Minimum educational standard to complement taxation in the presence of hidden activities

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Abstract

This article advocates that a minimum educational standard could be an efficient complement to taxation in order to achieve an optimum level of education in developing countries characterised with a high degree of hidden activities. We propose an overlapping generations model in line with Glomm (97) in which two educational regimes are defined. In the private regime, the economy works without any government intervention. In the public regime, the government collects taxes to finance education and determines the tax rate taking into account that a child is a future parent. This is Pareto improving because an inter-temporal inefficiency naturally arises in this theoretical framework, altruism being imperfect. When we compare this tax rate with the private investment rate of education, the former is naturally optimal in the Pareto sense. However, knowing that a large part of workers in developing countries are working in the informal sector, the hypothesis of complete information on revenue by the government is not satisfying. In this case, we propose a second-best equilibrium where the public regime can dominate the private one if the governement imposes an educationnal minimum standard.

1 Introduction

Education is a fundamental element of economic and social development. It constitutes a means for directly increasing the welfare of the population as well as for stimulating economic growth. For this reason, education has always been considered as a priority by the governement even in the poorest countries. In the beginning of this decade, the Sub-Saharan African countries dedicated 4 percent of their G.D.P. on public spending on education. That is less than the OECDs countries (5 percent), but the same as Latin American countries (4 percent) and more than Asian countries (2 percent for South Asia and 3 percent for East Asia and the Pacific)[1]. Nevertheless, the rates of schooling are the weakest in Sub-Saharan Africa.

In this context, we have to consider the means that the government has in terms of educational policies to give incentives for children to go to school. In developing countries, governments face a more stringent budget constraint because, among others causes, there exists a large amount of informal activities which considerably lessen fiscal ressources.

We propose to show analytically that informal activities, which are a source of tax evasion, makes public education non optimal in terms of welfare even with the government taking into account the intergenerational efficiency of education. We show that to remedy this problem, the government should implement a minimal educational standard policy which offers better collective welfare than the private educational system.

To study this phenomenon in developing countries, we adopt an overlapping generations model with a representative agent. This model, taking into account the accumulation of capital, was introduced by Diamond (1965) from Samuelson (1958). Here we consider here the Glomm (1997) version who studies the consequences of the two educational regimes on economic growth. The model is based on the altruistic behavior of parents who are sensitive to the education of their children but imperfectly. In the case of the private education regime, parents determine the schooling duration and expenses for the education of their children. In order to do this, parents maximize their utility function under the family budget constraint which depends on the amount of time children devote to education. The empirical literature focused on employment in developing countries shows that parents and children tend to

[1] Source : World Development Indicators, 2007.

work together. Thus, we can assume that the specificity of their tasks makes their contribution to the family income imperfectly substitutable.

After the presentation of the assumptions of the model (section 2), we analyze, at the steady state, the welfare in the two educational regimes, according to different educative policies (section 3). Section 4 contains concluding remarks.

2 The model

We consider an overlapping generations economy in which individuals live for two periods and die at the end of the second period. In the second period of life, each individual gives birth to another so that the population remains constant over time. Each generation consists of a continum of agents. Population size is normalized to unity. Invidivuals are endowed with one unit of time. When young, the agents allocate this unit to schooling or to non - skilled labor activities. When old, individuals supply inelastically to skilled labor activities using their accumulated human capital from when they were young. In developing countries where "pays as you go" systems do not exist, an individual must work throughout thei entire lifetime. Therefore, models such that Barham and *alii* (1995), which assume an end of life period of non activity seem hardly realistic.

2.1 Technology of production, altruism and human capital

At each date t, there exists three goods in this economy : labor, human capital and a consumption good y_t produced whith constant returns to scale technology using the work of young and old individuals.

The parents allocate all their temporal endowment equal to 1, to labor. The children allocate their identical temporal endowment to labor and education. At the date t, technology depends on the human capital of the old h_t, accumulated when young at the previous date $t-1$ and available at the date t, and the fraction of time children allocate to labor, n_t. The children do not have any human capital because it is not immediately validated; it will only be in use the period after. These two types of labor being imperfectly

substituable, technology can be described by a Cobb-Douglas function:

$$y_t = h_t^{\eta} n_t^{1-\eta}$$

$0 < \eta < 1$.

