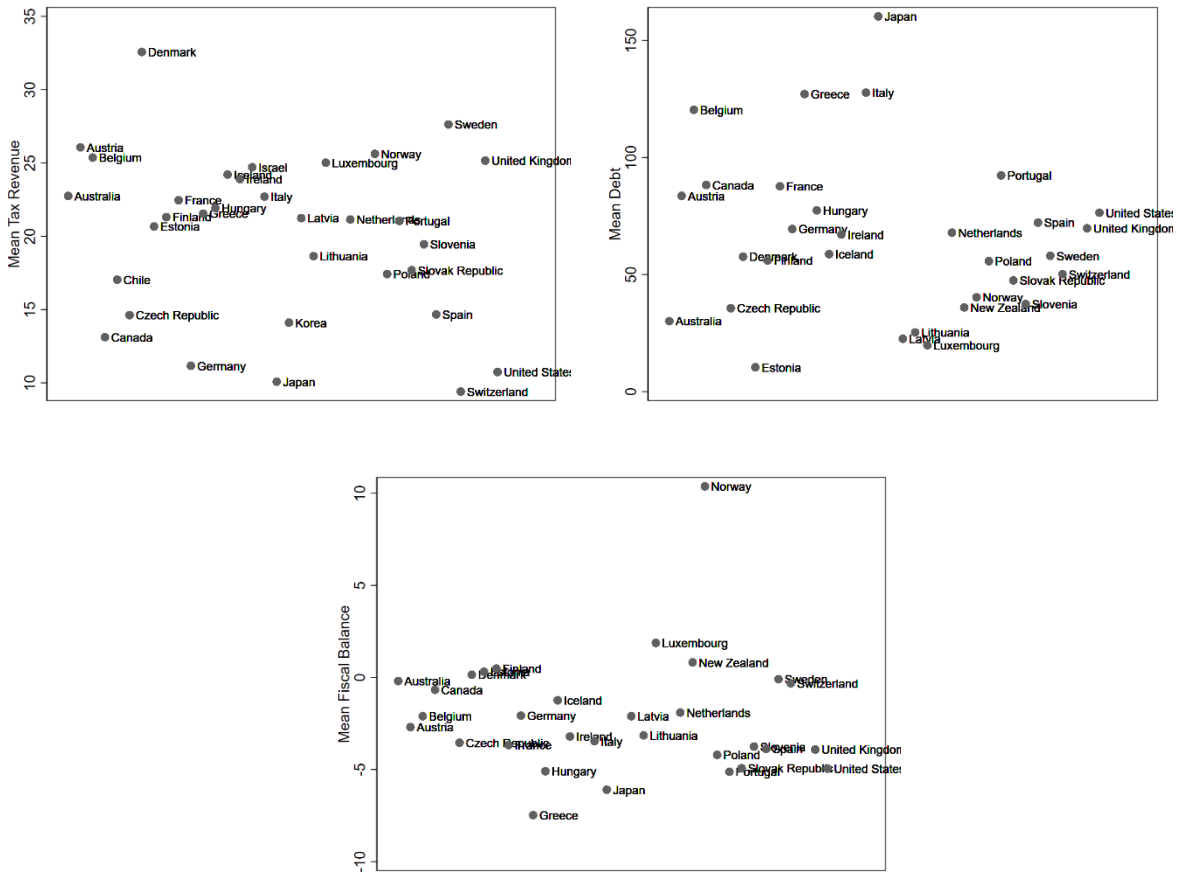

Figure 13: Mean tax revenue, debt and fiscal balance by country
(33 OECD for tax revenue and 31 OECD for the remaining indicators)

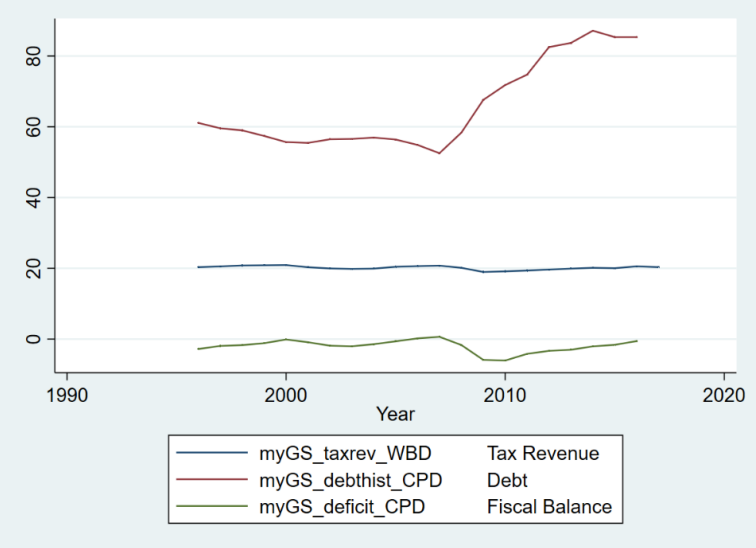

Figure 14: Mean tax revenue, debt and fiscal balance over time
(OECD 1995-2017 for tax revenue and 1995-2016 for the remaining indicators)

