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Beatriz González López-Valcárcel

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International Center for Public Policy
Andrew Young School of Policy Studies
Georgia State University
Atlanta, Georgia 30303
United States of America

Phone: (404) 413-0235
Fax: (404) 651-4449
Email: paulbenson@gsu.edu
Website: http://icepp.gsu.edu/

International Center for Public Policy
Andrew Young School of Policy Studies

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Abstract

We focus the analysis on the regional factors meddling through the effects of Covid 19 on a territorial basis. In the first part of the paper, we explore mortality COVID rate from the outbreak of the pandemic up to September 2020, when uncertainty was global on how to react to the virus, across the European regions. The main objective of this part is to explore the influence on Covid mortality of the nature of the Health Systems and the role of the regions in responding the pandemic. In the second part we translate some of the hypothesis in the empirical arena. We use for this purpose a rich data set of NUTS-2 from Eurostat[1]. We adjust for the Social Insurance (SIS) or the National Health Service nature (NHS) of the Health systems, and the Regional Authority index (RAI) on the degree of decentralization from the OECD fiscal federalism network. In addition, we correlate to mortality EQI, the quality of the regional government index (basically the sense of corruption). Other than these institutional country aspects we delve into the impact of variables such as the size of the population, age structure, per capita GDP, the density of the NUTS and some other spatial factors. We find that at the beginning of the health crisis, with the chaotic irruption of the infection, the uncertainty of the policies to be applied and with some regional random responses, those richer, more populated NUTS and countries with a hierarchical NHS did show worse mortality ratios, with low significance for RAI. We focus on the differences in the global mortality in our NUTS2 sample between 2020 and 2021. In 2021, started massive vaccination, the Covid evolution was better understood, and decentralization-based policies were instrumented in some countries. In these models, RAI is statistically significant, but not the nature of the systems anymore. It looks like an idiosyncratic, close to the problem, regional answer to the pandemics diluted the differences of the national health systems. The quality index of the regional government is also highly correlated to mortality changes. In the third part of the paper, we *zoom* in the reality of a single country (Spain) by analyzing territorial heterogeneity. We compute for the Spanish provinces (NUTS3) the total number of Quality Adjusted Life Years calculated the QALYs lost in the three defined periods (initial lockdown, centralized management and decentralized management) given the gender and the age structure of each province. We calculate then the number of QALYs lost with coronavirus, given absolute mortality and provincial relative age-related health damage.

Keywords: Covid-19 mortality; NUTS2; Spanish provinces; QALYs lost

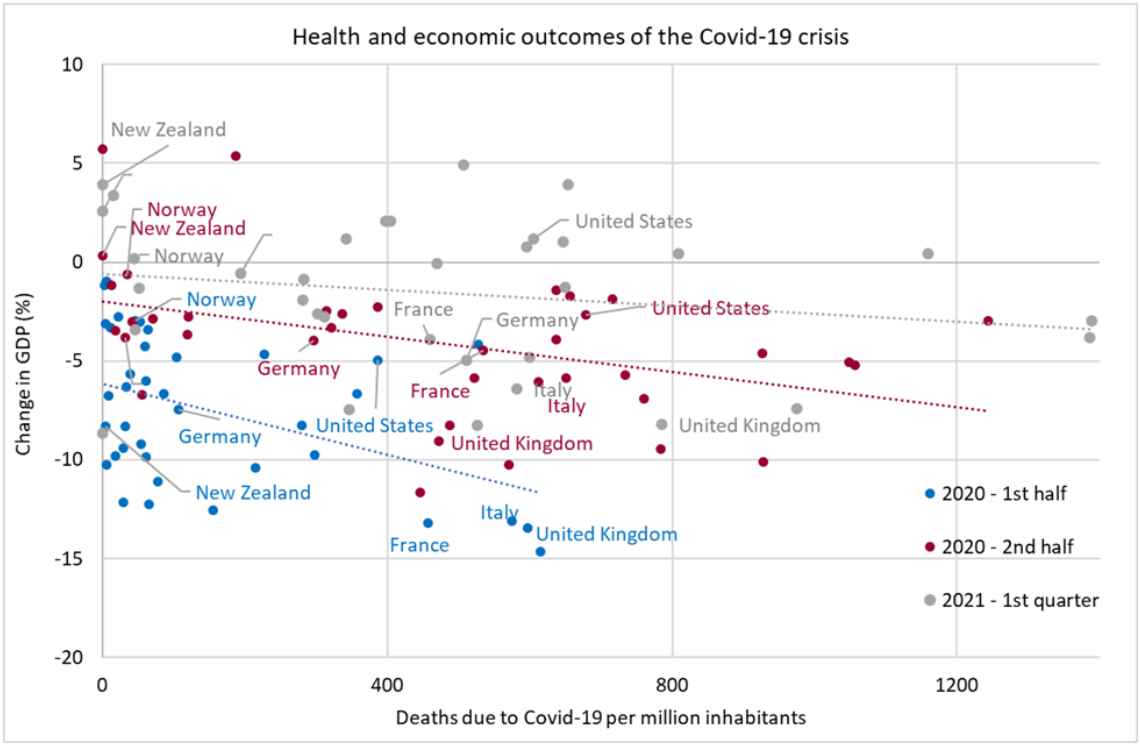
[1] NUTS stands for "Nomenclature of territorial units for statistics". More detailed information can be read at: https://ec.europa.eu/eurostat/web/nuts/principles-and-characteristics

(#) We are thankful to Albert Prades, CRES researcher, for his help in building parts of our data bases.

I. Introduction

The pandemic has generated an extensive literature for the analysis of COVID-19 in terms of moderation factors (lock downs, income maintenance strategies) and mediation factors (housing available, types of jobs). Comparative results for countries concerning disease burden and income losses have been published. The pandemic has caused significant trade-offs between health and wealth. Health and economic policies have become more intertwined than ever. From an international perspective, in the first six months of the outbreak there was a strong correlation between health and economic burden of the infection, i.e., between mortality rates and change in countries' GDP. That correlation vanished in the second and third semester of the pandemic (see Figure 1).

Figure 1. Health and Economic Outcomes of the Covid-19 Crisis

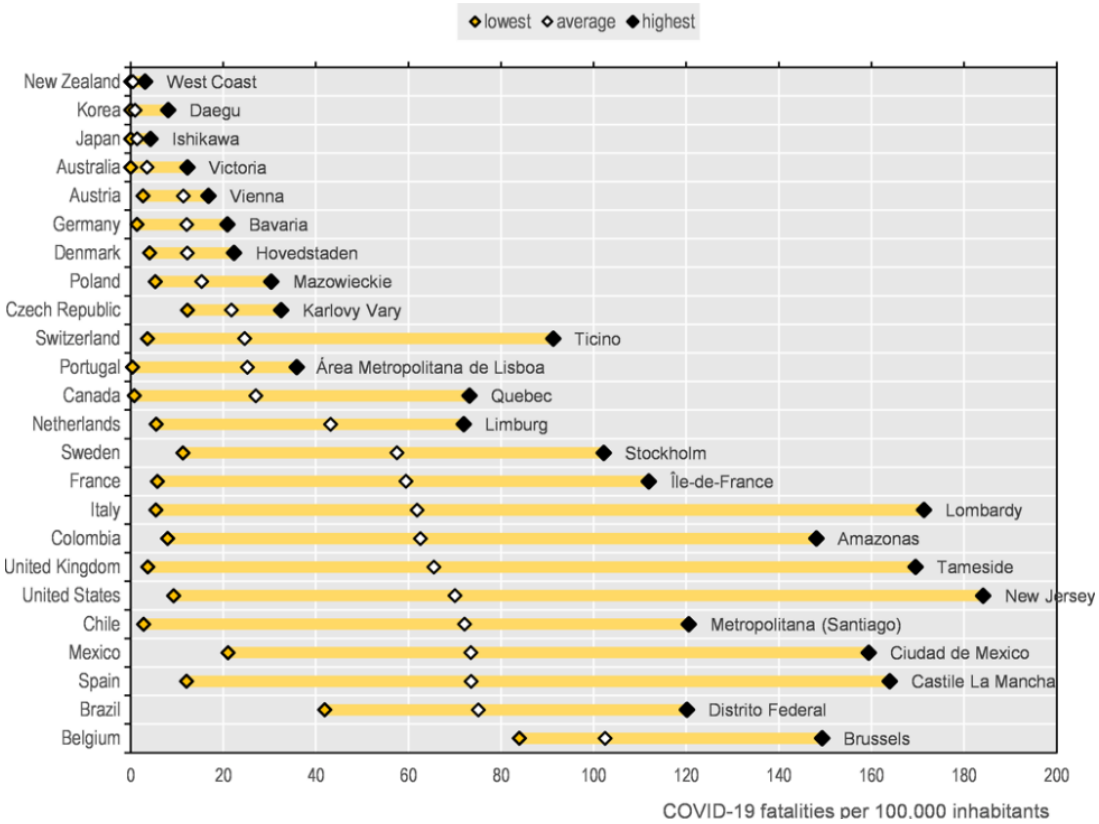


Note: in the first half of 2020 in France, there were 457 deaths per million inhabitants and a recorded fall in GDP of around -13% compared to the same period in 2019. Lines indicate the correlation relationship for each period.
Source: Algan et al., 2022

Policy treatments to combat the infection caused side effects. Efforts to mitigate the direct public health consequences of COVID-19 (in the form of infection-related illness and death) may not only have negative effects on other dimensions (e.g., the economy), but may also have additional indirect adverse consequences for public health. And "just as policies designed to promote public health have had unintended adverse health consequences, policies designed to preserve the economy have sometimes had opposite effects" (Darden et al., 2021).

