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Public sector efficiency in the design of a COVID fund for the euro area

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Abstract

This study examines the importance of incorporating public sector efficiency considerations in the design of a "COVID Fund" in the euro area, aimed at providing insurance for member states against common health shocks. To test our proposition, we examine the efficiency of government spending on health during periods of severe resource constraints, which mirrors what occurs during pandemics like COVID-19. Specifically, we considered 19 administrations in the euro area during the global financial crisis and euro area sovereign debt crisis that followed. The results support our proposition. First, they reveal the average efficiency for all 19 administrations to be 0.950, which implies that member countries had wasted about 5% of funds allocated to health during this period. This suggests the need for the supranational institution to first of all ensure improvements in the use of public funds allocated to health by national governments in order to prevent wastage of the financial aid transferred to them during pandemics. Also, two of the four administrations that adopted the Economic and Financial Adjustment Programme of the troika (Portugal and Greece) during the twin crisis were among the most efficient. This suggests that making conditionalities an integral part of the central coordination of health funds during pandemics will result in improvements in the efficiency of funds transferred to member states.

Keywords: Public Sector Efficiency, Covid-19, Centrally Coordinated Health Fund, COVID Fund, Euro Area

1. Introduction

The novel coronavirus disease (COVID-19) which began as a health crisis but has since morphed into an economic crisis, with deleterious effects on economies across the globe, has exposed major flaws in the proposals advanced for a central insurance mechanism for the euro area. Proposals from academic institutions and policy circles before the virus outbreak had focused on initiatives such as unemployment or social benefit schemes designed to provide insurance against idiosyncratic shocks (see for instance Balassone et al., 2014; Dullien, 2014a & b; Dolls, Fuest, Nuemann, and Peichl, 2015; Beblavý, Marconiz and Maselli, 2015; Dolls, Clemens, Dirk, and Andreas, 2015; Berger, Dell’Ariccia, and Obstfeld, 2018 and Olanubi et al., 2019). These initiatives are however ill-suited to protect countries against common shocks, such as the health shock triggered by the coronavirus outbreak. To further complicate the situation, present institutional agreements at the European
Union (EU) level were not also designed to deal with common shocks. According to Beck (2020), existing institutions such as the European Central Bank (ECB), the European Stabilization Mechanism (ESM) and the Outright Market Transactions (OMTs) scheme cannot address the uniqueness of the current crisis which is a common and not an idiosyncratic shock.

Against this backdrop, a large number of proposals have emerged following the virus outbreak, proffering different proposals for the central coordination of policy measures in Europe. Based on these proposals, Bénassy-Quéré et al. (2020a) argued that a policy response at the EU level should not be limited to any single initiative but should include a set of instruments. They identified 3 important instruments: a COVID Fund, credit guarantees by the European Investment Bank (EIB) and dedicated credit lines. The COVID fund for instance requires member states to contribute a certain percentage of their gross national income (GNI) to a common fund with disbursements made on a “needs-basis” and in accordance to the extent of the crisis faced by member countries. The fund targets member countries hit the most by the shocks and could either be used to finance health-related expenditures or for risk-sharing against asymmetric shocks. Credit guarantees could also come from the EIB to prevent companies under stress from failing. Finally, dedicated credit lines such as the COVID credit line of the ESM as proposed by (Bénassy-Quéré et al. 2020b) and the SURE proposal of the European Commission can also help provide financial relief during pandemics. The SURE scheme for instance will provide as much as €100 billion in long-term loans to member countries to finance an important expenditure requirement of governments during a pandemic. It focuses specifically on providing limited funding for partial unemployment schemes with their accompanying expenses.

We contribute to the ongoing debate by making a case for incorporating public sector efficiency considerations in the design of a centrally coordinated health fund (specifically, the COVID Fund proposed by Bénassy-Quéré et al, 2020a) in the euro area aimed at protecting member states against common health shocks. First, we argue that funds transferred from the COVID Fund or its variants will not have the desired effect in the receiving economies if governments are already inefficient in the use of resources allocated to health from their national budgets, as there will be large-scale wastage in the utilization of the funds transferred. Olanubi et al., 2019 identified the importance of integrating public sector efficiency considerations in the design of a centralized insurance mechanism for the euro area, focusing on the unemployment insurance scheme. They argued that this consideration will ensure that the funds disbursed by the supranational institution are efficiently utilized by member states. In line with their study, we consider 19 administrations in the euro area that existed roughly during the global financial crisis and euro area sovereign debt crisis. This approach will help to determine how efficient governments are in the use of public funds allocated to health when confronted with severe resource constraints since pandemics such as the coronavirus are accompanied by severe constraints on government budgets.

