

On the institutional limits to human capital

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ABSTRACT

Education as an investment has competitive investment assets to which is compared usually by the respective return rates, which crucially depend on institutional quality. High returns to education depend on education quality whereas returns to rent seeking are basically determined by the quality of economic institutions. To analyse the implications of these settings an extension of standard OLG models is designed to allow for rent seeking activities (when institutions are weak) as an alternative to invest in human capital, affecting long term growth. The analysis shows that in the long term the individual welfare maximising behaviour leads to stationary equilibrium where human capital accumulation stops: when rent seeking is present and/or individuals are impatient it is reached a long term equilibrium with lower levels of human capital.

Then, the pursuit of individuals' profits leads in the long term to an impoverished situation to individuals due to output level stagnation; from this, an immediate implication is that reducing incentives to rent seeking by enhancing institutional settings, becomes a close substitute to allocate more resources to education investment in the short term, an a more effective option in the long term.

Key words: institutions, human capital, development

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INTRODUCTION

According to Psacharopoulos and Patrinos (2004) returns to schooling in developing countries are significantly higher than in advanced countries; according to their data presented in Table 1 the private returns to higher education in the OECD are below the world average of 19% and

well below that in less developed countries as those in Africa where the return is as high as 27.8%.

Table 1. Returns to investment in education by level, full method, latest year, regional averages (%)

Region	Social			Private		
	Primary	Secondary	Higher	Primary	Secondary	Higher
Asia*	16.2	11.1	11.0	20.0	15.8	18.2
Europe/Middle East/North Africa*	15.6	9.7	9.9	13.8	13.6	18.8
Latin America/Caribbean	17.4	12.9	12.3	26.6	17.0	19.5
OECD	8.5	9.4	8.5	13.4	11.3	11.6
Sub-Saharan Africa	25.4	18.4	11.3	37.6	24.6	27.8
World	18.9	13.1	10.8	26.6	17.0	19.0

Source: Table A1.

*Non-OECD.

Source: Taken from Psacharopoulos and Patrinos (2004)

These differentials in returns also means differential in incentives to invest in education which may explain individuals' choices, as according to North (1991) *"In every system of exchange, economic actors have an incentive to invest their time, resources, and energy in knowledge and skills that will improve their material status."* Indeed, the available data show a higher response to higher returns to schooling across countries: during the period 2000-2010, according to Barro and Lee (2013) the share of the population with higher education in the OECD rose 15%, (below the world average growth of 26%), the Latin American region grew roughly at world average rates while Sub-Saharan Africa grew at a much higher rate of 34%; though, is this latter rate really "high"?

How responsive can we expect investor's decisions to be to the returns to education incentives? There is no straightforward answer, but elements to the decision will be individual's preferences, characteristics of the education system, and characteristics of the labour market. It also depends on the financial conditions, as individuals' budget constraints and the incentives structure given by the relative return of competing investment assets. The latter may vary significantly with the quality of economic institutions which have a direct impact on the returns on illicit/unethical behaviour, some extremes are highlighted by Pritchett (2001) quotation of an African president: *"Rent seeking in our (African) economies is not a more or less important phenomenon, as would be the case in most economies. It is the centrepiece of our economies. It is what defines and characterizes our economic life."*

In his pioneer works Gary Becker (1962) and (1968) built, respectively, the pillars to modern theory human capital theory and crime theory, though without discussing connections between them. More recent works, for instance by Usher (1996), Lochner (2004), Lochner and Moretti (2004), Buonnano and Leonida (2006) among others, have analysed the links between education (among other factors) and incentives to illicit or unethical behaviour, often related with their impact to economic growth, but it has not been common to discuss the mechanisms

underlying their interactions leading to desirable or undesirable outcomes on long term growth. The aim of these notes is to study the short and long term impacts of institutional quality on education and economic growth, with an approach that attempts to integrate research in the areas of institutions, crime, education and growth. It develops a stylised Overlapping Generation (OLG) model which allows broadening the scope of the analysis respect to previous literature, also providing a more structured background analysis for highly complex situations involving education, crime and long term growth.

This paper is organised as follows. Section 2 presents the theoretical framework. Section 3 develops the main features of the model. Section 4 provides some simulated examples. Section 5 concludes.

