

**MASTERS DEGREE
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Assessing Public Expenditure Effectiveness in the EU: Public Expenditure Effectiveness Index, Determinants and the Comparative Analysis of the Case of Portugal

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Accessing Public Expenditure Effectiveness in the EU: Public Expenditure Effectiveness Index, Determinants and the Comparative Analysis of the Case of Portugal

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Abstract: This dissertation aims to measure the effectiveness of public expenditure across EU countries and find the factors that it is influenced by, with special attention to Portugal's relative performance. The size of government and its efficiency is a widely researched and discussed topic, however there's little information on the effectiveness with which public money is spent. This report highlights relevant contributions for the topic in the existent literature; distinguishes relevant concepts such as outcome and effectiveness; and discusses outcome measures regarding accessibility, responsiveness and quality for Health, Education and Justice. A Public Expenditure Effectiveness Index (PEEI) is designed, showing best performance for the Netherlands and worst for Hungary, with Portugal being the 3rd worst, and serves as the base for a linear regression analysis. The linear regression analysis uses the PEEI as the dependent variable to proxy the quality of public services and concludes that population density, public debt, democracy, corruption, regulatory burden and expenditure per capita are significant. Additionally, it shows that tax wedge is non-significant; and produces interesting results regarding public expenditure as a percentage of GDP. The results of the PEEI as well as of the linear regression are discussed at length. Furthermore, it introduces the relevance of the topic for the Portuguese economy and does a closer inspection of the Portuguese public administration focusing on the main issues highlighted by the analysis.

JEL Codes: H11, H51, H52, D73, O15

Keywords: Public Expenditure, Effectiveness, Government Spending, Quality of Public Services, Government Size, Economic Development, Social Welfare

Resumo: A presente dissertação visa medir a eficácia da despesa pública nos países da UE e encontrar fatores que a influenciam, dando especial atenção ao desempenho relativo de Portugal. A dimensão do governo e a sua eficiência é um tema amplamente estudado e discutido, no entanto, há pouca informação sobre a eficácia com que o dinheiro público é gasto. Este relatório destaca contribuições relevantes para o tema na literatura existente; distingue conceitos relevantes como resultado (*outcome*) e eficácia (*effectiveness*); e discute medidas relativas à acessibilidade, capacidade de resposta e qualidade da Saúde, Educação e Justiça. É concebido um Índice de Eficácia da Despesa Pública (PEEI), que mostra melhor desempenho dos Países Baixos e pior da Hungria, sendo Portugal o 3º pior, e serve de base para uma análise de regressão linear. A análise de regressão linear utiliza o PEEI como variável dependente para representar a qualidade dos serviços públicos e conclui que a densidade populacional, a dívida pública, o índice de democracia, a corrupção, a carga regulatória e a despesa per capita são significativos. Mostra, ainda, que o corte fiscal (*tax wedge*) não é significativo; e produz resultados interessantes em relação à despesa pública em percentagem do PIB. Os resultados do PEEI, bem como da regressão linear, são discutidos detalhadamente. Além disso, apresenta a relevância do tema para a economia portuguesa e explora mais particularmente a administração pública portuguesa com foco nas principais questões destacadas pela análise.

Códigos JEL: H11, H51, H52, D73, O15

Palavras-chave: Despesa Publica, Efetividade, Eficácia, Qualidade dos Serviços Publicos, Peso do Estado, Desenvolvimento Económico, Bem-estar Social

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1. Introduction

It is well accepted that Public Expenditure is a fundamental component of a well-structured economy as it influences competitiveness, income inequality, short-term stabilization and long run growth objectives. Public Expenditure comprehends all expenses related to government activity and fiscal policies, as well as public sector services. It has a major impact in the population's life as it secures many essential services.

Notwithstanding, public expenditure accounts in developed economies have become a point of interest as it has been considered that they have surpassed the optimal level of government size (European Commission., 2008). This notion was actively spread in the wake of the 2008 financial crisis and the sovereign debt crisis in the EU.

Fifteen years later, the size of the public sector is a growing problem especially with the increase of social expenditure due to population ageing, the need for investment, and heavy tax frames conditioning economic competitiveness.

In this light, it is necessary to review public finances based on its contribution to socio-economic goals, investment and productivity. This evaluation should be based on two main concepts: Efficiency, which is the use of resources in an optimal manner, and Effectiveness, which is the ability of those resources to produce outcomes that achieve the intended targets and match users' standards.

This is particularly relevant for Portugal, a country affected by the financial crisis, with enlarged government functions, aggravated by the underinvestment in strategic, capital enhancing areas (Health, Education, and Infrastructures), the relevance of electorate preferences, corruption and bad practices (OECD, 2023d). A study of Afonso and Kazemi (2016) found that Portugal not only has one of the least efficient public sectors in a sample of 20 OECD countries but is also ranked second to worse in overall performance showing degradation when compared to a similar study of Afonso et al. (2005).

Although it's not a linear relation, it has been found that while bigger governments are associated with better income distribution, smaller governments tend to be more efficient and perform better in public sector services (e.g. Afonso et al., 2005). Additionally, government size and quality seem to be negatively related (European Commission, 2012) with multiple studies pointing to the possibility of a reduction of at least 30% in expenditure of heavy governments to obtain the same results (Afonso et al., 2005; Grigoli & Ley, 2012),

proving much room for improvement where efficiency is concerned. Composition of expenditure is also seen as more important than size for growth (Chu & Hemming, 1991) with health, education and R&D as the main gateways.

Diminishing public expenditure will allow for economic-growth-inducing investments, but it must not be forgotten that the quality of these services is intimately related to the quality of life of the populations through two paths: the direct use of the services and taxation. Thus, the main goal should be to improve public spending quality through effectiveness (in which efficiency is implicitly influential).

To this end, we must understand where to improve public spending so that “wasted” resources may be engineered to better purposes.

Work related to this matter is mainly produced through the independent evaluation of the efficiency of a sector regarding only unitary measures of input and output according to the relevant resources and products, such as Aubyn et al. (2009) and Grigoli and Ley (2012). This approach diminishes the multidimensional character of the effects of public services and hinders comparison between the weight of tax contributions or other public administration characteristics and the quality of the services provided.

This dissertation poses the question of how to measure effectiveness of the public expenditure? And what exactly influences the quality of public services?

The aim is, then, to first provide the literature with a measure of effectiveness (Public Expenditure Effectiveness Index) by offering possible indicators of outcome rather than output to better evaluate the quality of public spending according to accessibility, responsiveness and quality in three main areas of activity: Health, Education and Justice. Further, it wishes to find an explanation for the performance of the different public sectors based on a linear regression analysis of possible contributing factors.

Additionally, it will look into whether Portuguese public expenditure is being used to its full potential and in which areas public services may be lacking.

Comparison of public sectors across countries will ultimately help to understand the relative strong and weak points of the Portuguese case through a more tailored look into expenditure and its socio-economic results to root possible performance improvements, complementing the traditional efficiency focused approach.

The following section provides an overview of the existing literature concerning the context and relevance of the research questions, the importance of effectiveness, the key sectors and indicators and a description of the case of Portugal with a brief summary. Section

3 discusses the methodology, data and choice of indicators for both the PEEI and the linear regression. Section 4 describes and explores the results of the PEEI, of the ensuing profile of Portugal and of the linear regression analysis. Finally, section 5 concludes, highlighting limitations and future lines of investigation.

2. Literature Review

2.1 Context and Relevance

By modern standards, Public Expenditure encompasses all expenditure made by a government in its capacity to adequately meet its roles and responsibilities. It relates mainly to healthcare, education, justice, defence, infrastructure, social welfare, public administration and aims to promote economic stability, growth, equality and maintenance of public necessities (Martins, 2011). Furthermore, it can be wielded as different fiscal policies to target specific shocks. It is mainly funded by taxes and public debt and thus has direct effects on the population income and competitiveness of a nation Chu and Hemming (1991, pp. 14-15).

A great majority of the work made aims to gauge the adequacy of public expenditure from the efficiency with which resources are implied. Most use a DEA or FDH approach to specific areas of government involvement such as health or education and compare it to some measure of performance. These include work by Herrera and Pang (2005) that concluded that higher levels of expenditure are linked to lower efficiency scores; Afonso et al. (2005) which evaluated 23 OECD countries and concluded that smaller governments perform better than big ones; Aubyn et al. (2009) that evaluate 26 EU countries plus the USA and Japan and concluded that better performance comes from efficiency rather than size; and Afonso and Fernandes (2008) which evaluated 278 Portuguese municipalities and concluded that most should be able to perform better implying the same inputs. Furthermore, Afonso et al. (2005, p. 337) suggest that “spending by big governments could be, on average, about 35% lower to attain the same PSP [public sector performance]”.

Other approaches design indexes based on different dimensions of government.

Fazekas and Czibik (2021) compute a Public Spending Quality Indicator based on government attributes: transparency, competition, administrative efficiency and corruption control, to assess its performance. They conclude that high PSQ are related to higher GDP per capita, trust and European Quality of Government Index.

Grigoli and Ley (2012) concentrate on wasted resources generated by public sector specific characteristic, like the mismatch between professionals and accountability and estimate that an average of 32.6% and 65% of allocated inputs are not availed in education and health, respectively (Grigoli & Ley, 2012, p. 10).

Additionally, some authors concentrate on the role of public expenditure for growth, arguing that “it is more likely that growth is influenced by the composition [rather than size] of expenditure” (Chu & Hemming, 1991, p. 16).

2.2 Effectiveness

Some authors agree that public expenditure is well allocated when it efficiently and effectively contributes to the achievement of socio-economic goals improving living standards, economic growth, employment and investment, supported by a strong, competitive tax system (European Commission, 2012; Martins, 2011).

Generally, efficiency is seen as the ratio of inputs to outputs produced while effectiveness relates to outcomes and standards/expectations (Hedley, 1998). It has been argued that there isn’t efficiency without effectiveness as it is irrelevant to do something to its full potential if it does not meet the necessities of those who wish it (Drucker, 2001).

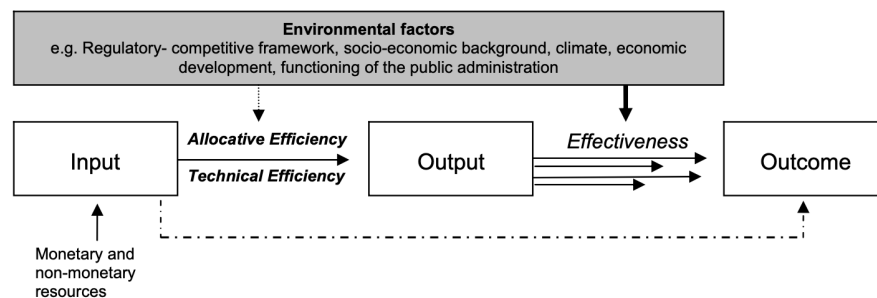


Fig. 1. Conceptual framework of efficiency and effectiveness

(Mandl et al., 2008)

Output is defined in the Oxford Dictionary as “the amount of something produced by a person, machine or industry” while outcome is “the way a thing turns out, a consequence”. In this light, an output of a health system can be the number of surgeries performed, while the outcome would be the impact of those surgeries to individual life, i.e. a good outcome is a timely surgery with adequate follow ups that present the least amount of inconvenience possible (distance, unnecessary bureaucracy, ...).

Mihaiu et al. (2010) distinguishes that Efficiency is influenced only by inputs and outputs while Effectiveness is influenced by outputs, outcomes and environmental factors – one of which is the quality of public administration.

Profiroiu (2001, p. 8) suggests that performance results from the “simultaneous pursuit of efficiency, effectiveness and a corresponding budget”.

In Mandl et al. (2008) it is suggested that when evaluating public services via efficiency, what is often seen as “public inefficiency” is the difference between the economic benefits of private action and the economic benefits of public action. The authors argue that, in reality, this difference represents, rather, the social benefits of public action. This highlights the importance of effectiveness to relate the established objectives of government expenditure as they differ from the economic benefits typically measured by efficiency.

Technical Efficiency characterizes the situation where the optimal output is produced from a set level of input. Allocative Efficiency characterizes the situation where resources are optimally distributed concerning cost and benefit. Effectiveness characterizes the situation where not only the optimal amount is produced given the resources, not only are those resources properly allocated but the results produced take in consideration all the effects that this will have on the life of the consumer (Mandl et al., 2008, pp. 3-7).

Although literature on effectiveness measures is somewhat lacking, some general work (Levesque et al., 2013; Miningou, 2019; OECD, 2023b) looks at it through three different aspects: accessibility, responsiveness and quality/satisfaction.

Accessibility regards not only the existence of services but also the ability to recognize their usefulness. It relates to approachability (openness of providers), acceptability (inexistence of barriers), availability, affordability and appropriateness. It regards aspects related to geographical dispersion of services and equality of treatment.

Responsiveness is the ability of public services to actually meet populations necessities in a timely and appropriate manner and is usually connected to the capacity of infrastructure, number of professionals on duty and waiting times.

Quality means that the provision of services creates desired outcomes and is up to standard with current professional knowledge. In this sense, it's related to the direct effects of the services as well as satisfaction measures.

Although satisfaction measures are highly subjective, they are believed to be a well fitted proxy for the performance of public services and provide great insight into its quality, expectations of population and public opinion on the system as a whole (Andrews et al., 2011). Notwithstanding, it's difficult to gauge the influence of external factors, nature of the service and expectations on subjective evaluations. In particular, it is found that good prior performance increases normative expectations while bad performance does not seem to change them (James, 2011) proving the biased nature of public opinion.

2.3 Key Sectors and Indicators

When analysing public expenditure, it is common to focus on key sectors that are most relevant for people's lives. The OECD typically regards healthcare, education, justice (public courts, police, lawyers, prosecutors, judges and prison officers) and public administration (defined as the way for agents to comply with regulation, exercise rights and claim benefits) as most important and consistently publishes work and individual analysis on them.