Second, we argue that funds should not be transferred to countries from the COVID Fund on a “needs basis” as proposed by Bénassy-Quéré et al (2020a). This approach is susceptible to the problem of moral hazard as countries will not be concerned with ensuring efficiency in the utilization of funds transferred to them. We, therefore, propose that a way to improve the efficiency of funds transferred across the euro area is to integrate conditionalities in the design of the COVID Fund. This would involve requirements for member states to improve upon the efficiency of their spending levels as a condition to receiving transfers from the COVID Fund. An advantage of imposing conditionalities is that they make room for reforms in the health sector which in turn result in improvements in the efficiency of government spending levels. To empirically test our propositions, we examine the effect of the conditionalities imposed by the troika (the International Monetary Fund [IMF], the European Commission [EC] and the European Central Bank [ECB]) on the efficiency of health spending of government administrations that adopted the reforms. In the aftermath of the global financial crisis and the euro area sovereign debt crisis that followed, four euro area countries (Greece, Ireland, Portugal and Cyprus), beginning in 2010, each signed a memorandum of understanding with the troika. The agreement was for a bailout programme based on the conditionality of countries participating in an Economic and Financial Adjustment Programme (EFAP) which necessitated the implementation of certain reforms in their economies in exchange for a loan (Hazakis, 2015; Greer, Jarman, & Baeten, 2016). The reform objectives were to bring about changes in the conduct of fiscal policy by instituting measures to tame rising budget deficits in countries. It also included large scale reforms in the healthcare sector (Greer, Jarman, & Baeten, 2016).

As a preview of our empirical findings, our results reveal the average efficiency for all 19 administrations to be 0.950, which implies that member countries of the euro area have wasted about 5% of funds allocated to healthcare during the period of the global financial crisis and sovereign debt crisis that followed. This suggests the need to incorporate public sector efficiency considerations in the design of a centrally coordinated health fund for the euro area in order to prevent the wastage of funds transferred from the supranational institution during a common health shock or pandemic. Also, two out of the four countries that adopted the EFAP of the troika were among the most efficient of the 19 member countries of the euro area. The Pedro Manuel administration of Portugal was ranked second with an efficiency score of 0.99 while the George A. Papandreou/Antonis Samaras of Greece came fifth with an efficiency score of 0.969. This suggest that making conditionalities an integral part of the central coordination of health funds during pandemics will result in improvements in the efficiency of public funds allocated to health by member states.

The rest of the paper is structured as follows. In Section 2 we present our methodology for the study. Section 3 presents and discuss the results of our efficiency analysis while Section 4 concludes the study.
2. Model specification and measurement of variables

We adopt the Stochastic Frontier Analysis (SFA) to measure the efficiency of health expenditures for the different government administrations in the euro area. Specifically, the Battese and Coelli (1992) truncated normal random time-varying specification for unbalanced panel was adopted in line with the works of Olanubi et al., 2019 and Olanubi and Osode (2017).

The translog functional form of the model is thus specified:

\[
\ln LEX_{it} = \alpha_0 + \beta_1 \ln HEXP_{it} + \beta_2 \ln EDUC_{it} + \beta_3 \ln HEXP_{it}^2 + \beta_4 \ln EDUC_{it}^2 + \beta_5 \ln HEXP_{it} \ln EDUC_{it} + \beta_6 t + v_{it} - u_{it}
\]

Where LEX_{it} is the life expectancy of the different administrations at time t; HEXP_{it} is general government health expenditure as a percentage of total government expenditure for the different administrations at time t; EDUC_{it} is adult education attainment rate for the different administrations at time t; t is the time trend; \( v_{it} \) is the component of the error term that corresponds to the statistical noise while \( u_{it} \) is the portion that accounts for technical inefficiency. We adopt the innovative approach developed by Olanubi and Osode (2017) and applied to euro area level data by Olanubi et al., 2019 to compare efficiency across different government administrations in the euro area instead of across countries. Their approach involves examining efficiency across specific government administrations in order to relate the timeframe considered to a particular policy era; instead of subjectively selecting a study period, as is the conventional practice in the literature. An advantage of this approach is that it provides a context for policy transfer as the least efficient administrations can learn from the policies implemented by the highly efficient ones.

