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Public Sector Performance and Economic Growth –The Case of the Euro Area

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Abstract

Despite the high expectation for the Eurozone to lead to convergence, empirically it has not materialized. There are clear "winners" and "losers" after entering the EMU. Our aim is to find to what extent the different institutional aspects are related to this. Our approach is to build a composite indicator to measure public sector performance, based on previous literature. We found that the countries who grew the most are the same ones whose institutional improvement was the greatest over the last 20 years. Using a panel data regression, we've also concluded that our indicator has significant relation with economic growth.

Keywords: Economic Growth, Public sector performance, Institutions, Monetary Union, Euro Area

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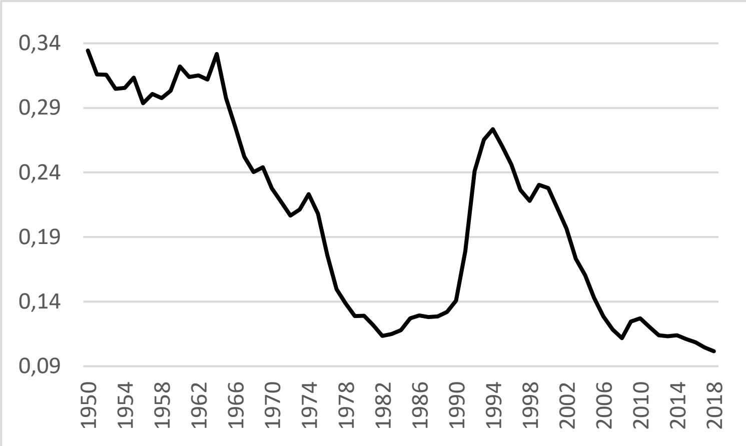
1. Introduction

At the time of the emergence of the monetary union in Europe, whose creation was the culmination of several political efforts, expectations were extremely high regarding convergence in terms of economic growth. Actually, according to some authors this would be the endogenous and evident result, given the conditions (Frankel and Rose, 1998). Still, some concerns were also raised (James, 2012). The underlying theory is the so-called Optimal currency area (Mundell, 1961). It has been developed with the intention of determining the optimum scope of an economic area with fixed exchange rates and common monetary policies. It lays emphasis on the trade-off between the reduction of transaction costs within a single currency area and the increase in adjustment costs in terms of employment and inflation associated with the loss of the exchange rate as an instrument when facing asymmetric shocks. The expectation was that the first aspect outweighed the last one (Rose, 2000, and Rose and Wincoop, 2001).

For the eurozone to come into existence, the main institutional changes that were made were: the elimination of exchange rates, the introduction of an independent central bank that conducts the common monetary policy, the regulations for fiscal policies, and the labour market and wage setting institutions in the euro area (Hein and Truger, 2005).

However, empirically, and now, after a few years, the so anticipated convergence has not materialized.



[1]

Figure I- σ Convergence in the Eurozone, 1950-2016

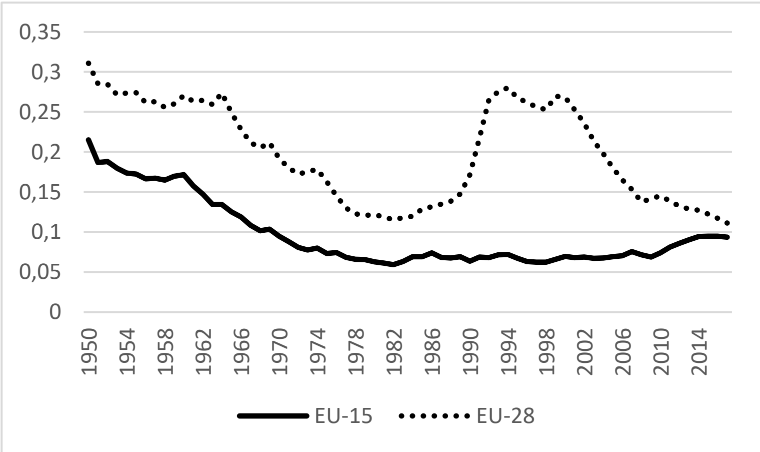


Figure II- σ Convergence in the EU, 1950-2017

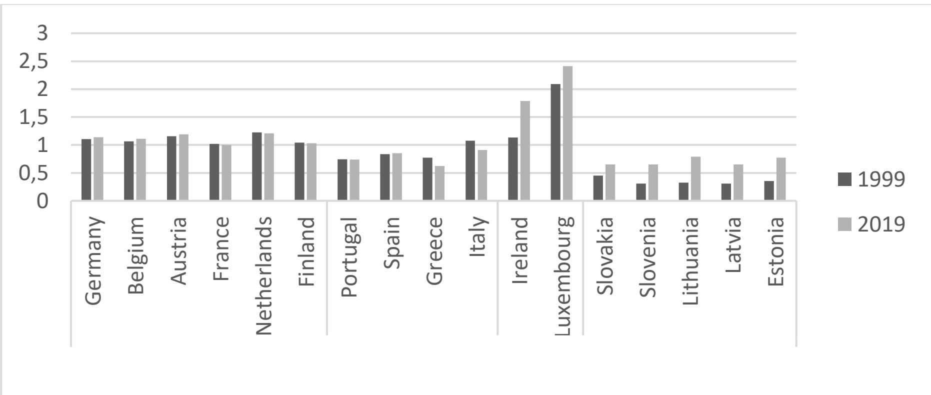


Figure III- GDPpc as share of the GDPpc of EMU, 1999 and 2019.

[1] The information in the figures I and II refers to σ-convergence, which is measured as: σt= $[1n\sum(lnyit-ln\bar{y}t)2ni=1]12/$, where $lnyit$ is the natural logarithm of GDP per capita in country i at time t, and $ln\bar{y}t$ is the natural logarithm of the average of GDP per capita in the sample under consideration, constituted of n observations. GDP = GDP per capita in 2017 US$ (converted to 2017 price level with updated 2011 PPPs). Source: The Conference Board

The matter of convergence mostly lies in the fact that after the fall of communist regimes that used to prevail in Eastern countries, have passed through big crises, diverging in the early 1990s, and then recovered during the nineties, giving the appearance of a very sharp convergence. However, if we take a closer look to the values at the end of the period, they are just a retriever to the values from the eighties. In Figure II, we can see the same phenomenon: there is a strong convergence of the EU-28, where the Eastern countries are included, but there is not in the EU-15, where the classic members are.

With Figure III it becomes evident that while some countries adapted to euro and were well succeeded, others did not show the same improvement. There are big losers and big winners, and then some who neither gain nor lose much.

As winners, we have the countries of the East: Slovenia (increased its ratio of GDPpc to GDPpc of EMU from 0.31 to 0.65) Slovakia (0.45 to 0.65), Lithuania (0.32 to 0.79), Latvia (0.31 to 0.65) and Estonia (0.35 to 0.77). Also, there are some special cases such as Ireland and Luxembourg, that have some unique characteristics. As losers, we have the southern countries: Greece (decreased its ratio from 0.77 to 0.62), Italy (1.07 to 0.91), Portugal and Spain. Regarding the central countries, they maintain their levels across the time period, some were even able to increase it.

Our empirical work will then try to explain to what extent the different institutional aspects are related to these differences. With this aim, we applied the composite indicators Public sector performance (PSP) and Public sector efficiency (PSE) from the article "Public sector efficiency: evidence for Latin America", written by António Afonso, Alma Romero and Emma Monsalve. In order to estimate the impact, we have also estimated an economic growth model, based on literature on this subject, including human capital, investment, government expenditure, openness, and population growth. Regarding the estimation itself, we chose panel data econometric methods, and our sample comprises data from 1999 to 2019.

The paper is organized as follows. The following section, section 2, presents a literature review on the EMU, and on the relationship between economic growth and institutions. Section 3 presents our composite indicators, PSP and PSE as well as statistical description of the data for the relevant variables. In section 4, we do a descriptive analysis on PSP and PSE and interpretation of the results of our indicators. Next, in section 5, methodological considerations are made, and econometric specification is laid out. In section 6, we discuss the empirical results. And the final section presents the main outcomes of our research, the contributions of this study and policy implications.