"Government at a Glance" (OECD, 2023b) highlights that regarding health: access implies a supply of doctors equitably distributed across population to avoid untimeliness and costly transportation; cardiovascular diseases and cancer are the leading causes of death making 30-day case-fatality for stroke a good evaluation of timely transportation and efficient care. Regarding education: outcomes are highly related to level of early enrolment; responsiveness is related to the share of 15–29-year-olds not enrolled in education, employment or training; and that socioeconomic context plays a major role in the results and opportunities presented. Regarding justice: the system should cover a wide range of necessary services properly fitted, geographically spread and able to deliver in a timely manner. Regarding public administration: the focus should be on perception of availability of information, geographical distribution, quality of facilities and delivery channels and the use of complex language or bureaucratic processes.

"Health at a Glance" (OECD, 2023c) provides an overview of health related indicators namely for access and affordability, health status, quality of care and, in less detail, of capacity and resources. Work by Onofrei et al. (2021) concentrates on measures of outcome according to quality of life and governance, healthcare system performance and socioeconomic vulnerabilities.

Some work on the subject also regards QALY (quality adjusted life years) to be a relevant, equitable indicator for health outcomes (Wichmann et al., 2020).

"Education at a glance" (OECD, 2023a) aims to "reflect a consensus among professionals on how to measure the current state of education internationally" mostly related to access, participation and progression. Angrist et al. (2020) introduces the use of LAYS (learning adjusted years of schooling) adjusted by the value of the education, combining measures of access and quality and Miningou (2019) finds significant importance of factors like institutional capacity, quality of equity policies and low unemployment rates, which signal healthy labour market that incentivizes education.

“The 2023 EU Justice Scoreboard” (European Commission, 2023) shows indicators of efficiency (length of proceedings, clearance rate (incoming/outgoing) and the number of pending cases), quality (regarding access of services and information, resources and capacity for assessment of the service) and independence. A proper Justice system should ensure laws and legal needs are met and assures consequences to violations to all citizens, institutions and governments. Its use should be preferred when compared to alternative methods.

Additionally, issues related to expenditure may not only stem from the direct application of allocated resource within the above-mentioned sectors, but from the allocation itself. Drawing on work by Fazekas and Czibik (2021), other dimensions of governance, such as corruption and level of democracy, prove relevant to the quality of public services. Political Efficacy, for example, implies that public input is felt to be well received and taken in consideration by decision makers (OECD, 2023b). According to Prats and Meunier (2021) this indicator comprises an internal sense, i.e., the ability and confidence in one’s political understanding and capacity to express opinions; and an external sense, i.e., the belief of representation and impact on political decisions through political activity and thus reflects the correspondence of policy and allocation with the relative importance of issues from the population’s standpoint.

These open the discussion for what has influence over the quality of public services.

Drawing on the definition of effectiveness by Mandl et al. (2008), in government operations the "environmental factors" may include the quality of public administration, organizational structure, IT technology, HR management and corruption.

Moreno-Enguix and Lorente Bayona (2017) suggest that PEEI is related to state of development, democracy, corruption, and population density and refers the importance of bureaucracy, red tape, overregulation, lack of transparency and the political dependence of judicial system.

Furthermore, Sanz and Velázquez (2003) conveys the relevance of size of expenditure, land area and age structure.

2.4 The Case of Portugal

According to the “Government at a Glance 2021 Country Fact Sheet” for Portugal, in 2020 only 36% of citizens believed that the government heeds their concerns, however, satisfaction with public services is higher than the OECD average for police services and education while staying below in healthcare and judiciary services.

Portugal is consistently ranked as bad performer and inefficient (Aubyn et al., 2009). From the above explored literature we find Portugal at the bottom in Afonso et al. (2005) and (Afonso & Kazemi, 2016). Work done on its municipalities shows no different results (Afonso & Fernandes, 2008). Finally, work by Grigoli and Ley (2012) shows that Portugal lost 3.1% and 4.8% of its GDP, on average between 1998 and 2002, on education and health, respectively.

A book on the overweight of the Portuguese Government (Cadilhe, 2005, p. 40) called for the necessity to lower by one fourth to one third the “Administrative Public Sector”, while extensively describing the consequences of its size and advising for the importance of lowering the fiscal burden to liberate consumption and much needed investment.

Eight years later, a second edition showcases little improvement regarding the size of government functions, highlighting the role of “great public outlays” that did not produce adequate growth effects (Cadilhe, 2013, pp. 7-8). Also, it justifies the resistance of policy makers on the unpopularity of the strict measures traditionally used to target the situation (e.g. closing down public services, pension cuts).

The “OECD Economic Surveys: Portugal 2023” (OECD, 2023d) highlights the importance of designing a credible and efficient public spending plan for fiscal sustainability and growth in the face of pressure from population ageing and growing investment necessities due to under-investment in key areas such as education, health and infrastructure. Ageing related expenditures are expected to increase 2.7% of GDP until 2040. Additionally, keeping long hours and low wages reduces labour market quality and makes it difficult to retain workers. Social expenditures have risen quickly, making imperative the planning of structural changes. It also suggests that many tax expenditures have little proof of significant benefits and that labour is often implied through more expensive temporary labour contracts rather than permanent staff.

It stresses the importance of identification of costs and benefits of policies along with budgetary improvements.

2.5 Summary

Three main conclusions may be driven from the literature: i) Composition of public expenditure is more important than size for performance; ii) Larger governments tend to exhibit less efficiency; iii) There is significant space for administrations to employ less resources while maintaining the same performance.

There are, however, two main gaps. First, the work mentioned above relies strongly on the connection between input and output, reducing the performance of the public sector to its capacity to produce unitary results disregarding all the revolving factors that deeply affect the delivery and quality of the services and consequentially the life of populations.

Second, most evaluations relate only to one or two sectors, treating them as separate and independent. However, as part of a greater public administration, a joint evaluation is fundamental to better assess the product of taxpayers' contributions.

Effectiveness looks into outcomes rather than outputs and is related to standards. It accounts more strongly for social benefits and costs rather than looking just at the economic aspects. It concentrates on the accessibility, responsiveness of the service and quality of output, instead of looking solely at unitary measures. There's extensive work detailing indicators related to these characteristics, including some typically used in efficiency measures which highlights the complementary nature of this approach.

Multiple analyses are made to explain the factors that influence the results of public services, usually using linear regressions with one or more explanatory variables. They focus mostly on expenditure, governance, demographic and confidence indicators.

3. Methodology

What factors influence the effectiveness of public expenditure and how can effectiveness be measured?

This section produces a Public Expenditure Effectiveness Index, alternatively to the measures for efficiency that have already been explored, and describes a linear regression analysis to gauge what influence governance and country characteristics may have over it.

By using effectiveness rather than efficiency, it is possible to relay a more faithful image of the effects produced by the public services. The measures for effectiveness should also relate efficiency, as such, it will enhance the existing approach rather than act as a mutually exclusive alternative. This measure also aims to aggregate multiple sectors in one indicator as they are ultimately the product of one single administration, budget and public revenues.

The multi-sector indicator will allow for direct comparison with macroeconomic variables that influence the administration as a whole.

For this, a composite indicator is produced from 22 baseline indicators, chosen based on the previous section, that spread across 3 sectors – Health, Education, Justice.

Further, a regression analysis is produced in order to understand the underlying causes of public expenditure performance.

Section 3.1 describes the data, sample and sources used. Section 3.2 describes the choice of baseline indicators as well as the construction of the composite indicator, including the harmonization of baseline indicators. Section 3.3 suggests possible explanatory variables and explains the production of the regression analysis.

3.1 Data

For the baseline indicators, data was originally collected for five consecutive years – 2017, 2018, 2019, 2020, 2021 - for EU28 countries - Austria, Belgium, Bulgaria, Croatia, Republic of Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden and UK. However, after the exploration and treatment of the data some exceptions were made: Republic of Cyprus, Malta and Luxembourg were excluded due to their small dimension which created significant deviation from fellow states particularly in measures related to expenditure; Bulgaria, Greece and Romania were excluded due to the unavailability of data mainly regarding healthcare indicators; Croatia was excluded due to the lack of multiple indicators particularly relevant

to the analysis; the UK was excluded as its exit from the EU led to difficulties in attaining recent data, as one of the most relevant sources was EUROSTAT.

Data was collected, mainly, from OECD Data Explorer (OECD, 2024), EUROSTAT (EUROSTAT, 2024), World Bank Databank (World Bank, 2024) but includes indicators from The World Justice Project¹ (World Justice Project, 2024) and one indicator from the European Centre of Disease Prevention and Control² (ECDC, 2024).

Part of the time range selection includes effects from the COVID-19 pandemic, which causes some relevant accentuated variations in some indicators. Non-the-less, the parallel production of two analysis – one including post-COVID-19 years and one regarding “normal” years – provides coverage for both situations allowing for the comparative analysis of pre- and post-COVID-19 scenarios and the discussion of any relevant differences.

For some indicators, particular countries may be regarded as outliers and hence produce doubts regarding the fidelity of the data and potential errors that may have occurred in its collection. However, due to the level of development of the countries in question it can be considered that the atypical performance is, rather, due to credit alone. Excluding them would result in uneven indicators and compromise the validity of the study.

Similarly to the construction of the PEEI, data for all potential explanatory variables was gathered for the 20 countries in analysis - Austria, Belgium, Czech Republic, Denmark, Estonia, Finland, France, Germany, Hungary, Ireland, Italy, Latvia, Lithuania, Netherlands, Poland, Portugal, Slovakia, Slovenia, Spain and Sweden - for the same five-year period - 2017 to 2021.

Data was collected , from OECD Data Explorer (OECD, 2024), EUROSTAT (EUROSTAT, 2024), World Bank Databank (World Bank, 2024), Our World in Data³ (Our World in Data, 2024), the World Economic Forum⁴ (World Economic Forum, 2024) and the Tax Foundation⁵ (Tax Foundation, 2024).

For all indicators used, in the composition of the PEEI and in the linear regression analysis, a summary table of the indicators and a ranking of the concerned countries are

¹ Independent, multidisciplinary organization working to advance the rule of law around the world. Funded by the European Commission, United Nations Development Program, the World Bank and others.

² (ECDC) EU agency aimed at strengthening Europe's defences against infectious diseases.

³ Collaborative effort between researchers at the University of Oxford and the non-profit organization Global Change Data Lab (GCDL). Publishes research and data to make the knowledge on the big problems accessible and understandable.

⁴ International Organization for Public-Private Cooperation. Global, impartial and not-for-profit platform.

⁵ World's leading nonpartisan tax policy 501(c)(3) nonprofit.

available in Annex A and B, respectively, for the baseline indicators of the PEEI and in Annex C and D, respectively for the explanatory variables.

3.2 Public Expenditure Effectiveness Index

The Public Expenditure Effectiveness Index (PEEI) is an indicator designed to compare countries by the quality of the services provided in key areas for the well-being of the population. These are Health, Education and Justice as these are the main areas of government action directly connected to public services. Ideally, and following the framework set by the OECD, the previously mentioned Public Administration would be added, but due to a lack of sufficiently developed indicators and databases for this particular sector, it was impossible to produce measures comparable to those of the other sectors.

The analysis features 20 countries from the European Union: Austria, Belgium, Czech Republic, Denmark, Estonia, Finland, France, Germany, Hungary, Ireland, Italy, Latvia, Lithuania, Netherlands, Poland, Portugal, Slovakia, Slovenia, Spain and Sweden.

The PEEI is produced for two-time ranges: first, for years 2017, 2018 and 2019 to avoid the influence of the COVID-19 pandemic; and second, for years 2017-2021 to showcase the most up to date information. Comparison between them will be further explained in the results.

The choice of baseline indicators reflects the best attempt at producing an adequate measure of the effectiveness of public services, strongly guided by OECD and European Commission frameworks, as well as, other relevant literature and the availability/accessibility of data.

The methodology chosen is strongly based on previously mentioned literature, particularly on Afonso et al. (2005) and the methodology for the International Tax Competitiveness Index (Mengden, 2023).

3.2.1 Choice of Indicators

The PEEI is composed by three sectorial indicators for each of the relevant areas, denominated Healthcare Effectiveness Index, Education Effectiveness Index and Justice Effectiveness Index. Again, these were developed using the OECD framework in mind by basing them on 3 key dimensions: Accessibility, Responsiveness and Quality.

The Healthcare Effectiveness Index (H) comprises six baseline indicators.

For Access, it considers the household out-of-pocket payments per capita (H1) to illustrate financial coverage. It could have been substituted by already produced measures of financial coverage, however, these typically relate to only a set of basic healthcare services and thus do not include aspects such as payment for prescription drugs. It also considers reported unmet needs due to financial, distance or waiting list issues (H2) to account for accessibility concerned with transportation, availability of time or others.

Regarding Responsiveness, the index uses the annual number of hip replacements per 100 000 inhabitants (H3), to relate the appropriate distribution of resources/inputs. In this category, other useful indicators would be the number of visits to the ER without reasonable cause, as this would provide insight into the ability of health services to meet populations needs and incentives for population to seek non urgent care rather than overuse emergency services and thus proxy populations perception on responsiveness.

Regarding Quality, the indicator accounts a general sense through the number of healthy life years expected at birth (H4), which includes in the definition of life expectancy aspects regarding quality of life; and uses the number of avoidable hospital admissions from asthma and chronic obstructive pulmonary disease (H5) and the 30-day mortality rate from ischemic stroke (H6) to provide measures for the quality of primary and secondary care, respectively. It also concerns the number of antibiotics prescribed (H7), to gauge the safety of primary care as broad-spectrum antibiotics are a common course of treatment but often mishandled as a “cure-all” and their overuse is considered a dangerous practice with serious risks for public health.

The Education Effectiveness Index (E) is composed of seven baseline indicators.

For Access, it uses the rate of enrolment of 15- to 19-year-olds in education (E1), including children with ages for which school may be mandatory as well as young adults who choose to continue their education, ultimately portraying the ease with which one might pursue further education regarding geographical, financial and social aspects. Further, the percentage of students enrolled in private educational institutions (E2) shows the availability of quality public education as precepted by population (this indicator is, of course, limited when it comes to the relative affordability of private education, notwithstanding, it is still regarded as a good proxy for socioeconomic barriers to quality education); and the percentage of 18- to 24-year-olds who attain tertiary education in rural areas compared to

cities (E3)⁶ shows the distribution and accessibility of relevant institutions as well as the importance of differences produced by cultural background.