THEORETICAL FRAMEWORK

Institutions affect the determinants of the decision to invest in education at least at two levels: 1) within the education sector, affecting school quality; 2) partly outside the sector, affecting the profitability of competing unproductive investment assets.

In reference to the first point, even when difficult to assess and often unobservable, institutional aspects are key elements in students' performance, in particular, the Education for All Global Monitoring Report by Unesco (2009) states: *“Education is about much more than what happens in schools. Through education, societies inculcate their values and ideas, and equip their citizens with skills. (...) The aim of good governance in education, as in other areas, is to strengthen accountability and give people a voice in decisions that affect their lives so as to enable the delivery of good-quality services. Good governance is also about social justice and fairness. Education for all, as the term itself makes clear, is about all citizens enjoying an equal right to quality education.”* Indeed, there is increasing empirical evidence of the relevance of institutional aspects for better educational outcomes (e.g. OECD 2013, Wößmann et al. 2007; Wößmann 2003), however, the impacts of education quality on wages are more difficult to assess due to the lags between the schooling spell and the labour market experience and the empirical evidence is more scarce (some evidence is provided by Hanushek 2005, Wilson 2002, and Altonji and Dunn 1996).

With respect to the second point, according to Usher (1997): *“Education does more than teach skills to enhance one's capacity to earn income. It perpetuates the values of society, enculturates people to serve their communities, and promotes the virtues of hard work and honesty”* This leads to the broader literature more disperse and heterogeneous, that links quality of institutions and the economy. In a general sense, according to North (1991) *“Institutions provide the incentive structure of an economy; as that structure evolves, it shapes the direction of economic change towards growth, stagnation, or decline.”* But although the links between institutional aspects and economic performance are acknowledged in the literature, the direction of the causality is still not well established (for discussions with opposite conclusions, see for instance, Glaeser et al. 2004 versus Rodrik et al. 2004). The main contributions of this stream of literature come from interpretations of historical facts or from empirical evidence

and either the underlying links or mechanisms of transmission are seldom considered, thus the role of incentives to invest in education is at best hidden.

There is a more recent growing literature that focuses on the linkages relating institutional aspects and growth to human capital accumulation. For instance, Hall et al (2010) consider that the quality of institutions affects the productivity of human and physical capital, providing empirical evidence; in the same vein, Faruq and Taylor (2011) consider that the relevant impact on long term growth is from quality (rather than quantity) education, and they find evidence that quality of education have a larger impact on economic performance in countries with better institutions. Besides, a contribution from Dias and Tebaldi (2012) considers the microfoundations of the link between institutions and human capital; it provides an endogenous mechanism where the quality of institutions affects the effectiveness of the education sector by generating more productive educated workers, also affecting economic growth, and provide empirical evidence to support this theoretical framework.

This article follow this latter line of research, the aim of the paper is to develop an approach that makes explicit the links between institutional quality and education allowing to stretch both the scope and the horizon for the analysis of the decisions to investment in education and its implications for long term growth. To this purpose it is used a stylised extension of standard overlapping generation models that accommodates for a range of institutional settings. Contrary to previous models that only consider saving as an alternative to invest in education (e.g. Barham et al. 1995) it assumes that there is a competing investment assets socially unproductive (activities such as rent seeking) in the same line as Mauro and Carmesi (2007) although human capital do not enter explicitly into their model; it also shares the “spirit” of the study by Mehlum et al. (2005). It follows a similar interpretation of underlying links between institutions, human capital and growth that the one present in Hans et al. (2010) and Pritchett (2001), and somewhat more distant than that in Pecorino (1992) applied to trade success and lobbying activities.

The novelty of this paper is to consider as alternative to invest in education the possibility of profitable socially unproductive activities that crucially depends on institutional quality, affecting welfare and long term growth in a unified approach with a compact model. Although the disruptive effects of crime/rent-seeking on long term growth has been stressed in several articles, the approach in this paper aims to integrate those “results type” to the economics of education research and the growth literature, with a stylised model which allows to broad the scope of the analysis implications and policy recommendations. In the following two sections the model is described and discussed, follow by some examples.