More importantly, we make the study period coincide to periods of severe resource constraints, which mirrors what occurs during a pandemic. The 19 administrations considered in this study existed roughly between the period of the global financial crisis and the euro area sovereign debt crisis. This was done in order to examine the effect of the EFAP on the efficiency of government health spending and to also consider how efficient governments are when faced with severe resource constraints. This is especially important since pandemics such as the coronavirus are accompanied by severe constraints on government budgets.

Life expectancy was adopted as the output variable as it represents a broad measure of a country’s health system outcome. This variable was also adopted by Olanubi and Osode (2017) and Dutu and Sicari (2016). Moreover, it is the most important indicator of health during life-threatening pandemics.

The following were adopted as input variables: General government expenditure on health as a percentage of total general government spending and adult education attainment rate. This is in line with the works of Greene (2004) and Evans, Tandon, Murray & Lauer (2000). While many studies have documented the influence of external environmental factors on health outcomes and government health spending efficiency, we believe it is also important to assess inefficiency arising directly from within the health system as a result of wastage in the input resources used. This would help governments and policy makers identify and address inefficiency that is more directly related to their spending activities. Data for all variables adopted in this section are sourced from Eurostat database. We adopt a translog specification in the same spirit as Greene (2004) and Evans, Tandon, Murray & Lauer (2000). And even after conducting the likelihood ratio test for the appropriate specification to adopt, we could not accept the null hypothesis that the data best fits the Cobb-Douglas specification. As such, the translog specification was adopted. We however include a time trend to account for time effects in the analysis.

3. Empirical results

This section presents the empirical results of our analysis. We start by presenting the maximum likelihood estimates and then move on to present the efficiency estimates and ranking for all government administrations considered. Our focus is however on the efficiency estimates generated.

3.1. Health maximum likelihood estimates

The table below reports the maximum likelihood estimates for the health policy area, with model 2 and 4 including a time trend in the production function while model 1 and 3 do not. For the purpose of comparison, a Cobb–Douglas (CD) specification, which is but a truncation of the translog specification (TL), was also estimated.

Since a time trend was included in Models 2 and 4 we conducted likelihood ratio (LR) tests on its significance. For the translog model (that is, for models 1 and 2) the test statistic is 393.784 while the critical value from the Kodde and Palm (1986) table is 3.84. We therefore reject the null hypothesis of the irrelevance of a time trend in the model. Consequently, the inclusion of a time trend (which represents the hicksian neutral technological change) in the model is justified. For the Cobb-Douglas model (Models 3 and 4) the test statistic was 235.743 while the critical value from the Kodde and Palm (1986) table is 3.84. The null hypothesis of the insignificance of the time trend was also rejected for the Cobb-Douglas specification. The data therefore provides evidence of the importance of the inclusion of a time trend in the model, for both the translog and Cobb Douglas specifications.

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1 See Olanubi et al., 2019 for a detailed analysis of the approach.
2 The government administrations and the timeframe adopted in this study also come from Olanubi et al., 2019
Table 1
Health Maximum Likelihood Estimates.