Responsiveness is related by the students-to-teaching-staff ratio (E4) to showcase attention to which each student might be subject to, as well as, the annual statutory salary in public institutions for teachers with 15 years of experience in USD ppp (E5), which is considered to be generally related to the motivation of the professionals, most valuable for teaching.

Quality is inferred from the Learning Adjusted School Years (E6), which provides a comparable value for the average abilities of students across countries; and from the relative earnings of 25- to 34-year-olds who attained at least a bachelor's level or equivalent compared to those who attain a level 3 ISCED i.e. lower secondary education (E7), showing the return on investment in education. It would be beneficial to the study to include a measure of social civic engagement derived from education as these are regarded as closely related and would provide differentiated input to the quality dimension, however, no suitable measure was available.

The Justice Effectiveness Index (J) aims to shine a light on citizen safety and civil and criminal justice and does not involve defence.

It is composed of eight baseline indicators.

For Access this study uses the "people can access and afford civil Justice" indicator (J1) developed by the World Justice Project, which encompasses many relevant aspects. An awareness of rights indicator would be beneficial. There are some survey measures available, for example, in the 2023 EU Justice Scoreboards (European Commission, 2023), but not developed enough to be compared to the rest of the baseline indicators.

Responsiveness was measured by the number of police officers per 100 000 inhabitants (J2), the lack of unreasonable delay in civil justice courts (J3); and by the level to which people do not resort to violence to redress personal grievances (J4) to proxy the lack of incentives to resort to methods alternative to the legal justice system and ultimately show responsiveness of the system from the populations point of view.

Quality is derived from the crime rate (J5); from the perceived independence of the Justice system (J6), as this is considered as one of the most relevant characteristics; from the

⁶ Computed by dividing the attainment of tertiary education in rural areas by the sum of attainment in rural areas and cities

populations confidence in the justice system (J7), which shall be also proxied by the lack of alternative methods; and finally, from the overall rule of Law (J8).⁷

3.2.2 Harmonization and Construction

For the sake of the composite index, all baseline indicators were harmonized from a multi-year average, by a set of steps explained as follows.

For the indicator H1 the averages were calculated as:

$$H1_i = \frac{H1_{i,2017} + H1_{i,2018} + H1_{i,2019}}{3}$$

for the sample excluding COVID-19

or

$$H1_i = \frac{H1_{i,2017} + H1_{i,2018} + H1_{i,2019} + H1_{i,2020} + H1_{i,2021}}{5},$$

for the sample including COVID-19

$i=1, \dots, 20$ countries

The multi-year average is used as a starting point for the construction of the index, as it aims to compare structural behaviour rather than annual fluctuations. For the same reason, some indicators may not represent all five years due to a lack of data or may be represented by the latest available data to avoid further restrictions on the sample⁸. Note that the latest available data may be ahead of the intended sample.

For indicators whose behaviour goes against effectiveness (i.e. crime rate) the inverse of the average was used. For example:

$$J5_i = 1 / \left(\frac{J5_{i,2017} + J5_{i,2018} + J5_{i,2019}}{3} \right)$$

⁷ A potential Administration Effectiveness Index would have comprehended baseline indicators of the following structure: for Access the availability of information and some indicator related to bureaucracy or complex language; for responsiveness the length of administrative processes, time of production of identification documents and some measure related to the efficiencies of social security help desks; for quality the populations satisfaction with administrative services, the number of inquiries resolved and the accuracy of official information.

Although some of these indicators were attainable in a satisfactory condition, most were underdeveloped with small time series or simply not aggregated in useful data bases. This note will, hopefully, serve to draw attention to the lack of information and likely consequential lack of supervision of this very important area of government action.

⁸ If information is lacking, the average is made for the number of existing observations.

for the sample excluding COVID-19

It must be advised that the inversion of some indicators produces a distortion on the normalization of values, as this becomes the product of a hyperbola rather than a linear function of the original values, but without relevant prejudice to the accuracy of the indicators.

Next, all values were standardized, setting the average of each baseline indicator to zero:

$$H1'_i = \frac{H1_i - \overline{H1}}{\delta_{H1}}$$

$\overline{H1}$ is the average of the values for H1

To improve the interpretation of the values, they were further rescaled to values between 0 and 1. First, the minimum of each indicator is set to one by multiplying the minimum value by -1, adding 1 and adding the resulting value to each of the standardized values, eliminating the use of negative values:

$$H1''_i = H1'_i + H1'_{\min} \times (-1) + 1$$

$H1'_{\min}$ is the value for the country with the lowest H1'

Next, each value is divided by the maximum value of the indicator after the minimum has been set to 1:

$$H1^*_i = \frac{H1''_i}{H1''_{\max}}$$

$H1''_{\max}$ is value for the country with the best H1''

By setting the maximum value to 1 the interpretation becomes simple: 1 is the value for the country that shows the best effort and this becomes the benchmark against which other countries are compared. It follows that lower values show the capacity at which other countries are in relation to the best. For example, if country A has a value of 1 and B has a value of 0,7 than B is at 70% of A's results, i.e., it has reached 70% of the best-known possible outcome.

This rescaling could have been ignored or calculated at a later stage, for example for the values of the final index. However, this would have shown that the best overall performer would have a score of 1 and by interpretation that it would be perfect within the universe of

this analysis as there was no better country. Because this is a composite index, the overall performance is derived from the performance in all baseline indicators and, provided that no country excels in every single indicator and that the best possible performance in each indicator is that of the top performer, even if a country is best overall it will still have room to improve in baseline indicators in which it is not the top performer. By rescaling at this stage the final index will produce a more detailed view of the overall performance and particularly show how close each country is to the best performance at all levels.

From the baseline indicators, each one of the sectorial indicators was computed using two formulas: i) a simple arithmetic average of all baseline indicators (regardless of the dimension they represent); ii) a simple arithmetic average of three intermediate indicators: Access (A), Responsiveness (R), Quality (Q), which were in turn an arithmetic average of the baseline indicators that fell within each dimension as described above.

$$i) H_i = \frac{H1^*_i + H2^*_i + H3^*_i + H4^*_i + H5^*_i + H6^*_i + H7^*_i}{7}$$

$$ii) H_i = (A_i + R_i + Q_i),$$

$$A_i = \frac{H1^*_i + H2^*_i}{2},$$

$$R_i = H3^*_i,$$

$$Q_i = \frac{H4^*_i + H5^*_i + H6^*_i + H7^*_i}{4}$$

They showed similar values, thus, for the sake of simplicity, formula i) was used, avoiding issues related to the distribution of indicators across dimensions. In this light, Accessibility, Responsiveness and Quality served mainly as guidelines to gauge the best indicators for the effects of relevant public services on everyday lives.

For the final PEEI, there were 3 possible approaches.

First, to, again, do a simple arithmetic average of the Healthcare, Education and Justice Effectiveness Index which would attribute the same importance to the effectiveness of all services, and disregard the relative expenditure to each, as it can be argued that some areas are naturally more expensive and thus higher expenditure does not portray more “room for maneuver”.

$$PEE_i = \frac{H_i + E_i + J_i}{3}$$

Alternatively, a weighted average can be used by relating the weights of each sectorial indicator to its sector's percentage of government expenditure. In this case, we assume that not all services have the same importance but rather that there's a priority hierarchy according to which expenditure is distributed. By the principles of democracy, we can also derive that this distribution reflects the relative importance that the public attributes to each. In this light, although all services are important, due to the relevance of allocative decisions of resources it may not be fair to give all the same weight.

The weights can be derived either from the average of the weights of each sector in public expenditures for all countries (i), producing a uniform formula for the index across countries, or it can be derived from the weight of each sector in each country and thus produce a more tailored index to each country's characteristics (ii).

$$i) PEE_i = H_i w'_H + E_i w'_E + J_i w'_J,$$

$$w'_H = \frac{\overline{w}_H}{\overline{w}_H + \overline{w}_E + \overline{w}_J}^9$$

$\overline{w}_H$ is the average weight of health expenditure in percentage of GDP

$$ii) PEE_i = H_i w'_{Hi} + E_i w'_{Ei} + J_i w'_{Ji},$$

$$w'_{Hi} = \frac{w_{Hi}}{w_{Hi} + w_{Ei} + w_{Ji}}^{10}$$

w_{Hi} is the weight of health expenditure in percentage of GDP of country i

In both cases, the weights are the result of the ratio of expenditure of a sector (averaged or per country) by the sum of the expenditure on all three sectors, such that the sum of the ratios is equal to 1.

Ultimately, considering the differences between the 3 methods, mathematical simplicity and the individual nature of the purpose of this dissertation, the last formula mentioned was chosen.

⁹ This formula does not account for the relative size of economies, rather, it gives all countries the same importance and may obscure some mathematical sense when described to its basic nature. Economically, it hopes to emulate some version of a general importance ranking amongst people not discriminated by citizenship, providing a unified analysis amongst countries whilst maintaining the differentiation between sectors.

Alternatively, a formula that relates the importance of each country to its population or GDP could be used to emulate the preference of the cumulative population of the countries in analysis more strongly.

¹⁰ Mathematically, this ratio is equivalent to using the absolute values of expenditure, as such, the GDP is not relevant. The percentage is used purely because of the format of the available data.

3.3 Regression

Besides assessing the effectiveness of public expenditure, the present work aims to understand the underlying causes that may be rooted in countries' social-economic characteristic and behaviour of government. In this sense, the next section produces a linear regression analysis, estimating the importance that multiple potentially relevant variables might have on the quality of public services, proxied by PEEI as the dependent variable.

3.3.1 Choice of Indicators

The regressions were estimated using an OLS approach applied to cross-sectional data.

Multiple indicators were considered as potential explanatory variables to proxy characteristics that may be relevant to the performance of the public sector. These are mainly related to characteristics of the country and governance.

The choice for the considered indicators was based on previous similar work mentioned in point 2.3., other literature and general sensibility, as well as availability of data.

The candidates include expenditure per capita and GDP per capita, since more resources should produce not only more but better outcomes, as it allows for more inputs and stronger investment which should lead to increased efficiency and quality; Expenditure as a percentage of GDP which showcases the relevance of the distribution of resources; and public debt as a percentage of GDP to understand if the use of debt impacts the quality of services.

Density and land area are also included, as population distribution is believed to be important since areas with more density may have higher affluence to public services limiting responsiveness but also better access channels than less dense areas. Age Structure has also been shown to be relevant, as it brings differentiated needs, productivity and other particularities (i.e. fertility issues, differentiated care). Similarly, the percentage of women may be relevant.

Further, the tax wedge¹¹ and the tax competitiveness index procure a relationship between tax system and its importance in household economy and the relative quality of the services provided, as taxation is one of the main sources of revenue used for public sector activity while having a huge impact in household income.

¹¹ Tax wedge as a share of labor cost and VAT, of a single worker with no children earning a nation's average wage

Regulatory burden and regulatory rigor hope to proxy bureaucracy, red tape and issues related to the excessive or improper regulation which may hinder productivity, efficiency and overcomplicate processes.

Finally, some indicators were included to relate the general quality of governance and administration. These include the human development index, the democracy index which relates the proximity of government to public preferences, the perceived corruption index and the GINI coefficients which concerns equality.

Other indicators could be included, particularly related to management of services.

To maintain the same treatment as for the PEEI, these indicators were aggregated in averages, one including COVID-19 years and one excluding them.

After some further analysis, the indicators that prove relevant are the perceived corruption index, regulatory burden, expenditure per capita, tax wedge, public debt, democracy index, population density and expenditure as a percentage of GDP and only these will be considered in the specification of the model, the results and the discussion.

Although HDI initially seemed like a strong candidate and does show relevant significance in the estimation, a more in-depth look at the composition of the HDI suggests that this might be rather a consequence of proper expenditure and not a cause, as it includes some of the indicators used to compute the PEEI. For this reason, it will not be considered in the estimations.

The Democracy Index, Perceived Corruption Index and Regulatory Burden may raise some doubts concerning their methodology and multicollinearity as it could be argued that they may be related through some of the same indicators. However, the Democracy Index “combines information on the extent to which citizens can choose their political leaders in free and fair elections, enjoy civil liberties, prefer democracy over other political systems, can and do participate in politics, and have a functioning government that acts on their behalf”¹². The Perceived Corruption Index uses information from 13 sources that gather evaluations from experts and business executives regarding bribery, diversion of public funds, use of public office for private gain, nepotism in the civil service and state capture, occasionally including the ability to enforce integrity mechanisms, the prosecution of corrupt officials, red tape and excessive bureaucratic burden, the laws on financial disclosure, conflict of

¹² <https://ourworldindata.org/grapher/democracy-index-eiu>

interest prevention and access to information and the legal protection for whistleblowers, journalists and investigators. Regulatory Burden is the result of the World Economic Forum “Executive Opinion Forum” responses to the survey question “In your country, how burdensome is it for companies to comply with public administration’s requirements (e.g. permits, regulations, reporting)?”.

Thus, these variables are not directly linked except for the occasions in which the sources of the perceived corruption index regard red tape and excessive bureaucratic burden. The potential multicollinearity comes most likely from indirect links through third variables, omitted or non-relevant for the analysis.

3.3.2 Estimated Model

Multiple estimations were produce considering all relevant constructions. All models were estimated using Python (libraries pandas, numpy and statsmodels).

Considering the relevance of the mentioned explanatory variables and the small sample most models were estimated in the form:

$$PEEI_i = \alpha + \beta X_i + \varepsilon_i$$

$i=1, \dots, 20 \text{ countries}$

Where α is the constant; β is the vector of coefficients; X_i is the vector of explanatory variables; and ε_i is the error term.

Additionally, some variables are highly correlated and proxy the same dimension. The variables expenditure per capita and GDP per capita, tax wedge and tax competitiveness, regulatory burden and regulatory rigor can be interchanged. Although, GDP and expenditure may be seen as representing different dimensions (GDP is the total value of production of a country while expenditure is allocated to specific functions) they are significantly correlated (R^2 of 0.578) so the theoretical difference can be ignored (it’s possible that all countries distribute expenditure according to GDP).

The same models were estimated for the sample excluding COVID-19 and the sample including COVID-19 to gouge any relevant differences and will be discussed further ahead.