The management of the pandemic, which involves both health and economic-fiscal policies, has been variable over time but also heterogeneous between and within countries. For the first stand, a relevant dimension is how the two "pure" strategies, one of mitigation and the other of suppression, or covid-zero, were confronted. For the second one, a possible reactive factor, with the potential to alter the pandemic's impact on health, has been the degree of decentralization of public powers, which in turn may have conditioned the institutional response and management of the pandemic (Dougherty et al., 2020).

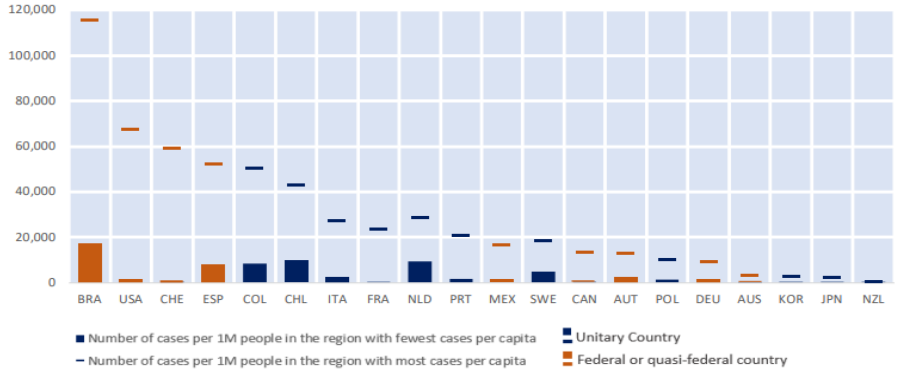
Figure 2A. COVID-19 Fatalities per 100,000 inhabitants, NUTS-2 (TL2) Regions as of November 2020



Note: The 24 countries are OECD countries plus Brazil. Among the 37 OECD countries, Estonia, Latvia and Luxembourg have no regions at NUTS 2 level; there are no data at NUTS 2 level for Iceland, Ireland, Israel, Finland, Greece, Hungary, Lithuania, Norway, Slovak Republic and Slovenia. For New Zealand, data is available by District Health Boards. For Canada and Japan, one province (Prince Edward Island) and one prefecture (Iwate) respectively are missing. For the United States, only the 50 States are considered. Data were retrieved between 24 October and 2 November.

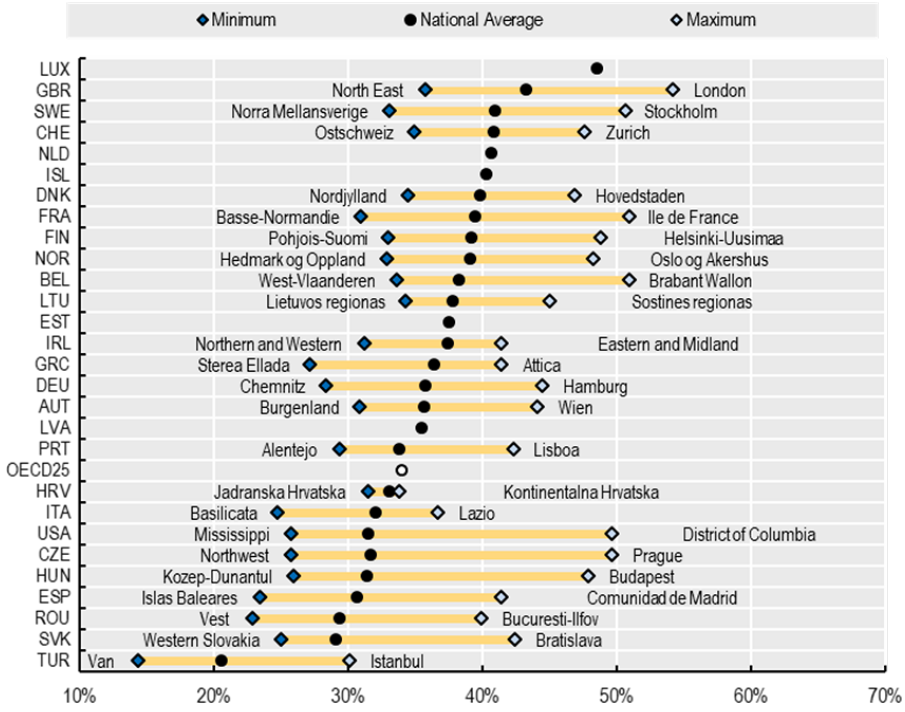
Source: OECD. (2020). *The territorial impact of COVID-19: Managing the crisis across levels of government*.

Figure 2B. Uneven Distribution of Cases across Regions within OECD and Partner countries.



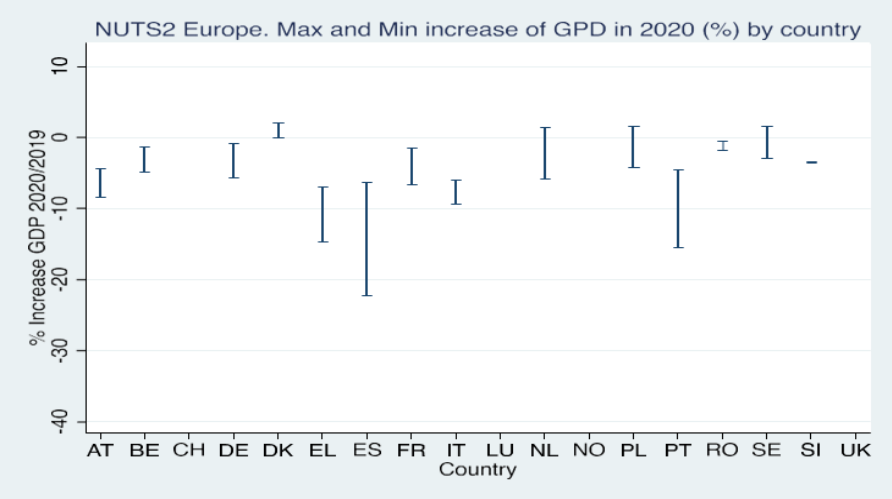
Note: Number of cases refers to cumulative cases reported from the start of the outbreak through 4 November 2020.
Source: OECD. (2021). *Federalism and public health decentralisation in the time of COVID-19.*

Figure 2C. Share of Jobs That Can Potentially Be Performed Remotely (%), 2018, NUTS-1 or NUTS-2 (TL2) Regions



Note: The number of jobs in each country or region that can be carried out remotely as the percentage of total jobs. Countries are ranked in descending order by the share of jobs in total employment that can be done remotely at the national level. Regions correspond to NUTS-1 or NUTS-2 regions depending on data availability. Outside European countries, regions correspond to Territorial Level 2 regions (TL2), according to the OECD Territorial Grid.
Source: OECD. (2021). *The territorial impact of COVID-19: Managing the crisis across levels of government*.

Figure 2D. Heterogeneity in Pandemic First Wave and Economic Growth by Countries



Note: Per European countries. Intervals represent change in GDP between 2019 and 2020.
Source: COVID-19 Dataset by Our World in Data. Available at: https://github.com/owid/covid-19-data.

From previous literature it is well known that factors such as demographics (age composition), economic structure (relative weight of the most exposed sectors to infection) and cultural and educational variables (vaccine acceptance) are relevant factors in understanding the diversity of the Covid19 struggle and the consequences of the pandemic. Other factors cannot be so easily signed, such as the proportion of jobs that can be relocated in a territory, the level of digitalization and the extent of internet use and other additional 'active' factors such as dispersion, territorial concentration, or rurality (see Figures 2B, 2C and 2D). The percentage of jobs that can be performed remotely, which varies largely among OEDC countries and among NUTS1 regions in a given country is another relevant factor (OECD, 2020). Interpersonal trust and confidence in government have also been identified as relevant factors of success (Charron et al, 2021; Algan et al., 2022).

Although there are global databases2 at national level, and hundreds of articles have been

[2] See https://ourworldindata.org/coronavirus

published comparing countries, the impact of the COVID at regional level has been by far less studied.

Given the great heterogeneity observed in both the incidence of the pandemic and its lethality in various populations, our starting point is the intuition that place-based factors could exert some influence on the effectiveness of mediator and moderator variables. We look for spatial conditions beyond some of the observed effects. Is it just an issue of erratic groupings of variables combined over the territory, or are there some structural elements of a spatial nature that influence those different results? We look for geographical, political, or institutional variables that on a territorial basis, independently of other adjustment variables, could contribute to predicting damage caused by COVID. Such analysis requires national and regional data to consider variations between countries and within countries among their regions.

What weighs more, those territorial factors between or within a region, other things equal? Is the size and concentration of the population? Is the rural, dispersed, primary sector economy? Is perhaps the fiscal decentralization political regime? Is the health system type, social security based or NHS? Is trust on regional governmental policies?