THE MODEL

The modelling strategic considers explicitly the impact of rent seeking activities on building human capital and growth, which implies a step forward on the road from Bishop and Woßmann (2004) model stress the importance of institutional aspects affecting both the use of educational resources and the incentives to invest in education, however, they focus on the direction (sign) of the effect rather than the mechanism. This model is close to Dias and Te-

baldi (2012) but more concise with arguably an improved modelling of the investment in education decision where there is a clear role for rent-seeking in the incentives menu, thus with more intuitive implications.

An overlapping-generations model with agents living for two periods is used here, where a single final good is produced by means of a production function which utilizes human capital and unskilled labour as factors of production. Young Individuals invest resources in education that determines their human capital and income when old, in the second period the old work along the unskilled young.

In the model individuals are assumed to consider all possible investment alternatives available, education and rent seeking, where the relative return varies with the quality of institutions. The quality of institutions affects two elements in this investment decision, school quality, and the profitability of competing unproductive investment assets. Considering r_S as the return to schooling and r_R the return to rent seeking, pursuing education will be more attractive the lower is r_R/r_S . Considering that return to schooling is higher for better education institutions quality and return to rent seeking is lower for good quality institutions, Table 2 display all possible values of r_R/r_S :

Table 2

	r_S high	r_S low
r_R low	r_R/r_S low	Intermediate
r_R high	intermediate	r_R/r_S high

The best scenario is given by for strong institutions and good school quality and the worst one is for poor school quality and weak institutions. It can be argued (see for instance, Bjørnskov and Méon 2013) that good education quality and good economic institutions are correlated, and the model incorporates this assumption.

It is a two period life cycle model where people live two periods: they work in the first period and invest either in education or rent seeking. In the first period people invest either in education (buying books and study them to be able to get a future better paid job) or rent seeking (buying goods to give away as gifts/bribes expecting future monetary favours). The goods invested in education are embodied in individuals increasing human capital available for production in the second period. Then, goods invested in education increase human capital available for productive purposes in the second period, following the scheme shown in Figure 1.

Figure 1

N generations

$$\begin{aligned}
 &||\text{-----}l_1\text{-----}||\text{-----}h_2 = l_1x_1i_1\text{---}|| \text{ Gen 1} \\
 &||\text{-----}l_2\text{-----}||\text{-----}h_3 = l_2x_2i_2\text{-----}|| \text{ Gen 2} \\
 &||\text{-----}l_3\text{-----}||\text{-----}h_4 = l_3x_3i_3\text{-----}|| \text{ Gen 3}
 \end{aligned}$$

Consumers: Intertemporal additive consumer utility function is defined as $U(c_t, c_{t+1}) = U(c_t) + \beta U(c_{t+1})$, β is the discount factor $\beta = 1/(1 + \nu)$ where ν is the discount rate, and individuals budget constraint are given by:

$$\begin{aligned}
 c_t + i_t &= w_{Lt} \\
 c_{t+1} &= (1 + r_R)(1 - x_t)i_t + w_{St+1}h_{t+1}
 \end{aligned}$$

where c_t, c_{t+1} consumption in period t and t+1, w_{Lt} wage unskilled worker, w_{St} wage skilled labour, $R_R = (1 + r_R)$ is rent seeking return, l_t labour supply is fixed, $l_t = 1$ for all periods, i_t investment in two uncertain assets, $i_t x_t$ fraction invested in education (resources), $i_t(1 - x_t)$ fraction devoted to rent seeking.

Human capital accumulation is modelled as a direct function of resources, as it is “produced” by embodying resources in individuals. Following a human capital accumulation Cobb Douglas function it could be expressed as $h_{t+1} = A(x_t i_t)^\alpha l_t^{1-\alpha}$; a very simplified version of the education production function will be used instead, also considering $l_t = 1$, as follows:

$$h_{t+1} = x_t i_t \tag{1}$$

So, considering (1) the t+1 budget constraint can be re-written as $c_{t+1} = [(1 + r_R)(1 - x_t) + w_{St+1}x_t]i_t$, and using a logarithmic utility function the maximisation program can now be written as:

$$\text{Max } U(c_t, c_{t+1}) = \log c_t + \beta \log c_{t+1}$$

$$\text{s.t. } c_t + i_t = w_{Lt}$$

$$c_{t+1} = [(1 + r_R)(1 - x_t) + w_{St+1}]i_t$$

Then the optimal investment i_t is

$$i_t = \frac{\beta}{1 + \beta} w_{Lt} \tag{2}$$

Producers: There are two factors, skill and unskilled labour, that are used to produce one good (or various goods with the same technology). Firms act competitively hiring skilled labour to the point where marginal productivity equal wages as