Admittedly, the concept of intra-family division of labor does not mean that the activities of each are totally separated. In actuality, most of them overlap. In the case of developing countries and specifically in Madagascar, the informal sector is prominent. In Antananarivo, 59.5 percent of workers in 1997 belonged to the informal sector (Projet MADIO, 1997). The studies of dualism in the urban labor market show that the informal sector is formed by small domestic firms. As Pourcet (1995 page 202) showed, family members practice diverse complementary activities as a way to regularly and sufficiently finance the family budget. Consequently, children have to work with one of their parents and not independently. Most of the time, they will be hired as a household assistant or apprentice. In Senegal, apprentices represent almost 85 percent of the employed workers and are mostly hired within the family circle. Due to the high level of training labor demand, managers prefer to recruit their own children (Saïp Sy, 1994).

In the case of young people working and going to school, as assumed in the model, we can also infer that parents and children work together. The study of Roubaud (1994) concerning the informal sector in Mexico illustrates that schooling duration for the young poor often depends on their participation to the family production unit.

Hence we adopt a Cobb-Douglas domestic production function rather than a linear budget constraint which implies a perfect substitution between h_t and n_t as did Glomm (1997).

We assume that only old individuals consume the good by c_t, and finance the education of their children by e_t either privately or publicly through taxes. Parental preferences are defined by consumption goods and the future human capital of their children h_{t+1}. This reflects imperfect altruism from parents as it is assumed by Behrman et *al.* (1982) but also by Galor and Zeira (1993), Saint-Paul and Verdier (1993) and Epple and Romano (1998). This specification is simple and acknowledges that parents are concerned by the welfare of their children through specific criteria (such as education) while ignoring the situation of their descendants. These preferences are represented by a Cobb-Douglas function :

$$U_t(c_t, h_{t+1}) = c_t^{\alpha} h_{t+1}^{1-\alpha}$$

$0 < \alpha < 1$, where $1-\alpha$ denotes the degree of inter-generational altruism[2].

The human capital accumulated at date t for the later date h_{t+1} depends on human capital acquired by the previous generation h_t which does not deplete. It also depends on educational expenses e_t financed by parents alone (private regime) or by the government (public regime). Finally it depends on the fraction of time devoted to education $1 - n_t$. Human capital is accumulated according to the Cobb-Douglas learning technology :

$$h_{t+1} = \theta(1 - n_t)h_t^{\delta}e_t^{\gamma}$$

$\theta > 0$,
$0 \leq \delta, \gamma \leq 1$.

The parameter θ gives the efficiency of human capital. The duration of schooling $1 - n_t$ and the parental knowledge h_t are considered inputs of human capital accumulation corresponding to the field of growth theory and human capital. For example, Bénabou (1996) considers that childrens human capital is determined by that of the parents through at-home education. The assumption of a positive effect of schooling spending on human capital accumulation is less likely (Glomm, 1997, Glomm and Ravikumar, 1992).

2.2 The two education regimes

We make a distinction between two education regimes which is based on the presence or not of a government. In the private regime, we assume that there is no government, so parents have to enroll their children in private schools. In constrast, in the public regime, the supply of education is solely offered by public schools. The government is responsible for collecting taxes to finance education. We assume that the production technology of education is the same in the two regimes, consequently, for a given budget, public and private efficiency is identical.

In the private regime, the parents choose the schooling duration of their children $1 - n_t$ and the investment in education e_t in order to maximize the social welfare. Social welfare is defined here as the utility of a representative agent at the steady state.