The paper analyzes the territorial dimension of the health impact of COVID (mortality) in Europe at regional level. The two explanatory factors we are interested on are the degree of fiscal and government decentralization and the type of health system in the country. We empirically explore first these territorial dimensions with NUTS-2 data from European countries and thereafter we zoom the analysis intra-state, at the Spanish provincial level (NUTS--3). NUTS2 are basic regions for the application of regional policies (n=242). NUTS-3 are small regions for

specific diagnoses (n=1166)[3]. We move thereafter to the intra state analysis of the reality of a single country (Spain) by analyzing provincial heterogeneity: NUTS-3, 52 provinces belonging to 17 Autonomous Communities and 2 autonomous cities. We compute for the Spanish provinces the total number of Quality Adjusted Life Years estimated before the irruption of the pandemic given the gender and the age structure of each province, to calculate then the number of QALYs lost with coronavirus, given absolute mortality and provincial relative age-related health damage.

a. Surveying the territorial dimension: Health impact of Covid

Geography, far from playing a minor role in an increasingly interconnected world, does matter more than ever for social success. These growing divergences could be the result of agglomeration economies around successful areas (Glaeser, E., 2011). Moreover, there is ample consensus on the negative socio-political consequences, leading to the consolidation of a "geography of discontent" (see, for development issues, Farole et al., 2011).

Regarding the territorial dimension of health, regional inequality in life expectancy uses to be higher when it is computed by place of birth. Age structure and socioeconomic conditions have a major role. This may be the case despite interstate migration may mitigate the baseline in comparing cross-state differences in relative mortality of in-migrants, compared to the 'stayers' (Fletcher, 2021). Spatial disparities in mortality implicitly or explicitly aggregate death outcomes by individuals' place of residence at death or at some point during late adulthood, and we should be then aware on how this 'static' mortality may be attributed to territories (Chetty et al., 2016; Finkelstein et al., 2021).

The quality of the government may have also affected the success in the regional policy

[3] For further information see https://ec.europa.eu/eurostat/web/nuts/background

responses. COVID-19 may have eroded the trust of governments and the social capital, given the lack of confidence of the interactions between citizens and public officials due to lockdowns, school closures and other restrictions, plus some comparative aggrievances among territories.

Finally, the analysis of the geographical dimension of Covid 19 crisis may offer light on the effects on mortality of population dispersion, territorial concentration, or rurality, together to the fact that the access to the solutions have a place-based component, with some cultural and idiosyncratic restrictions.

The nature of the Health Systems

The territorial overlaps with the organizational dimension, which in turn relates to the nature of the health systems. The hypothesis of few differences on Covid mortality impacts between National Health Services type of models and Social Insurance Systems has been explored in other texts (see Lopez-Casasnovas & Pifarré-Arolas, 2021). Expected differences are based on the assumption that the National Health Services models are more hierarchical in their structure, and therefore easier to recentralize during a crisis, meanwhile the Social Security systems mainly operate in a network and a more segmented base in terms of health functions and job categories of their professionals. In these Social Insurance systems, providers and organizations have greater autonomy and therefore could be better prepared to respond the pandemic with internal organizational changes and to assume greater responsibility, singling out their own. In principle, despite little coordination between providers, social security type of systems would have the conditions to react more quickly to crises such as COVID. In public administered systems, providers have lower autonomy, central purchases of inputs do not allow for individual stocking of inputs and salaried physicians use to expect for political rules and central responses.

In NHS type of systems, the entire chain of value is overseen by the public sector from planning

to the definition of the portfolio of services, and its implementation over the national territory. Much like an administrative service, a variety of public departments manage the priority setting of the system, the health care workers, budgets, and the evaluation protocols. This task is undertaken by civil servants, organized in a hierarchical manner, with salaries and responsibilities that are not directly decided by the healthcare authorities but instead by the legislative power.

The efficiency gains of this system hinges on the integration of healthcare provision levels, only limited by the organizational capacity of the system itself. Both centralized purchases and uniform provision of services (with limited individual choice) are intrinsic to such systems. The prioritization of services and the planning of provision for vulnerable groups, however, are not always resolved in a coherent and consistent manner despite its centralized organization. Unnecessarily rigid structures, and the lack of incentives to efficiently manage the programs, together with the pressure of lobbies on vulnerable political and managerial positions are major weaknesses of this type of organizational scheme. While, in principle, the planning and allocation of health services is based on objective health outcomes targets, in practice funding is often governed by past allocations and is then updated incrementally.

Social insurance systems are molded from aspects of both public provision and private production systems. They combine, with varying importance, public provision via regulatory frameworks as well as private productions schemes, with healthcare providers that may include both for profit and non-for-profit organizations. Often, this is simply the result of integrating historical SIs providers from prior to the creation of the public system.

Healthcare providers, on account of their interests, play a fundamental role in the design of these systems, which is no longer fully determined by political considerations. Moral hazard issues and

overuse are kept at bay with a system of copayments, uncommon in systems of public production. The introduction of healthcare provision efficiency considerations may result in better planning and provision than for NHS.

The Institutional political dimension

From the institutional political dimension, one would expect that centralization would imply more prescriptive restrictions, less discretionary in their compliance, more standardized, and thus coordinated from the outset, and controllable. On the contrary, more decentralized countries would act mostly by way of recommendations or setting minimums (or maximums) and would achieve more capacity to adapt to specific realities and more capacity for innovation and trial-error. In addition, they have the economic capacity for autonomous action thanks to their financial skills. Thus, both centralization and decentralization of pandemic management have advantages and disadvantages (Biase & Dougherty, 2021), and many countries have modified on the fly the configuration of their federalism since the beginning of the pandemic, decentralizing or centralizing some activities and decisions, as well as by creating of new coordination and funding mechanisms. The quality of the government, the trust on public institutions may have an impact too (see Charron et al 2021). Indeed, the mentioned authors find that regional level corruption is closely linked to the extent to which citizens' have worried about the effects of the pandemic.

All this reflects on the government response in the balancing act between alleviating economic hardship and controlling the health impact. This tradeoff was present in the decision to establish lockdowns, travel bans, and other social distancing measures; it is also a consideration when deciding the government budget allocations towards economic relief and additional healthcare resources.

The regional outcomes

As much as policy responses have been fundamental in curbing the spread of the pandemic, country and region-specific baseline socio-demographic factors have also played a role. We may classify these factors in two types: i) factors related to the vulnerability to the disease itself; ii) and factors associated with the spread of the pandemic and the likelihood of transmission and infection. Regarding the first type, existing literature on the factors influencing the severity of the disease for COVID-19 patients have established the importance of age and preexisting conditions (Sun et al., 2020). Consequently, countries with older populations (Dudel et al., 2020), such as Spain, and/or with higher burden of morbidity (Neponucemo et al., 2020), often middle- and low-income countries, have suffered more severely from the pandemic.

Among the second type of factors, those related to the transmission of the disease, research has identified certain socioeconomic variables. This is exacerbated by evidence suggesting the extent to which social distancing guidelines have been followed is heterogeneous across different socioeconomic groups.

Several reports and articles have found that (Weill et al., 2020; Durante, Guiso, & Gulino, 2020) areas with higher income and social capital follow more closely social distancing recommendations. The hypothesized channels include factors ranging from the ability to assess risk to the economic limitations that certain household could face in maintaining social distancing. A key factor may have been the ability to switch to remote work, which correlates with occupational categories. Thus, different countries and regions may have varying baseline levels of vulnerability to the pandemic stemming from their socio-demographic composition.

The OECD has already described some aspects of the regional dimension (OCDE, 2021), in terms of countries with centralized (unitary) and decentralized or federal governments, in

measuring the territorial impact of the COVID-19 crisis. By accounting for its health, economic, social and fiscal dimensions it provides some suggestions for a "place based" or territorially sensitive approach. However, in most countries, re- centralization of healthcare activities was more common than decentralization. Specifically, two decentralized countries (Belgium and Germany) have centralized their COVID-related public spending. On the other side, three unitary countries (Italy, Denmark and Sweden) have fully decentralized COVID spending. Can those differences simply be associated with a reporting problem that can be associated with the transparency of democracies? In principle we could anticipate that the less federal, the more dependent on its own fiscal capacity a territory is, the lower its response capacities will be in a mega crisis.

In brief, we explore in this paper territorial variations in the COVID health impact in Europe, having observed a large heterogeneity inter and intra states. Concerning health outcomes, we want to focus on mortality. COVID incidence is just an intermediate result since the final endpoint in terms of health is mortality. Although territorial studies that compare incidence abound, those that compare mortality are scarce. The mortality that matters is certainly the total one, whether due to COVID or due to other causes. Some of the deaths categorized by other causes are secondary effects of COVID, either due to lack of health care or due to the restrictions of access to care and having worsened the quality of life (suicides and mental health, diseases aggravated by sedentary lifestyle and impoverishment).

It is interesting, therefore, to compare not only the mortality from COVID but also the total excess mortality (‘from’ and ‘with’ Covid) and compare it with the registered deaths from COVID. Framed in the Global Burden of Disease (GBD) project (IHME, 2014), the estimate of total excess mortality in 191 countries in the world in the 2020- 2021 biennium has been

published, and for 10 of them (Canada, USA, Germany, Italy, Spain, United Kingdom, Mexico, Brazil, India, Pakistan), territorial comparisons within countries were provided (Wang et al., 2022). Two conclusions immediately emerge from the national comparisons. The first is the great difference in COVID mortality rates and in excess mortality between the countries with a suppression strategy and the rest. Four of the first (Australia, New Zealand, Iceland, and Singapore) even have negative excess mortality. The second is the great intra-country variability in the burden of disease, without the cause seeming obvious. At present, excess mortality in the 10 countries with subnational information ranges from 60 in Canada to 325 in Mexico. The ratio between the territory with the highest and the territory with the lowest excess mortality ranges between 29.2 in the USA and 2.23 in Italy (in the United Kingdom it is lower, but the disaggregation is only in four territories, England, Northern Ireland, Scotland, and Wales). Countries with large territorial extension generally have greater heterogeneity (USA 29.2; Canada 8.7; India 5.0), but Brazil (2.75) and Mexico (3.3) are exceptions. European countries oscillate around 2.5 (Italy 2.2, Germany 2.6, Spain 2.7). In these data, there is no evident pattern of greater territorial variability in federal countries than in unitary countries.

