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Government spending on education, human capital accumulation, and growth☆

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ABSTRACT

The difference between social and private returns to education often provides the rationale for government intervention. We assess the growth implications of alternative methods of financing public spending on education in a small open economy. We develop a multisector endogenous growth model with human capital accumulation and consider several fiscal instruments to finance the increase in government spending: transfers to households, output, capital and labor taxes. We find a significant difference in the growth impact generated by the choice of the financing method. The non-distortionary financing method provides the highest output increase through its strong effect on physical and human capital stocks. The other distortionary financing methods have lower impacts on long-run economic growth, with labor tax being the most performing. Our simulation results also suggest that even though all methods of financing considered in this paper are growth-inducing in the long-run, their transitional impacts differ.

1. Introduction

This paper assesses the growth implications of alternative methods of financing public spending on education. The importance of human capital in improving individuals' material well-being and in spurring overall growth in the economy can hardly be overstated. As a primary source of human capital, education raises labor force productivity, improves general welfare and fosters growth. The positive externalities associated with human capital accumulation and the difference between social and private returns to education often provide the rationale for government intervention. In most countries, primary and secondary education is mainly funded by the public sector, while tertiary education is often subsidized by means of scholarships and student loans. Several studies have suggested that government spending on education improves general welfare, reduces poverty and boosts growth. Glomm and Ravikumar (1997), Fan et al. (2000), Sequeira and Martins (2008), and Fan et al. (2008) are some examples among many others.

While the direct benefits of public spending on education are widely agreed upon, there is no consensus on the fiscal instrument that is best suited for financing this spending. An important reason for this is that tax-financed increases in government spending on education do not only affect individuals' consumption-saving decisions, but also decisions related to the amount of time devoted to the accumulation of human capital. For example, labor income tax may provide a disincentive for individuals to accumulate human capital as such tax effectively reduces future net earnings. In view of these market distortions, several studies have developed dynamic general equilibrium (DGE) models to explore the macroeconomic impacts of different types of public funding instruments in education.

Annabi et al. (2011), Blankenau and Simpson (2004), Verbic et al. (2009), and Voyvoda and Yeldan (2000) are prominent examples of such previous studies.[1] In Blankenau and Simpson (2004), the relationship between public spending on education and growth is highly conditional on the tax structures imposed by the government.[2] The authors consider non-distortionary taxes, consumption taxes, and capital and labor income taxes. In their specification, education is more likely to boost growth if financed through consumption taxes, while the growth

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[1] Additional references include Davies and Whalley (1991), Glomm and Ravikumar (1998).

[2] Another recent example on the topic is Del Rey and Lopez-Garcia (2016).

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effects of income and capital taxes are ambiguous. The authors analyze the short-run and long-run implications of a 1% permanent increase in public spending on education. This increase in spending can be financed by three alternative fiscal policies: lump-sum taxes, personal income taxes and the re-composition of public spending. They find that the latter policy produces the best welfare outcomes. In contrast, under the first two policies, significant crowding-out effect emerges: higher taxes reduce disposable income and lower savings. In each policy scenario, however, an increase in public spending on education triggers a temporary withdrawal from the labor market particularly by high-skilled workers.

Verbic et al. (2009) compare similar fiscal policies in a DGE model of a small open economy. In their model, households invest their time and income in accumulating human capital. Firms are more willing to invest in human capital the more skill-intensive is their production technology. Government supports human capital accumulation by means of various taxes and subsidies to firms and households. In this setting, growth is achieved most efficiently with a decrease in the personal income tax rate, thereby allowing households to invest in human capital themselves. Meanwhile, corporate tax credit to firms is the least effective fiscal policy instrument, particularly for long-term growth.

Fiscal policy options are also the subject of study in Voyvoda and Yeldan (2000). In their model, the public education system endows labor market entrants with human capital in addition to the human capital received from previous generations. Meanwhile, the government repays its debt, levies proportional tax either on consumption or on wage income, and funds public education. Instead of increasing taxation, the government may choose to allocate a smaller share of its expenditures to education in order to service its debt obligations. Such policy leads to the most detrimental welfare losses and slow growth in the long-run. As a policy alternative, a 5% increase in the income tax invigorates long-run growth, although the generation that enters the labor force at the time of policy implementation suffers. However, with a 5% increase in the consumption tax rate, the burden of taxation is more equally shared across generations, and the economy experiences higher long-run growth.