[2]For a complete presentation see Gérard-Varet, L.A. , Kolm S.C. and J. Mercier Ythier (ed) (2000)

Revenue is separated into educational spending and consumption spending as follows:

$$e_t = y_t - c_t$$

We note that in the standard theory of human capital, exposed among others by Ben-Porath (1967), it is up to the individual to decide whether they invest for themselves in education depending on its anticipated rate of return. Nevertheless, for many reasons this individual decision is inadequate. On the one hand, in many African countries, the mean duration of schooling does not exceed that of primary level. So, as Glomm (1997) writes "(it seems logical) to assume that all schooling decisions are made by the old for the young and that the young have to passively accept these decisions". On the other hand, the decision of education implies a confrontation with two kinds of costs : the opportunity cost and the direct cost of eduction. Under the assumption of a perfect capital market, the young who do not have enough funds available can borrow. However in a developing country, this assumption is unrealistic : either banks refuse the loans due to the absence of collateral or they accept the loans, but with too high interest rates (Becker, 1975, 1981). Consequently, to finance education, children need parental funds.

We assume that, in the public regime, the government does not determine the schooling duration in the same way that parents do in the private regime. As the social planner, the government collects taxes at a uniform rate τ_t from the family income y_t[3] in order to maximize the social utility. In contrast to the parents, the government knows that a child is a future parent. It invests more than the parents to whom temporal horizons are limited to the following period. To determine τ_t, the government maximizes the representative agent utility at the steady state taking into account the intertemporal transmission of knowledge. This means that it must calculate the human capital at the steady state. However, in the public regime, when taxpayers under declare their revenue, the government faces a tax evasion phenomenon. Consequently, we shall study two cases with and without tax evasion in the public regime. Before we can do this, we must first describe the equilibrium in the private regime.

[3]It is easy to show that a personal income tax is equivalent to a consumption tax which is more common in Africa.

2.2.1 The private regime

Only households are present in the economy. At date t, parents solve the following problem :

$$\begin{aligned} Max_{n_t,e_t}\ U(c_t, h_{t+1}) &= c_t^{\alpha} h_{t+1}^{1-\alpha} \\ s/c\ y_t &= h_t^{\eta} n_t^{1-\eta} \\ c_t &= y_t - e_t \\ h_{t+1} &= \theta(1-n_t) h_t^{\delta} e_t^{\gamma} \end{aligned} \tag{1}$$

with $n_t \in [0,1], h_t > 0, c_t > 0, e_t > 0$.

For h_t given, the parental human capital only results from the schooling when young at date $(t-1)$, the equilibrium in the private education regime is defined by a set of sequences : $\{n_t\}_{t=0}^{+\infty}$, $\{e_t\}_{t=0}^{+\infty}$, $\{h_{t+1}\}_{t=0}^{+\infty}$.

The first order conditions lead to the following equations :

$$\begin{aligned} e_t &= \left(\frac{h_t}{n_t}\right)^{\eta} \left[\frac{n_t(1-\eta\alpha) - \alpha(1-\eta)}{1-\alpha}\right] \\ e_t &= \left(\frac{h_t}{n_t}\right)^{\eta} n_t \frac{\gamma(1-\alpha)}{\alpha + \gamma(1-\alpha)} \end{aligned} \tag{2}$$

Equalizing these two equations, we obtain the optimal level of work time n^* :

$$n_t^* = \frac{(1-\eta)[\alpha + \gamma(1-\alpha)]}{(1-\eta\alpha) + \gamma(1-\alpha)(1-\eta)}$$

Time devoted to work by the young is constant and independant of h, the parental stock of human capital. This means that the distribution of wealth among the population has no effect on the time allocation between school and work. Although this result seems questionable, it is frequent in economic literature [Lucas (1988) and Azariadis and Drazen (1992) among others].

$0 < n_t^* < 1$ confirms that parents want their children to study because of their altruism ($n_t^* < 1$). Moreover, because of the imperfect substituability of inputs in the domestic production function, not all of a child's time can be devoted to schooling ($n_t^* > 0$)[4].

Knowing n_t^*, we can infer that the optimal level of the education spending:

$$e_t^* = \frac{\gamma(1-\alpha)}{\alpha + \gamma(1-\alpha)} h_t^{\eta} n_t^{*(1-\eta)}$$

with $\frac{de_t}{dh_t} > 0$.