2. Literature Review on EMU and Institutions

It is quite clear the fact that EMU countries have not been converging as we would have expected. In fact, there must be significant differences between them, given the different economic performance they present. This could be explained by a various number of reasons, namely the fact that, structurally, there is an incomplete synchronisation of the business cycle across the euro area, because even though member countries display different long-run trend rates of growth, inflation and employment rates, the ECB must apply the same interest rate, inducing asymmetric effects on them (Arestis et al., 2002). In addition, this asymmetry problem is deepened by the variety of monetary transmission mechanisms in EMU countries, following from differences in the structures of goods, labour and especially financial markets. Also, Cecchetti (1999) argues that countries with many small banks, weak banking systems, and low access to direct finance through capital markets display a greater sensitivity to monetary policy shocks compared to countries with big, healthy banks and well-developed capital markets, which may have considerable long-term effects.

Although standard macroeconomic policies are important for growth, other aspects of "policy" – broadly interpreted to encompass all government activities related with economic performance are even more significant (Robert Barro, 2013).

There is now a flourishing intellectual consensus that institutions matter for growth, but there is disagreement about how precisely, the extent to which this is the case, and which institutional arrangements affect growth more than others. Since Veblen and Marx, it is known that technological change and institutions are the main drivers of capitalism. Nevertheless, it was Joseph Schumpeter (1934, 1962) who developed a theory on technology, institutions and economic development that really succeeded in rivalling neoclassical equilibrium theory. Among other things, it lays emphasis on how important interactions between economic actors and national institutions are for economic development.

Also, North (1990), whose definition of institutions is "*the humanly devised constraints that structure human interaction and provide the rules of the game. To an important extent, institutions determine the scope and degrees of freedom for policy making. Together with policies and culture, institutions provide the incentives which guide the behaviour of economic actors*.", brings the focal point on the relationship between institutional change and technological progress overtime. In his perspective, technological development is linked to the adaptive efficiency, e.g., the rate at which a society's institutions are able to change. According to North, economic history exhibits that only a few countries had flexible institutions conducive for growth; most societies, however, got stuck in an institutional setting that hindered them from fully benefitting from technological-economic challenges.

3. Methodology

3.1 PSP

Public sector performance as defined by Afonso, Schuknecht and Tanzi (AST), applied to 23 industrialized countries in 2003, is assessed by constructing composite indicators based on observable socio-economic variables that are assumed to be the output of pursued public policies:

$$PSP_i = \sum_{j=1}^{n} w_j PSP_{ij};\ \sum_{j=1}^{n} w_j = 1; PSP_{ij} = f(I_k), k = 1, \ldots, r \qquad \text{(I)}$$

Where w_j is the weight applied to the j^{th} government activity, PSP_{ij} represents the public sector performance for each country in each year, and $f(I_k)$ is a function of k observable socio-economic indicators. Following AST seminal work, PSP composite indicator is divided into two separate groups, as Figure IV shows.

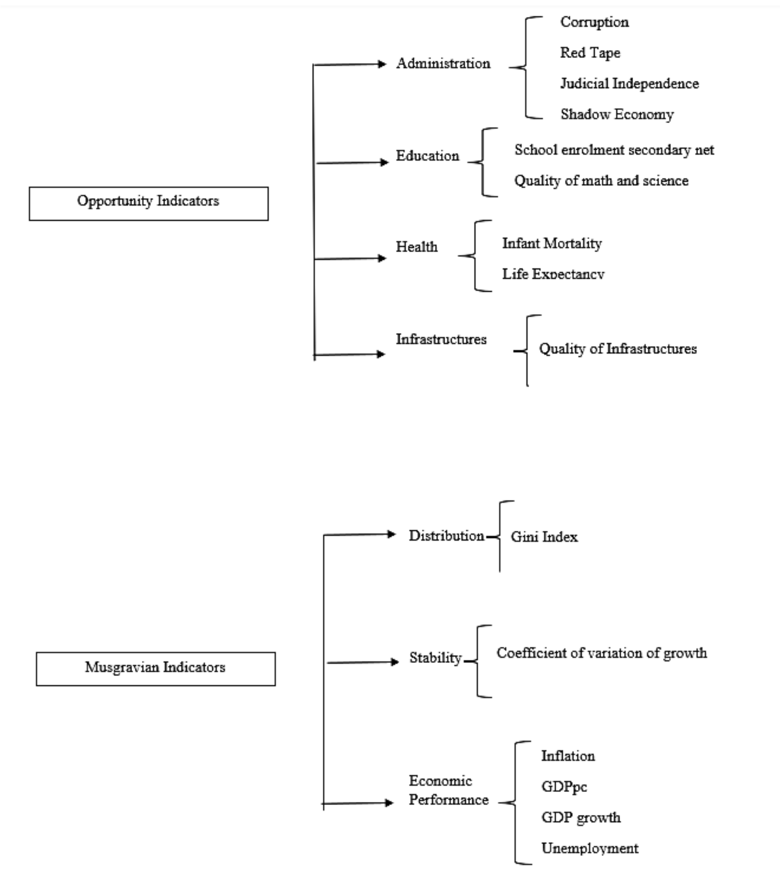


Figure IV. Public sector performance (PSP) indicators

The first group alludes to the role of the government as a promoter of equal opportunities. As for the second group, it comprises outcome indicators of government activities in terms of allocation, distribution and stabilization functions as defined by Musgrave.

All performance indicators were normalized by $\frac{x-min}{\max - min}$, being both min and max relative to the all sample of all countries across the time period, for each indicator. We opted for this normalization so that we could face one of AST's work limitations:

"A word of caution is in order when making the comparative analysis. Changes in public sector performance experienced by countries over time are measured relative to that of other countries. Hence, a given country could have improved its PSP score over time either because of the improvement of its output indicators or because other countries in the sample obtained weaker results."

So, by using both maximum and minimum values of the all sample in the normalization we are able to capture improvements on the country's performance regardless of the performance of others. We compile the performance indicators from the various indices giving equal weight to each of them[2]. For example, when computing the administrative performance indicator, all corruption, red tape, judicial independence and shadow economy contribute 25%, inducing a strong assumption. Also, note that, for variables such as shadow economy, - aspects that would lower our composite indicator - we've used the reciprocal value or performed other transformations, with the purpose of all indicators varying in the same direction. (See table I)

[2] We have also computed the indicator attributing different weights, having similar results. (See appendix IX)

3.2 PSE

Performance indicators as defined by the PSP scores do not relate the achievement of public policies to their cost in terms of public spending. To that effect, it emerges the concept of Public Sector Efficiency.

$$PSE_i = \sum_{j=1}^{n} w_j \frac{PSP_{ij}}{EXP_{ij}}; \sum_{j=1}^{n} w_j = 1; \tag{II}$$

This indicator weighs the public sector performance for each government activity (e.g., Achievements on education) by the amount of relevant public expenditure (EXPij) that is used to achieve such performance (e.g., public spending on education). For the Musgravian indicators, performance on income distribution is related to spending on transfers and subsidies, while outcomes on the functions of the state in terms of stability and economic performance are weighted by total spending.

The overall assumption behind the assessment of public sector performance and efficiency employing PSP and PSE indicators is that the observed outcome indicators are solely the result of public spending policies.

On this computation, expenditures were not normalized, since they are all expressed by ratio of GDP. We normalized only the PSE in the end to ease the analysis.

3.3 Description of proxies and data sources

The present paper considers 17 countries of the monetary union. We've excluded Malta and Cyprus due to the large lack of data. This is not very important since they are both small countries with particular economies. We have also performed multiple imputation to deal with other missing data, which should out bring any problems, since the data shows a stable behaviour.

Relative to the time period, our intention was to initially analyse the biggest time period possible, since the dynamics of economic growth change very slowly overtime. However, we have only considered a time period of 20 years (1999-2019), due to the lack of availability of data, namely “quality of infrastructures”, “red tape” and “quality of math and science”, whose source is the “*world competitiveness report*”, that only has this data from 2007 onwards and there’s no good substitutes to measure these variables to our knowledge.

There is some quite of a consensus in the literature about the main determinants of economic growth. Thus, we chose to consider: Population growth (Dreher, 2006; Aisen and Veiga, 2013), Investment In Physical Capital (Barro, 1991; Benhabib and Spiegel, 1994; Fabro and Aixalá, 2009; Aisen and Veiga, 2013), Public consumption (Barro, 1991; Levine and Renelt, 1992; Moral-Benito, 2012; Afonso and Jalles, 2014), Trade openness (Krueger, 1978 ; Bhagwati, 1978) and Human Capital (Romer, 1990; Benhabib and Spiegel, 1994; Teixeira and Fortuna, 2011; Bodman and Le, 2013).