The insights derived from these studies produce diverging recommendations regarding the most efficient fiscal instrument for increasing growth and welfare through higher public spending on education. While Verbic et al. (2009) propose a decrease in the personal income tax, Voyvoda and Yeldan (2000) and Blankenau and Simpson (2004) advocate an increase in the consumption tax. Yet, Annabi et al. (2011) suggest a reallocation of public spending without altering the tax structure at all. It follows that the optimal method of financing public spending on education remains an open question in the literature.

This paper contributes to this debate by inquiring further into the growth implications of alternative methods of financing public spending on education in a developing country. In our model, human capital increases labor efficiency and its accumulation over time is affected by the decisions of households and the decision of the government in the choice of the fiscal instrument used for financing education spending. Our main contribution is to consider a more realistic setting by extending, to an open economy and a multisector framework, the analysis of the potential impacts of alternative methods for financing public spending on education. We are not aware of any study that analyzes the same issue within an open-economy, multisector dynamic general equilibrium model with human capital accumulation. The model is calibrated to a consistent dataset of the economy of Benin.

The rest of the paper is organized as follows. The next section presents the main characteristics of the model. In the third section, we discuss the data and the model calibration, and we analyze the results. In the last section, we conclude.

2. The model

2.1. Households

We consider an infinitely-lived household[3] who has preferences over an aggregate consumption good and leisure; its labor supply is endogenous. As in Becker (1965) we allow for the household to invest in human capital. Referring to previous papers, such as Heckman (1976), the specification of leisure in the utility function takes into account both the quality and the quantity of time devoted to it. Human capital h_t augments the enjoyment of leisure time, and hence reflects its quality. The efficiency of the household's labor supply depends on the level of human capital, which increases over time through schooling. In each period, the representative household has one unit of time that can be devoted either to schooling, x_t, to work l_t, or to leisure. Time devoted to schooling makes it possible to increase human capital in the next period. The expression of leisure that enters the utility function is thus: $h_t(1-x_t-l_t)$.

Human capital evolves over time through the following accumulation equation that describes the technology of human capital:

$$h_{t+1} = h_t(1-\delta_h) + h_t\phi(x_t, G_t^e) \tag{2.1}$$

where δ_h is the depreciation rate of human capital; ϕ is the function of investment in human capital that depends on, among other variables, the time spent on education, x_t, current human capital, h, and on government expenditures on education, G_t^e.

Referring to Blankenau and Simpson (2004), we define the function ϕ as:

$$\phi(x_t, G_t^e) = x_t^{\gamma}(G_t^e)^{\mu}$$

where $\gamma \in (0,1)$ reflects diminishing marginal productivity of time spent studying. This parameter restriction is consistent with the empirical observation of diminishing marginal returns to education (Mincer, 1958). Empirical evidence suggests that the annual returns from primary education are greater than those of higher-level education; moreover, these returns tend to diminish with each additional year of schooling (Blundell et al., 1999). Furthermore, the inclusion of public investment as an argument of human capital technology with $\mu \in (0,1)$ is common in the literature. The inclusion in the function of human capital from previous periods implicitly reflects the fact that parents pass on their knowledge to their children, albeit imperfectly. As the transfer of human capital from one period to the next is not perfect, we also include human capital depreciation, δ_h.

When the representative household works in period t, it receives $w_t l_t h_t(1-x_t)$ as labor income. The household is the owner of the domestic capital stock, K_t, which is rented to domestic firms at the rental rate R_t. The firm value is V_t. The representative household is responsible for the country's foreign liabilities, B_t^F, for which it pays an interest rate, r_t. Hence, the household's portfolio, A_t, consists of domestic assets, V_t, and foreign assets (liabilities), with a return rate, r_t. Assuming appropriate arbitrage conditions (discussed later), which require that both assets generate the same rate of return, the household net asset holdings has the following expression:

$$A_t = V_t - B_t^F. \tag{2.2}$$

Households pay labor income taxes to the government at a fixed rate τ_L, and receive lump-sum transfers, Tr_t^G, and Tr_t^F from, respectively, the

[3] As opposed to an overlapping-generations framework used in most of the existing papers such as Annabi et al. (2011).