In the next section we analyze data of regions (NUTS-2) of European countries. In section 3 we further explore variations at NUTS3 level by considering the specific case of Spain and the variations in total mortality within the country at provincial level (n=52 NUTS-3 provinces, from 18 Autonomous Communities (NUTS2- regions). We calculate the QALYs lost in the three defined periods (initial lockdown, centralized management and decentralized management). The final section is for discussion, policy recommendations and conclusion.

II. Analysis of the European countries: NUTS-2

a. Data sources and variables

We gathered data of European countries at the national and at the NUT-2 level from Eurostat. NUTS2 are basic regions for the application of regional policies (n=242). NUTS-3 are small regions for specific ones (n=1,166). Currently the 2021 NUTS regions have come into effect since 1st January 2021. Not all countries in Europe are in the European Union, and hence are not subject to Eurostat reporting/data sharing requirements. While all countries have correspondence tables between their own region definitions and NUTS, providing NUTS level information is not mandatory for non-EU countries. This list includes the UK (post Brexit), Norway, and Switzerland.

Our data of the explanatory variables are cross-sectional for 2019-2020 and correspond to 16 European countries. We modelled mortality at NUTS2 level in two phases of the pandemic (models 1 and 2 respectively). The first one is from the breakdown in March 2020 to September 2020 and corresponds to the first wave of the pandemic outbreak. The dependent variable is the rate of COVID mortality. The second compares the total mortality in the year 2021, once most of the responses were in place (the first vaccinations in Spain were on December 27, 2020) with that of March- December 2020.

The dependent variable for model 1 is the Covid mortality ratio, defined as the cumulative cases per 100,000 population- from March 1st, 2020 to September 1st, 2020. It has been compiled by (Omrani et al., 2021) We corrected specific errors when detected with other sources as for Spain. The total number of observations (NUTS2) is 252. After eliminating missing data, the final sample for regression analysis is n=178. For model 2 we did lose Germany[4] given the lack of

[4] There is no Germany data for mortality during 2021 at NUTS-2 level published yet.

data. The dependent variable for model 2 is the increase in mortality rate from all causes from the period March -December 2020 to January-December 2021. We adjusted for the difference in the number of weeks considered in both pandemic periods (43 weeks in 2020, 52 in 2021). The source of this endogenous variable is Eurostat, Weekly Death Statistics[5].

The explanatory control variables correspond to the demographic age structure, the rate of unemployment, the level of adjusted per capita income (as an indicator of income and fiscal capacity); and two explicit geographic variables of dispersion (% of built-up land) and/or concentration (population density). Surface has also been included. The delays in the political response from the first Covid case -in number of days- and the high school ratio complete the set of the adjustment factors. We use the 2021 European Quality of Government Index (from Charron et al., 2021) on a NUTS-2 basis to explore bivariate correlations between the quality of the regional government and mortality. Besides those variables, we empirically considered others (sectoral composition of the job force, number of households per house, internet use, population rate of ICU beds among others). The final decision comes from a trade-off between missing data and the amount of information the considered variable contributes to the model.

The explanatory variables of interest are the continuous value for the Regional Authority Index, RAI (so called the federal index) as a proxy for the degree of decentralization of the country where the NUT is registered (Appendix 1 summarizes its content), and the binary nature of the health system (either a Social Health insurance-based system or a one of the National Health Services' type of models).

Hypothesis testing

Specifically, the approach may provide some intuitive primary associations of that heterogeneity,

[5] Available at: https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Weekly_death_statistics&stable

analyzed in more detail through multiple regressions between the dependent and explanatory variables. Thus, we should expect that the delay in the response would act positively on mortality; the unemployment rate, other things equal, should reduce mortality since a lower percentage of workers may be exposed to the infection; the same with the ratio of working population in the hotel and the share of jobs in the upgraded technological services, over the total sectoral occupation: the first one since the drastic lock down and the elimination of travelling did eliminate job exposure, the second one since they were favored by performing non presential tasks. The share of population over sixty and the population density could be expected to increase the mortality ratio, as probably do the per capita GDP and the ratio of high school population. Finally, a more decentralized empowered region could adjust and better respond to the local challenges, as perhaps those less hierarchical systems, commonly working on a network based, as it is the case with the social security health systems.

Dependent variables

- Model 1: COVID-19 deaths per 100.000 inhabitants from the onset of the pandemic to August 31, 2020 (*covid_mortality*)
- Model 2: Adjusted for the number of weeks' increment in mortality rates for all causes from March-December 2020 to January-December 2021 (*inc_mortality*)

Explanatory variables

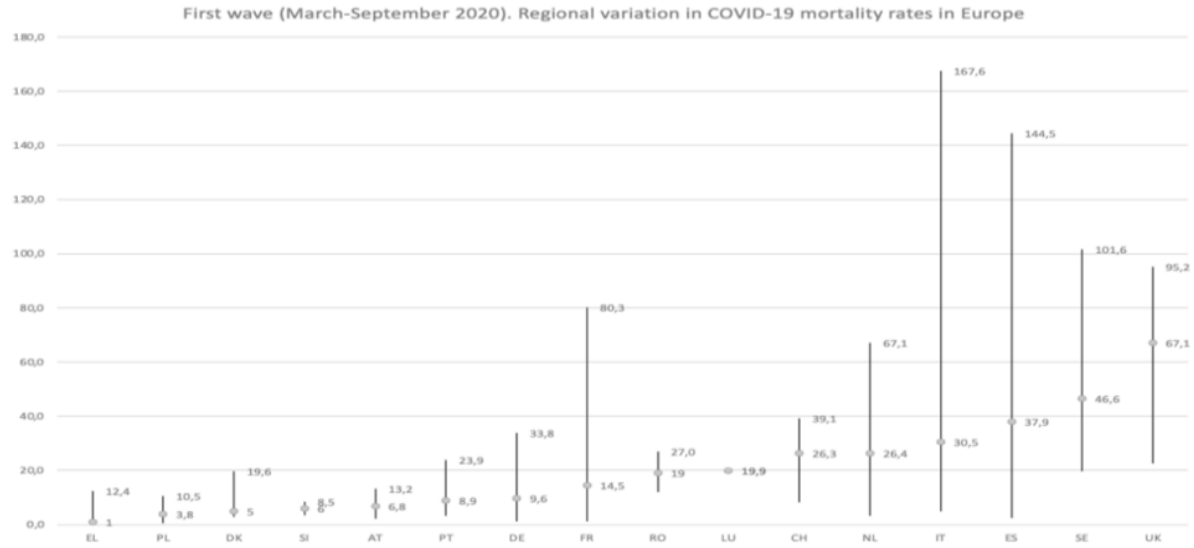
- Density: population/surface (population per Square Km)
- Surface
- % Land development (% Built-up land)
- Lag (number of days) from the first case and the lockdown or other restrictive measures
- % Population older than 60
- Highschool ratio: % population with secondary education or more

- Unemployment rate
- GDP per capita
- Regional Authority Index, RAI (see appendix 1)
- SS: Dummy=1 for Social Security health systems

b. Results for the European NUTS

The regional variability in covid mortality rates in the first wave (up to September 2020) was large in some countries, particularly in Italy and Spain (figure 3). The countries with highest median mortality (UK, Sweden, Spain and Italy) had also large regional variations. France had a relatively low median rate, but with large regional variations.

Figure 3. Regional Variation in COIVD-19 Mortality Rate in Europe during the First Wave, March–September 2020



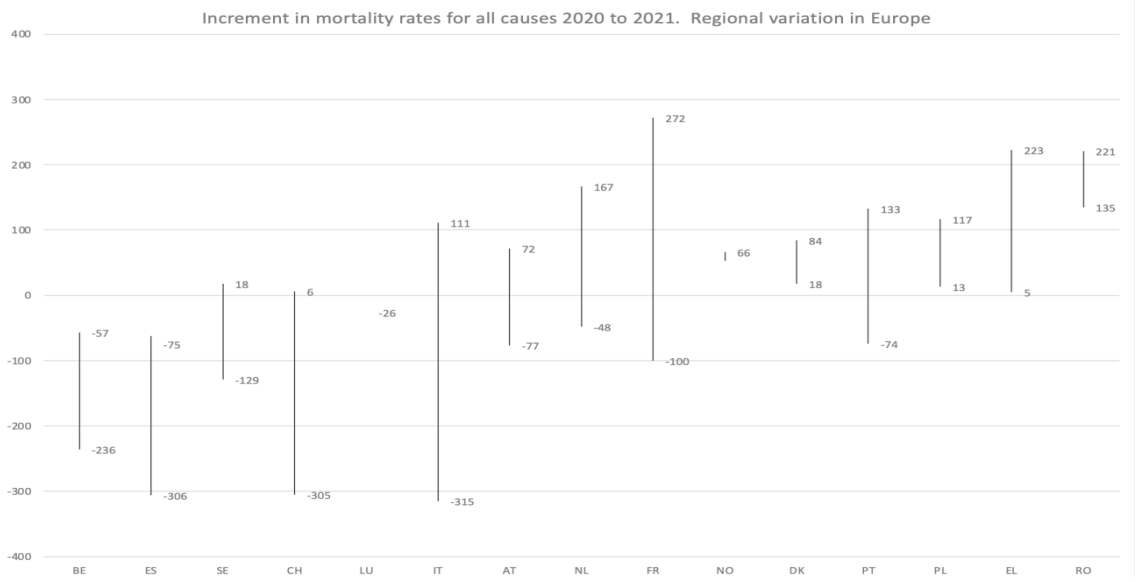
Note: NUTS-2 minimum, median and maximum mortality rates by countries.