4.6 An overview of the dimension 'Control Variables'

Due to the large number of variables with the potential to influence economic growth, the results of the statistical analyses of the relationship between the welfare state and economic growth depend on the control variables included in the regression, an issue known as model uncertainty (Ulaşan (2012)) that has been dealt with using different methodologies for the identification of the most relevant growth determinants (Sala-i-Martin, (1997); Sala-i-Martin et al. (2005); Jarociński (2010); Moral-Benito (2012)). We used this literature and results from previous empirical studies on the relationship between the welfare state and economic growth to identify the variables to include in the dimension control variables.

The control variables dimension of the WISER CD thus includes variables that reflect important growth determinants identified in previous studies, such as those predicted by exogenous growth models (e.g. investment) or more closely related to endogenous growth theory (institutional characteristics; foreign competitiveness). This is the dimension with more variables in our dataset, in the one hand because of data availability and, on the other hand, because our intention was to gather a vast amount of information reflecting the many potential growth determinants. This dimension additionally includes variables that cover topics such as the rule of law, freedom and civil rights, market regulations, political regime, corruption, investment on physical capital, globalization and trade openness.

Based on the number of observations available, three indicators related to population stand out from the OECD statistics – total population in millions, working age population (% of total population), and young population (% of total population). For this set of variables, all countries have more than 33 observations, the only exception is Lithuania with no observations. The highest values in the for total population, the share of working age population and the share of young population are recorded,

respectively by the United States in 2014, Korea in 2012 and Mexico in1980; the lowest values are recorded by Iceland in 1980, Mexico in 1980 and Japan in 2013. Figure 15 summarizes the country mean for each variable and figure 16 presents the evolution of the OECD mean over time. In figure 16 is possible to identify a positive for total population and the share of working age population and a negative trend for the share of young population, confirming rapid population ageing.