$\pi_t = f(h_t) - w_{St}h_t - w_{Lt}$, with FOC: $\frac{\partial \pi_t}{\partial h_t} = f'(h_t) - w_{St} = 0$, then

$$f'(h_t) = w_{St} \quad (3)$$

$$f'(h_{t+1}) = w_{St+1}$$

In the long term equilibrium $\pi_t = 0$ so, also considering (3) results

$$\pi_t = f(h_t) - w_{St}h_t - w_{Lt} = f(h_t) - h_t f'(h_t) - w_{Lt} = 0$$

$$\text{Then } w_{Lt} = f(h_t) - h_t f'(h_t) \quad (4)$$

$$w_{Lt+1} = f(h_{t+1}) - h_{t+1} f'(h_{t+1})$$

Then recalling (2) and substituting the value of w_{Lt} found in (3) and (4), results

$$i_t = \frac{\beta}{1+\beta} [f(h_t) - h_t f'(h_t)] = 0 \quad (5)$$

Then, assuming a Cobb Douglas production function $f_t(h_t) = Ah_t^\alpha$, with ($L_t = 1$), the expression (5) becomes:

$$i_t = \frac{\beta}{1+\beta} (1-\alpha) Ah_t^\alpha \quad (5')$$

where $\partial i_t / \partial h_t > 0$ and $\partial^2 i_t / \partial h_t^2 < 0$

Goods market equilibrium: For goods market to be in equilibrium, in a closed economy, savings are to be equal to investment, which has been already modelled in individuals budget constraint as i_t . Though not all investment is accumulated as human capital: only a fraction x_t of investment i_t is destined to build human capital (education), it is assumed no attrition; the rest of the investment $1 - x_t$ is destined to rent seeking activities.

The expected return to the investment in education is

$$R_S = 1 + r_S = 1 + (w_{St+1} - w_{Lt+1}) / w_{Lt+1} \quad (6)$$

while the expected return to rent-seeking is given by $R_R = 1 + r_R$ which is constant over time (exogenous). The proportion x_t is assumed to be proportional to the expected return in each activity as

$$\frac{x_t}{1-x_t} = \frac{r_S}{r_R}$$

$$\text{So, } x_t = \frac{r_S}{r_S + r_R} \quad (7)$$

Using definition of r_S in (6) and substituting the values of w_{St} and w_{Lt} found in (3) and (4), all in (7) results

$$x_t = \frac{r_S}{r_S + r_R} = \frac{[(1 + h_{t+1})f'(h_{t+1}) - f(h_{t+1})]/[f(h_{t+1}) - h_{t+1}f'(h_{t+1})]}{[(1 + h_{t+1})f'(h_{t+1}) - f(h_{t+1})]/[f(h_{t+1}) - h_{t+1}f'(h_{t+1})] + r_R} \tag{7'}$$

Then, considering expression (1) in (7') results

$$\frac{h_{t+1}}{i_t} = \frac{[(1 + h_{t+1})f'(h_{t+1}) - f(h_{t+1})]/[f(h_{t+1}) - h_{t+1}f'(h_{t+1})]}{[(1 + h_{t+1})f'(h_{t+1}) - f(h_{t+1})]/[f(h_{t+1}) - h_{t+1}f'(h_{t+1})] + r_R} \tag{8}$$

Using Cobb Douglas production functions in (8) results in (8')

$$i_t = h_{t+1} \frac{[\alpha + (1 - \alpha)h_{t+1}(r_R - 1)]}{\alpha - (1 - \alpha)h_{t+1}} \tag{8'}$$

where $\partial i_t / \partial h_{t+1} > 0$ and $\partial^2 i_t / \partial^2 h_{t+1} < 0$