Source: Own elaboration from NUTS-2 database.

The increment in mortality from 2020 and 2021 in the European NUTS2 regions has been quite heterogeneous between countries. All regions in Belgium and Spain decrease mortality rates while in all regions of five countries (Romania, Greece, Poland, Portugal and Denmark) there

has been an increase of mortality. Within country mortality varies largely, with Italy, France and Czechia reporting the largest differences among regions.

Figure 4. Increment in Mortality Rates for All Causes, 2020–21. Regional Variation in Europe



Note: NUTS-2 minimum, median, and maximum increment in mortality rates (all causes) by countries
Source: Own elaboration from NUTS-2 database.

Table 1 reports the results of models predicting mortality rate in the first wave of the pandemic. The model with fixed effects of the country has a determination coefficient of 0.56, dropping to 0.18 for the model including RAI and 0.21 for the models including SS. As expected, larger share of elderly population goes with higher mortality ratio, but the relation is significant only when in model 1.3. This last variable is positively associated to per capita GDP, negatively with better educated populations. Urban land development and population density are insignificant. Larger countries suffered higher mortality in the first wave. In all models GDP per capita and percentage of high school educated population are significant predictors of mortality, with positive sign, while unemployment rate has negative significant coefficient. The regional

Authority Index is not statistically significant while the dummy for social security health system has a negative consistently negative sign.

Table 1. Regression Results for NUTS-2 Covid Mortality Ratio, March to September 2020

	M1.1 Country fixed effects	**M1.2 RAI**	**M1.3 Social Security System**	**M1.4 RAI & Social Security System**
Density	0.002	-0.001	0.000	-0.000
	(0.93)	(0.24)	(0.06)	(0.11)
Surface	0.000	0.000	0.000	0.000
	(1.15)	(2.49) *	(1.99) *	(2.02) *
% Built-up land	-34.940	-2.797	1.533	0.922
	(1.92)	(0.97)	(0.49)	(0.29)
Lag 1st Case to Lockdown (days)	-0.433	-0.186	-0.105	-0.158
	(0.50)	(1.21)	(0.75)	(1.05)
% Population older than 60	0.605	1.175	1.541	1.444
	(0.85)	(1.52)	(2.03) *	(1.88)
Highschool ratio	0.000	0.000	0.000	0.000
	(2.01) *	(1.58)	(2.07) *	(2.15) *
Unemployment rate	-3.154	0.967	0.374	0.376
	(4.65) **	(2.18) *	(0.76)	(0.76)
GDP per capita	767.978	1,081.303	1,021.812	952.645
	(2.50) *	(3.98) **	(3.90) **	(3.51) **
Country	0.000			
Germany	50.320			
	(2.06) *			
Denmark	22.053			
	(0.76)			
Greece	49.071			
	(2.72) **			
Spain	84.019			
	(2.64) **			
France	53.851			
	(1.74)			
Italy	91.749			
	(5.57) **			
Luxembourg	6.758			
	(0.23)			
Netherlands	131.086			
	(2.43) *			

Poland	-0.719			
	(0.04)			
Portugal	36.960			
	(2.55) *			
Romania	3.457			
	(0.17)			
Sweden	0.000			
SI	0.000			
RAI		0.401		0.320
		(1.19)		(0.96)
SS			-18.923	-18.275
			(2.69) **	(2.58) *
Constant	29.529	-52.030	-46.390	-44.918
	(0.97)	(2.21) *	(1.99) *	(1.92)
R^2	0.56	0.18	0.21	0.21
N	177	177	177	177

Note: * p<0.05; ** p<0.01. Results for model 1. First model (M1.1) takes into consideration the country fixed effects. Second model (M1.2) takes into consideration Regional Authority Index (RAI) effects. Third model (M1.3) takes into consideration the type Social Security System (SIS). Fourth model (M1.4.) takes into consideration both RAI and SIS. Source: Own elaboration from NUTS-2 database.

Results of models 2 are reported in table 2 in the same sequence as in table 1. Although the samples are not the same, so that results are not fully comparable, it is worth noting that the sign of GDP per capita is the opposite (negative) while unemployment turns to positive and urban land is now negative in model M2.1 of fixed effects. That model suggests, then, that richer countries with urban areas managed better to contain mortality in the second year of the pandemic, while unemployment and the initial delay in reacting to the outbreak are risk factors for mortality in 2021. Nevertheless, the sign of the later variable changes to negative in models without countries fixed effects.

Table 2: Regression Results NUTS2. Increase in Mortality (All Causes), 2020–21

	M2.1 Country fixed effects	M2.2 RAI	M2.3. Social Security System	M2.4 RAI & Social Security System
Density	-0.008	-0.002	-0.003	-0.002
	(0.87)	(0.20)	(0.30)	(0.14)
Surface	-0.001	-0.001	-0.001	-0.001
	(1.45)	(2.38) *	(2.34) *	(2.42) *
% Built up land	-159.318	-9.273	-10.539	-7.431
	(2.72) **	(1.20)	(1.15)	(0.86)
Lag 1st Case to Lockdown (days)	10.590	-1.936	-1.786	-1.928
	(4.82) **	(3.11) **	(2.69) **	(3.09) **
% Population older than 60	2.257	-2.598	-2.372	-2.303
	(0.80)	(0.94)	(0.78)	(0.81)
Highschool ratio	-0.000	-0.000	0.000	0.000
	(0.54)	(0.01)	(0.43)	(0.11)
Unemployment rate	8.084	0.333	-1.696	-0.059
	(3.02) **	(0.19)	(0.84)	(0.03)
GDP per capita	-1,706.276	-3,828.629	-4,774.409	-3,900.709
	(1.41)	(3.85) **	(4.54) **	(3.87) **
Belgium	157.144			
	(0.81)			
Denmark	365.804			
	(3.62) **			
Greece	-137.239			
	(2.74) **			
Spain	-491.089			
	(6.86) **			
France	-362.734			
	(5.34) **			
Italy	-35.541			
	(0.51)			
Luxembourg	155.731			
	(1.47)			
Netherlands	477.621			
	(2.46) *			
Poland	-59.503			
	(1.68)			
Portugal	96.150			
	(1.57)			
Romania	0.000			
Sweden	0.000			

RAI		-5.779		-5.752
		(4.30) **		(4.26) **
SS			-16.450	-12.059
			(0.63)	(0.49)
Constant	-8.380	359.821	317.815	360.729
	(0.08)	(4.10) **	(3.42) **	(4.10) **
R^2	0.59	0.34	0.25	0.34
N	141	141	141	141

Note: * p<0.05; ** p<0.01. Results for Model 2. First model (M2.1) takes into consideration the country fixed effects. Second model (M2.2) takes into consideration Regional Authority Index (RAI) effects. Third model (M2.3) takes into consideration the type Social Security System (SIS). Fourth model (M2.4.) takes into consideration both RAI and SIS. Source: Own elaboration from NUTS-2 database.

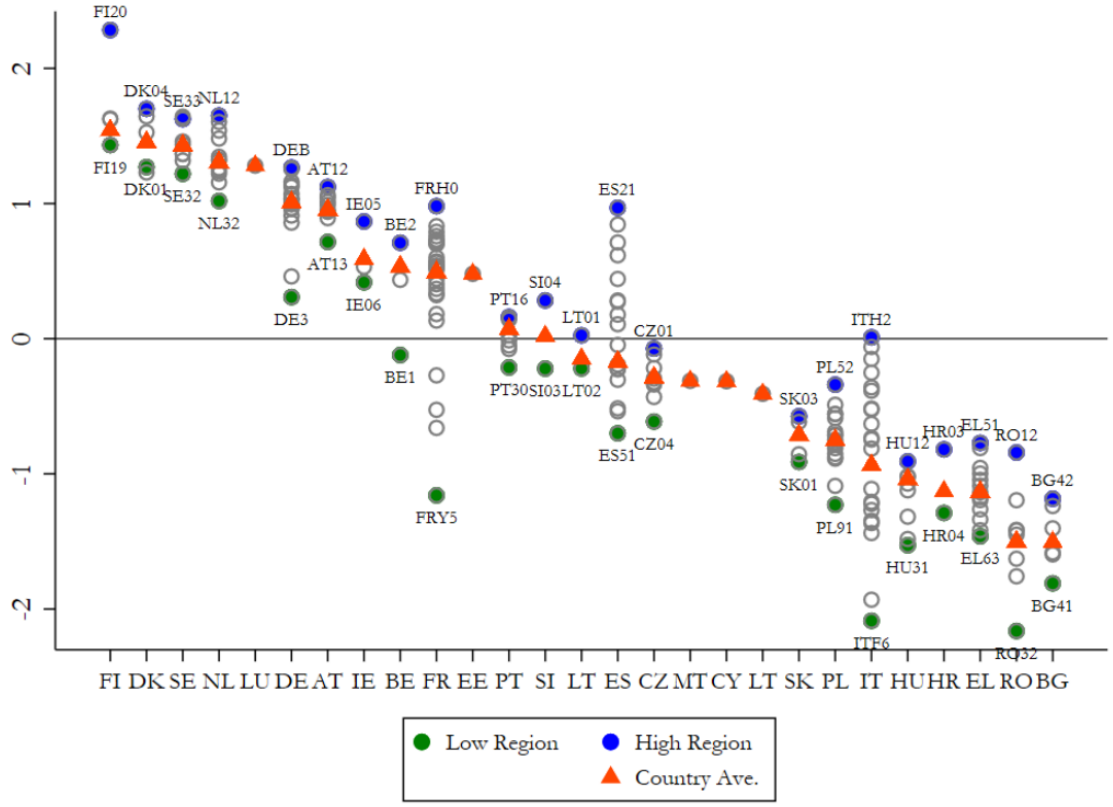
As an additional analysis, we checked finally in this section the correlation of our dependent variable here (variation in total mortality) and EQI. EQI is conformed from the 2021 data, relying on over 129,000 respondents in 208 NUTS 1 and NUTS 2 regions in all EU 27-member state countries. Quality of Government is a broad, latent multi- dimensional concept consisting of corruption (perception and experience), impartiality and quality of public service delivery (education, health care and law enforcement, see Charron et al., 2021). Figure 3, taken from the Charron et al publication, shows the heterogeneity of the quality of governance index. Table 3 contains the linear correlations between COVID mortality in the first wave (dependent variable on models 1), increase in mortality rates for all causes (i.e., our dependent variable in models 2), the EQI index and its components for the NUTS in our database.