|                      | T.L Specification            | C.D Specification            |
|----------------------|------------------------------|------------------------------|
|                      | Model 1          | Model 2          | Model 3          | Model 4          |
| Constant             | 3.914***         | 3.485***         | 0.020***         | 3.256***         |
|                      | (4.005)          | (64.132)         | (7.156)          | (39.461)         |
| lnHEXP               | -0.047           | -0.059***        | -0.002           | -0.003           |
|                      | (-0.064)         | (-5.553)         | (0.02)           | (-0.418)         |
| lnEDUC               | 0.695***         | 0.492***         | 0.819***         | 0.363***         |
|                      | (2.318)          | (31.723)         | (33.62)          | (9.937)          |
| lnHEXP²              | 0.158            | 0.011            |                  |                  |
|                      | (0.964)          | (1.107)          |                  |                  |
| lnEDUC²              | 0.039            | -0.079***        |                  |                  |
|                      | (0.183)          | (-8.503)         |                  |                  |
| lnHEXP * lnEDUC      | -0.357           | 0.027            |                  |                  |
|                      | (-0.686)         | (1.425)          |                  |                  |
| Time trend           |                  | 0.017***         |                  | -0.018           |
|                      |                  | (4.096)          |                  | (1.552)          |
| σ²                   | 0.11             | 0.005            | 0.214            | 0.025            |
|                      | (1.445)          | (1.079)          | (1.129)          | (0.901)          |
| γ                    | 0.697            | 0.897***         | 0.485            | 0.680*           |
|                      | (0.87)           | (10.08)          | (1.06)           | (1.916)          |
| μ                    | 0.383            | 0.093            | 0.076            | -0.017           |
|                      | (0.465)          | (1.191)          | (0.114)          | (-0.056)         |
| η                    | -0.067           | -0.21            | 0.005            | -0.055           |
|                      | (-0.963)         | (-1.320)         | (0.05)           | (0.654)          |
| Log Likelihood       | 3.795            | 200.582          | -39.97           | 77.9             |

Note: Models 2 and 4 include a time trend in the production function while Models 1 and 3 do not. t-ratios are reported in parenthesis. Significance: ***: 1% level; **: 5% level; *: 10% level

Table 2
Government Health Spending Efficiency Estimates and Ranking.

| Administration                        | Average Efficiency | Ranking |
|---------------------------------------|--------------------|---------|
| Wener Fayman (Austria)                | 0.956              | 10      |
| Yves Leterme (Belgium)                | 0.954              | 11      |
| Demetris Christofias (Cyprus)         | 0.991              | 1       |
| Andrus Ansip (Estonia)                | 0.915              | 17      |
| Martti Vanhanen (Finland)             | 0.943              | 13      |
| François Fillon (France)              | 0.958              | 8       |
| Angela Merkel (Germany)               | 0.962              | 7       |
| George A. Papandreou/ Antonis Samaras (Greece) | 0.969          | 5       |
| Enda Kenny (Ireland)                  | 0.899              | 19      |
| Mario Monti / Matteo Renzi (Italy)    | 0.969              | 5       |
| Valdis Dombrovskis (Latvia)           | 0.923              | 15      |
| Algirdas Butkevičius (Lithuania)      | 0.922              | 16      |
| Jean-Claude Juncker (Luxembourg)      | 0.972              | 4       |
| Lawrence Gonz (Malta)                 | 0.973              | 3       |
| Mark Rutte (The Netherlands)          | 0.939              | 14      |
| Pedro Manuel Mamede Passos Coelho (Portugal) | 0.99         | 2       |
| Robert Fico (Slovakia)                | 0.912              | 18      |
| Borut Pahor (Slovenia)                | 0.958              | 8       |
| José Luis Rodríguez Zapatero (Spain)  | 0.954              | 11      |
| Mean                                  | 0.95               |         |

Note: We report average efficiency for 4 years, a time frame all administrations had efficiency scores.

We also went ahead to test for the adequacy of the Cobb–Douglas functional form which has been adopted by many studies on health spending efficiency. By including a time trend, the test of a Cobb–Douglas functional form (Model 4) against that of the translog (model 2) yields a test statistic of 245.356. This is greater than the critical value of 7.81 from the Kodde and Palm (1986) table. The Cobb–Douglas assumption is therefore rejected in favour of the translog. The results therefore corroborate that of the studies by Greene (2004) and Evans et al. (2000) that adopted a translog functional form. Nevertheless, neither of the studies included a time trend which has been found to be important in this study. The closest attempt was however made by Greene (2004) who included year effects in his model. This still nonetheless does not play the role of the time trend.