The more educated the parents, the more they spend on the edication of their children.This is the conclusion of Becker and Tomes (1976) which states that an increase of income should generate a relative increase of education spending for children.

With $y_t = h_t^{\eta} n_t^{1-\eta}$, the saving rate at the steady state in the private regime is :

$$s_t^* = \frac{e_t^*}{y_t^*} = \frac{\gamma(1-\alpha)}{\alpha + \gamma(1-\alpha)}$$

An increase in γ, the elasticity of school spending in the human capital accumulation function, will increase the optimal savings rate, which represents the part of income parents allocate to education spending. Similarly, an increase in $(1-\alpha)$, parental altruism, will increase the savings rate. In contrast δ, the elasticity of initial human capital has no effect. Parents do not internalize the external positive effect of inter-generational transfers of human capital although giving a better education to their children would contribute to improving the human capital of future descendants. In the public regime, however, the social planner takes into account the indirect inter-generational effect.

2.2.2 The public regime without tax evasion

In the public regime, all households enroll their children in public schools. The government collects income taxes which are used to finance schools with

[4]The decrease of income associated to the duration of schooling is an opportunity cost which negative effects on human capital investment have been highlighted by Schultz (1963).

a homogenous level of quality in terms of the functioning and construction of schools. The government budget is balanced and only devoted to education. In many works dedicated to public education, Saint-Paul and Verdier (1993), Fernandez and Rogerson (1995) and Epple and Romano (1996, 1998a et b) among others, education is financed by personal income taxes. This assumption seems unrealistic in developing countries where the personal income tax system is not developped (Bourguignon, 2000). Only the civil servants and the few modern sector employees are concerned by this tax. In these countries, tariffs represent the biggest part of government revenues, although taxation on consumption goods is becoming more and more significant[5]. There is no savings in the public regime, so it is equivalent to taxing revenue or consumption in our model.

The decision process is the following : first the parents decide the level of rule n depending on the tax rate, then the government decides the tax rate knowing this rule n.

In the first step, the households solve the following problem :

$$\begin{aligned} Max_{n_t}\ U(c_t, h_{t+1}) &= c_t^{\alpha} h_{t+1}^{1-\alpha} \\ s/c\ y_t &= h_t^{\eta} n_t^{1-\eta} \\ c_t &= (1-\tau) y_t \\ h_{t+1} &= \theta(1-n_t) h_t^{\delta} e_t^{\gamma} \end{aligned}$$

with $n_t \in [0,1]\,, h_t > 0, c_t > 0, e_t > 0$

For a given h_t, the equilibrium in the public regime is defined by the sequences $\{n_t\}_{t=0}^{+\infty}$, $\{h_{t+1}\}_{t=0}^{+\infty}$. The parents choose the fraction of time that children have to work $n^*$and, consequently, have to study $(1-n^*)$, for a given tax rate :

$$n_t^* = \frac{(1-\eta)\left[\alpha + \gamma\left(1-\alpha\right)\right]}{(1-\eta\alpha) + \gamma\left(1-\alpha\right)\left(1-\eta\right)}$$

We acknowledge that the utility function, the production function and the human capital accumulation function are log separable, that is the optimal

[5]For example, in Mali from 1995 to 2000, the part of the tax on consumption goods in the government ressources has grown from 25% to more than 40% (Gunther and al., 2007).

fractions of time devoted to work are identical in both regimes, private and public.

In the second step, given the duration of schooling $(1 - n^*)$, the government determines the optimal tax rate, which maximizes individual welfare at the steady state (the index t disappears). The individual solves the following problem :

$$\begin{aligned} & Max_\tau \ U(c,h) \\ s/c \ y &= h^\eta n^{1-\eta} \\ c &= (1-\tau)y \\ h &= (\theta(1-n)\tau^\gamma n^{(1-\eta)\gamma})^{\frac{1}{1-\delta-\gamma\eta}} \end{aligned}$$

The optimal tax rate is then :

$$\tau^* = \frac{\gamma\left(\eta\alpha + 1 - \alpha\right)}{\alpha\left(1-\delta\right) + \gamma\left(1-\alpha\right)}$$

It is worth comparing the effort required for education from the family in the private regime s^* with this tax rate τ^*. It appears without any ambiguity that $\tau^* > s^*$ which implies a sub-optimality in the private regime caused by an external factor. At the steady state, the public regime is better in terms of individual welfare.