Furthermore, an Impact analysis was produced as the explanatory variables differ greatly in magnitude and thus become hard to compare directly. To this end, the coefficients of each variable were multiplied by its standard deviation. This hopefully helps create an even ground

to show which of the significant variables may be more important, that is, have greater impact.

4. Results

4.1 Public Expenditure Effectiveness Index

Figures 2 and 3 show the final results of the PEEI per country, organized from the best performance - on the left - to the worst performance - on the right.

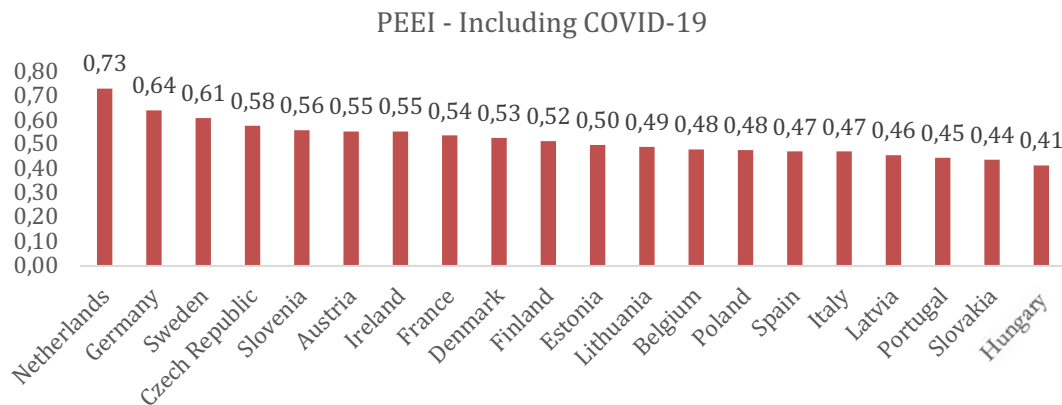


Fig. 2. PEEI, series including COVID-19

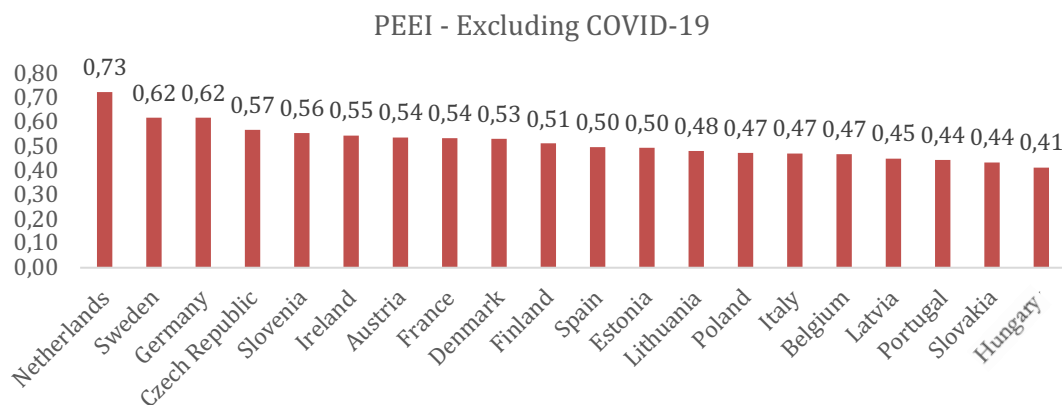


Fig. 3. PEEI, series excluding COVID-19

All values are between 0 and 1 with neither being present. This shows that no country is neither the best performer in all aspects regarded in the evaluation nor the worst performer in all accounts. Further, the values are presented within 0.41 and 0.73 which shows a moderate level of performance all through the sample, i.e., there are no dire performances, nor near-perfect.

We can also observe that there are very few alterations when including the COVID-19 years (2020, 2021) compared to excluding them. As expected, most of these alterations are a product of the health sector without major prejudice to education or justice. Even then, some

alterations are only 0.01 points apart or less in which case these might be caused by rounding errors. The following discussion will, thus, regard the sample including COVID-19 to account for the most recent data, but can also be extrapolated to the alternative.

The Netherlands are the best performer followed by Germany and Sweden while the worst performer is Hungary, preceded by Slovakia and Portugal. These results are in line with expectations and previous analysis with no big surprises along the ranking.

It should be noted that some values are very close or even similar and may be due to rounding errors. In this situation, order should not be considered as it may be a product of the mathematical treatment and, chances are, the concerned countries perform very similarly. Any conclusions should allow for a centesimal point of lea way.

The PEEI can be interpreted as how close any country is to perfecting the quality of their public service system in all the aspects considered. This interpretation lies on the assumption that the ideal outcome of services is measured by the best outcome attained so far, as other possible measures seem to fall short of feasible. If the value of PEEI is 1, that means that the value for each baseline indicator is also 1 and, according to the previous section, the value of an indicator is 1 for the best value of that indicator. The use of 0 to 1 scale also allows for the simplification that for a level of 0,40 a country is at 40% capacity when compared to the hypothetical perfect country (with PEEI=1).

The results for the sectorial indexes are available for the series including COVID-19 in Annex E.

4.2 Portugal

Portugal is the 3rd lowest ranked country in quality of public services, with a PEEI of 0,45 and much below the highest obtained score of 0,73, going in accordance with expectation and other previously mentioned work (Afonso et al., 2005).

This profile aims to showcase and explain the low score as well as distinguish the main issues for the country's public sector services.

Table 1 shows the values for each baseline indicator as well as for the sectorial indicators. For each indicator the maximum value is one and it represents the best outcome observed in the sample.

Health Effectiveness Index	0,37	Education Effectiveness Index	0,52	Justice Effectiveness Index	0,52
Out of pocket payments	0,26	Enrolment rate	0,81	People can afford and access	0,67
Waiting times	0,22	Share of private enrolment	0,21	Policemen per inhabitant	1,00
Reported unmet needs	0,31	Cities vs rural tertiary education	0,28	Not subject to unreasonable delay	0,43
Healthy life years	0,45	Students to teaching staff ratio	0,39	Incentive to alternative methods	0,24
Antibiotics prescribed	0,41	Teacher salary	0,52	Crime rate	0,44
Avoidable hospital admissions	0,57	LAYS	0,78	Perceived independence	0,47
30-day case fatality stroke	0,37	Relative earnings	0,67	Rule of law	0,60
				Confidence in judicial system	0,35

Table 1. Portugal Profile, series including COVID-19

Although average performance is very relevant to situate the efforts of the country, this analysis will focus on comparison with the best outcomes as these should be the end goal

Furthermore, the ideal results indicated are the direct result of other EU countries and, as such, should be regarded as reasonably feasible and attainable.

Portugal also shows a median tax wedge, however the below average salaries mean that these contributions weigh more heavily on populations income, making this analysis all the more pertinent.

Health is the sector in analysis that struggles the most, with an index of 0,37 (best is 0,74). Out-of-pocket payments is the low (0,26) and reflects a major gap in the country's financial protection. The number of surgeries performed is also the worst (0,22) and way below ideal. Reported unmet needs are badly classified, although this seems a general problem, there's clearly a significant improvement to be made. The number of antibiotics prescribed indicator is also slightly low suggesting some carelessness in treatment, as this is typically regarded as a "cure all". Regarding the quality of care, Portugal shows a 0,45 in healthy life years and a rather well places 0,57 in avoidable hospital admissions (3rd best placed). This quality diminishes in secondary care with a value of 0,37 for 30-day mortality after stroke.

Access should clearly be a point of interest as it represents a problem in terms of financial coverage and distance. Long waiting lists and relevant unmet needs, further, show a lack of responsiveness. Quality seems to be better handled especially in the primary care. However, safety of care and secondary care can be improved. The overall healthy life years should also present a higher value especially taking in consideration the diet and culture of this mediterranean country, which are by themselves conducive of a healthy life. Regarding Education, Portugal shows a high rate of enrolment (0,81), unfortunately a relevant part relates to private education institutions showing distrust in the public system or a lack of access. There is significant imbalance between urban and rural tertiary education attainment suggesting, again, lack of access. Student-to-teaching-staff ratio is also weak with low salaries for teachers, which might mean less motivated teachers, and a less attractive profession (becoming a circular issue). Non-the-less, Portugal shows a good LAYS Score (0,78) and a fairly good return on investment with relative earning classified at (0,67). The question remains if these outcomes are a result of the public or private education (according to the previous indicators the latter may be more likely).

Access to education is reasonable as there's a high enrolment rate, but access to quality public education is called into question when looking at private enrolment and the rural attendance of higher education. Responsiveness should improve with an increase of salaries which is expected to also increase teaching staff, creating a more appropriate learning environment. Notwithstanding, the quality of education seems to be commendable.

When it comes to Justice, it seems that access is not necessarily a problem (0,67) with the most policemen per 100 000 inhabitants. However, crime rate is rather high (0,44) along with significant delays (0,46). The overall rule of law is reasonable (0,60) with a lower perceived independence (0,47). These are conducive of the lower confidence in the judicial system (0,35) and possibly consequential incentive to use alternative methods to legal ones, which are a main issue for justice in Portugal (0,24).

Access does not necessarily represent an issue; however, responsiveness and quality are below reasonable standards, made obvious by the lack of confidence and use of alternative methods.

Although most of these issues could be dismissed as a lack of funds, the regression analysis (ahead) refutes this hypothesis.

These outcomes highlight the importance of some of the measures mentioned in section 2.4.

The aim of this profile is to bring to light the main issues faced by the Portuguese public administration. A lengthy discussion of the possible solution requires a much deeper delve into the organization of public services and policies in place that concern the mentioned issues.

4.3 Regression Analysis

The models and variables presented were chosen based on economic and statistical criteria. All were evaluated based on theoretical relevance and significance as well as adjusted R2 and F-statistics.

Again, when comparing to the exclusion of the COVID-19 years, there were no relevant differences, thus the analysis regards only the full sample, although the alternative estimations are accessible in Annex F.

Alternative specifications of the models were produced as robustness checks, found in annex G, and corroborate the following conclusions.

Table 2 shows the results of seven estimated models with dependent variable PEEI and different combinations of the explanatory variables Density, Democracy, Corruption, Regulatory Burden, Expenditure per capita, Public Debt, Tax Wedge and Expenditure as percentage of GDP. The values shown for the variables are the resulting coefficients with the p-value in parentheses.

Table 3 shows the results from the impact analysis (coefficient multiplied by the standard deviation) for each variable.

In models 1- 4, density shows significant (at level 1% for models 1, 2 and 3, and 5% for model 4) and positive coefficients meaning that performance should improve with higher population density.

In models 1, 2 and 4, public debt has a consistently negative impact but is only significant in models 1 and 4 (at the 5% and 1% level, respectively) showing that the use of public debt has negative effects of public service quality.

For model 1, democracy shows significant (at the 1% level) and positive coefficient meaning that performance should improve with democracy level. The constant is non-significant.

For model 2, corruption shows a significant (at the 1% level) and positive coefficient meaning that corruption has a negative impact in performance¹³.

For model 3¹⁴, regulatory burden shows significant (at the 1% level) and positive coefficient meaning that services do not benefit from extensive bureaucracy¹⁵.

For model 4, expenditure per capita shows significant (at the 5% level) and positive coefficient meaning that an increased expenditure per capita translates into better public outcomes.

Model 5 shows expenditure per capita and expenditure as percentage of GDP as significant (at the 1% and 10% level, respectively). While the former is positive, the latter is negative with half the impact. This implies that an increase in expenditure per capita leads to better outcomes, however an increase in expenditure as a percentage of GDP has the opposite effect. The constant is non-significant.

¹³ Note that the indicator used marks higher values as lower perceived corruption.

¹⁴ Model 3 does not include Public Debt as the F-statistic is significantly higher while R2 change is minimal compared to its inclusion. Public Debt is also non-significant.

¹⁵ Note that the indicator used marks higher values as lower regulatory burden.

Variable	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
Democracy	0,0557*** (0,000)						
Corruption		0,0031*** (0,004)					
Regulatory Burden			0 ,0577*** (0 ,003)				
Expenditurepc				0,000006262*** (0,006)	0,000009795*** (0,001)		
Tax Wedge						-0,0673 (0,846)	
Public debt	-0,0006** (0,051)	-0,0005 (0,138)		-0,0009*** (0,009)		-0,0008* (0,065)	-0,0009** (0,050)
Expenditure%GDP					-0,0045* (0,065)		0,0013 (0,565)
Density	0,0003*** (0,003)	0,0003*** (0,013)	0 ,0003*** (0 ,011)	0,0003** (0,025)		0,0004*** (0,010)	0,0004*** (0,010)
Constant	0,0675 (0,506)	0,3006*** (0,001)	0,2720*** (0 ,000)	0,4136*** (0,000)	0,4979 (0,314)	0,4969*** (0,005)	0,4743*** (0,000)
Adj R2	0,677	0,581	0 ,501	0,558	0,396	0,287	0,300
F statistic	14,29	9,769	10 ,54	8,996	7,241	3,543	3,712

*** significant at the 1% level; ** significant at the 5% level; * significant at the 10% level
P-value in parenthesis

Table 2. Regression Results, series including COVID-19

Variable	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
Democracy	0,0452***						
Corruption		0,0391***					
Regulatory Burden			0,0415***				
Expenditurepc				0,0387***	0,0605***		
Tax Wedge						-0,0031	
Public debt	-0,0223**	-0,0185		-0,0334***		-0,0281*	-0,0316**
Expenditure%GDP					-0,0317*		0,0090
Density	0,0358***	0,0358***	0,0358***	0,0358**		0,0474***	0,0474***
Constant	0,0675	0,3006***	0,2720***	0,4136***	0,4979	0,4969***	0,4743***

*** significant at the 1% level; ** significant at the 5% level; * significant at the 10% level

Table 3. Impact Analysis, series including COVID-19

Models 6 and 7 show that neither the tax wedge nor the expenditure as percentage of GDP are significant. This means that there is no evidence to believe that the coefficient of these variables is significantly different from zero, and thus suggests that these are not good predictors of the dependent variable, PEEI.