For the above-mentioned variables, we expect their effects on economic growth to be: negative for government expenditure, since the ratio of real government expenditure to real GDP has a negative association with growth and investment (Barro, 1989;1990), as it has no direct effect on private productivity, lowers savings and growth through the distorting effects from taxation on government expenditure programs; Positive for Investment as percentage of GDP (Mankiw et al. 1992); In what regards population growth, there is no consensus on its impact on economic growth. There are both conceivable reasons for it to have either a positive or negative impact, according to Solow’s growth model, even though the increase of population growth leads to the shrinking of income per capita in the steady state, it does not have an impact on per capita income growth. On one hand, the argument for the possible negative effect is that population growth forces economies to use their scarce savings to undertake capital widening rather than capital deepening. On the other hand, it is also plausible to argue the opposite, a large population might positively affect economic output if the population has superior human capital quality (Purnamasari, 2015). For Trade Openness, a positive effect is expected, due to the specialization in sectors with economies of scale who contribute to the improvement of efficiency and productivity in the long-run, as a consequence of trade liberalization, as stated by Krueger (1978) and Bhagwati (1978), and, at the same time, because of the international diffusion of advanced technologies, which also promotes economic growth (Coe & Helpman, 1995; Grossman & Helpman, 1991; Romer, 1994). Lastly, it is also expected a positive effect for human capital if we agree that individuals with more education are more productive and innovative, which gives rise to the creation of new products and improvement of productivity of factors (Romer, 1990; Benhabib and Spiegel, 1994; Teixeira and Fortuna, 2011; Bodman and Le, 2013).

Table I. Variables and respective sources

Indices/ Variables	Sources	Explanation
Corruption	Corruption Perception Index (CPI)	Scale of 0 (highly corrupt) to 100 (very clean)
Red Tape	World Economic Forum Global Competitiveness Index: Burden of Government Regulation	Scale of 1 (extremely burdensome) to 7(not burdensome at all)
Judicial Independence	Global State of Democracy Indices	Scale to range from 0 (lowest score) to 1 (highest score)
Shadow Economy	Elgin et. Al, 2021	Dynamic general equilibrium model based (DGE) estimates of informal output (% of official GDP). It was used the reciprocal value 1/x
Expenditure on Administration	Eurostat	%GDP
School Enrolment Secondary Net	UNESCO Institute for Statistics	Ratio of children of official school age who are enrolled in school to the population of the corresponding official school age.
Quality of Math and Science	World Economic Forum	Scale of 1 (extremely poor/among the worst in the world) to 7 (excellent/among the best in the world)
Expenditure on education	Eurostat	%GDP
Infant Mortality	The World Bank	Per 1,000 Live Births each year. It was used the Infant Survival Rate: (1000-IMR)/1000
Life Expectancy	The World Bank	At birth, measured in number of years.
Expenditure on health	The World Bank	%GDP
Infrastructure quality	World Economic Forum	Scale of 1 (Extremely Underdeveloped) to 7 (Extensive and Efficient by International Standards)

Expenditure on Infrastructure	OECD	%GDP
Gini Index	The World Bank	Scale of 0 (Perfect Equality) to 100 (Perfect Inequality). It was used: 100-GINI
Expenditures on transfers and subsidies	Eurostat; The World Bank[3]	%GDP
Coefficient of variation of growth	The World Bank	Std. of GDPpc / Mean of GDPpc within the studied period. It was used the reciprocal value 1/x
GDPpc	The World Bank	GDP per capita, PPP (current international $)
Inflation	IMF	Average Consumer Prices
GDP growth	IMF	Gross domestic product constant prices percent change
Unemployment	IMF	It was used the reciprocal value 1/x

4. Descriptive Analysis

Before heading to our estimation process and results, we are scrutinizing our PSP and PSE results. The summary statistics, with the non-normalized data, for easier understanding, are presented in table II, below.

Table II: Descriptive Statistics; yearly data 1999-2019; 17 countries

Variable	Obs	Mean	Std. Dev.	Min	Max
Corruption	357	6.745	3.237	3.4	60
Red Tape	357	3.179	.756	1.55	5.685
Judicial Independence	357	.739	.077	.57	.9
Shadow Economy	357	20.14	6.667	8.836	31.372
Exp on Administration	357	6.546	2.8	.2	41
School Enrolment	357	90.842	4.395	79	100
Quality of math and science	357	4.859	.766	3.07	8.871
Exp on Education	357	5.076	.919	1.4	7.1
Infant Mortality	357	.996	.002	.988	.998
Life Expectancy	357	78.664	3.264	70	84
Exp on Health	357	8.17	1.689	4.7	11.7
Infrastructure Quality	357	5.347	.601	3.45	6.63
Exp on Infrastructure	357	.895	.38	.165	2.328
Gini Index	357	68.291	3.653	61	76.8
Transfers and subsides	357	14.968	4.04	6.8	32.018
Coefficient of variation of growth	357	.262	.094	.133	.436
Total Spending	357	19.514	2.665	11.9	26.2
Average Inflation	357	2.262	2.061	-1.684	15.253
GDPpc	357	34945.723	18641.261	7405.8	117846.1
GDP Growth	357	2.365	3.729	-14.839	25.177
Unemployment	357	9.313	4.567	2.217	27.475

[3] For Belgium 1999,2000; France 1999-2008; Germany 1999-2011. For these data the computation was: Transfers (%Expense) * Expense (%GDP)

Starting by evaluating the opportunity indicators, firstly analysing the Administration: The countries that rank better in terms of corruption are Finland, the Netherlands and Luxembourg, while the ones which rank worse are Greece, Italy, Latvia and Slovakia. The countries with the least Burden of government regulation are Estonia, Finland and Luxembourg; in opposition, the ones with the most are Greece, Italy and Slovakia. Where there is more Judicial Independence is in Finland, Germany, Lithuania and Spain, and where there is less is in Luxembourg and Slovakia. Finishing the Administration with the expenditure as percentage of GDP, the countries that invest the most are Belgium, Greece and Italy, which could lead us to think, at first sight, that the investment is not being conducted in an efficient way in these countries.

Moving forward to Education, the school enrolment secondary net is very similar everywhere in the members of the monetary union, of about 91%. In terms of quality of math and science, the best results are presented by Belgium and Finland, whereas the worst ones are from Portugal and Spain. The investment in this area is larger in Estonia, Portugal and Slovenia, leading us to the same conclusion as the above mentioned.

Talking about health, in terms of infant mortality, the values are very low in the all sample. The life expectancy is also quite similar, but the ones that positively stand out are France, Italy and Spain. In terms of expenditure on health, the countries that choose a larger share of their GDP to assign to health are Belgium and Germany, and the ones with the smallest are Estonia, Latvia and Luxembourg.

Lastly, the best infrastructure quality is in Austria, Finland and France. The worst is in Greece, Italy and Slovakia. The ones that spend the most, in relation to their GDP, are Greece, Lithuania and Slovenia; the ones that invest the least are Belgium, Finland and the Netherlands.

Focusing now on the Musgrave indicators, we conclude that the countries that present more equality are Slovakia and Slovenia and the ones with less equality are Latvia, Lithuania and Portugal. The countries with less unemployment are Austria, Luxembourg and the Netherlands; the ones with more are Greece, Slovakia and Spain.

Finally, analysing GDP growth, the biggest rate belongs to Latvia, Lithuania and Slovakia and the lowest are from Finland, Luxembourg.

Table III. Ranking by Sub-Indicator

	Administration	*Education*	*Health*	*Infrastructure*	*Distribution*	*Stability*	*Economic Performance*
Austria	2	13	6	3	6	9	3
Belgium	11	2	9	8	4	8	6
Estonia	10	7	14	10	11	14	9
Finland	1	1	5	1	3	7	7
France	7	6	2	2	9	4	8
Germany	4	11	7	4	7	10	5
Greece	16	14	12	15	12	1	17
Ireland	6	4	11	13	10	13	2
Italy	17	10	4	17	14	2	11
Latvia	14	9	17	14	17	15	14
Lithuania	12	3	16	12	16	17	13
Luxembourg	5	17	1	6	8	11	1
Netherlands	3	8	10	5	5	5	4
Portugal	9	16	13	7	15	6	12
Slovakia	15	15	15	16	2	12	16
Slovenia	13	5	8	11	1	15	10
Spain	8	12	3	9	13	3	15

From the table presented above, we can draw some conclusions about what variables are contributing to countries' public performances and those that are deteriorating it, coloured in green and red, respectively. This could be interesting to further study, in order to assess particular problems in each economy and finding some suggestions for their future.