Results of the maximum likelihood estimates vary between the translog and Cobb-Douglas models estimated, both with and without a time trend. We however focus on interpreting estimates from the translog assumption since it has been adjusted as the most appropriate by the likelihood ratio test.
Since the translog functional form cannot be directly interpreted we estimate the output elasticities of life expectancy with respect to health expenditure ($\theta_h$) and educational attainment rate ($\theta_e$) evaluated at the sample mean.

$$
(\theta_h) = \beta_1 + 2\beta_3 \text{HEXP} + \beta_5 \text{EDUC}
$$

(1)

$$
(\theta_e) = \beta_2 + 2\beta_4 \text{EDUC} + \beta_5 \text{HEXP}
$$

(2)

Our results show the output elasticity of life expectancy with respect to health expenditure ($\theta_h$) to be 1.029 while that for educational attainment rate ($\theta_e$) to be -3.721. This implies that a 1 percent increase in health expenditure by the government will cause life expectancy to increase by 1.029 percent. This also implies constant returns to scale as the increase in funds allocated to health by the different government administrations cause life expectancy to increase by roughly the same amount; as the output elasticity value is approximately 1. On the other hand, a 1 percent increase in educational attainment rate by the government will cause life expectancy to decrease by 3.721 percent. This implies decreasing returns to scale as life expectancy falls by a higher proportion to the increase in educational attainment rate.

The estimate of $\gamma$ at 89.7 is high and statistically significant, suggesting that a large percentage of variation in the composite error term is due to the inefficiency components. As such, the model is well suited for the efficiency analysis (Coelli et. al, 2005)

3.2. Health: Efficiency Estimates for 19 Administrations

Table 2 below presents efficiency estimates for 19 different administrations across all member states of the euro area during the financial crisis and sovereign debt crisis that followed. The results reveal the average efficiency for all 19 administrations to be 0.950 which implies that member countries of the euro area had wasted about 5% of funds allocated to healthcare during this period. As such, by improving efficiency in the use of health resources, government administrations in the area can save up to 5% of the funds allocated to healthcare from their national budgets. This lends support to our proposition for the need to incorporate public sector efficiency considerations into the design of a centrally coordinated health fund in the euro area in order to prevent wastage of resources transferred from the supranational institution to member states during pandemics.

With regards to the ranking of efficiency across countries, our results show that the Demetris Christofias administration of Cyprus is the most efficient administration with an efficiency score of 0.991. This implies that the administration was able to efficiently utilize about 99.1% of funds allocated to healthcare. More precisely, the health system in the nation under this government administration was able to operate at about 99.1% efficiency with regards to the transformation of health inputs (government expenditure) into outcomes (in this case, life expectancy). This is rather surprising because the healthcare system in Cyprus has performed poorly when compared to that of other countries in the euro area. The country is still without a universal health coverage system; as such, access to health care is highly fragmented with a large percentage of the populace having to offset their medical bills through out-of-pocket spending (Theodorou, Charalambous, Petrou and Cylus, 2012; Petrou and Vandoros, 2018).

It should however be noted that our results do not intend to make a generalization on the performance of the Cypriot health system as against that of other countries in the area. It only shows that the Demetris Christofias administration was able to efficiently utilize funds allocated to healthcare during its tenure to bring about significant improvements in the health outcome considered (life expectancy in this context) above other countries in the area. This implies that, although Cyprus does not have the best health system in the euro area, other countries can learn from the Demetris Christofias administration on how health outcomes can be improved when confronted with significant challenges in the health system.

It is worthy of note that it was after the administration had completed its tenure that a health sector reform programme was instituted in 2013 as a result of the Economic Adjustment Program agreement with the troika. We did not consider the Nicos Anastasiades administration that was in tenure when the EFAP was signed. This was in order to ensure that all administrations considered in the study fall roughly between the period of the global financial crisis and euro area sovereign debt crisis. The first tenure of the Nicos Anastasiades administration however lasted from 2013 to 2018.

The rankings also reveal that the Pedro Manuel Mamede Passos Coelho administration of Portugal and the Lawrence Gonz administration of Malta came second and third with an efficiency score of 0.990 and 0.973, respectively. The Economic and Financial Adjustment Programme between Portugal and the troika was just signed in May 2011 before the Pedro Manuel Mamede Passos Coelho administration assumed office. The administration’s tenure began in 21 June 2011 and lasted till 26 November 2015. The results, therefore, suggest that the high level of efficiency of the administration in the use of public funds allocated to health can be attributed to the health sector reforms instituted under the EFAP. The reforms included 34 measures targeted at significant cost reduction, improved regulation and advancement in efficiency. Reforms were then implemented by the Portuguese Ministry of Health in compliance with the EFAP conditionalities. The reforms include the following: improvement in regulation, health promotion strategies, changes in the pharmaceutical market, and empowerment of primary care (Simões, Augusto, Fronteira and Hernández-Quevedo, 2017).