For the impact analysis, the resulting numbers should be interpreted as the number of standard deviations of PEEI that one standard deviation of the relevant variable produces. For example, in model 1, 1 positive standard deviation from the mean in democracy implies 0.0473 positive standard deviations from the mean in PEEI.

The models also present two significant limitations. First, the possible multicollinearity of the variables which will be discussed further ahead. Second, the size of the sample which comprises only 20 observations. Naturally, given the proper data this number could be increased to all countries which might give better insight into the relations. However, this sample should be sufficient to take significant conclusions and, perhaps, in more detail since the breadth of the indicators should be much smaller avoiding underestimation of the effects of deviations.

The present analysis clearly distinguishes six variables as the main predictors for public expenditure effectiveness: population density, public debt, democracy level, corruption, regulatory burden and finally expenditure per capita. Density and public debt are the only variables that are mostly significant without tampering with others, most likely, they are less correlated with the other variables.

Additionally, it concludes that the tax wedge and expenditure as a percentage of GDP are not necessarily related to the quality of public services.

The latter seems to go according to some of the conclusions presented in the literature review regarding the size of expenditure. It seems, in fact, that expenditure as a percentage of GDP is not as relevant as would be expected. On the other hand, expenditure per capita does have an important role in the performance of the public sector.

Model 5, which concludes a positive impact of expenditure per capita but negative impact of expenditure as a percentage of GDP, might seem contradictory: An increase in the percentage of GDP for expenditure necessarily means an increase in per capita expenditure, *ceteris paribus*. Therefore, an increase in expenditure in percentage - through an increase in per capita expenditure - should indeed improve the quality of services.

Even though the difference between expenditure per capita and expenditure as a percentage of GDP may be surprising, this is the result of an empirical analysis.

While a higher level of expenditure per person will tend to have better results, countries who show heavier governments are less efficient and effective. When looking at other explanatory variables it's likely that larger public sectors imply greater misallocation, corruption and bureaucracy.

That is: higher expenditure is preferable if it is the result of higher GDP - too great of a weight might mean more mismanagement.

Regardless, it should be noted that two of the relevant sectors (education and health) are very "people based", hence it is possible that the PEEI reacts more strongly to increases in expenditure per capita.

Similarly, public debt could be expected to have a positive impact in a leveraging optic, but a negative impact is witnessed. This might, again, point to the mishandling of resources (in this case, in a recent past). Debt can be seen as the excess resources used by public administration. If, however, there are no positive results to show for it (public sector effectiveness), we can arrive at the same conclusions as before.

Again, the PEEI represents only 3 sectors (granted, typically regarded as most important and largest), thus it is possible that the excess public debt could have been invested in different sectors where it had in fact positive effects.

In both cases, it is relevant to mention that for a significant period of time (during the 20th century) an increase in public expenditure as a percentage of GDP and of public debt likely had a positive impact on public service effectiveness but have now reached such a size that that effect has been inverted.

Also unexpected, is the behaviour of the tax wedge, which is one of the main sources of public revenue. Tax wedge concerns the income cut faced by citizens of a country to contribute to the development and upkeep of government functions (as well as having a major role in equality). This indicator relates the tax wedge faced by a worker without children who earn the median salary, thus, the lower the median salary, the more significant, the cut. It should be expected that countries who ask for bigger effort also deliver in higher quality. The higher the taxation, the higher the revenues, the more resources for expenditure, investment and upkeep of public services. When comparing the PEEI to the tax wedge (Annex D), the lack of correspondence is very clear. As an example, we have that the Netherlands have the highest PEEI but the third lowest tax wedge. Contrastingly, Hungary

has the lowest PEEI but the fourth highest tax wedge. This comparison leaves no doubt that it is possible to produce the best outcomes with lower taxes, i.e. it is possible to give populations better quality care without weighing as heavily on their income. The issue at hand is, than, not a lack of resources but rather the mishandling of the existent.

Further, the relevance of corruption and bureaucracy underscores this issue giving two possible explanations for the mismatch between resources and outcomes.

On one hand, excessive bureaucracy not only implies longer and harder processes but, in some cases, also discourages action (procurement of services, complaints, less incentive to legal methods).

On the other hand, corruption implies the deviation of resources from their rightful end. Many practices may fall under the name corruption, and, although it may often be seen as malicious, as “perceived corruption” it may present in different ways. In the particular context of this analysis, and considering the lack of preferable management indicators, one fundamental role of corruption may be to absorb the effects of mismanagement of public services at all levels, additionally to the possibility of “criminal corruption”. Unfortunately, the present study does not discern between the two. This may also be a consequence of insufficient supervision, which may solve both problems regardless of which is the real cause.

It is possible that corruption and red tape are taking away from the benefits of tax revenue, effectively reducing its relevance when it comes to producing public expenditure quality.

The democracy index shows a positive correlation with public service effectiveness.

It's hard to imagine a situation where a population subject to democracy has good public services but is unhappy with democracy. Vice-versa, it's not likely that the same population is happy with democracy if public services do not perform properly.

Nevertheless, its positive impact on public sector performance highlights the importance of reflection of public opinion on government action. It is interesting to reference the theory of a benevolent dictator¹⁶ as these results loosely show that democracy produces significantly positive outcomes and appropriate freedoms and representation translate into better quality of life.

¹⁶ Government in which an authoritarian leader exercises absolute political power but is perceived as doing so for the benefit of the population, contrasting with the decidedly malevolent stereotype of a dictator who focuses on his supporters and own self interests.

The presentation of the models is also intentional. Other models not here presented (available in Annex G) show that when including any of the other variables in model 1 these become non-significant. The same happens when including Expenditure per capita in model 2 or 3. For the Corruption-Regulatory Burden pairing, both become non-significant. This could be a consequence of multicollinearity. By including extra variables, the effect of these on the dependent variable becomes masked by the initial variable. It does not mean that the variable that shows significance is more relevant than the non-significant, but rather that the exclusion of either provides better specification.

Because of multicollinearity, the true relative impact among them cannot be differentiated. Rather, the more segmented analysis produced permits the comparison between models. It shows that Democracy, Corruption, Regulatory Burden and Expenditure per capita have similar impacts with the first being the highest (0,0452) and the latter the lowest (0,0387). Density shows a slightly lower impact (0,0358) and Public Debt shows the lowest, between 0,0223 and 0,0334 (negative).

The lack of significance of the constant in models 1 and 5 may suggest multicollinearity but it also means that it is less likely that there are non-systematic bias.

Note that the results of the regression show correlation but not necessarily causality. Some of these variables may be correlated due to other omitted variables and not because of direct effects. Nonetheless, following the discussion above, it is reasonable to believe they are in fact influential on public sector performance.

5. Conclusion

A Public Expenditure Effectiveness Index is computed aggregating 22 baseline indicators for Health, Education and Justice, based on the characteristics of Accessibility, Responsiveness and Quality of public services, across 20 EU Countries. A linear regression analysis links the computed indicator to key explanatory variables.

The PEEI shows the Netherlands as the most effective (at 0,73) and Hungary as the least (at 0,41), with Portugal as the 3rd least effective (0,45).

The regression analysis shows democracy, corruption, regulatory burden and expenditure per capita as the most influential. Population density and public debt also play a relevant role. Tax wedge and expenditure as percentage of GDP are not significant, except when comparing expenditure per capita and expenditure as a percentage of GDP, in which case expenditure as a percentage of GDP has a negative impact on effectiveness.

A profile for Portugal is detailed showing less than ideal indicators, in particularly for access and responsiveness of health, for responsiveness and quality of public education and for responsiveness and quality of Justice.

In this light, the Portuguese government should have a closer look at the allocation and management of their resources, to make sure that the contributions of taxpayers are being allocated according to their preferences; that there is stronger surveillance and control of public service inputs and production; that bureaucratic processes are limited and necessary; and that public debt is being used responsibly.

The reach of this analysis is significantly limited by the availability of data and, consequentially, reflects a relatively small sample of countries. It would be interesting to include the full set of western countries, as well as, adapting the analysis to other world blocks.

It uses some survey measures, which may not be ideal due to subjectiveness and other influential factors.

It includes other limits concerning data treatment, rounding errors and approximations. Multicollinearity is also present in the regression analysis.

It does not include indicators and/or explanatory variables considered relevant, as mentioned before, such as to proxy management adequacy.

Future investigation may consider expanding the present analysis to other geographies, as well as, extending it through new data that may be available in the future particularly for additional sectors.

A deeper look into how to address the issues highlighted by the analysis particularly for Portugal would also be beneficial to steer decision makers toward progress and reform on the public service front.

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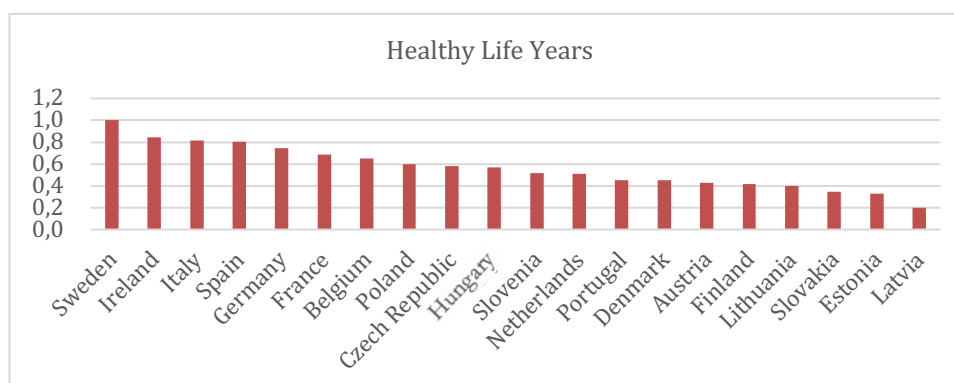
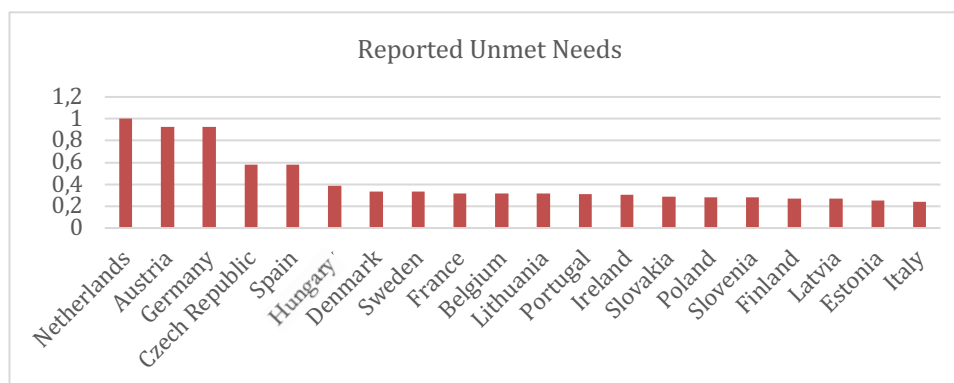
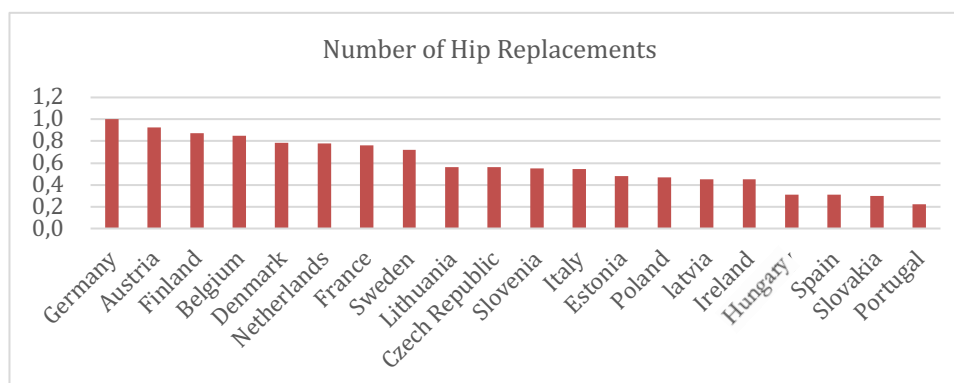
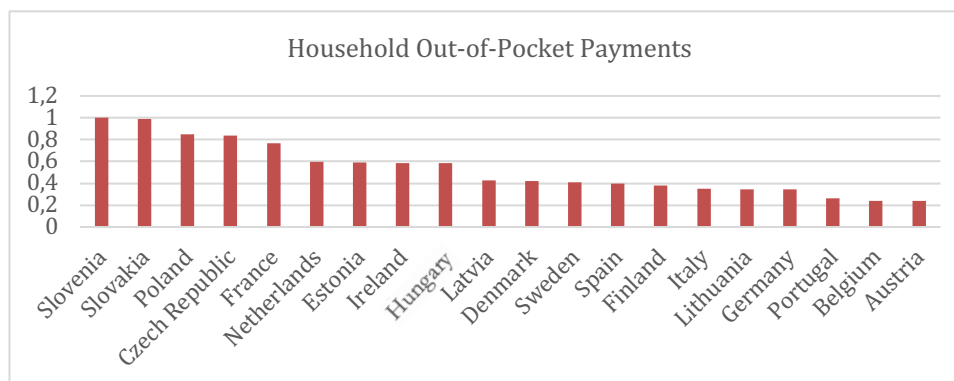
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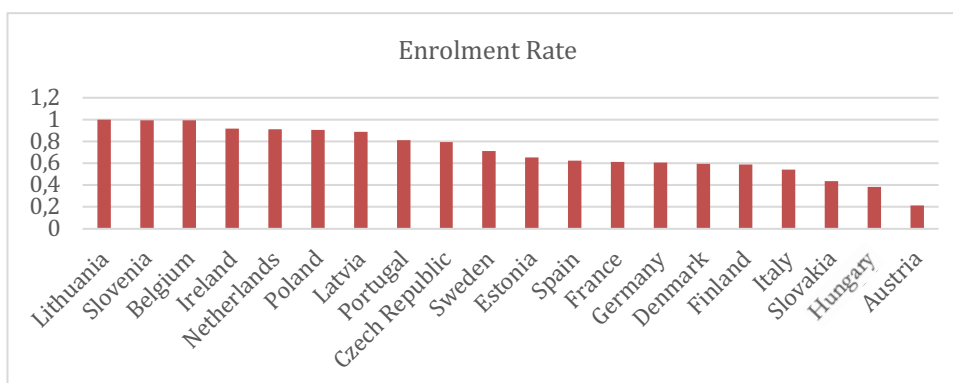
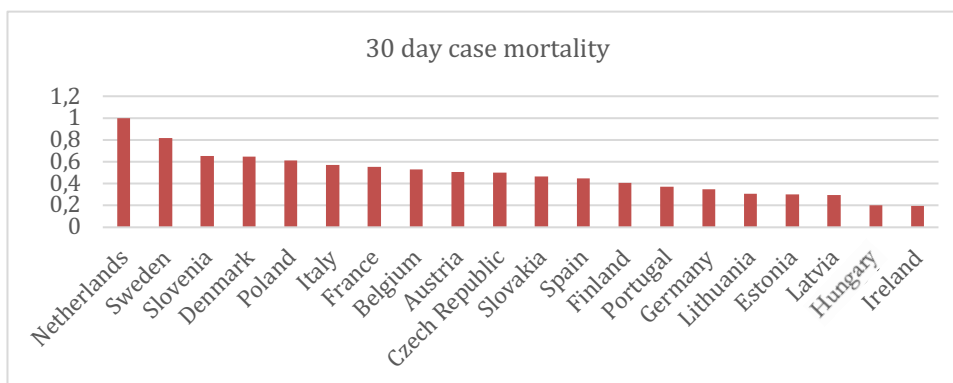
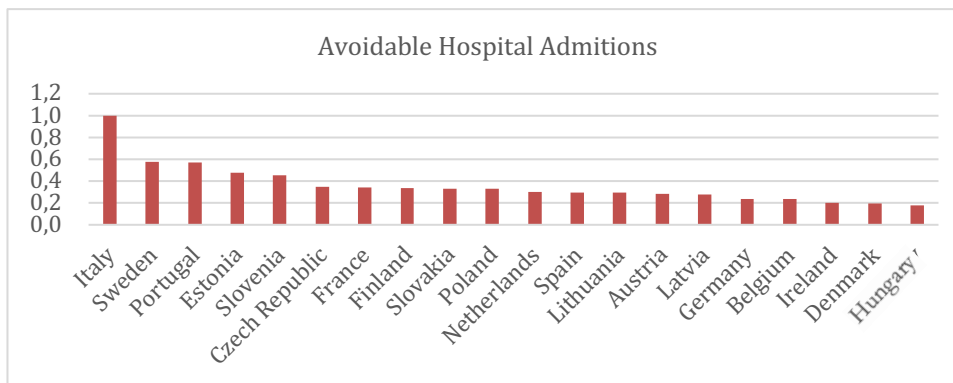
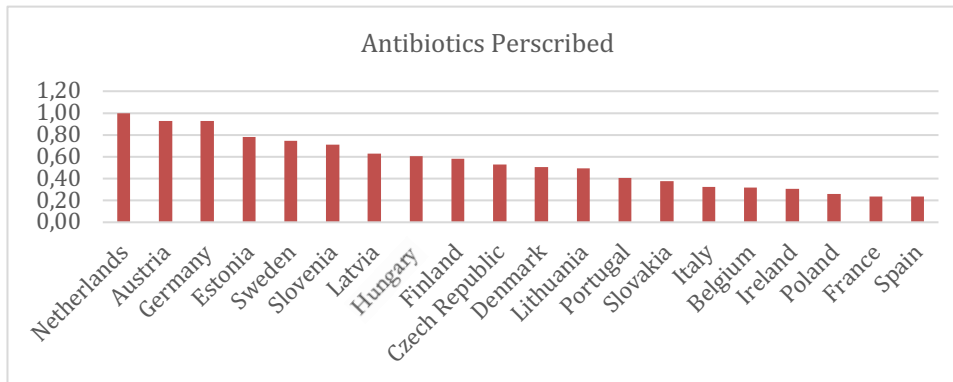
Annex A. Baseline Indicators – Data and Sources