Paying attention to the better ranked countries, for example in Belgium, the aspect that hurts the public performance is Administration, and in the Netherlands are both education and health.

In what regards education, this might be led by a more technical education-oriented system, such as in Germany, where the outcome is not so great as well. In opposition, Slovenia is ranked on top 3 in this indicator, which could be explained by the fact that schools there provide free fees, health insurance and medical examinations, as well as transportation for younger children if they live within four kilometres of the school building. The schools are also required to provide meals for children from lower-income families, so that they can purchase the food at a reduced cost. With these measures, they are likely to mitigate the impacts of income gaps on education, which is one of the variables that impact the most on different school achievements (Krueger, 2004), which is also mirrored on the distribution indicator. Looking into Portugal, we have a good outcome on infrastructures, as a result of a large investment in it, between 1986 and 2011. However, the overall performance is quite discouraging, raising the question of was this investment appropriate or could it have been done better?

It is worth mentioning that, even though economic stability might be a positive aspect, it also translates to poor economic growth, hence the better ranked countries on this are Greece, Italy, Spain and Portugal.

It is interesting to see that the countries, previously pointed out as winners, have some similarities in terms of what sub-indicators are the ones in which they perform the best, see education and distribution for Slovakia (2nd in distribution ranking), Lithuania (3rd in education ranking) and Slovenia (1st and 5th in distribution and education rankings, respectively). This may indicate that their political and economic performance in these areas made them succeed in their Euro journey. On the other hand, also quite interesting is that the “losers” are ranked worst in those same indicators, namely Portugal, Spain, France and Greece which are ranked at the bottom for both education and distribution. Besides, infrastructure and economic performance also stand out for some of them: Italy (17th in infrastructure), Spain (15th in economic performance) and Greece (15th in infrastructure). So, once again, one may see these as a highlight on some poor political choices leading these countries to not succeed after entering the EMU.

Table III, however, does not make the dynamic evolution of the indicator clear. On table IV, we can see that the countries whose public performance indicator increased the most are Estonia, Lithuania, Latvia and Slovakia. This outcome goes in line with our previously announced "winners" and "losers", meaning that the countries that better adapted to the monetary union and thrived with it are the same ones whose institutions have had the greatest evolution out of all 17 countries (see appendix VIII).

Table IV. PSP in 1999 and in 2019

	PSP 1999	*PSP 2019*
Austria	0.524	0.567
Belgium	0.525	0.597
Estonia	0.261	0.480
Finland	0.591	0.650
France	0.499	0.562
Germany	0.484	0.555
Greece	0.458	0.543
Ireland	0.432	0.529
Italy	0.414	0.519
Latvia	0.237	0.402
Lithuania	0.242	0.418
Luxembourg	0.502	0.515
Netherlands	0.569	0.606
Portugal	0.395	0.526
Slovakia	0.341	0.477
Slovenia	0.435	0.546
Spain	0.432	0.520

Looking into PSE, the countries with the largest efficiency are Belgium, the Netherlands and Finland, and the smallest are Lithuania, Greece and Slovakia. It is, however, worthwhile stressing a few caveats. Public spending across countries is not always fully comparable. For example, some countries' transfer payments are taxed, thereby overstating public spending compared to countries where such benefits are not taxed. Nevertheless, it is not possible to systematically assess and correct such problems. Moreover, comparing expenditure ratios across countries implicitly assumes that production costs for public services are proportionate to GDP per capita. While this approximation is likely to be quite good for labour intensive services (such as education or administrative efficiency), it is likely to not be as good for infrastructure quality. In the absence of cross-country data of different public service sector costs, this is the best possible approximation.

5. Econometric Specification

Considering that our main purpose in this study in to analyse the economic performance in the long term of various countries, the econometric technique chosen is panel data estimation. This methodology is suited to study the dynamics of adjustment and to estimate their effects over a long period of time; therefore, it suits our aim. Adding to that, one of panel data underlying assumptions is that countries are heterogenous, with specific and unobservable characteristics, in opposition to '*Cross-section'* and 'time-series' estimations that do not control for heterogeneity, which could lead to biased results (Greene, 2011).

Following what has been mentioned so far and the literature review, the econometric specification to be estimated is:

$$y_{it} = \alpha_1 + \alpha_2 HC_{it} + \alpha_3 I_{it} + \alpha_4 G_{it} + \alpha_5 PG_{it} + \alpha_6 OP_{it} + \alpha_7 PSP_{it} + \alpha_8 PSE_{it} + \mu_i + \varepsilon_{it} \quad \text{(III)}$$

Where i represents the countries' index and t represents time.

y_{it} represents the logarithm of GDPpc, PPP (current international $)

HC_{it} represents the Human capital index, based on years of schooling and returns to education

I_{it} represents investment in physical capital, utilizing gross capital formation, as a share of GDP

G_{it} represents government consumption, measure by general government final consumption expenditure (%GDP)

PG_{it} represents population growth (% annual)

OP_{it} represents openness of the country, measured by Trade as a share of GDP

PSP_{it} Public sector performance indicator

PSE_{it} Public sector efficiency indicator

μ_i the unobserved time-invariant country fixed effect

ε_{it} the unobserved random error

6. Empirical Results

The previously specified model serves to test the impact of PSE and PSP on economic growth. The estimation also includes a set of control variables related to public investment, public consumption, population growth and openness of the country, which the literature identifies as determinant factors of economic growth, as previously explained. Within the panel data framework, it is relevant to take into consideration the existence of two models: '*random effects model*' and '*fixed effects model*'. The crucial distinction between them is whether the unobserved individual effect embodies elements that are correlated with the regressors in the model (Greene, 2008). The first one assumes that the observations have unobserved individual effects that are constant over time and are correlated with the explanatory variables. Contrariwise, the second considers that countries have specific effects, correlated with explanatory and non-observed variables (Dreher, 2006; Batten and Vo, 2009). To assess which of these models is more suitable, we must perform the Hausman test, where the null hypothesis is that the preferred model is random effects, whereas the alternative is fixed effects (Greene, 2008). For our data, the Hausman Test has a *p-value* of 0.000, leading us to reject the null hypothesis (H_0), at a significance level of 1%. Thus, we chose the fixed effects model.

In addition, from the scatter plot analysis, the existence of a trend is quite clear (see figure V). We have performed the Levin–Lin–Chu test unit root test, including a trend, which had a *p-value* of 0.0072, so we reject the null hypothesis of the panel containing unit roots, against the alternative of stationarity around a trend. Hence, we added a trend to our estimation. Furthermore, we can also take some insights on the relation between each variable and the Log (GDPpc) (see figure V), and here, both our main variables of interest, PSP and PSE have a positive one, especially PSP whose relation is much clearer. All Openness, public consumption and human capital show what we expected. But investment, contrarily to what we expected shows a negative relation. Since we are analysing developed economies, most of them are likely to have achieved similar levels of capital accumulation, with very high capital labour ratios. So, the dissemblance is going to emerge from their total factor productivity (TFP), which is related to new technology, organization of production etc., where we can include institutions as well, given the major role they have on this matter.

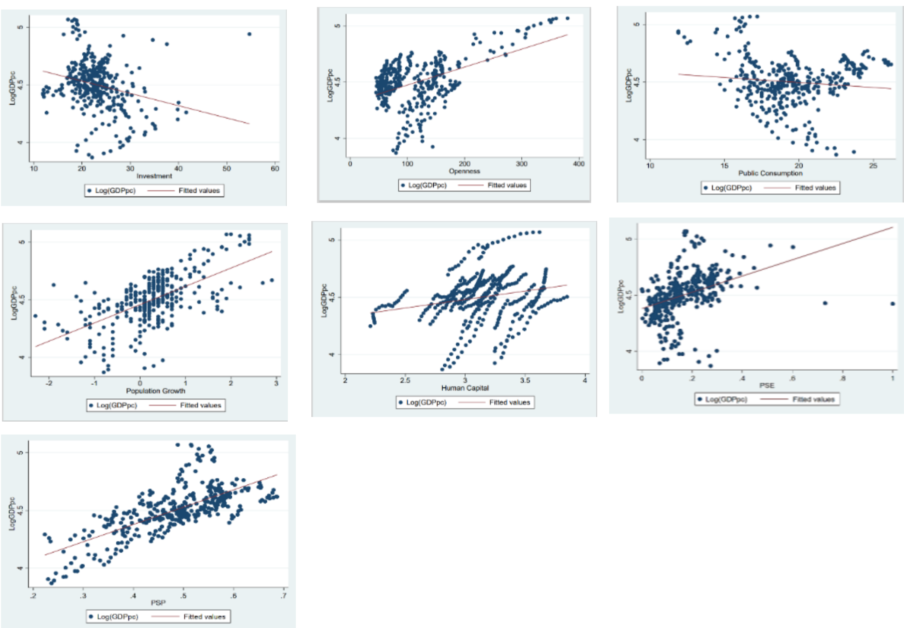


Figure V – Scatter Plot

With that being said, we performed estimation, both with fixed effects (see table VI) and without it (see table V), using robust standard errors.

