

Can more education be bad? Some simple analytics on financing public education

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Abstract

While the paper remains close to the Heckscher-Ohlin tradition, it is shown that, contrary to the standard results, it is the net effect of prices, taxation, and education that determines the Rybczynski-type growth effects, which may help explain the lack of consensus in the empirical literature on education and growth. While stocks depends on the output of education, changes in labour supply, which determine the effective production possibilities frontier, also depend on individuals' decisions on allocation of time. The analysis has implications for policymakers in developing countries where skills formation needs to be enhanced, as it reveals the possibility of a skill supply-reducing government intervention, contrary to intended. A sufficient condition to avoid this situation is identified in the paper.

Resumen

Mientras que el trabajo se mantiene próximo al enfoque tradicional de Heckscher-Ohlin, se muestra que contrariamente a los resultados convencionales, lo que determina el efecto de crecimiento de tipo Rybczynski es el resultado neto de precios, impuestos y educación. Mientras que el cambio en los stocks de trabajadores calificados es el resultado de la actividad educativa, son los cambios en la oferta de calificaciones -función de las preferencias de los individuos sobre la asignación del tiempo-, lo que determina la frontera efectiva de posibilidades de producción. El análisis tiene implicaciones para los tomadores de decisiones en los países en desarrollo donde se requiere el fortalecimiento de la formación de calificaciones, ya que revela la posibilidad de una intervención gubernamental que contrariamente

a lo esperado, reduzca la oferta de calificaciones; la condición suficiente para que evitar este resultado es identificada en el trabajo.

Keywords: Skill formation, education finance, developing countries.

JEL classification: I28, I22, F16.

1 Introduction

Almost all governments allocate significant amounts to finance public education. For instance, in 2005, the United States allocated 5.3% of its GDP to public education, and the United Kingdom, 5.6%. In middle income countries as those in Latin America, the fraction of GDP allocated to public education in general is not that high but is still significant. For instance, in 2004, in Brazil was 4%; Argentina, 3.8%; Chile, 3.7%, and Mexico, 5.4% (UNESCO, 2008). These facts seem to show that the relevance of education is not overlooked by policy makers.

The importance of education for growth has been highlighted by the endogenous growth literature (for instance, Romer, 1986; Lucas, 1988, among others); however, the empirical evidence is mixed. So, what's the matter? Could education be good, neutral, or bad, depending on the case? It could be any of them; in particular, it could be bad for two reasons: inefficient educational expenditure (see, for instance, Clements, 1999; Hanushek, 2002) and distortions caused by government interventions in education (see, for instance, Glomm and Ravikumar, 1998; Blankenau and Simpson, 2004; Blankenau et al., 2007). This paper deals with the latter aspect using a simple model, identifying the general equilibrium effects of taxation on skills supply and making it possible to deal with some analytics. Moreover, a sufficient condition for a skill supply-enhancing government intervention is identified in the paper. In this paper, a central feature is the presence of systemic inefficiencies in the public provision of education, which is the typical situation in developing countries. Thus, inefficiencies can be targeted by policymakers and the process of accumulation of endowments can be enhanced; however, the way in which an increase in the budget is financed affects the results of the intervention.

The paper is organised as follows. Section 2 describes the model. Section 3 describes the properties of the model as well as some policy implications. Section 4 presents the conclusions.

2 Model description

This model remains close to the standard Heckscher-Ohlin tradition, which is extended to include education activities that produce endowments: skilled and unskilled labour. The pattern of endowment growth is the result of the output of education, leaving aside demographic considerations and retirement rates. In addition, people make a consumption-leisure choice, so that the supply of labour is endogenous.

The government raises revenue from taxes to provide education. The government runs a balanced budget, financed via income and indirect taxes. Taxation affects the consumption-leisure choice by changing the relative prices, thus modifying the labour supply. This, in turn, determines the actual production possibilities.