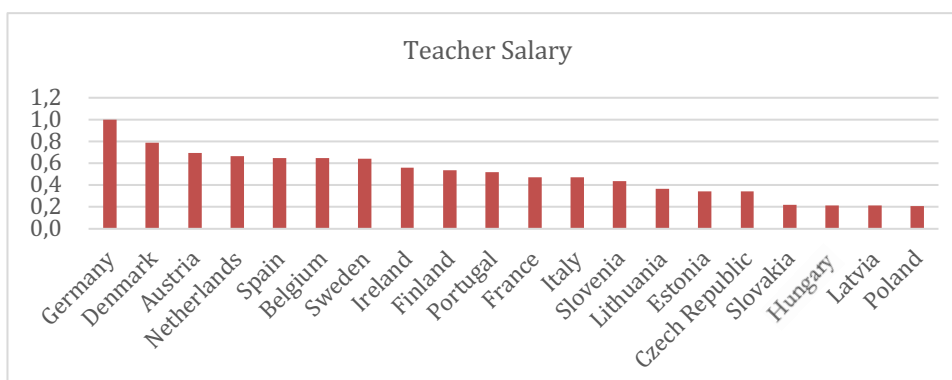
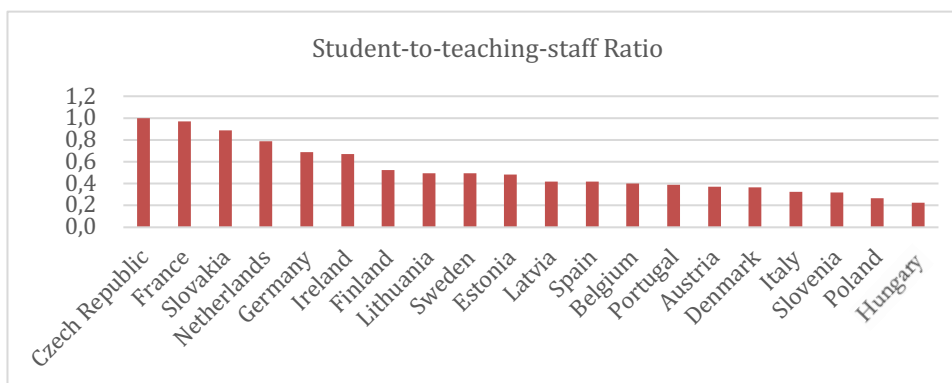
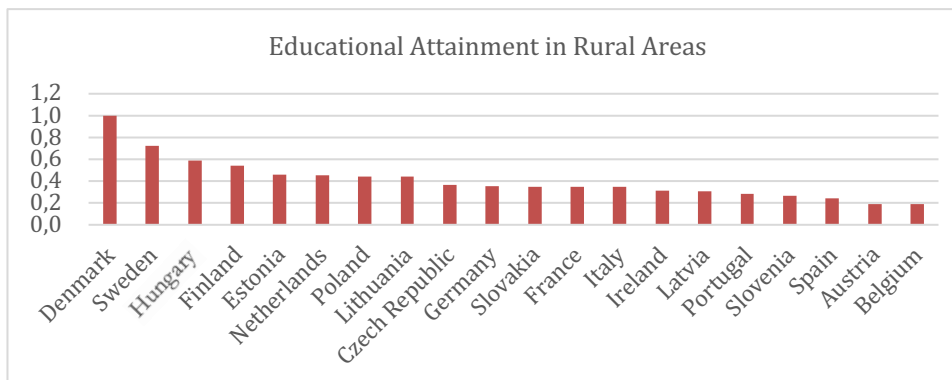
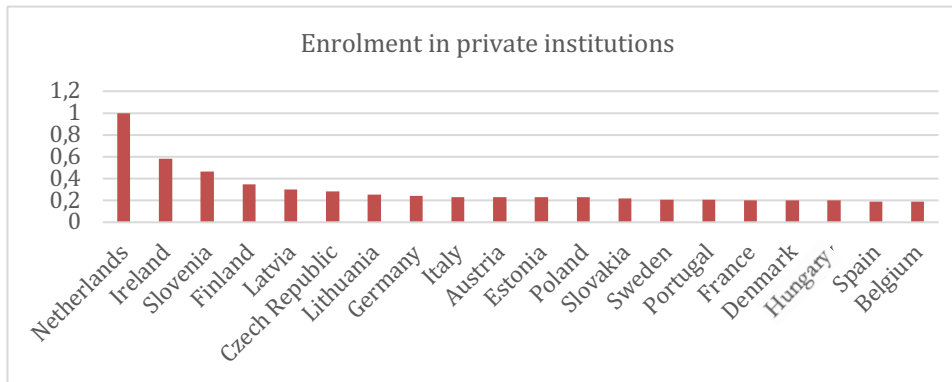
Code	Name	Unit	Notes	Source	Access Date
H1	Household out of pocket payments	Per capita, current prices, current ppps	All health functions	OECD	29/02/2024 16:33
H2	Reported unmet needs	Percentage	Due to financial issues, distance and waiting lists	EUROSTAT	29/02/2024 13:13
H3	Annual number of Hip replacements	Per 100 000 inhabitants		EUROSTAT	29/02/2024 13:22
H4	Healthy life years expected at birth	Absolute value		EUROSTAT	29/02/2024 13:22
H5	Avoidable hospital admissions	Per 100 000 inhabitants	Age-sex standardised rate	EUROSTAT	29/02/2024 13:22
H6	30-day mortality rate from ischemic stroke	Per 100 000 inhabitants	Age-sex standardised rate	EUROSTAT	29/02/2024 13:22
H7	Antibiotics prescribed	DDD per 1000 inhabitants per day		ECDC	03/04/2024 18:41
E1	Rate of enrolment of 15 to 19 -year-olds	Percentage	Relative to total 15 to 19 -year-olds	OECD	29/02/2024 15:09
E2	Percentage of students enrolled in private institutions	Percentage	Relative to total enrolled	OECD	29/02/2024 19:31
E3	Percentage of 18 to 24 -year-olds who attain tertiary education in rural areas	Percentage	Relative to total who attain tertiary education;	EUROSTAT (original data)	29/02/2024 21:18
E4	Student-to-teaching-staff ratio	Number of students per teaching staff	In primary education	OECD	28/02/2024 11:17
E5	Annual statutory salary for teachers	Equivalent used converted using ppps for private consumption	For teacher with 15 years of experience; most prevalent qualifications at this stage of career and this level of education	OECD	28/02/2024 11:53

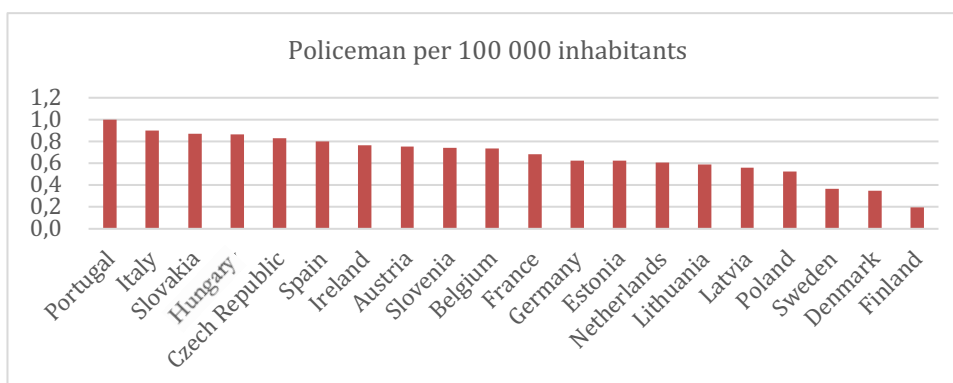
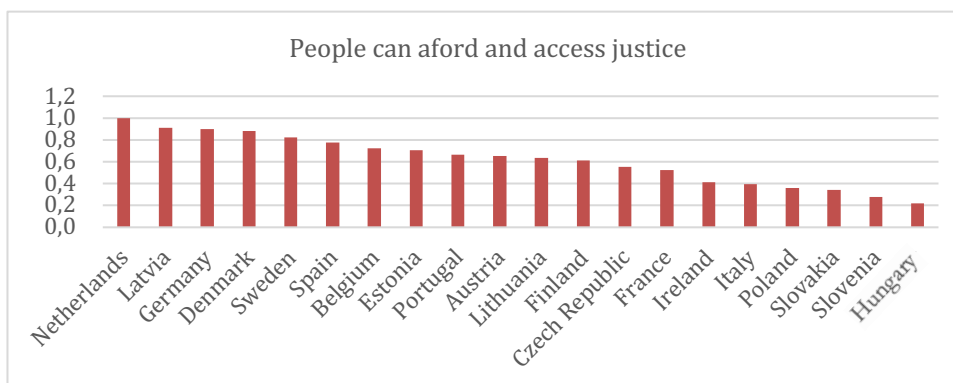
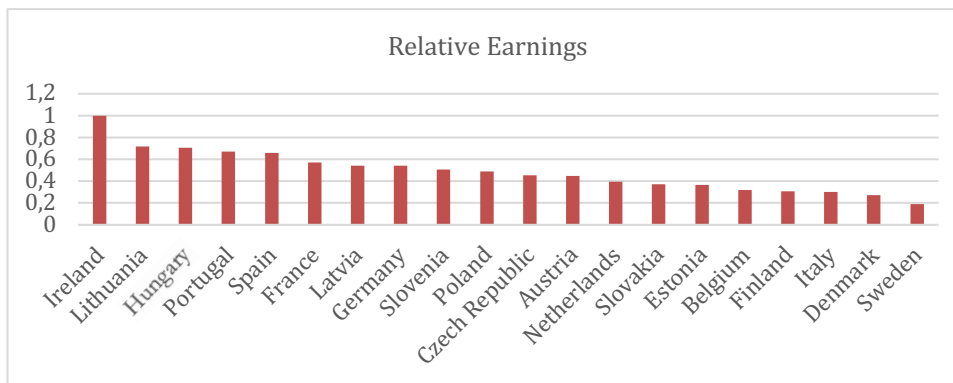
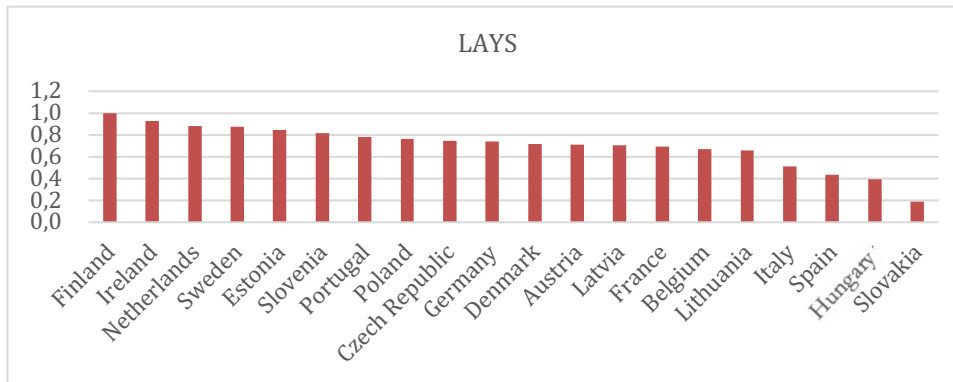
Code	Name	Unit	Notes	Source	Access Date
E6	Learning adjusted school years	Absolute value		The World Bank	29/02/2024 15:37
E7	Relative earnings of 25 to 34 -year-olds who attain at least a bachelor's level	ISCED 3 = 100	Or ISCED 3+4 =100 if data for ISCED 3 not available	OECD	28/02/2024 16:18
J1	People can access and afford civil justice	0-1		World Justice Project	28/02/2024 18:12
J2	Number of police officers	Per 100 000 inhabitants		EUROSTAT	28/02/2024 18:16
J3	Lack of unreasonable delay in civil justice courts	0-1		World Justice Project	28/02/2024 18:12
J4	People do not resort to violence to redress personal grievances	0-1		World Justice Project	28/02/2024 18:12
J5	Crime rate	Per 100 000 inhabitants	Police recorded offences, theft	EUROSTAT	29/02/2024 16:49
J6	Perceived independence of justice system	Percentage	Viewed as very good or fairly good	EUROSTAT	29/02/2024 16:59
J7	Populations confidence in the justice system	0-1		World Justice Project	28/02/2024 18:12
J8	Rule of law	(-2,5) - 2,5		The World Bank	29/02/2024 16:12