On the simple OLS regression, we can see that both PSP and PSE are significant, with a coefficient of 1.424, the largest one compared to all the others, and -0,199, respectively.

Moving forward to our fixed effects regression, looking into our variables, all government expenditure and openness coincide with our expectations and are significant, which is aligned with the previously presented literature, except for human capital, which loses significance once we apply fixed effects, this may be due to the fact that, as it was previously explained, when using fixed effects, in order to assess the net effect of the predictors on the outcome variable, we must ignore the time-invariant differences between countries. When estimated, investment shows significant, but a quasi-null effect on Log (GDPpc), which makes sense considered what we have previously discussed. Population growth, on opposition to some findings, here has a positive relation to the Logarithm of GDP *per capita*.

With respect to our variables of interest, PSE, though significant, has a negative relation with our dependent variable, with a coefficient of -0.201, which was not initially expected. This may be explained by the fact that, on one hand, even with low institutional quality, public expenditure can lead to good outcomes, on another hand, countries with good institutions may manage badly their public spending leading to an unsatisfying outcome. So, most likely it is more important for economic growth the quality of institutions themselves rather the efficiency of their spendings. Besides, this can also indicate that public sector efficiency might have a heterogeneous impact on countries, depending on their conjecture and context, which may be interesting to do further extensions on.

PSP, on its turn, has a positive and significant relation with Log (GDPpc), with a 0.617 coefficient, which one would expect based on the knowledge on institutions and economic growth, as approached in section 3.

The question that may arise from here is causality. Does better public performance lead to economic growth, or is it with the increase on income per capita that it is possible to have better institutions and performances?

Table V- Regression results without Fixed Effects

Log (GDPpc)	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
HC	.394	.082	4.82	0	.234	.554	***
Inv	0	.002	0.23	.819	-.003	.003	
Exp.	-.006	.006	-1.00	.316	-.018	.006	
PG	.01	.01	1.01	.311	-.01	.031	
Op	.001	0	3.63	0	.001	.002	***
PSP	1.424	.209	6.81	0	1.015	1.834	***
PSE	-.199	.084	-2.36	.018	-.364	-.034	**
Trend	.001	0	1.41	.158	0	.001	
Constant	2.454	.22	11.17	0	2.024	2.885	***

Mean dependent var	4.501	SD dependent var	0.207
Overall r-squared	0.492	Number of obs	357
Chi-square	340.873	Prob > chi2	0.000
R-squared within	0.844	R-squared between	0.392

**** p<.01, ** p<.05, * p<.1*

Table VI- Regression results using Fixed- effects model

Log (GDPpc)	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
HC	.027	.081	0.33	.745	-.145	.199	
Inv	.001	.001	1.15	.267	-.001	.004	
Exp.	-.015	.005	-2.65	.017	-.026	-.003	**
PG	.018	.007	2.56	.021	.003	.033	**
Op	.001	0	1.97	.066	0	.001	*
PSP	.617	.265	2.33	.033	.056	1.179	**
PSE	-.201	.078	-2.58	.02	-.365	-.036	**
Trend	.015	.002	8.91	0	.012	.019	***
Constant	1.596	.187	8.51	0	1.198	1.993	***

Mean dependent var	4.501	SD dependent var	0.207
R-squared	0.907	Number of obs	357
F-test	135.766	Prob > F	0.000
Akaike crit. (AIC)	-1313.026	Bayesian crit. (BIC)	-1282.004

**** p<.01, ** p<.05, * p<.1*

It is possible to find equally appealing arguments for both parts of the simultaneous causation problem: arguments that explain why growth has been an historic prerequisite of institutional development, and inversely, why institutional maturity has been a prerequisite for growth. For the first one, a possible line of reasoning is that as countries become wealthier, they can afford more resources to institution improvement (Butkiewicz and Yanikkaya, 2006). For the second one, the idea of institutions being the main responsible for the setting of conditions for prosperity, such as diminishing uncertainty, establishing property rights and laws, contributing to a decrease of transaction costs, structuring societal behaviour, which in turn determines the economic path followed by a country (North, 1990).

However, the literature on the subject has acknowledged the limitations and challenges inherent to the empirical analysis of data aiming at unveiling the precise impact of different institutions on growth and to solve reverse causality. We could use the IV technique in order to sort this problem; however, the most common ones are applied on a very different context than ours, particularly on developing countries and/or ex colonies. Besides, even if using mortality rate from 100 years ago, as suggested by Acemoglu, Johnson and Robinson (2001), we would have a problem due to be using panel data and the IV being time-invariant.

Conclusion

After empirically observing the non-convergence in the countries of the monetary union and pointing out as the most successful, or “winners”, the eastern countries and Ireland, and as the least successful, or “losers”, Portugal, Greece, Spain, Italy and partly France; despite recognizing multiple valid and relevant justifications for this phenomenon in the literature, it seemed interesting to us to think about the possible relationship between the different growth rates and performance of these countries’ institutions.

With this aim, we have used a composite indicator, previously developed by António Afonso, Alma Romero and Emma Monsalve, Public Sector Performance Indicator, in which different social and economic aspects are studied as outputs of decisions taken by institutions in each country, such as education, health, administration, distribution, among others.

Hereupon, we realized that the countries whose public performance is better are Finland, the Netherlands, Belgium and Austria, and on the opposite, the ones which perform the worst are Latvia, Lithuania, Slovakia and Estonia. To deepen our analysis, we have also disaggregated the indicator. It is interesting to see that the countries, previously pointed out as winners, have some similarities in terms of what sub-indicators are the ones in which they perform the best - see education and distribution for Slovakia (2nd in distribution ranking), Lithuania (3rd in education ranking) and Slovenia (1st and 5th in distribution and education rankings, respectively) - which may indicate that their political and economic performance in these areas made them succeed in their Euro journey. On the other hand, what is also quite interesting is that the "losers" are ranked worst in those same indicators, namely Portugal, Spain, France and Greece which are ranked at the bottom for both education and distribution. Besides, infrastructure and economic performance also stand out for some of them: Italy (18th in infrastructure), Spain (16th in economic performance) and Greece (16th in infrastructure). So, once again, one may see these as a highlight on some poor political choices leading these countries to not succeed after entering the EMU.

Our main finding arises from our dynamic analysis. Looking into the evolution of the performance of our countries' institutions, we found that the previously named "winners", in what regards economic growth and thriving in the eurozone, are also the ones which have the largest improvement in their PSP indicator, namely Estonia, Lithuania, Latvia and Slovakia, compared to all other EMU countries.

Moving forward to our econometric specification and regression, we chose the commonly used variables in economic growth literature, adding PSP and PSE on it. Using panel data estimation with fixed effects, we found that PSP is very significant, and it presents quite a big coefficient, yet PSE, though significant, presents a negative coefficient, going against what we initially expected. However, this can be explained by the fact that on one hand, even with low institutional quality, public expenditure can lead to good outcomes; on the other hand, countries with good institutions may badly manage their public spending, leading to an unsatisfying outcome. So, most likely the quality of institutions themselves is more important for the economic growth than the efficiency of their spendings.

Moreover, unexpectedly, when we use fixed effects, human capital loses its significance. this may be due to the fact that, as it was previously explained, when using fixed effects, in order to assess the net effect of the predictors on the outcome variable, we must ignore the time-invariant differences between countries.

In short, our main finding is the correlation between public sector performance and economic growth in the countries in the monetary union, namely the fact that the countries that better adapted to euro and thrived in terms of growth are the same ones whose institutions have had the greatest improvement over the last 20 years. Our work also presents aspects in which some countries have gained advantage, which can be extremely relevant for future political decisions and economic policies taken, in terms of investment and incentives, such as the application of funds from the European Union, in order to make countries prosper and, if possible, converge.

