



# Endogenous mortality, human capital and economic growth

Thomas Osang <sup>a,1</sup>, Jayanta Sarkar <sup>b,\*</sup>

<sup>a</sup> *Department of Economics, Southern Methodist University, Box 750496, Dallas, TX 75275-0496, USA*

<sup>b</sup> *Department of Economics and Finance, Louisiana Tech University, Ruston, LA 71272, USA*

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## Abstract

We consider growth and welfare effects of lifetime-uncertainty in an economy with human capital-led endogenous growth. We argue that lifetime uncertainty reduces private incentives to invest in both physical and human capital. Using an overlapping generations framework with finite-lived households we analyze the relevance of government expenditure on health and education to counter such growth-reducing forces. We focus on three different models that differ with respect to the mode of financing of education: (i) both private and public spending, (ii) only public spending, and (iii) only private spending. Results show that models (i) and (iii) outperform model (ii) with respect to long-term growth rates of per capita income, welfare levels and other important macroeconomic indicators. Theoretical predictions of model rankings for these macroeconomic indicators are also supported by observed stylized facts.

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\* Corresponding author. Tel.: +1 318 257 2887; fax: +1 318 257 4253.

*E-mail addresses:* [tosang@mail.smu.edu](mailto:tosang@mail.smu.edu) (T. Osang), [jsarkar@latech.edu](mailto:jsarkar@latech.edu) (J. Sarkar).

<sup>1</sup> Tel.: +1 214 768 4398; fax: +1 214 768 1821.

## 1. Introduction

Countries differ dramatically in the way they finance their educational systems. Education can be provided through public funds, through private funds, or a combination of the two. As reported in the Education at a Glance (OECD, 2003), a number of countries in 2000 had public education shares close to 100%, such as Norway (98.7%), Turkey and Portugal (98.6% each), Finland (98%) and Sweden (97%). Of the 36 OECD and non-OECD countries covered in this study, 19 countries (53%) financed at least 90% of their overall educational expenditures through public spending in 2000. In contrast, a number of countries put a larger responsibility on the private provision of education. Among those, Chile has gone the furthest with a private education share of more than 46%. Other countries in the above dataset with large private education shares include South Korea (41%), Indonesia (36%), Jamaica (35%), and the United States (32%).

Overall investment in education, through its effect on the stock of human capital, has long been identified as a source for long-run growth in an economy (see, for example, Rebelo, 1991). In this broad category, a number of studies have specifically stressed the importance of public investment in education in further enhancing the growth performance of the economy (Glomm and Ravikmar, 1992, 1997; Boldrin, 1992; Benabou, 1996). Given the trade-off between public and private financing in education, the question arises how different degrees of public (versus private) involvement in the production of human capital affect welfare, long-term growth, and other indicators of economic performance.

Furthermore, budget components like public education spending must compete with other budget items such as internal and external security, infrastructure expenditures, and debt servicing, to name a few. One of the fastest growing budget components of many countries is public health expenditure. World Bank (2001) data show that between 1972 and 1999 the share of public health expenditure in total public spending has increased two-fold or more in many countries. Over the 1972–1999 period, the average annual growth rate of the public health expenditure share was 1.7%.<sup>2</sup> Just like the market for education, the provision of health services can also be linked to a number of positive externalities, which in turn explain the large public involvement in the health sector. One such externality that has not been sufficiently recognized in the literature is the impact of public health spending on longevity: Increased levels of public health expenditures are most likely to be positively associated with higher life expectancy (Lichtenberg, 2002). In addition to the individual benefits of living longer lives, increased life expectancy may confer important growth effects. These effects arise since increased longevity produces stronger incentives to invest in physical and human capital as these long-term assets yield high returns only later in life (Chakraborty, 2004). Importantly, since public spending on education competes with public spending on health, a second trade-off exists that, like the first one between public and private education shares, may matter for the long-term growth rate of the economy as well as its level of welfare.

In this paper, we study the trade-off between public and private spending on education in a model with uncertain lifetimes and endogenous growth. To this end, we construct a

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<sup>2</sup> This average growth rate is based on data from 26 countries. 10 countries have been excluded due to missing or unreliable time series data on public health care expenditures. Countries with the fastest growing public health expenditure share are Uruguay (from 1% to 6%), Israel (from 4% to 13.7%), the US (from 8.6% to 20.5%), Paraguay (from 3.5% to 7.3%), Australia (from 7% to 14.8%), and Thailand (from 3.7% to 7.4%).

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