From (5') and (8') the expression $E(h_t, h_{t+1}) = 0$ results as

$E(h_t, h_{t+1}) = \frac{\beta}{1 + \beta} (1 - \alpha) A h_t^\alpha - h_{t+1} \frac{[\alpha + (1 - \alpha)h_{t+1}(r_R - 1)]}{\alpha - (1 - \alpha)h_{t+1}} = 0 \tag{9}$
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The level of the exogenous pure rent r_R is a key variable. Thus with this information it is possible to determine the optimal amount of resources to be consumed, devoted to education and rent seeking. The level of rent is variable with institutional settings, and it is an increasing function of institutional strength such as:

$$E(r_R) = 0 \text{ or minimum with strong institutions}$$

$$E(r_R) = 1 \text{ or maximum for weak institutions}$$

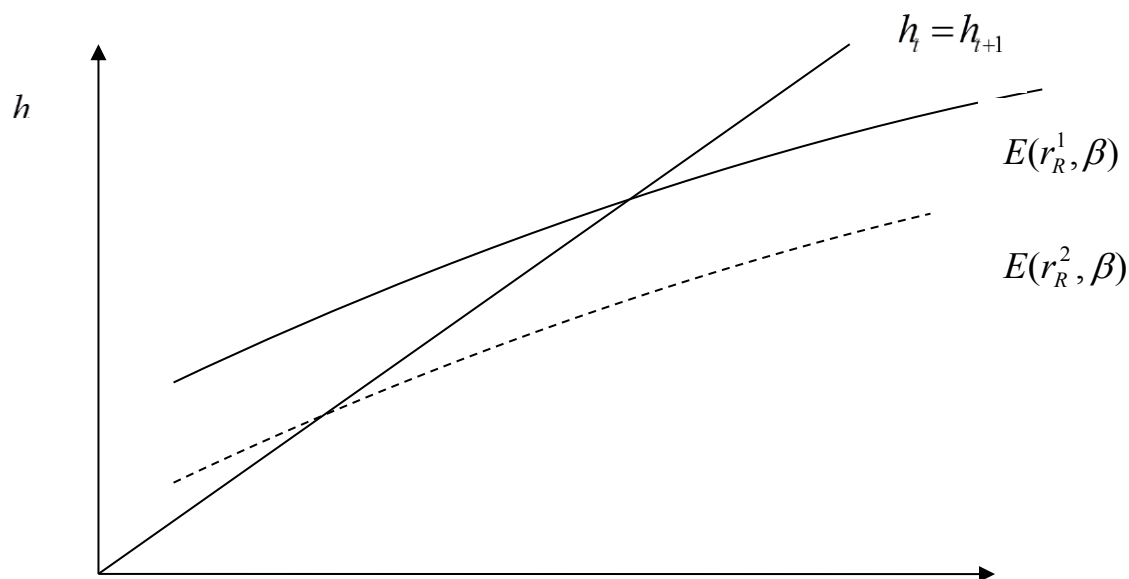
A suitable density function is $y = e^{-\lambda r_R}$ as $E(r_R) = 1/\lambda$ then

$$E(r_R) \text{ is maximum for } \lambda = 1, E(r_R) = 1$$

$$E(r_R) \text{ min } \lambda \rightarrow \infty, E(r_R) \rightarrow 0$$

It requires to identify λ from the available data.

Figure 2



The graphic representation of (9) is presented in Figure 2 considering that $dh_t / dh_{t-1} > 0$, along with the 45 degrees line representing the locus $h_t = h_{t+1}$. The curve represented on the plane h_t, h_{t+1} depends on institutional parameter r_R and preference parameter β (disregarding technical parameter α), which allows to determine a stationary equilibrium with no growth at the crossing point with the 45 degrees line. A steady-state equilibrium corresponds to a stationary point of the non linear difference equation (9). In equilibrium the human capital-unskilled labour remains constant; with no population growth this means that the stock of human capital remain constant.