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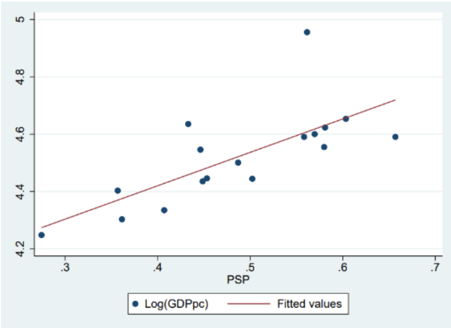
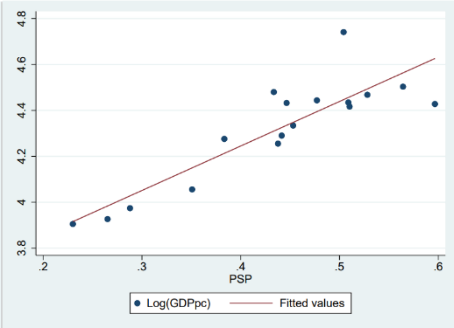
Appendix I: PSP in 2000, 2010 and 2019





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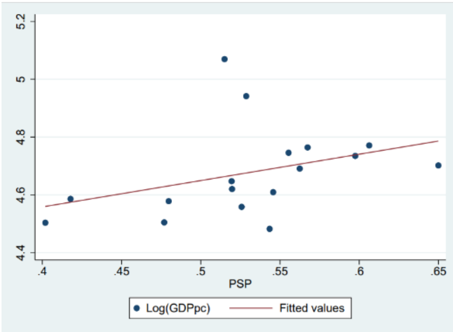
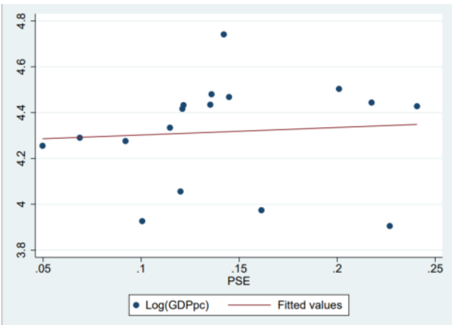
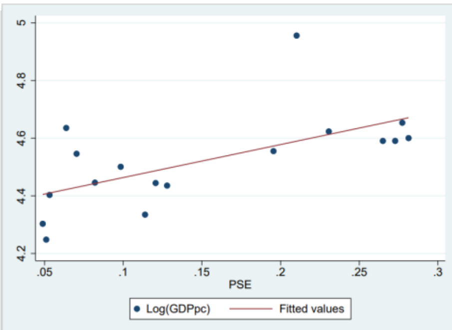


2019

Appendix II: PSE in 2000, 2010 and 2019





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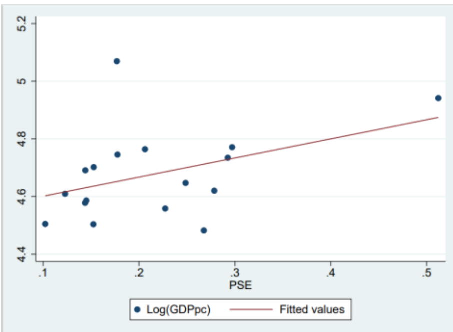

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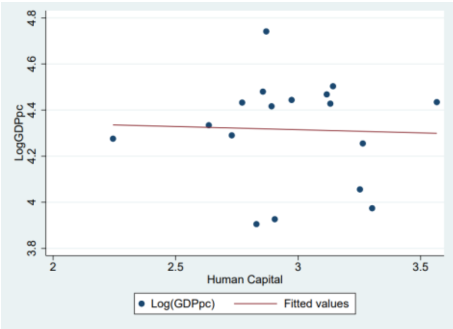
Appendix III: Human Capital in 2000, 2010 and 2019



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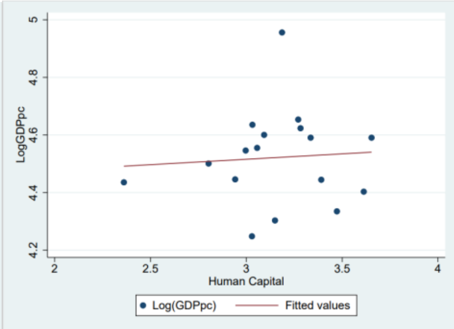

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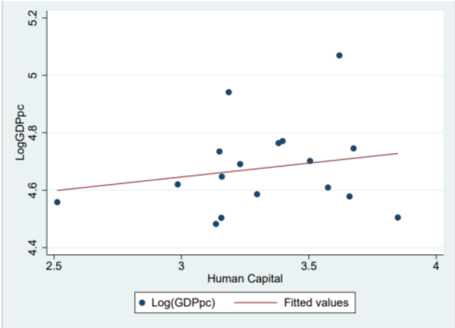
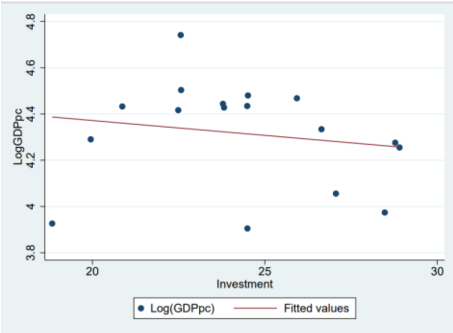
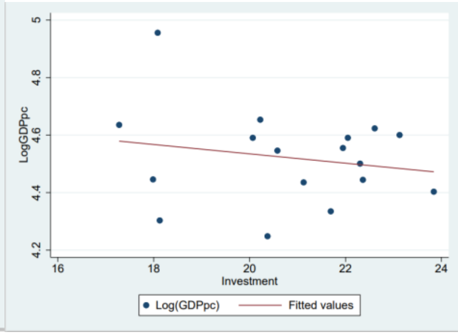


2019

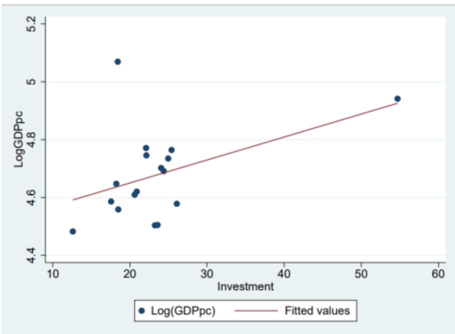
Appendix IV: Investment in 2000, 2010 and 2019



2000

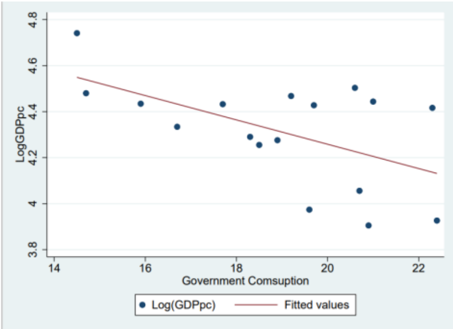


2010



2019

Appendix V: Public Consumption in 2000, 2010 and 2019



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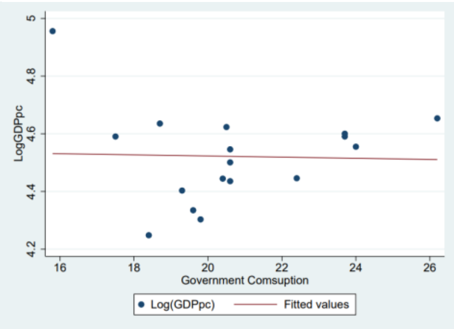

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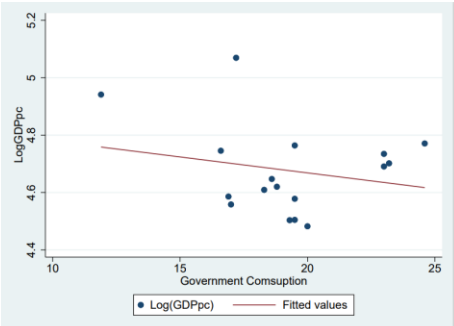
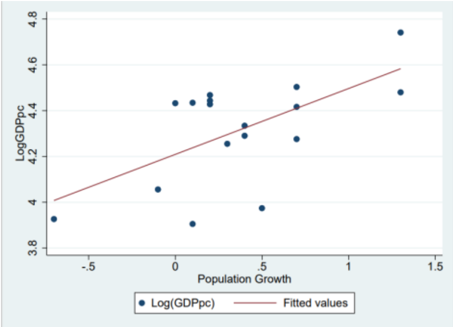
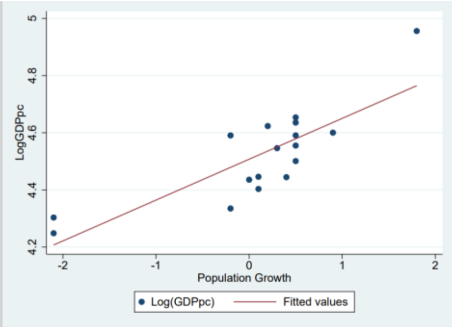