Table 3. Linear Correlations of EQI and Its Pillars with Mortality

	Mortality rate COVID first wave	Increase in mortality rate 2020-2021 (all causes)
Mortality rate COVID first wave	1	
Increase in mortality rate 2020-2021 (all causes)	-0.78 0.000 n=142	1
EQI	0.15 n.s. n=112	-0.33 0.000 n=111
Impartiality pillar	0.11 n.s. n=112	-0.26 0.005 n=111
Corruption pillar	0.12 n.s. n=112	-0.28 0.003 n=111
Corruption experiences index (corruption sub-pillar)	0.27 0.004 n=112	-0.56 0.000 n=111
Corruption perception index (corruption sub-pillar)	0.22 0.02 n=112	-0.42 0.000 n=111
Quality pillar	0.22 0.02 n=112	-0.40 0.000 n=111

Note: the components of the EQI are country centered and z-score standardized (see Charron et al, 2021) Second line: p-value. Third line: Number of observations.
Source: Own elaboration from NUTS-2 database.

Figure 5. EU-27 Countries in Rank Order with Regional Variation



Note: Figures 3 summarizes the final EQI index; showing the countries in rank order from top to bottom on the y-axis and regional variation on the x-axis. As with the 2013 and 2017 EQI index, the Swedish speaking Finish Island region of Åland (FI20) is an outlier on the top of the EQI 2021 index ranking.
Source: Charron et al., (2021). *Sub-national Quality of Government in EU Member States: Presenting the 2021 European Quality of Government Index and its relationship with Covid-19 indicators.*

As it can be seen in Table 3, we observe a strong correlation between increased mortality in 2021 and EQI, with the expected negative sign (the better the quality of government, the lower the increase in mortality). This association is noticeable for both sub-pillars of corruption (perception and experiences), and with the quality of the public services (-0.41). With the lack of reliance in the role of those regional governments less effective the general proposed measures may be in this phase of the pandemic evolution. On the contrary, the associations between the quality of government and the COVID mortality in the initial months of the pandemic are low and positive. Apparently, the initial burden of COVID was stronger in regions with better governments.

Other than that, there is a negative correlation between the initial impact of the COVID (mortality in the first wave) and the increase in the mortality for all causes in the second year of the pandemic, compared to 2020.

III. The Intra-State Analysis: The Case of the Spanish Provinces

Spain is an interesting case of change from centralized to decentralized management of the pandemic. Territorial organization is made up of 17 Autonomous Communities and 2 autonomous cities, with full competence in health planning and management, but during the first months of the pandemic there was a sudden and almost absolute centralization.

Spain has been heavily affected by the COVID-19 outbreak, with the first infection case detected on February 25, 2020. During the first wave, a state of emergency took effect from March 14-June 21, 2020, with restrictions on movement to essential purposes only, limited commercial, cultural, recreational, hotel and restaurant activities, and reduced operation of public transport. From March 30-April 9, 2020, all non-essential activities were halted. Temporary restrictions were in place from May 15-24, 2020, on entries through ports and airports from Schengen

countries, with only Spanish citizens, residents, cross-border workers, and health and elder care professionals allowed to enter. The spread of the virus and necessary containment measures led to a significant drop of the activity in the first half of 2020, followed by a partial rebound in the second half.[6]

For the key policy responses, we will distinguish between three periods. Period zero is from March 2020 to June 2020, it is characterized for a strict lockdown at national level, homogeneous in all the Autonomous Communities, under a "State of Alarm" law. Period 1 is from June 2020 to May 2021, of centralized control of the pandemic with successive states of alarm that imposed restrictions at national level, according to a set of regional incidence and bed occupancy indicators and a common set of thresholds for categorizing each territory. Restrictions were more or less stringent depending on the specific levels of the indicators in each region or province. Second period started in May 2021, the management of the pandemic is decentralized since then, although coordinated, outside of alarm states.

a. Data and methods

We perform an analysis at provincial level[7]. We downloaded the weekly data of mortality from the experimental statistics by the National Institute of Statistics (INE)[8], and calculated the QALYs lost in the three defined periods (initial lockdown, centralized management, and

[6] The first state of emergency was lifted on June 21, 2020, allowing for unconstrained mobility across all provinces and reopening of EU borders. Schools are open for face-to-face teaching at all levels, with a series of preventive and hygienic measures in place including mandatory use of masks for 6 years and older. A coordinated action plan was agreed between the government and the autonomous communities on September 30, 2020, which includes triggers for regional containment measures. The second state of emergency took place from October 25, 2020 to May 9, 2021. With the state of emergency ending, most regions began to relax part of the restrictions, including by ending the mandatory use of masks in public spaces (except when social distancing cannot be maintained) by end- June. Temporary restrictions are in place for flights from Brazil and South Africa.

[7] NUTS-3, n=52 in Spain belonging to 17 Autonomous Communities and 2 Autonomous cities.

[8] Available at: https://www.ine.es/dyngs/INEbase/es/operacion.htm?c=Estadistica_C&cid=1254736177074&menu=ultiDatos&idp=1254735573175

decentralized management) as a percent of the total QALYs in the province in 2019. This is the endogenous variable of the models.

The steps to calculate it were:

- Calculate the QALYS in 2019 in each province. We merged the file of the province's population by sex and five-year age groups (INE) with the file of life expectancy by age and sex in the province to calculate the expected years of life ahead in the province. We weighted them with the average quality of life (0-100 scale) for each age and sex in Spain (obtained from the National Health Survey of Spain 2011). Then we did aggregate all age-sex groups to get the number of QALYs in the province in 2019.
- Calculate the QALYs lost in each province from the weekly mortality data with the same procedure (expected life years weighted by quality of life).
- Calculate the % of QALYs lost in each province over the human capital available (QALYs calculated in step 1) for each period.

We look for a differential regional effect in the decentralized period compared to the centralized one. Our regression models control for some territorial, demographic, and economic variables that might contribute to the heterogeneous impact of the COVID.

b. Results

Table 4 reports the descriptive variables of the percentage of QALYs lost in the provinces in the three phases and the within-group correlation, where groups are autonomous communities. Province averages are not comparable among phases because the duration of the phases is different (T=15, 46 and 43 weeks respectively).

Table 4. Descriptive Variables of the % QALYs Lost

Period	Observations	Mean value	Standard deviation	Minimum value	Maximum Value
Period 0	52	0.096	0.030	0.055	0.169
Period 1	52	0.256	0.051	0.181	0.383
Period 2	52	0.221	0.041	0.127	0.327

Note: each line represents one of the observation periods: Period 0 is from June 2020 to May 2020, Period 1 is from June 2020 to May 2021, Period 2 is from May 2021.
Source: Own elaboration from NUTS-3 database.

In order to make the phases comparable, Table 5 reports the univariate descriptive variables of the QALYs lost per week per 10,000 QALYs in the provinces.

Table 5. Univariate Descriptive Variables of the % QALYs Lost

Period	Observations	Mean value	Standard deviation	Minimum value	Maximum Value
Period 0	52	0.642	0.201	0.364	1.124
Period 1	52	0.557	0.110	0.393	0.833
Period 2	52	0.513	0.096	0.294	0.759

Note: each line represents one of the observation periods: Period 0 is from June 2020 to May 2020, Period 1 is from June 2020 to May 2021, Period 2 is from May 2021.
Source: Own elaboration from NUTS-3 database.

The average QALYs lost per week decreases from phase 0 to phase 1 and to phase 2. From table 5, It is clear that the average health burden has decreased along the three phases and also its variation. The correlation is high (0,92) between QALYs lost in phases 1 and 2 (table 6). Phases 0 and 1 are also positively correlated (0,6).

Table 6. Linear Correlations between the QALYs Lost per Week (per 10,000 QALYs in the Province in 2019) in Spanish Provinces in the Three Phases (n=52)

Period	Period 0	Period 1	Period 2
Period 0	1		
Period 1	0.600	1	
Period 2	0.468	0.916	1

Note: each line represents one of the observation periods: Period 0 is from June 2020 to May 2020, Period 1 is from June 2020 to May 2021, Period 2 is from May 2021.
Source: Own elaboration from NUTS-3 database.