The results also reveal that George A. Papandreou/Antonis Samaras of Greece is ranked 5th with an efficiency score of 0.969. Greece adopted three Economic Adjustment Programmes (EAPs) of the troika between 2010 and 2018 which required large scale reforms aimed at taming public spending, including expenditures on health. Total government spending on health
was not to exceed 6% of GDP. The agreement also includes reforms in the health sector aimed at addressing inequities and inefficiencies (Economou, Kaitelidou, Karanikolos and Maresso, 2017). The two administrations lasted from 6 October 2009 to 26 January 2015. The results also suggest that the relatively high level of efficiency in the use of public funds allocated to health during the administrations can be attributed to the health sector reforms instituted under the EFAP.

Furthermore, our results reveal the least efficient administrations to be the Robert Fico administration of Slovakia and the Enda Kenny administration of Ireland, with an efficiency score of 0.912 and 0.899 respectively. This reveals that the EFAP reforms that took place during the Enda Kenny administration did not result in improvements in the efficiency of government health spending in Ireland like it did in Portugal and Greece. However, according to Olanubi et al., 2019, the EFAP resulted in improvements in the efficiency of funds allocated to social protection under the administration as it ranked 1st among all administrations in the euro area.

4. Conclusion

This study examined the importance of incorporating public sector efficiency considerations in the design of a “centrally coordinated health fund” in the euro area, aimed at providing insurance for member states against common health shocks. To test our proposition, we examined the efficiency of government spending on health during periods of severe resource constraints, which mirrors what occurs during a global pandemic. Specifically, we considered 19 administrations in the euro area during the global financial crisis and euro area sovereign debt crisis that followed. The results support our proposition. First, they reveal the average efficiency for all 19 administrations to be 0.950, which implies that member countries had wasted about 5% of funds allocated to health during this period. This suggest the need for the supranational institution to first of all ensure improvements in the use of public funds allocated to health by national governments in order to prevent wastage of the financial aid that will be transferred to them during pandemics. Also, two of the four administrations that adopted the Economic and Financial Adjustment Programme of the troika (Portugal and Greece) during the twin crisis were among the most efficient. The Pedro Manuel administration of Portugal was ranked second with an efficiency score of 0.99 while the George A. Papandreou/Anonis Samaras of Greece came fifth with an efficiency score of 0.969. This suggests that making conditionalities an integral part of the central coordination of health funds during pandemics will result in improvements in the efficiency of funds transferred to member states. (Appendix A, B, Eqn 1, 2, Table 1).

Conflicts of Interests

None

Appendix A. Descriptive Statistics

| Variable       | Mean  | Std. dev. | Minimum | Maximum |
|----------------|-------|-----------|---------|---------|
| LEX            | 79.765| 2.761     | 73.1    | 83.2    |
| HEXP           | 13.834| 2.838     | 7.1     | 19.8    |
| EDUC           | 29.203| 11.826    | 12.9    | 61.6    |
| Observations   | 94    | 94        | 94      | 94      |

Life expectancy (LEX), the health outcome variable adopted in this study, is high in the euro area with an average of 79.77 years. There is however some degree of variation in the variable among member countries. While its minimum value stands at 73.1 years the maximum is 83.2 years. This could be due to the significant disparity in the budgetary funds allocated to healthcare (HEXP) by the different government administrations considered in the study. While the lowest amount allocated among member countries is 7.1% of the general government’s total budget during the study period, the highest is 19.8%. The variation is also likely due to the disparity in the efficiency levels of public funds allocated to health among member countries. The education attainment rate indicator (EDUC) shows the highest degree of variation with a standard deviation of close to 12 percentage points.

Appendix B. Summary of variable description*

| Variable                                           | Description                                                                 |
|----------------------------------------------------|-----------------------------------------------------------------------------|
| Life expectancy (LEX)                              | This is the estimated number of years a child born in a country is expected to live. |
| Government expenditure on health (HEXP)            | This is the general government expenditure on health as a percentage of total general government spending |
| Adult education attainment rate (EDUC)             | This is the percentage of those between the age of 15-65 who have lower primary, primary and lower secondary education. That is, those whose highest educational level is lower secondary. These group of individuals with little education would be expected to have lower health outcomes. |

*Note: All data are sourced from the Eurostat database

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