The diagram shows that higher r_R leads to a lower stationary equilibrium; on the contrary, higher β (i.e. less impatience) to a higher one (not shown). The main implications are:

- The role of time horizon or discount rate in the preferences is a crucial contextual variable. Short-term-minded individuals are more incline to rapid profits, and more long-term horizon person will place greater value to future gains, there may be a reinforcing force to rent seeking activities.
- While higher returns increase the incentives to invest in education the returns to schooling shows diminish returns to scale so there is a reduction in the incentives to study coming from the rising attractiveness of competing asset. Increases in human capital stock reduces its return (according to 3) as it has diminishing returns, then it indirectly increase incentives to rent seeking and consequently reducing the share of investment in education in total investment. **This imposes the limits to human capital accumulation** in the model.
- Thus, the need to improve institutions overtime is apparent. This means constant need of improving institutions, as a way of maintain attractiveness of building human capital (i.e. low r_R/r_S). The level of rent seeking puts limits to the expansion of human capital, thus

could be related to poverty traps, though contrary to the propositions in the poverty traps literature where institutional settings do not allow the poor to leave poverty, in this case the **need of ever improving institutional settings**, even when they are set at initially reasonable good quality levels, is introduced.

EXAMPLE

When institutional quality deteriorates (r_R rises) long term output declines, the lower the decline the higher is the discount rate (lower β), as shown in Panel A of Table 3. But the interaction between the discount factor and institutional quality also impose limits to policy, as its potentiality differs widely across individuals' temporal preferences. According to Panel B of Table 3, when institutions are improved (r_R declines) the long term output increase only slightly in countries with low discount rates (high β), the response to the same policy for high discount rates amounts to almost 80%. Arguably, high discount rates are part of the explanation of the underdevelopment, which makes it a central part of any policy consideration.

Table 3

Panel A

β	0.5	0.5	0.9	0.9
r_R	0.01	0.1	0.01	0.1
h_T	10	9.23	10.05	9.58
output	635	591	638	611

Panel B

β	0.5	0.5	0.9	0.9
r_R	0.01	0.001	0.01	0.001
h_T	10	19.04	10.05	10.10
output	635	1141	638	641

CONCLUSIONS

Education is usually seen as an investment with long term economic and non-economic benefits, leading people to engage in studying efforts. But, how good can this be as an explanation of people's engagement in education? Are there substantial blockers to investments in education?

Education as an investment has competitive investment assets to which is compared usually by the respective return rates, that crucially depend on institutional quality. High returns to education depend on education quality whereas returns to rent seeking are basically determined

by the quality of economic institutions. To analyse the implications of these settings an extension of standard OLG models is designed to allow for rent seeking activities (when institutions are weak) as an alternative to invest in human capital, affecting long term growth. The analysis shows that **in the long term the individual welfare maximising behaviour leads to stationary equilibrium where human capital accumulation stops: when rent seeking is present and/or individuals are impatience it is reached a long term equilibrium with lower levels of human capital.** Then, the pursuit of individuals' profits leads in the long term to an impoverished situation to individuals due to output level stagnation; from this, an immediate implication is that reducing incentives to rent seeking by enhancing institutional settings, becomes a close substitute to allocate more resources to education investment in the short term, an a more effective option in the long term.

This approach shows that overlooking the real fact that agents are not always ethical and "law abiding"-minded, even if economically rational, undermines the potential of economic modeling and weakens the implications for policy analysis. This is relevant considering recent trends in education, as while education becomes increasingly universal it also becomes less profitable for individuals (relative to no schooling), so crime becomes relatively more attractive even when its profitability may remain the same, contrary to what might be expected for higher levels of education (e.g. Machin et al. 2011; Lochner 2004).

The analysis is also relevant for developing countries as institutions are given a central role in development, and particularly it has been stressed the role of impatience in developing countries as cause of underdevelopment. Time preferences are crucial when the competing activities have different time profile for rewards: while in education the cost are paid today expecting future rewards, in criminal activities the rewards are immediate and the costs are seen as distant. In developing countries increased access to education in their development path has indeed reduced returns to schooling, and this joint with high discount rates has dramatically increased the relative profitability of unproductive/illicit options. The associated dynamics may lead to long term economic decline, a "generalisation" of low growth equilibrium result in the poverty trap literature (e.g. Berti Ceroni 2001, Santos 2011), and this may help to explain economic decline in countries like Mexico and Argentina.

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