2.1 The education sector

Education is publicly provided, with a budget exogenously determined. Following the tradition in the education production function literature (see for instance, Levaèiæ and Vignoles, 2002), the output of education activities is given by $Q = F(K, E)$, Q is the output of the activity given the resources K , and the enrolment E . The function F is subject to constant returns to scale, so the output per student can be written as $q = Q/E = F(k)$, where k measures the resource intensity per student, and $\partial q/\partial k > 0$. For each student, q is the amount of knowledge embodied in him/her on the successful completion of schooling, which builds his/her human capital. Following Hanushek (1979), students' acquired knowledge defines 'school quality', therefore, in this model the output per student (q) measures school quality.

School quality is modelled as a major determinant of students' path, following Barnes (1999) who points out that students drop out of school if

they ‘fail to learn’. Thus, early exit rates can be expressed as $\theta = \theta(q)$, where $\partial\theta/\partial q < 0$ and $\partial^2\theta/\partial^2q > 0$. The accumulation of endowments in the economy depends on time of exit. Thus, the composition of the inflow of labour to the market are given by dL_z , $z = S, U$, skilled and unskilled labour as follows

$$dL_U = \theta E$$

$$dL_S = (1 - \theta) E$$

which determine endowment growth. Thus, the rate of endowment growth in the economy is given by $\hat{L}_z = dL_z/L_z$, where L_z corresponds to the stocks of factors.

2.2 Producers and households

There are two tradable sectors that use both factors; markets for goods and factors are competitive. All production functions are subject to constant returns to scale; in the long run equilibrium prices are equal to unit costs. There are two representative households: one that owns only unskilled labour and the other that owns only skilled labour. Households make a consumption-leisure choice, so that the total supply of labour is endogenous.

Household’s utility is an increasing function of consumption goods (a ‘composite consumption good’) and leisure time. In the model the same subscript associates households and factors: $z = S, U$ for skilled and unskilled, respectively. Let L_z be the stocks of units of labour of type z . H_z represents the units that the household chooses to work (so, leisure time is $R_z = L_z - H_z$), and C_z is a composite of consumption goods. Assuming a CES function, household’s utility is given by

$$U_z = (\alpha C_z^{\mu_z} + (1 - \alpha)(L_z - H_z)^{\mu_z})^{1/\mu_z}$$

where $\alpha > 0$, and the elasticity of substitution is $\sigma_z = 1/(1 - \mu_z)$, $\mu_z < 1$.

Consumers choose C_z and H_z to maximise utility subject to their budget constraint $P_{C_z} C_z = w_z H_z$, where w_z is the wage rate (after tax) for one unit of H_z and P_{C_z} is the price index of the composite consumption good

for household z (at consumer's prices). From the first order conditions, the optimal values for consumption and labour supply are given by

$$C_z = \frac{w_z}{P_{C_z}} \frac{\alpha_{C_z}^{\sigma_z} P_{C_z}^{1-\sigma_z}}{\alpha_{C_z}^{\sigma_z} P_{C_z}^{1-\sigma_z} + \alpha_{R_z}^{\sigma_z} w_z^{1-\sigma_z}} L_z \quad (1)$$

$$H_z = \frac{\alpha_{C_z}^{\sigma_z} P_{C_z}^{1-\sigma_z}}{\alpha_{C_z}^{\sigma_z} P_{C_z}^{1-\sigma_z} + \alpha_{R_z}^{\sigma_z} w_z^{1-\sigma_z}} L_z \quad (2)$$

From (1) and (2) the elasticities may be derived. The elasticity of labour supply with respect to the wage rate is $\eta_{H_z w_z} = (\sigma_z - 1)(L_z - H_z) / L_z$, which is positive provided $\sigma_z > 1$. The elasticity of consumption with respect to prices is given by $\eta_{C_z P_{C_z}} = -(\sigma_z(L_z - H_z) / L_z + H_z / L_z)$, which is negative.