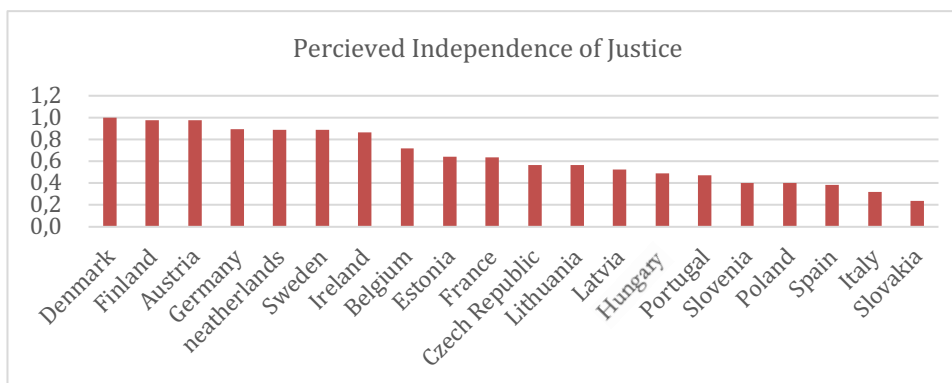
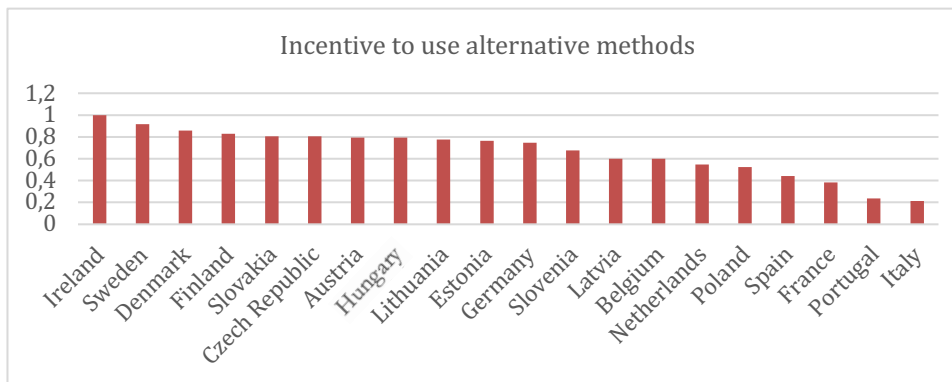
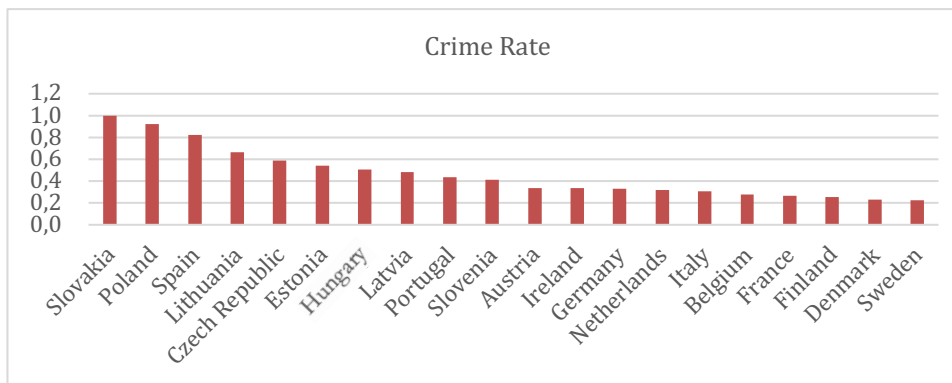
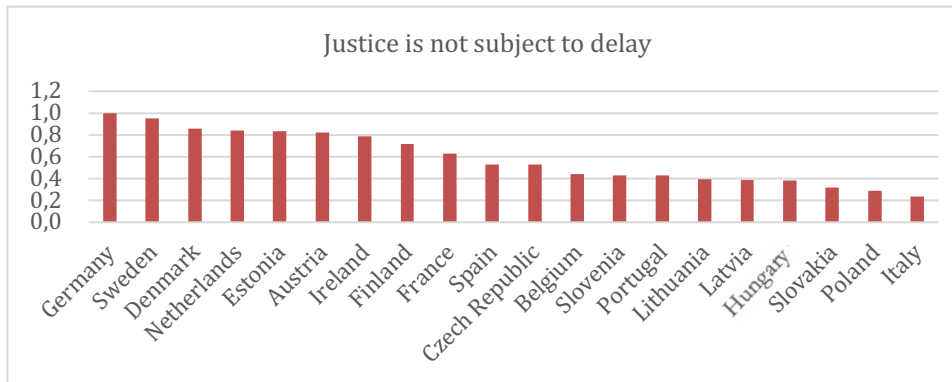
Annex B. Baseline Indicators, Series including COVID-19

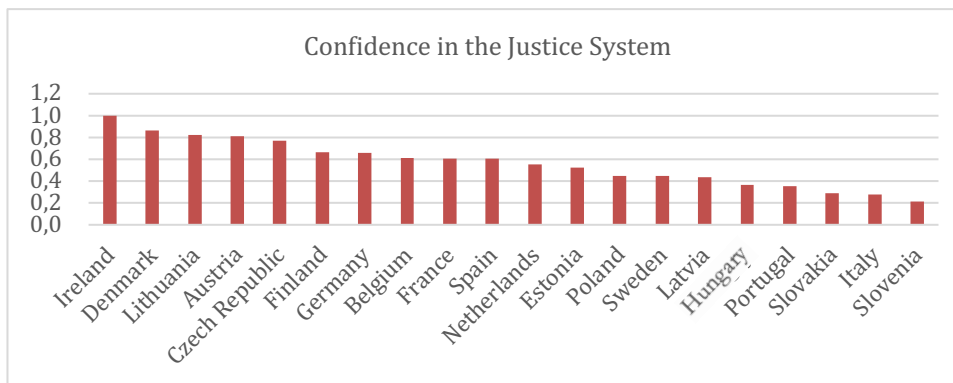
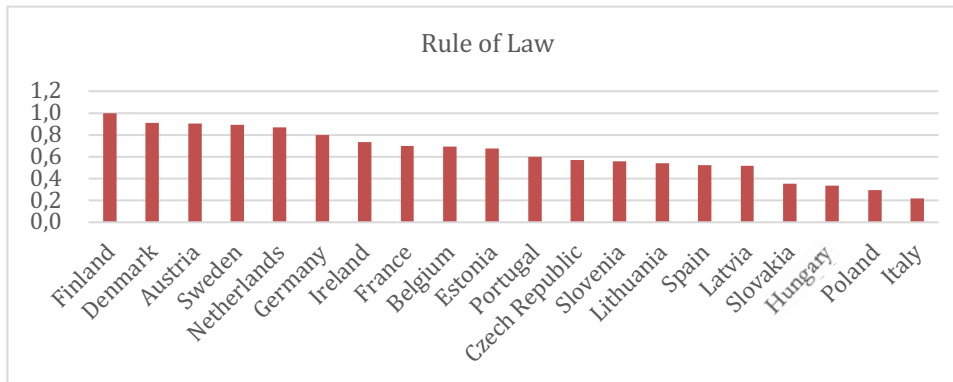








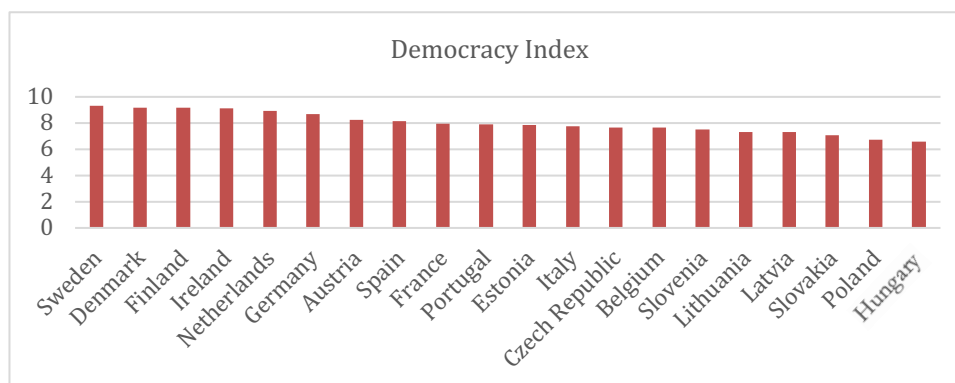
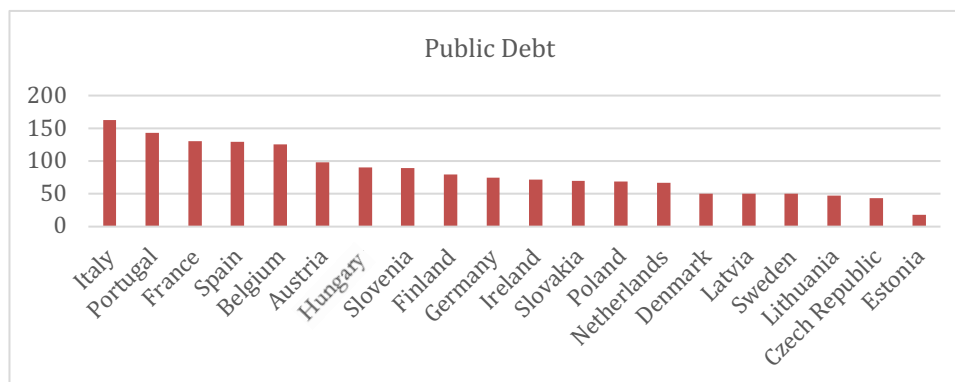
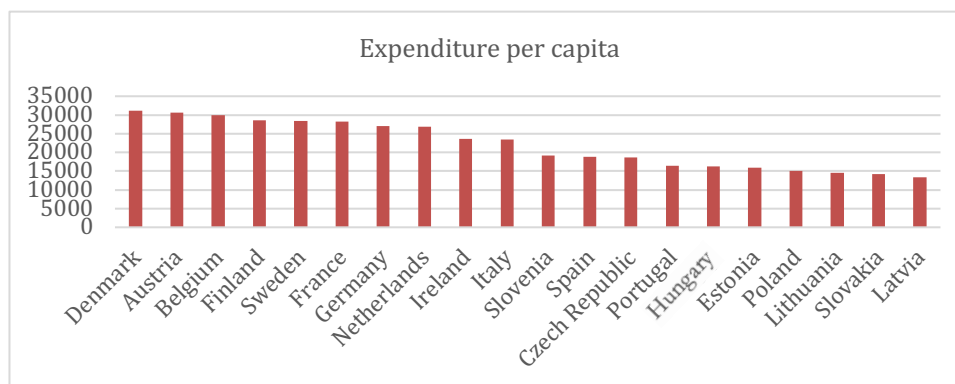
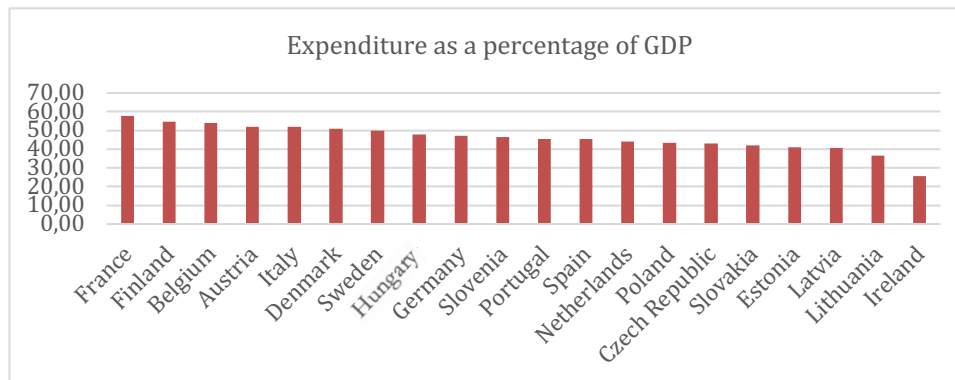


