Does early-life health enhance growth? Evidence from Spain

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This article focuses on the causal effect of early-life health on economic growth for the Spanish regions over the period 1980–2007. The hypothesis follows from recent literature, in which mortality affects growth by diminishing incentives for behaviour with short-run costs and long-run pay-offs. We provide empirical evidence that higher infant mortality has a direct negative impact on per capita income growth. Also, that a greater risk of early-life death is associated with losses on accumulation of both physical and human capital, and fertility gains, which in turn more even reduces growth.

Keywords: growth; infant mortality; investment; human capital; fertility; health power

JEL Classification: I10; J10; O10

I. Introduction

The correlation between health capital and economic growth has been traditionally seen as a causal link in only one direction: wealth allows better access to food, investments in health care or education. However, in recent years, a sizeable body of research has addressed the reverse causation, that is, healthy populations increase labour productivity and per capita income (Cooray, 2013). In this context, there is little research on the health-related growth in countries of southern Europe, let alone on regions which exhibit less extraneous variation than those. Thus, the aim of this article is to analyse the growth effects of early-life health for the 17 Spanish regions over the period 1980–2007.

Several features distinguish this study. Initially, as far as we are concerned, it is among the first to disentangle the health-related growth for the Spanish regions, when using infant mortality as a proxy for health. Second, we should note that our analysis is based on the methodology introduced by Lorentzen et al. (2008). It provides a unified framework that encompasses the growth effect of both infant mortality and the channels through which growth is affected. Third, from an economic policy perspective, this article encourages debates about the implications of governments’ involvement in the provision of health. The rest of the article is organized as follows. Section II describes the model and data. Section III presents the results. Section IV concludes.
II. Empirical Model

There are two causal links running from health to economic growth: one direct and the other indirect. Following Acemoglu and Johnson (2007), the former can be specified as

$$\Delta y_{it} = \eta_i + y_{i,t-1} + imr_{it} + x_{it} + Z_{it} + \varepsilon_{it}$$ (1)

where lowercase letters denote logs, $y$ is per capita income, $imr$ stands for health status which we proxy for infant mortality rate, $x$ is a vector of growth channels (investment, school and fertility), $Z$ denotes control variables, and $\eta$ reflects unobserved time-invariant region-specific effects. Next, the channel equations can be written as:

$$x_{it} = \eta_i + y_{i,t-1} + imr_{it} + Z_{it} + \varepsilon_{it}$$ (2)

Last, we consider a system of structural equations making explicit the causal relations between economic growth and the channels indirectly linking it to infant mortality as:

$$\Delta y_{it} = \eta_i + x_{it} + \mu_{it}$$ (3)

$$x_{it} = \eta_i + imr_{it} + \xi_{it}$$ (4)

Our sample is primary based on the BD.MORES database; therefore, it covers the period 1980–2007. Output is measured as gross value added. We exclude the real estate sector, which includes imputed rents of owner-occupied properties, because of its volatility (Tortosa and Peiró, 2014). All monetary data are quoted at 2000 constant prices. Regarding control variables, we use health power. In Spain, since 1978 a centralized state has turned into a decentralized one according to three models. Basque Country (1987) and Navarre (1991) were both fiscally and politically accountable. Catalonia (1981), Andalusia (1984), Valencian Community (1987), Galicia (1991) and Canary Islands (1994) kept health powers, but with fiscal responsibility limited. The remaining regions had no health powers until 2002. Table 1 provides details concerning the variables.

In order to estimate Equation 1, we start by applying linear panel data models. Though, it is well known in studying growth regressions that problems of endogeneity and reverse causality arise. Thus, we also use GMM and system-GMM estimators. The next step is to estimate Equation 2 by applying IV estimators (Schaffer, 2010). Last, to appropriately estimate the structural model, econometric methodology relies on three-stage least squares estimation. It should be noted that the overall impact on income growth was calculated as the sum-product of the effect of the channels on growth and the effect of infant mortality on the channels. The remaining issue to discuss is how we obtain valid instruments for mortality and the channels. It is worth mentioning that whilst climatic and geographic characteristics are used in the referred studies for countries, within a country such differences might not be sensitive. To deal with this drawback, we instrument for lagged variables of both infant mortality and the channels.

Table 1. Variables and data sources

| Variable          | Definition                                      | Units                                         | Data source                        |
|-------------------|-------------------------------------------------|-----------------------------------------------|------------------------------------|
| $y$               | Per capita income (gross value added)           | Thousands of euros (2000 constant prices)    | Regional database of the Spanish economy (BD.MORES) |
| $imr$             | Infant mortality rate                           | Deaths per thousand inhabitants 0–4 years    | Spanish National Institute of Statistics (INE) |
| health power      | Health care power                               | 1 when the region gets it, 0 otherwise       | Authors’ elaboration BD.MORES      |
| investment        | Gross fixed capital formation                   | Share to income                               |                                   |
| school            | Human capital                                   | Average schooling years based on 1970 General Education Law | Valencian Economic Research Institute (IVIE) |
| fertility         | Fertility rate                                  | Births per thousand women                    | INE                                |
whenever they appear on the right-hand side of equations. The validity of instruments can be tested by the use of Sargan tests of overidentifying restrictions.