Table 7 contains within-group correlation, calculated as the estimated variance of the group (Autonomous Community) effects over the total variance of the error in empty random effects model whose endogenous variable is the % of QALYs lost in the province.

Table 7. Percentage of QALYs Lost in the Spanish Provinces in the Three Phases of the Pandemic. Within Group Correlations

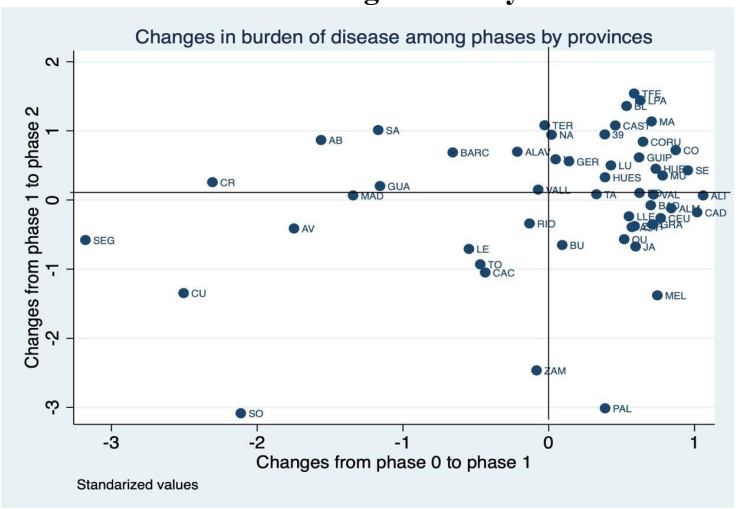
Period	Within group correlation
Period 0	0.572
Period 1	0.559
Period 2	0.565

Note: each line represents one of the observation periods: Period 0 is from June 2020 to May 2020, Period 1 is from June 2020 to May 2021, Period 2 is from May 2021.
Source: Own elaboration from NUTS-3 database.

The differences among phases are negligible; between 56% and 57% of the variability among provinces in QALYs lost are associated to the Autonomous Community. This effect has been similar in the centralized phase and in the decentralized phase of pandemics management.

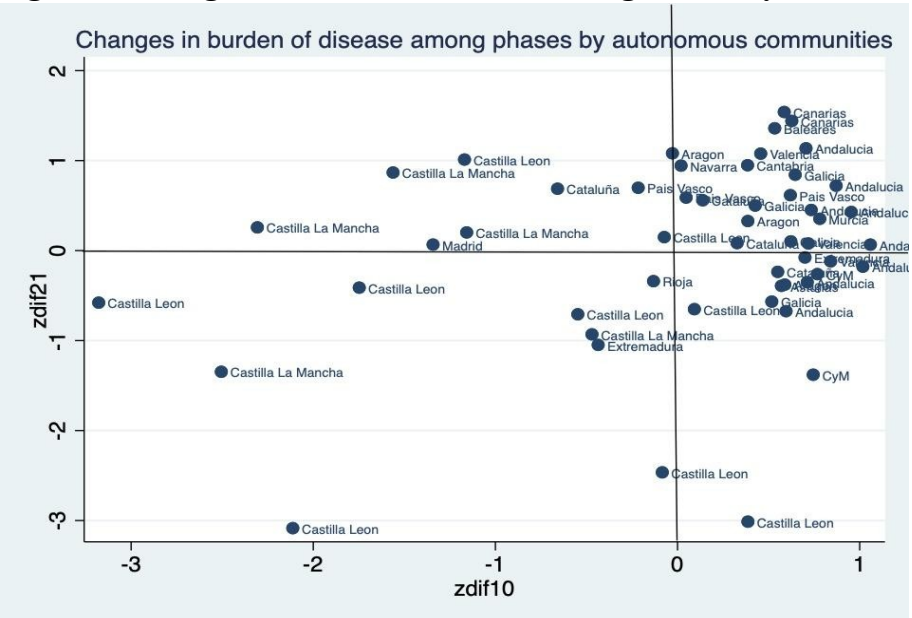
Figures 6 and 7 show the scatterplot of the changes in QALYs lost from phase 0 to phase 1 and from phase 1 to phase 2. In figure 7 provinces are labelled with the autonomous-community label.

Figure 6. Changes in Burden of Disease among Phases by Provinces



Note: standardized values, with mean equal to zero; variance equal to 1.
Source: Own elaboration from NUTS-3 database.

Figure 7. Changes in Burden of Disease among Phases by Autonomous Communities



Note: standardized values, with mean equal to zero; variance equal to 1. Zdif10 represents changes in QALYs from period 0 to period 1. Zdif21 represents changes in QALYs from period 1 to period 2.
Source: Own elaboration from NUTS-3 database.

In table 8, we report the results for each phase of regressions of the percentage of QALYs lost on demographic variables (% of older than 70), density of population, GDP per capita and the distribution of active force among economic activity sectors (agriculture, construction, services and no sector –for those that never worked before. Models contain also fixed effects of the autonomous communities. In the three phases the percentage of old population predicts higher loss of QALYs so that the higher mortality compensates the lower remaining health expectancy and lower health related quality of life. There is not a clear effect either of density, surface, GDP per capita or active population by sectors of economic activity. Only in the final decentralized phase the economic structure of employment seems to have some impact in the burden of disease.

Table 8. Results for Each Phase of Regressions of Percentage of QALYs Lost on Demographic Variables

Period	Period 0 (lockdown)	Period 1 (Centralized management)	Period 2 (Decentralized management)
% older than 70	0.005	0.014	0.011
	(3.47) **	(7.50) **	(8.09) **
GDP 2019	0.000	-0.000	-0.000
	(0.90)	(1.03)	(0.65)
density	0.000	0.000	-0.000
	(0.22)	(0.29)	(1.25)
agriculture workers	0.001	0.001	0.002
	(1.56)	(0.64)	(2.06) *
construction workers	0.002	-0.001	-0.002
	(0.78)	(0.43)	(0.94)
service workers	0.000	0.000	0.002
	(0.26)	(0.44)	(2.81) **
non-sector workers	-0.001	0.002	0.005
	(0.74)	(0.79)	(3.30) **
2.CCAA	0.003	-0.016	0.021
	(0.19)	(0.71)	(1.35)
3.CCAA	0.003	-0.020	-0.003
	(0.13)	(0.67)	(0.16)
4.CCAA	-0.006	-0.012	0.017
	(0.30)	(0.43)	(0.84)
5.CCAA	0.012	-0.029	-0.019
	(0.76)	(1.42)	(1.35)
6.CCAA	-0.008	-0.052	-0.004
	(0.38)	(1.77)	(0.19)
7.CCAA	0.032	-0.026	-0.012
	(1.86)	(1.15)	(0.77)
8.CCAA	0.052	-0.025	-0.013
	(4.34)**	(1.61)	(1.15)
9.CCAA	0.011	-0.010	0.009
	(0.75)	(0.52)	(0.71)
10.CCAA	0.001	-0.011	0.014
	(0.06)	(0.56)	(1.00)
11.CCAA	0.016	-0.016	-0.023
	(1.17)	(0.94)	(1.92)
12.CCAA	-0.012	-0.044	-0.003
	(0.57)	(1.66)	(0.15)
13.CCAA	0.011	-0.025	-0.029
	(0.39)	(0.65)	(1.09)
14.CCAA	-0.007	-0.000	0.012
	(0.43)	(0.01)	(0.74)
15.CCAA	0.005	-0.041	0.013
	(0.22)	(1.34)	(0.58)
16.CCAA	0.002	-0.054	-0.005
	(0.10)	(1.90)	(0.24)
17.CCAA	0.017	-0.026	0.003
	(0.72)	(0.88)	(0.12)
18.CCAA	0.049	0.029	0.045
	(0.73)	(0.33)	(0.72)

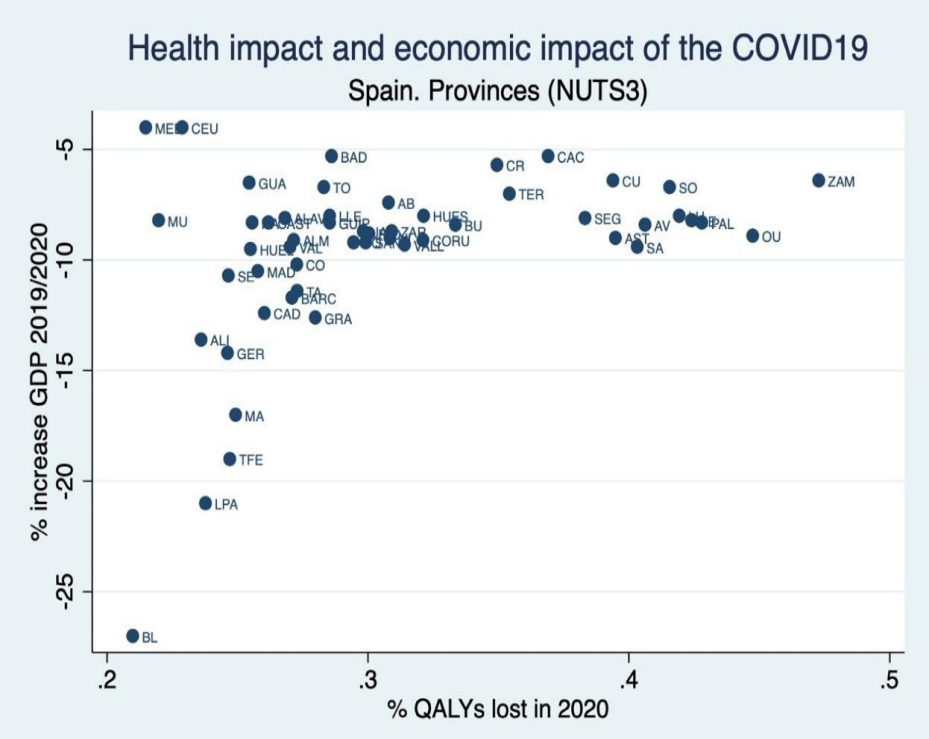
Constant	-0.129	-0.272	-0.344
	(1.67)	(2.71) *	(4.84) **
R^2	0.87	0.92	0.94
N	52	52	52