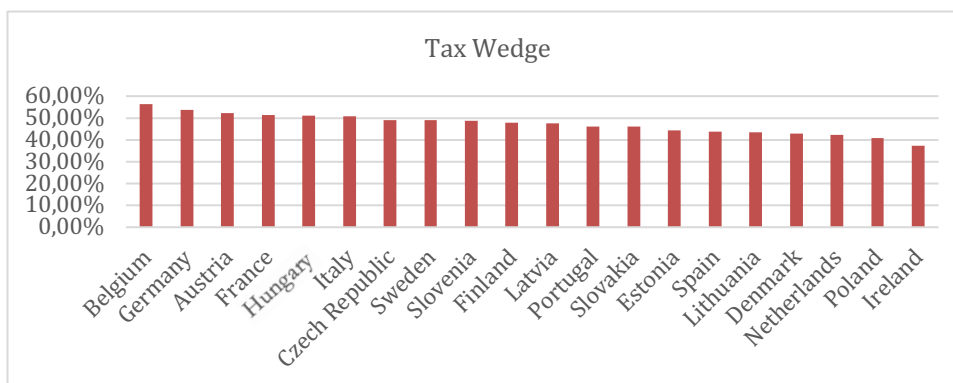
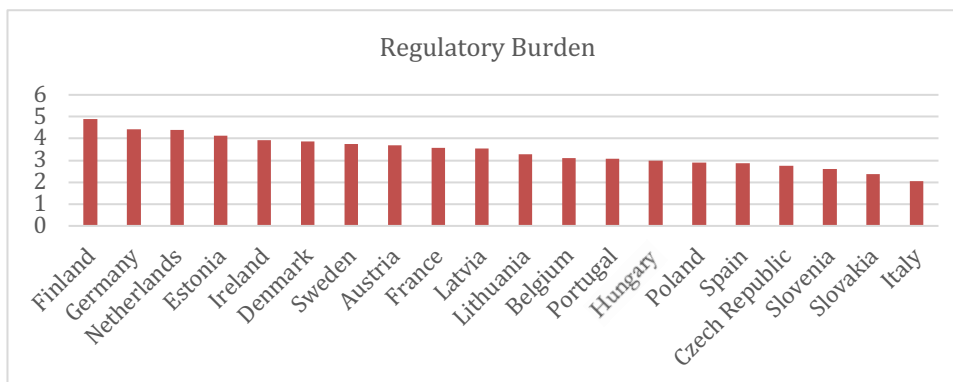
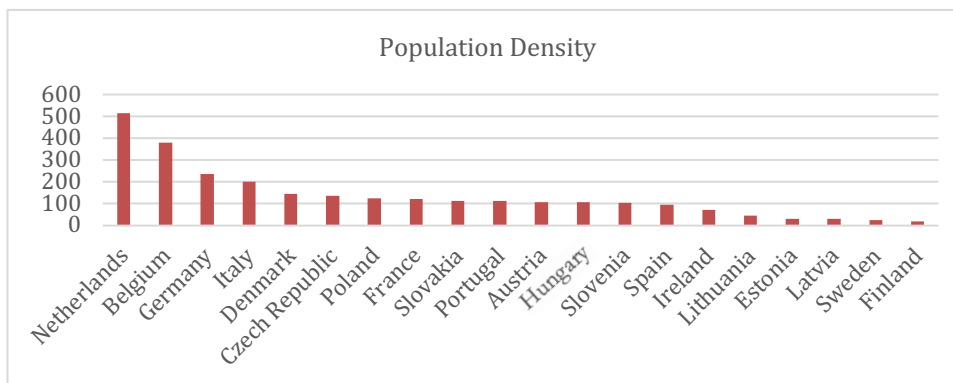
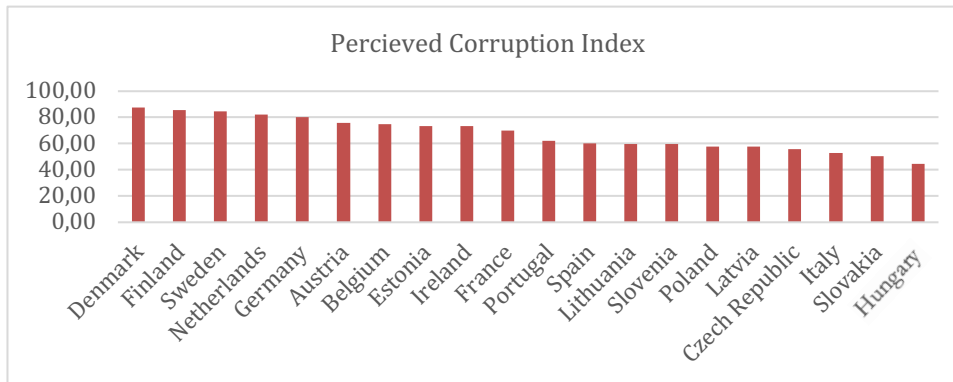


Annex C. Explanatory Variables – Data and Sources

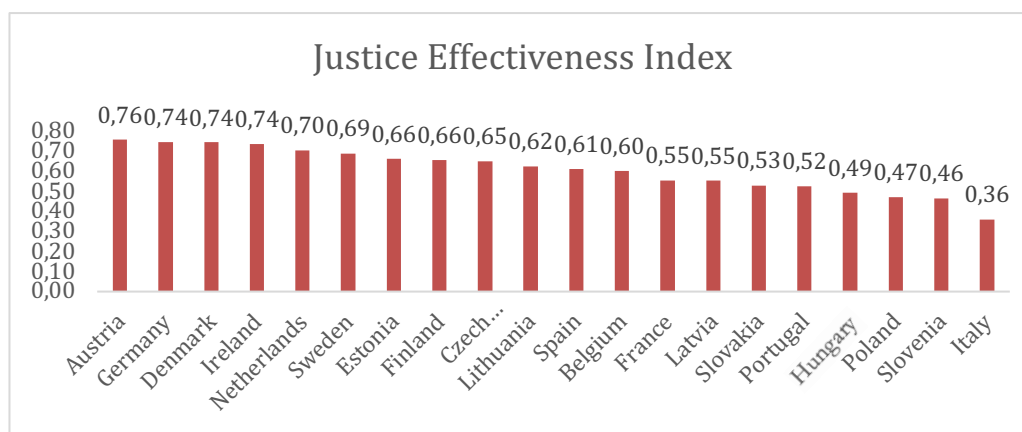
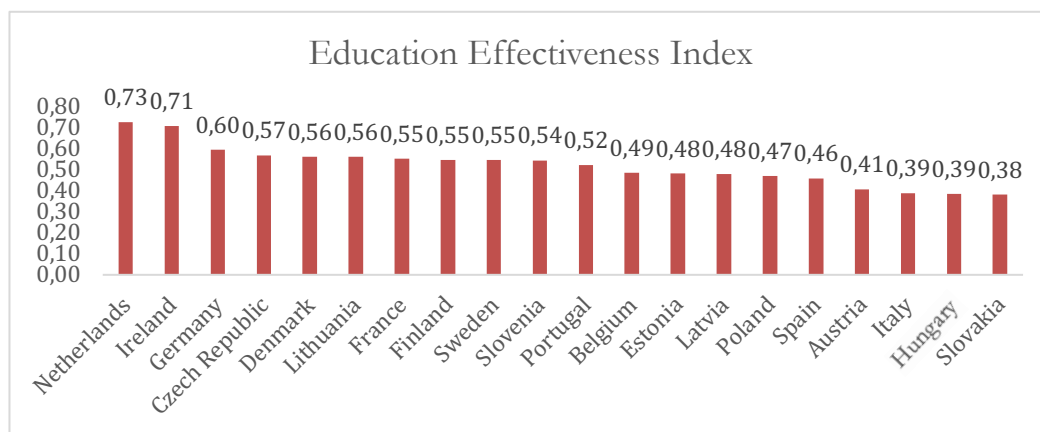
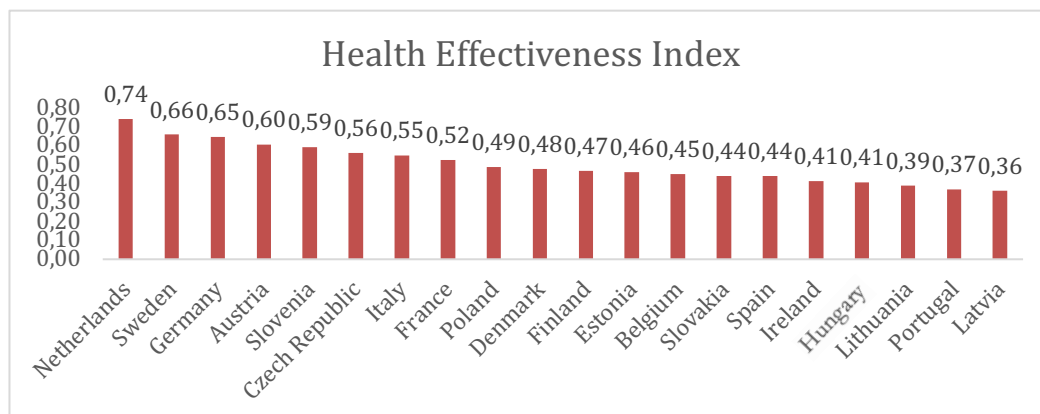
Name	Unit	Notes	Source	Access Date
Democracy Index	0-10		Our World in Data	19/03/2024 17:48
Perceived Corruption Index	0-100	Score of 0 representing a very high level of corruption and a score of 100 representing a very clean country	EUROSTAT	19/03/2024 15:42
Burden of Government Regulation	Index	Higher score represents less regulatory burden	WE Forum	24/03/2024 19:43
Government Expenditure per capita	US dollars per person, PPP converted		OECD	19/03/2024 18:44
Tax Wedge	Percentage	Tax Wedge Including VAT in % (As a Share of Labor Cost and VAT)	Tax Foundation	06/04/2024 18:06
Public Debt	Percentage of GDP		OECD	15/04/2024 11:53
Population Density	People per sq km of land area		World Bank	23/03/2024 16:03
Government Expenditure as a percentage of GDP	Percentage of GDP		EUROSTAT	19/03/2024 16:46
GDP per capita	PPP (current international \$)		World Bank	
Regulatory Rigor	Index		OECD	
Tax Competitiveness Index	0-100		Tax Foundation	

Annex D. Explanatory Variables, Series including COVID-19





Annex E. Sectorial Indicators, Series including COVID-19



Annex F. Linear Regression – Series excluding COVID-19

Variable	Model 1#	Model 2#	Model 3#	Model 4#	Model 5#	Model 6#	Model 7#
Democracy	0,0557*** (0,000)						
Corruption		0,0032*** (0,004)					
Regulatory Burden							
Expenditurepc				0,000006426*** (0,008)	0,00001047*** (0,001)		
Tax wedge						-0,0679 (0,844)	
Public debt	-0,0006** (0,051)	-0,0004 (0,218)		-0,0009** (0,016)		-0,007 (0,122)	-0,0009* (0,075)
Expenditure%GDP					-0,0049** (0,053)		0,0013 (0,573)
Density	0,0003*** (0,003)	0,0003*** (0,025)		0,0002** (0,038)		0,0003** (0,015)	0,0003** (0,016)
Constant	0,0675 (0,506)	0,2912*** (0,001)		0,4186*** (0,000)	0,5131*** (0,000)	0,5512*** (0,002)	0,4727*** (0,000)
Adj R2	0,677	0,553		0,509	0,395	0,320	0,244
F statistic	14,29	8,828		7,568	7,214	2,896	3,046

*** significant at the 1% level; ** significant at the 5% level; * significant at the 10% level;
P-value in parenthesis

Annex G. Linear Regression – Full Set, series including COVID-19

Variable	Model 6	Model 7	Model 8	Model 9	Model 10	Model 11	Model 12
Democracy	0,0485* (0,084)	0,0488*** (0,015)	0,0704*** (0,003)	0,0585*** (0,000)	0,0557*** (0,000)		
Corruption	0,0008 (0,65)					0,0025 (0,157)	0,0041** (0,018)
Regulatory Burden		0,0167 (0,421)				0,0222 (0,452)	
Expenditurepc			-2,181E-06 (0,462)				-1,413E-06 (0,678)
Tax Wedge				-0,0549 (0,82)			
Public debt					-0,0006** (0,051)		
Density	0,0002** (0,021)	0,0002*** (0,012)	0,0003*** (0,012)	0,0003*** (0,015)	0,0003*** (0,003)	0,0002** (0,028)	0,0002** (0,037)
Constant	0,032 (0,803)	0,0254 (0,818)	-0,0515 (0,685)	0,0299 (0,861)	0,0675 (0,506)	0,2309*** (0,002)	0,2308*** (0,003)
Adj R2	0,593	0,604	0,602	0,589	0,677	0,534	0,522
F statistic	10,22	10,67	10,56	10,07	14,29	8,262	7,923

*** significant at the 1% level; ** significant at the 5% level; * significant at the 10% level;
P-value in parenthesis

Variable	Model 13	Model 14	Model 15	Model 16	Model 17	Model 18
Corruption	0,0035*** (0,002)	0,0031*** (0,004)				
Regulatory Burden			0,0476** (0,026)	0,0574*** (0,005)	0,0493** (0,018)	
Expenditurepc			2,509 (0,317)			0,000006493** (0,017)
Tax Wedge	-0,1027 (0,701)			-0,0357 (0,899)		-0,4148 (0,201)
Public debt		-0,0005 (0,138)			-0,0004 (0,319)	
Density	0,0002** (0,034)	0,0003*** (0,013)	0,0002** (0,042)	0,0003*** (0,014)	0,0003*** (0,008)	0,0002* (0,103)
Constant	0,2859* (0,059)	0,3006*** (0,001)	0,2575*** (0,001)	0,2896* (0,072)	0,3282*** (0,001)	0,5327*** (0,001)
Adj R2	0,521	0,581	0,503	0,47	0,503	0,383
F statistic	7,902	9,769	7,412	6,627	7,403	4,938

*** significant at the 1% level; ** significant at the 5% level; * significant at the 10% level;
P-value in parenthesis