Nevertheless, in African cities, 50 percent of the labor force is working in the informal sector. Therefore, the goverment does not know the totality of the resources available from population. The question then arises : does this tax evasion alter the welfare optimality of the public regime?

2.2.3 The two public regimes with tax evasion

Two cases are examined; each one refers to two different educative policies.

Case (a):

In the first case, the educative policy consists in financing education as before with the fiscal resources that the government collects.The size of the tax base, therefore, plays an important role. This tax base is underestimated

when households are working in the informal sector because they do not declare their informal income. The mean income declared to the government is $(1-p)y_t$, with p the rate of tax evasion. We assume, consequently, that consumption is not completely observable. In this first case (a), households continue to decide the duration of schooling for their children. $(1-n)$. They also have to determine their tax evasion rate equivalent to the portion of time they devote to informal activities. Thereafter, the government chooses the tax rate τ. The government knows that there exists an informal sector but does not know its size. We assume that they underestimate its size, so household income is assumed to be $(1-\overline{p})y$ with $\overline{p} < p$.

Households maximize their utility function with respect to n and p under the usual constraints :

$$\begin{aligned} Max_{n_t,p}\, U(c_t, h_{t+1}) &= c_t^{\alpha} h_{t+1}^{1-\alpha} \\ s/c\; y_t &= h_t^{\eta} n_t^{1-\eta} \\ c_t &= [1-\tau(1-p)]\, y_t \\ h_{t+1} &= \theta(1-n_t) h_t^{\delta} \left[\tau(1-p) y_t\right]^{\gamma} \end{aligned}$$

In our framework, the duration of work/schooling of children is not changed by fiscal evasion tax.

The evasion tax rate, endogeneously determined, is:

$$p^* = 1 - \frac{(1-\alpha)\,\gamma}{\tau\left[\alpha + \gamma\,(1-\alpha)\right]}$$

We observe that $(1-p^*)\,\tau = \frac{(1-\alpha)\gamma}{\tau[\alpha+\gamma(1-\alpha)]} = s^*$. The parental choice to work or not in the formal sector depends on their schooling spending. In fact, their choice leads to a level of tax exactly equal to the part of revenue they would devote to education in the private regime in which there is no government[6].

The government derives τ^* from the following problem :

[6] The optimal value of the evasion tax rate p does not depend on the timing of the game because it does not depend on τ.

$$\begin{aligned} & Max_{\tau}\ U(c,h) \\ s/c\ y &= (1-\overline{p})h^{\eta}n^{1-\eta} \\ c &= (1-\tau)y \\ h &= (\theta(1-n)(\tau(1-\overline{p}))^{\gamma}n^{(1-\eta)\gamma})^{\frac{1}{1-\delta-\gamma\eta}} \end{aligned}$$

The first order condition is the same whether or not there is tax evasion. The tax rate does not depend on either the governement's belief concerning the size of the informal sector $\overline{p}$ or on its real value p. This can possibly explain why households declare an official income such that the part of their effective income devoted to education is equal to the one in the private regime.

Case (b) :

In this second case, contrarily to the preceeding case, the educative policy is defined not only by the amount of official resources devoted to education but also by a mandatary duration of schooling. The government acts first and determines the optimal duration of schooling and the tax rate, with $\overline{p}$ given. The households then react and determine the real tax evasion rate p for n and τ given.