Note: * p<0.05; ** p<0.01. Period 0 is from June 2020 to May 2020, Period 1 is from June 2020 to May 2021, Period 2 is from9 May 2021.
Source: Own elaboration from NUTS-3 database.

c. Economic impact of the pandemic

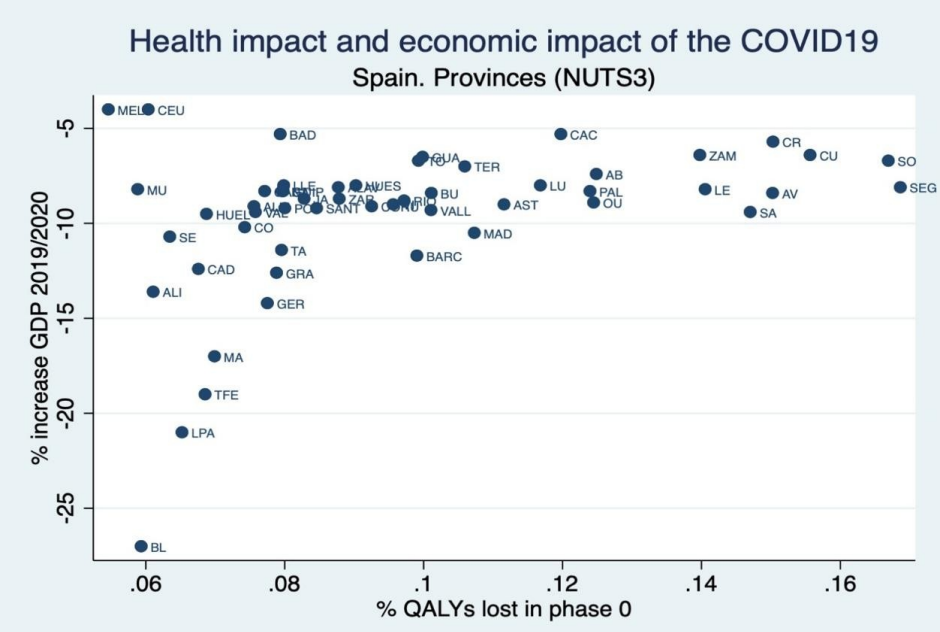
In regards to the economic impact of the pandemic, there is a positive and significant correlation (r=0.39, p=0.004) between the % of QALYs lost in 2020 and the % of change in provincial GDP in 2020. This is an unexpected result. Figures 8 and 9 suggest a non-linear relation for both the whole 2020 year and for the initial part of the first wave (figure 9).

Figure 8. Percentage of QALYs Lost for Each Province and Change in GDP 2019/20



Note: per provinces.
Source: Own elaboration from NUTS-3 database.

Figure 9. Provincial Analysis. Health and GDP



Note: per provinces.
Source: Own elaboration from NUTS-3 database.

IV. Conclusion

We find that at the beginning of the health crisis, with the chaotic irruption of the infection, the uncertainty of the policies to be applied and with some regional random responses, those richer, more populated NUTS and countries with a hierarchical NHS did show worse mortality ratios, with low significance for RAI.

We focus on the differences in the global mortality in our NUTS2 sample between 2020 and 2021. In 2021, started massive vaccination, the Covid evolution was better understood, and decentralization-based policies were instrumented in some countries. In these models, RAI is statistically significant, but not the nature of the systems anymore. It looks like an idiosyncratic, close to the problem, regional answer to the pandemics diluted the differences of the national health systems. The quality index of the regional government is also highly correlated to mortality changes.

Finally, we zoom in the reality of a single country (Spain) by analyzing territorial heterogeneity. We compute for the Spanish provinces (NUTS-3) the total number of Quality Adjusted Life Years calculated the QALYs lost in the three defined periods (initial lockdown, centralized management and decentralized management) given the gender and the age structure of each province. We calculate then the number of QALYs lost with coronavirus, given absolute mortality and provincial relative age-related health damage.

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APPENDIX 1

The measure can be used to estimate regional authority at the level of the individual region, regional tier, or country by combining the dimensions. Alternatively, it may be re-aggregated to needs. The intervals on the dimensions are conceptualized along equal increments, so one can sum dimension scores to produce a scale ranging between 1 and 30 for each region or regional tier. Country scores are zero for countries that have no regional government, but there is no a priori maximum because countries may have more than one tier. to compare not just countries, but regions and regional tiers within countries. RAI compares not only how regional governments exert authority over those living in its territory, but also how they co- govern the country as a whole. In short, the question is "In what ways, and to what extent, does a regional government possess authority over whom at what time. These dimensions are quite strongly associated with each other and can be thought of as indicators of a latent variable. Yet those who are interested in examining the pathways to regional authority can disaggregate regional authority into its components. Some dimensions, including those that tap regional representation, policy scope, and borrowing autonomy, exhibit more reform than others.

The regional authority index excludes informal arrangements. It is concerned exclusively with authority, which we define as formal power expressed in legal rules. Hence it omits contextual factors, such as leadership, political parties, or corruption, which may affect government performance Tiers. The RAI estimates the authority of subnational governments at each level between the local (>150,000 population) and the national. Dimensions. conceive decentralization as multidimensional and the RAI estimate regional assemblies. RAI estimates regional tax authority and evaluate whether residual powers rest with the region or the central state. In addition, the RAI estimates shared rule, the authority co-exercised by a region and regional tier

within the country on five dimensions for law making, executive control, fiscal decision making, borrowing, and constitutional reform

APPENDIX 2

Public intervention in healthcare in Western countries can be divided into two broad organizational forms: National Health Services (NHS), under which healthcare provision is a service provided by the public sector and National Health Insurance Systems (SIS), which are conceived as a publicly regulated health insurance primarily for workers.

The main traits of NHS can be found in the concepts included in its name: national, since it seeks to provide a homogeneous service within the national territory; a service, among the list of publicly provided services, such as education; health, and not only health services, denoting the ambition to encompass the different sectors needed to promote health. Among the countries that have adopted NHS are the United Kingdom, Scandinavian countries, and some Southern European Countries, including Spain.

Other European countries, such as Austria, Holland, Germany, France, and Belgium have opted for a NHIS, in which the system focuses instead on regulating the degree of insurance or coverage, and introducing a social component to the contracts offered by the health providers, such as setting limits to the degree to which payments can be tied to individuals based on actuarial criteria, or limiting the extent to which the funding of services falls on the patient alone and not all users.

Following this classification, these two organizational schemes assign to the agents in the system different responsibilities in the main areas necessary for a well-functioning healthcare system.

Those areas include planning, funding, and the provision of services. In addition, for each of these areas of governance, healthcare systems assign a relative weight to the influence of political and technical considerations. Planning and funding are typically heavily influenced by political criteria, and provision often is founded on economic evaluation approaches closer to the practices in the private sector. This disparity in the criteria utilized often leads to a clash between the traditionally more expansive political approach and the cost-conscious recommendations of economic evaluations.

Social insurance systems (SIS) are melded from aspects of both public provision and private production systems. They combine, with varying importance, public provision via regulatory frameworks as well as private productions schemes, with healthcare providers that may include both for profit and non-for-profit organizations. Often, this is simply the result of integrating historical SIs providers from prior to the creation of the public system. Insurance used to be compulsory and enforced through the employers. However, benefits are not tied to specific jobs but rather become lifelong entitlements. Over time, the choice of a healthcare provider or insurer becomes disentangled from the specific employer, which become intermediaries, but may also complement the funding and coverage of the insurance schemes. In these systems, there is universal coverage and the public sector guarantees access. Funding is based on a per capita basis, and as is expected from an insurance scheme, is also based on individual based risk factors.

Healthcare providers, on account of their interests, play a fundamental role in the design of the system, which is no longer fully determined by political considerations. Moral hazard issues and overuse are kept at bay with a system of co-payments, uncommon in systems of public production. The introduction of healthcare provision efficiency considerations may result in

better planning and provision than in SPP. At the same time, a major weakness of SI systems is that it may result in greater inequity due to schemes that discriminate against riskier (and more vulnerable) groups, as is common in insurance design, if appropriate public compensation is not implemented. To avoid these shortcomings, SIS may include additional provisions, outside of the common insurance schemes, to compensate for some vulnerable groups.

In our sample this makes for:

Austria 1, Belgium 1, Denmark 0, France 1, Germany 1, Greece 0, Italy 0, Luxembourg 1, The Netherlands 1, Norway 0, Poland 1, Portugal 0, Romania 1, Slovenia 1, Spain 0, Sweden 0, Switzerland 1, UK 0.