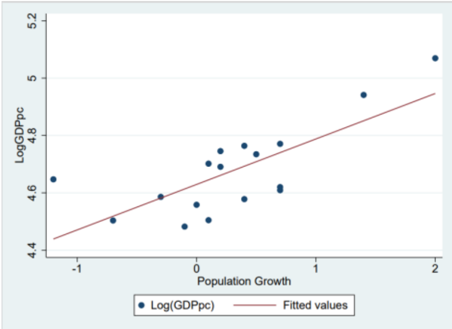
2019

Appendix VI: Population Growth in 2000, 2010 and 2019



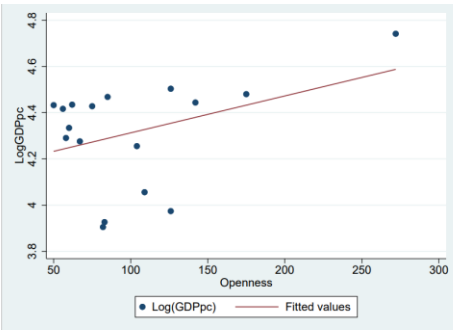


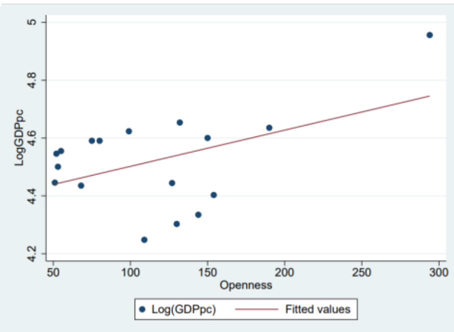
2000 2010



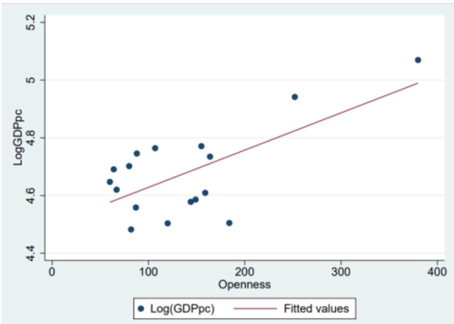
2019

Appendix VII: Openness in 2000, 2010 and 2019



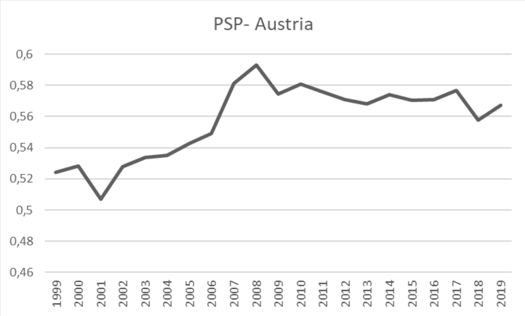


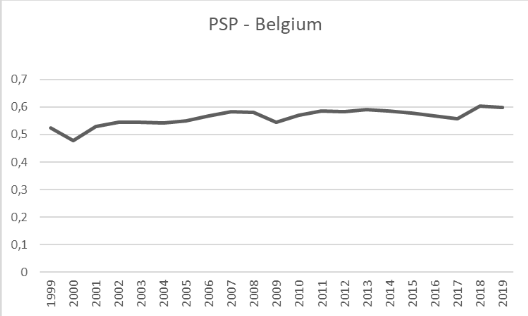
2000 2010

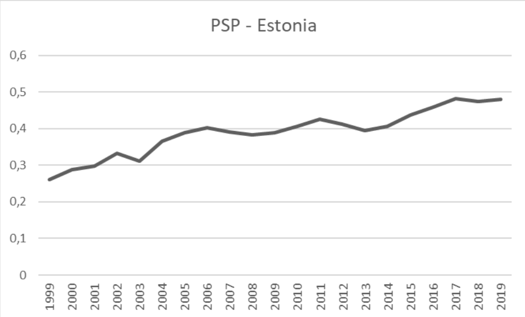


2019

Appendix VIII: PSP overtime for each EMU country


PSP- Austria
0,6
0,58
0,56
0,54
0,52
0,5
0,48
0,46
1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019


PSP - Belgium
0,7
0,6
0,5
0,4
0,3
0,2
0,1
0
1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019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PSP - Finland
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0,68
0,66
0,64
0,62
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0,58
0,56
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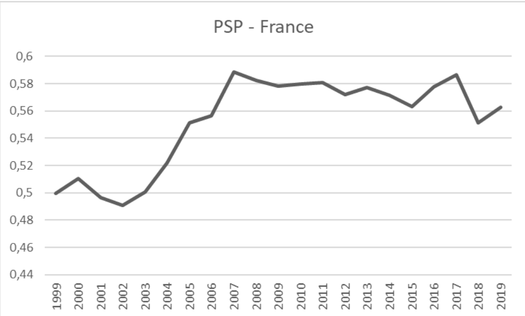
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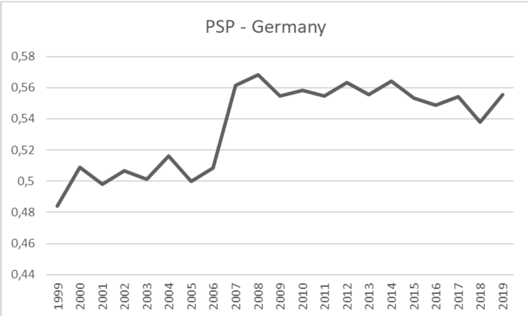
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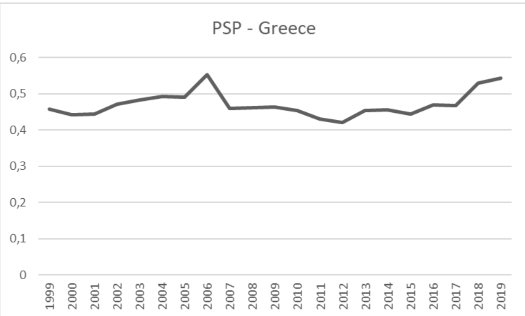
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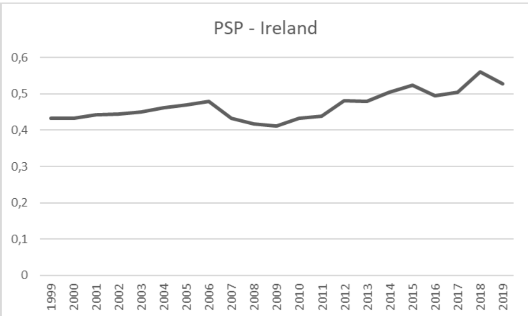
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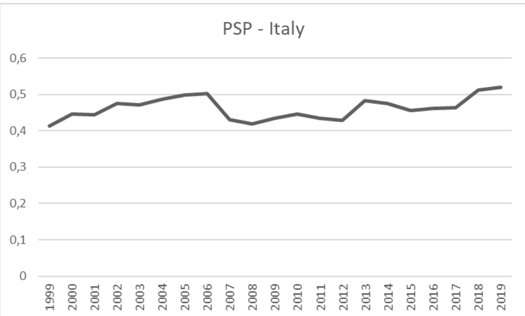
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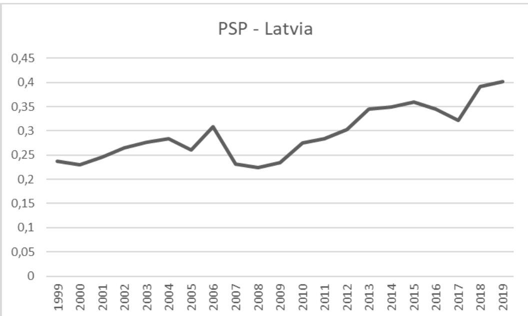
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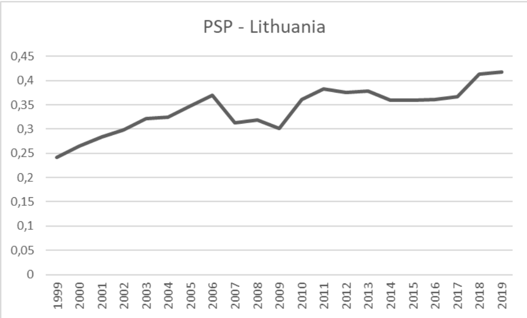
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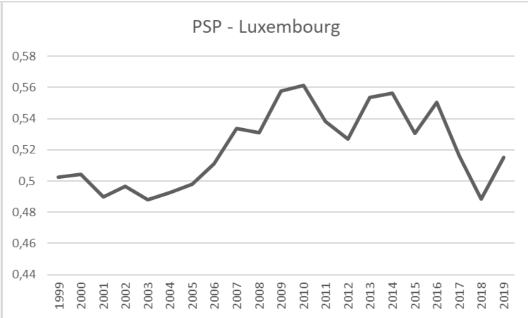
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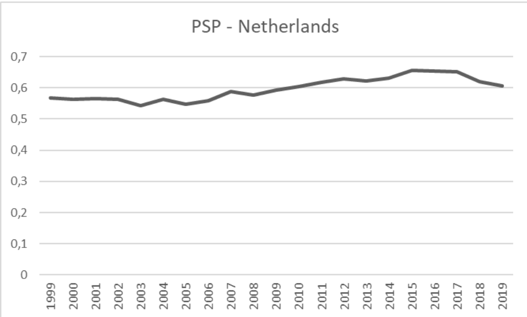
PSP - Netherlands
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0,2
0,1
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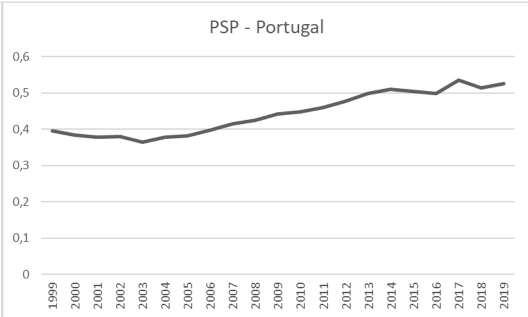
1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019