The government solves the following program :

$$\begin{aligned} & Max_{\tau,n}\ U(c,h) \\ s/c\ y &= (1-\overline{p})h^{\eta}n^{1-\eta} \\ c &= (1-\tau)y \\ h &= (\theta(1-n)(\tau(1-\overline{p}))^{\gamma}n^{(1-\eta)\gamma})^{\frac{1}{1-\delta-\gamma\eta}} \end{aligned}$$

The government ancipates a level of tax evasion $\overline{p}$, then it calculates the minimal standard of education $(1-\overline{n})$ while simultaneoulsy forming the tax rate $\overline{\tau}$. As the objective function is the same as before, the tax rate is also the same.

In constrast to the parents, the government takes into account the intergenerational transfer of human capital. Subsequently, it fixes a duration of schooling $\overline{n}$ different from that fixed by the parents in the private regime.

$$\overline{n} = \frac{(1-\eta)\left[\alpha(1-\delta-\eta\gamma)+\gamma\left(1-\alpha\right)\right]}{1+\alpha\eta\left[\delta-1+\gamma(\eta-1)\right]-\alpha\gamma}$$

The question now is to know whether or not $\overline{n}$ is greater than n^*. At first it is difficult to make the comparison, for this reason we use the first order condition for both cases.

In the private regime, n^* is determined by :

$$\begin{aligned} \frac{\partial U}{\partial n} &= 0 \\ &\Leftrightarrow \quad \frac{\alpha(1-\eta)}{n^*} = (1-\alpha)\left[\frac{1}{1-n^*} - \frac{(1-\eta)\gamma}{n^*}\right] \end{aligned}$$

And in the public regime with tax evasion (case b), $\overline{n}$ is defined by :

$$\begin{aligned} \frac{\partial U}{\partial n} &= 0 \\ &\Leftrightarrow \quad \frac{\alpha(1-\eta)}{\overline{n}} = \frac{(1-\alpha)}{1-\delta-\eta\gamma}\left[\frac{1}{1-\overline{n}} - \frac{(1-\eta)\gamma}{\overline{n}}\right] \end{aligned}$$

Assuming that $0 < (1-\delta-\eta\gamma) < 1$, we have $\frac{(1-\alpha)}{1-\delta-\eta\gamma} > (1-\alpha)$. The right-hand side of the equation is greater in the public regime with tax evasion. As a result, the left-hand side must also be greater in this public regime, which is only possible if $n^* > \overline{n}$. Thus, the government fixes a minimal standard of education $(1-\overline{n})$ higher than the one choosen by the parents. This result comes from the fact that n^* is determined by the parents for h_t given, without taking into account the positive externality arising from the term h_t^δ in the human capital accumulation function. Conversely in calculating $\overline{n}$ the government internalizes this positive effect.

Knowing $n^*$and τ^*, parents will then decide the effective level of tax evasion p. The household program is :

$$\begin{aligned} & Max_p\, U(c_t, h_t) \\ s/c\ y_t &= h_t^\eta n_t^{1-\eta} \\ c_t &= (1-\tau(1-p))y_t \\ h_{t+1} &= \theta(1-n_t)h_t^\delta(\tau(1-p)y_t)^\gamma \end{aligned}$$

It appears that the tax evasion rate is lower, implying a decrease in informal activity. We shall now compare the different equilibria in terms of welfare.

3 Comparison of both regimes, in terms of welfare, at the steady-state

Proposition 1 *Without tax evasion, the individual welfare is higher in the public regime than in the private regime*

Proof: This result is directly linked to the definition of the regimes, both private and public without tax evasion, and to optimal duration of schooling which is constant and identical in both regimes. This is due to the Cobb-Douglas formulation.

In the private regime, the optimal fraction of time children devote to work, is constant. We denote this fraction as $n^* = \frac{(1-\eta)(\alpha+\gamma(1-\alpha))}{(1-\eta\alpha)+\gamma(1-\alpha)(1-\eta)}$. The level of schooling expenses e^* is equal to $\frac{\gamma(1-\alpha)}{\alpha+\gamma(1-\alpha)}y_t$, which is a constant fraction of income denoted s^*.