3 Properties and policy implications

The production of skills may be hindered by inefficient education systems, which is the typical situation in developing countries where education quality is low. Thus, a government intervention consisting in an expansion of the educational budget could enhance the process of skill formation, according to the model, by allowing a higher resource intensity per student and thus a higher quality. This, in turn, improves the productivity of the activity in terms of graduates; then, the intervention would shift the composition of education output toward a higher share of skilled labour. However, financing this budget expansion with taxes will directly impact domestic relative prices and wages.

The economy's supply of skills is affected by real wages; this is so as totally differentiating (2), it results

$$\hat{H}_S = \eta_{H_S w_S} (\hat{w}_S / \hat{P}_{C_S}) + \hat{L}_S \quad (3)$$

Expression (3) shows that changes in skill supply are determined by changes in stocks (\hat{L}_S) and in real wages, depending on the elasticity of

labour supply to the wage rate. As long as $\eta_{H_s w_s} > 0$, a tax reform that reduces real wages will have a negative effect on skill supply.

Property 1: *The net effect of taxation and education output (for constant international prices) determines the ‘Rybczynski-type growth effect’ on productive sectors.*

The model merits the reinterpretation of the standard growth effects from changes in stocks of endowments (see Rybczynski, 1955). Expression (3) shows that changes in stocks –caused by education output– jointly considered with taxation, determine the effective supply of skills, and thus, the actual production possibilities.

Policy implication 1: *Given prices and taxes, a better performance in education activities leads to an increased skill supply and thus, the production possibilities for skill intensive sectors expands.*

Better systemic performance in education shifts the composition of the output towards a higher share of skilled labour; this target could be obtained by different policies, more or less effective and/or costly. When improvements are not (mainly) based on expanded funds (for instance, a new curriculum or teaching approach), then, the change in stock is equal to the change in factor supply. Thus, only in this case, education activities alone determine the standard Rybczynski effects; this can be seen in (3).

Policy implication 2: *‘Common sense rule’: Considering the economy as a whole, the government would engage in a tax reform intended to finance an increase in the economy’s availability of skills by enhancing education activities only if the expected expansion of endowments more than compensates the effects of taxation on factor supplies.*

It can be shown that factor supplies rise, recalling (3), when

$$\hat{L}_S > -\eta_{H_s w_s} (\hat{w}_S / \hat{P}_{C_S}) \quad (4)$$

A tax reform designed to enhance the education sector may undermine the expected benefits, by causing a fall in factor supply. A condition to avoid this situation is given in expression (4), thus this is a **sufficient condition** for a skill supply-enhancing government intervention.

4 Conclusions

A central feature of the model is that the accumulation of skills depends on the output of education, while the effective production possibilities also depend on individuals' decisions on allocation of time. It is shown that, in contrast to the standard approach, it is the net effect of prices, taxation, and education that determines the Rybczynski-type growth effects, which may help explain the lack of consensus in the empirical literature on education and growth.

An important aspect of the paper is that it allows the discussion of the general equilibrium effects of an expansion of education by means of some simple analytics. It is shown that the overall effects of enhancing education depend on how the government finances it. The analysis has policy implications for developing countries where skill formation is deficient, which may justify a government intervention to enhance the education sector. But, the risks of a skill supply-reducing government intervention are highlighted; so, in general, it would be convenient to follow a 'common sense rule': considering the economy as a whole, the government should engage in a tax reform oriented to expand the availability of skills by enhancing education, only if the expected 'production' of skills more than compensates for the negative effects of taxation on the supply. However, the analysis of real world cases would also require reliable estimates of parameters, which is beyond the scope of the paper.

Finally, the analysis also shows that any improvement in the efficiency / effectiveness of providing education not based on expansion of resources, as those coming from better organization of schools or teaching processes will unambiguously rise skills supply, expanding the production possibilities of skill intensive sectors, which highlights the importance of education policies.

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