PSP - Portugal
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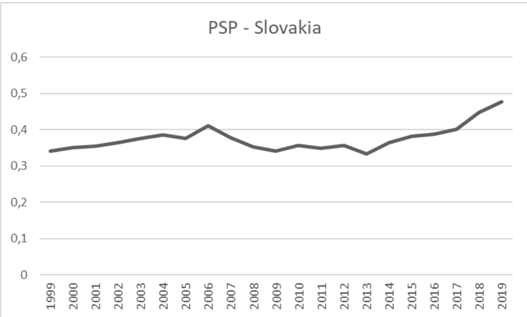
PSP - Slovakia
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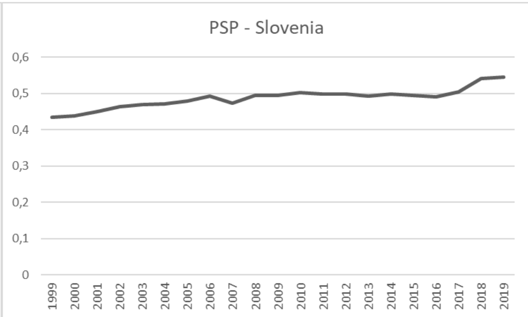
0,2
0,1
0
1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019


PSP - Slovenia
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0,5
0,4
0,3
0,2
0,1
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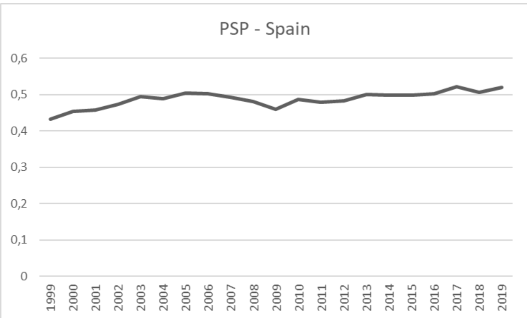
1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019


PSP - Spain
0,6
0,5
0,4
0,3
0,2
0,1
0
1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019

Appendix IX: Average and Ranking of PSP and PSE, different weights

	(b) Opportunity				(c.) Equality				(d) Stability				(e.) Economic Performance			
	Average PSP	Rank PSP	Average PSE	Rank PSE	Average PSP	Rank PSP	Average PSE	Rank PSE	Average PSP	Rank PSP	Average PSE	Rank PSE	Average PSP	Rank PSP	Average PSE	Rank PSE
Austria	0,57275249	3	0,20746382	6	0,55796799	5	0,15750435	6	0,52895911	7	0,2106458	6	0,52548498	4	0,21063818	6
Belgium	0,57238599	4	0,290875094	1	0,58521285	3	0,20719427	1	0,54101874	6	0,29317725	1	0,51754127	5	0,29317725	1
Estonia	0,41275233	14	0,130214068	11	0,38500566	14	0,11371631	11	0,31403958	15	0,12516461	11	0,37885731	14	0,12516461	11
Finland	0,66200924	1	0,239874493	3	0,66169605	1	0,1790524	3	0,61846198	1	0,24415624	3	0,58048049	1	0,24415624	3
France	0,57001639	5	0,162528192	9	0,52688749	7	0,12995516	9	0,55292257	4	0,16599012	9	0,50657792	6	0,16599012	9
Germany	0,55282141	6	0,212598044	5	0,5329797	6	0,15940171	5	0,50368329	8	0,21620567	5	0,50302986	7	0,21620567	5
Greece	0,46119961	11	0,084065427	16	0,42952836	12	0,08501266	17	0,58839863	2	0,09926164	14	0,43286224	12	0,09926164	14
Ireland	0,49346041	10	0,201677505	7	0,45475754	10	0,15744743	7	0,38837054	13	0,19950384	7	0,45851154	8	0,19950384	7
Italy	0,45940138	12	0,110145034	13	0,41877235	13	0,0989215	13	0,54544368	5	0,12255852	12	0,43415503	11	0,12255852	12
Latvia	0,31260316	17	0,111749798	12	0,26786894	17	0,09885653	14	0,2392921	17	0,10560694	13	0,29884804	17	0,10560694	13
Lithuania	0,36983976	15	0,091677145	15	0,30461442	16	0,0870079	16	0,26523007	16	0,08446694	16	0,33786711	16	0,08446694	16
Luxembourg	0,53479464	7	0,176597663	8	0,50657199	8	0,14062128	8	0,47309639	10	0,17972311	8	0,52878472	3	0,17972311	8
Netherlands	0,60518503	2	0,271206968	2	0,61123954	2	0,20170916	2	0,58642758	3	0,27636449	2	0,55531867	2	0,27636449	2
Portugal	0,45935288	13	0,224955408	4	0,3847059	15	0,1627153	4	0,46501262	11	0,22949829	4	0,417813	13	0,22949829	4
Slovakia	0,36796424	16	0,081894794	17	0,4684386	9	0,09313814	15	0,32809383	14	0,0813535	17	0,36141269	15	0,0813535	17
Slovenia	0,49764815	9	0,098676604	14	0,57520398	4	0,10082853	12	0,38964002	12	0,09503023	15	0,45411637	9	0,09503023	15
Spain	0,50502229	8	0,148829399	10	0,44085585	11	0,12202717	10	0,5030029	9	0,15532537	10	0,44896109	10	0,15532537	10

(b) Opportunity: 2/3 assigned to opportunity indicators and 1/3 to "Musgravian indicators". This means 1/6 assigned to each of the four opportunity indicators and 1/9 to each of the three "Musgravian indicators

(c) Equality: 1/3 assigned to the distribution indicator and 2/3 to the other indicators. This means that each of the other six indicators will have a weight of 1/9.

(d) Stability: 1/3 assigned to the stability indicator and 2/3 to the other indicators. This means that each of the other six indicators will have a weight of 1/9.

(e) Economic Performance: 1/3 assigned to the economic performance indicator and 2/3 to the other indicators. This means that each of the other six indicators will have a weight of 1/9

This approach follows the work by Antonio Afonso, Ludger Schuknecht and Vito Tanzi (2005)