In the public regime without tax evasion, the optimal fraction of time children devote to work selected by the parents is always n^*, however the tax rate τ^* choosen by the government is equal to $\frac{\gamma(\eta\alpha+1-\alpha)}{\alpha(1-\delta)+(1-\alpha)\gamma}$ which is greater than $\frac{\gamma(1-\alpha)}{\alpha+\gamma(1-\alpha)}$. As the government takes into account the externality of h_t^δ on human capital accumulation, the public saving rate is greater than the private one. At the equilibrium, the utility functions are the following.

In the private regime, $U = [(1-s)(h^\eta n^{*(1-\eta)})]^\alpha (h)^{1-\alpha} = (1-s)^\alpha h^{\eta\alpha+1-\alpha}\overline{n}^{(1-\eta)\alpha}$ with $h = s^{\frac{\gamma}{(1-\delta-\gamma\eta)}}[\theta(1-n^*)]^{\frac{1}{1-\delta-\gamma\eta}}\ n^{*(\frac{(1-\eta)\gamma}{1-\delta-\gamma\eta})}$.

So $U = (1-s)^\alpha s^{\frac{(1-\alpha+\alpha\eta)\gamma}{1-\delta-\gamma\eta}} f(n^*)$ with $f(n^*)$ a function of n^*, which is constant.

In the public regime without tax evasion, $U = (1-\tau)^\alpha \tau^{\frac{(1-\alpha+\alpha\eta)\gamma}{1-\delta-\gamma\eta}} f(n^*)$.

As $(1-\tau)^\alpha \tau^{\frac{(1-\alpha+\alpha\eta)\gamma}{1-\delta-\gamma\eta}} > (1-s)^\alpha s^{\frac{(1-\alpha+\alpha\eta)\gamma}{1-\delta-\gamma\eta}}$ because τ maximizes the function $g(x) = (1-x)^\alpha x^{\frac{(1-\alpha+\alpha\eta)\gamma}{1-\delta-\gamma\eta}}$, therefore welfare is greater in the public regime.□

Proposition 2 *In presence of optimal tax evasion, the levels of welfare are identical in both regimes, private and public.*

Proof: First we recall that the rate of taxation is the same whether or not there is tax evasion, whatever the beliefs of the government $\overline{p}$. Hence, the income y is replaced by $(1-\overline{p})y$. Being as the objective function is log-linear, the term $\log(1-\overline{p})$ disappears in the maximization. The duration of schooling decided by the parents remains identical to that of the private

regime. Lastly, we have shown that the household fixes its tax evasion rate in such manner that $s = (1-p)\tau$. Putting all this together, these three results lead to equality between the welfare in the public regime with tax evasion and that in the private regime which is equal to:

$U = [1-\tau(1-p)]^{\alpha}[\tau(1-p)]^{\frac{(1-\alpha+\alpha\eta)\gamma}{1-\delta-\gamma\eta}} f(n^*)$.

In terms of welfare, there is a perfect similarity between both regimes, public and private, whatever the belief of government $\overline{p}$.

Comment : We note that this equivalence property disappears if there are controlled fiscal costs or costs linked to conceal.

Proposition 3 *The level of welfare is higher in the public regime than in the private one when the government fixes the duration of schooling (case b).*

Proof : When the government chooses the duration of schooling, it internalizes the positive externality so that the utility is higher than the private one. □

4 Conclusion

We have presented an overlapping generation model to explore the idea that a minimum standard can be implemented in order to avoid the negative effect of tax evasion linked to informal activities. This educative policy allows an optimal level of education to be reached which is impossible to reach in either a private system where because the positive inter-generationnal externalities of human capital are underestimated or in a public regime where only the quality of education matters ignoring tax evasion.We would like to expand our results in case where there is more complementarity between the quality of education and duration of schooling.

5 Bibliography

Azariadis C. and Drazen A. (1990) : « Threshold Externalities in Economic Development », The Quaterly Journal of Economics, Vol.105, pp.501-526.