III. Results

As regard to identification, our article does not quantify the reducing-income effect of poor health as distinct from the horizon effect of infant mortality. It should be noted that extended life may result in an increase in working years, while enhancing the quality of life may boost the per capita income each year of life. Estimates for the baseline model (1) are reported in Table 2. The results for the linear regression, GMM and system-GMM are qualitatively similar. On the whole, they support the hypothesis of the impact of the channels on growth. The coefficients of investment share and education attainments have the expected positive sign and are strongly significant. So is the coefficient on lagged income, the negative sign is consistent with the hypothesis of convergence among regions. If we believe the Sys-GMM estimates in column (5), it would imply a catch-up of about 4% between Madrid (top) and Extremadura (bottom).\(^1\) In addition, it is noteworthy the corresponding coefficients suggest a negative effect of infant mortality. According to our findings, it should reduce up to 1.3% growth rate of per capita income.\(^2\)

Our results for Equation 2 are reported in Table 3. Overall, the estimated relations between health and the channels are consistent with the hypothesis stated earlier. The elasticity of investment and education to infant mortality is significant negative, while it is positive for fertility. Using estimates in the regression of column (2), for example, a one SD increase in infant mortality (equal to 0.39) is associated with 3.5% difference in investment. It is also worth mentioning that health power exerts a positive impact on the channels.

| Table 2. Estimates of the growth regressions |
|------------------------------------------------|
| Variable                          | Linear panel (1) | Linear panel (2) | GMM (3) | GMM (4) | Sys-GMM (5) | Sys-GMM (6) |
|-----------------------------------|-----------------|------------------|---------|---------|-------------|-------------|
| \(y \)                             | -0.021**        | -0.191***        | -0.067*** | -0.154*** | -0.053***   | -0.113***   |
|                                  | (2.03)          | (7.23)           | (4.45)  | (6.52)  | (4.27)      | (6.31)      |
| imr                              | -0.009          | -0.023**         | 0.005   | -0.009  | 0.004       | -0.012**    |
|                                  | (1.07)          | (2.44)           | (1.22)  |         | (1.66)      | (2.02)      |
| health power                      | 0.002           | -0.017**         | 0.005   | -0.009  | 0.004       | -0.012**    |
|                                  | (0.34)          | (2.01)           | (1.76)  | (1.22)  | (1.66)      | (2.02)      |
| investment                        | 0.037**         |                  | 0.025*  |         |             | 0.019       |
|                                  | (2.28)          |                  | (1.65)  |         |             | (1.61)      |
| school                           | 0.042***        |                  | 0.030***|         | 0.024***    |             |
|                                  | (5.63)          |                  | (4.59)  |         | (4.76)      |             |
| fertility                         | -0.030          |                  | -0.016  |         | -0.007      |             |
|                                  | (1.60)          |                  | (0.89)  |         | (0.55)      |             |
| constant                          | 0.076***        | 0.333***         | 0.190***| 0.264***| 0.155***    | 0.170***    |
|                                  | (2.92)          | (3.57)           | (5.22)  | (3.17)  | (2.22)      | (2.75)      |

Hausman test: \(p\)-value 0.38 0.00
Sargan test: \(p\)-value 0.22 0.65 0.42 0.62
Observations 459 459 408 408 408 408

Notes: \(z\)- and \(t\)-statistics in parentheses.
***, ** and * denote significant at 1%, 5% and 10%, respectively.
Instruments: lagged values of the endogenous variables.

\(^1\) With 14 870 and 7 240 euros of per capita income (sample average) in Madrid and Extremadura, respectively, the convergence effect vehicles a catch-up of \(0.05 \times \log (14\ 870/7\ 240) = 3.9\%\).

\(^2\) Being infant mortality 2 per thousand (time average for La Rioja) instead of 1.14 per thousand (the one for Balearic Islands), our GMM results imply a growth gap of \(-0.023 \times \log (2/1.14) = 1.3\%\).
We now consider the results of the structural model, Equations 3 and 4. On the one hand, the estimated elasticity of income growth to the channels to some extent differs from those of reduced-form regressions including all the channels (column 1 of Table 4 versus Table 2). On the other hand, the elasticities of the channels to infant mortality are quite consistent with the ones previously found (column 2 of Table 4 versus Table 3). Therefore, on the basis of the parameters reported in columns 1−2, the overall impact on income growth from infant mortality through the channels elongates to −0.10. We can now attempt to capture the order of magnitude of the indirect impact by comparing overall to direct elasticity. Taking into account that the point estimate of our baseline model equals to −0.02, the former is fivefold as large compared to the latter. It is also of interest to note that the accuracy of our estimates is very strong.

IV. Conclusions

This article examines the hypothesis of causal effect of early-life health on economic growth for the Spanish regions over the period 1980–2007. Our findings support those in the literature who found that worse health status is growth-reducing. While the impact seems to occur directly, somewhat unsurprisingly it is likely to work more strongly through investment in physical and human capital, as well as fertility.

Our results have a number of consequences from a policy economic perspective. On the one hand, early-life health would be related to the economy. So, one of the main objectives for policymakers should be clearly directed to improve population health, especially at an early age. This assumption is on primary importance in current debates on the cost and benefits of health care programmes. Budgetary adjustments in the years of financial downturn have had a disproportionate impact on children’s access to health care in Spain. On the other hand, being health one of the most sensitive indicators to reflect development, it is important to aware its significance in order to avoid social inequalities. Indeed, children are highly sensitive to the quality of health and other social services provided to them.
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