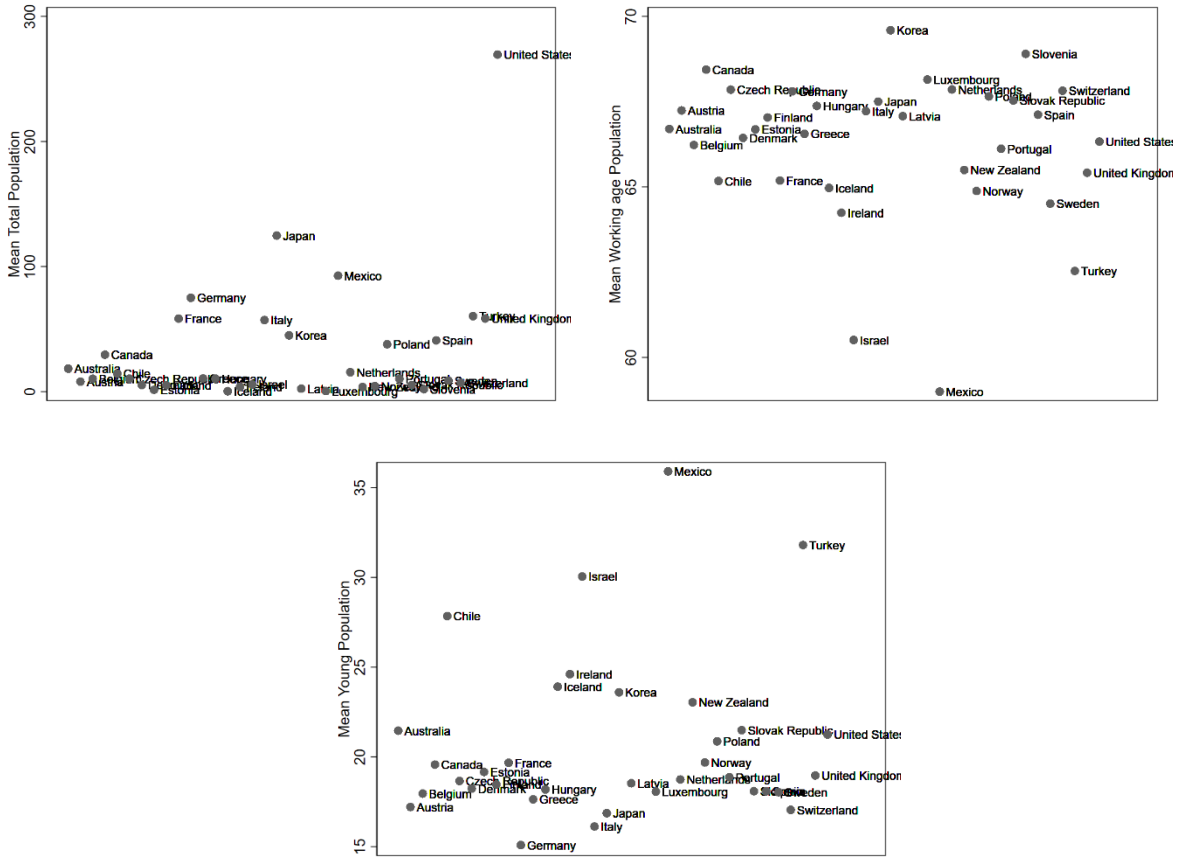

Figure 15: Mean total population, share of working age population and share of young population by country (35 OECD)

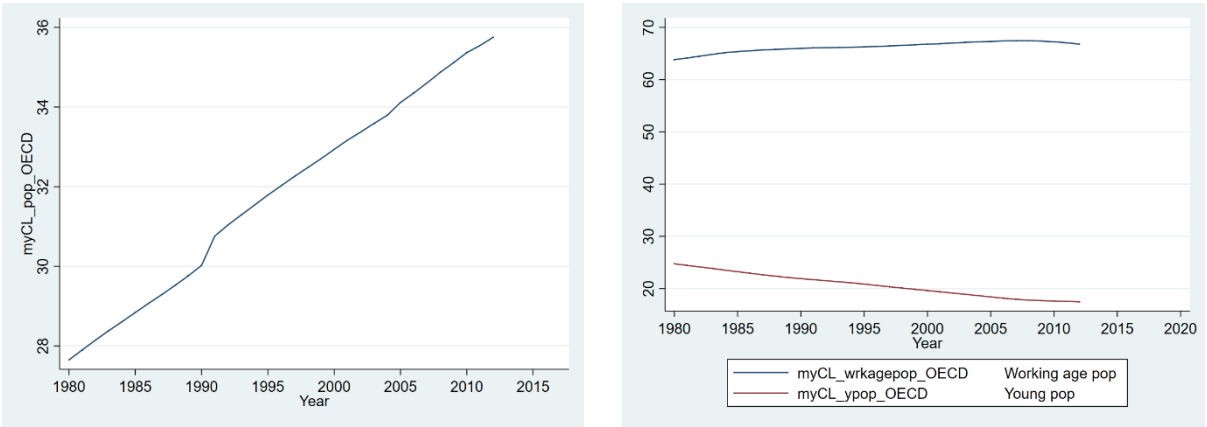

Figure 16: Mean total population, share of working age and young population (35 OECD from 1980-2012)

5. Conclusion

This paper describes the contents of the WIDER CD (**W**elfare **I**ntervention by the **S**tate and **E**conomic **R**esilience **C**omprehensive **D**ataset) database that includes 6 different dimensions of relevant data for empirical analyses of the relationship between the welfare state and aggregate macroeconomic performance (economic growth; welfare state; human capital; inequality; control variables; government size and financing). This data is especially useful for the study of the effects of the welfare state on economic growth, highlighting inequality and human capital as mechanisms of transmission. We collected information on 1085 variables for 36 OECD countries from 1980 to 2017. This database can also be useful for panel data studies on the relationship between the social and economic outcomes of the welfare state and also allows for the study of other relevant issues in the field of economic growth. Two additional datasets were constructed based on the estimation of missing values (Amelia II imputation) that allow researchers to apply a wider range of estimation methodologies, namely those that demand balanced panel datasets, although at the cost of reducing the number of variables available.

The database builds on existing databases with more specific thematic coverage selecting and uniting in a single database the variables considered of interest to the analysis of the welfare state-economic performance nexus and extends previous efforts regarding the measurement of specific dimensions, in particular human capital. As far as data availability of the variables of interest is concerned, human capital presented some challenges related to the short time coverage (yearly data) of the data for learning outcomes across countries. We tried to overcome this limitation by building a new variable for human capital based on learning outcomes that compares well with alternative measures proposed by the literature. In any case, time coverage remains limited. Welfare state measures provide an acceptable year/country coverage but this applies mainly to the variables from OECD SOCX. The variables in the Comparative Political Data Set present some disadvantages in terms of limited country coverage and lack of data for recent years. For the income inequality dimension, the Gini coefficient is the indicator most often used in the literature corresponding to a diversity of sources and construction methodologies. Alternative inequality measures such as Theil's T statistic and Atkinson's index were included in the database since they allow for additional insights but at the cost of more limited data availability.

Our aim is to contribute to sound empirical analyses of the relationship between the welfare state and aggregate macroeconomic performance by making it easier for researchers to access relevant data, comparable across countries and with good time coverage. The WISER CD database is a first attempt in this direction that must be explored, critiqued, and improved in the future, as well as updated as more recent data becomes available.

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