Barham V., Boadway R., Marchand M. et Pestieau P. (1995) : « Education and the poverty trap », European Economic Review, Vol.39, pp.1257-1275.

Becker G. (1975) : « Human Capital », New York, Columbia University Press for National Bureau of Economic Research.

Becker G. (1981) : « A Treatise on the Family », Cambridge : Harvard University Press.

Becker G.S. and Tomes N. (1976) : « Child Endowments and the Quantity and Quality of Children », Journal of Political Economy, Vol.84, n°4, pp.S143-S162.

Behrman J.R., Pollak R.A. and Taubman P. (1982) : « Parental Preferences and Provision for Progeny », Journal of Political Economy, Vol.90, n°1, pp.52-73.

Ben-Porath Y. (1967) : « The Production of Human Capital and the Life Cycle of Earnings», Journal of Political Economy, Vol.75, pp.352-365.

Bénabou R. (1996) : « Heterogeneity, Stratification, and Growth : Macroeconomic Implications of Community Structure and School Finance », American Economic Review, Vol.86, n°3, pp.584-609.

Bourguignon F. (2000) : « Redistribution et développement", in Conseil d'Analyse Economique, *Développemen*t, La documentation française, Paris, pp.11-42.

Diamond P. (1965) : « National Debt in a Neoclassical Growth Model », American Economic Review, Vol.55, n°5, pp.1126-1150.

Dupont V. (1996) : « Stratégies entrepreneuriales et rapports salariaux dans le secteur de la petite industrie textile en Inde de l'Ouest » dans « Profils d'entreprises au Sud. Les politiques de gestion face aux cultures et aux statuts » de R. Cabanes et B. Lautier, Karthala, Paris, pp.103-130.

Epple D. and Romano R.E. (1996a) : « Public Provision of Private Goods », Journal of Political Economy, Vol.104, n°1, pp.57-84.

Epple D. and Romano R.E. (1996b) : « Ends against the Middle : Determining Public Service Provision when there are Private Alternatives », Journal of Public Economics, Vol.62, pp.297-325.

Epple D. and Romano R.E. (1998) : « Competition Between Private and Public Schools, Vouchers, and Peer-Group Effects », American Economic Review, Vol.88, n°1, pp.33-62.

Fauré Y.A. (1994) : « Petits entrepreneurs de Côte d'Ivoire. Des professionnels en mal de développement », Karthala, Paris.

Fernandez R. and Rogerson R. (1995) : « On the Political Economy of Education Subsidies », Review of Economic Studies, Vol.62, pp.249-262.

Gérard-Varet, L.A. , Kolm S.C. and J. Mercier Ythier (ed) (2000) "The economics of reciprocity, giving and altruism" Palgrave Mac Millan.

Galor O. and Zeira J. (1993) : « Income Distribution and Macroeconomics », The Review of Economic Studies, Vol.60, n°202, pp.35-52.

Glomm G. (1997) : « Parental choice of human capital investment », Journal of Development Economics, Vol.53, pp.99-114.

Glomm G. and Ravikumar B. (1992) : « Public versus Private Investment in Human Capital : Endogenous Growth and Income Inequality », Journal of Political Economy, Vol.100, n°4, pp.819-833.

Gunther I., Marouani M-A. and Raffinot M. (2007) : « La croissance propauvres au Mali", Agence Française de Développement, Notes et Documents n°32.

Labazée P. (1995) : « Entreprises, promoteurs et rapports communautaires. Les logiques économiques de la gestion des liens sociaux » dans « Entreprises et entrepreneurs africains » de S. Ellis et Y.A. Fauré, Karthala - ORSTOM, Paris, pp.141-153.

Lucas R.E. (July 1988) : « On the Mechanics of Development Planning », Journal of Monetary Economics, Vol.22, n°1, pp.3-42.

Pourcet G. (1995) : « Instabilités et structuration du secteur informel » in Ph. Hugon, G. Pourcet et S. Quiers-Valette, « L'Afrique des incertitudes », IEDES, Collection Tiers-Monde, Presses Universitaires de France, Paris, pp.200-220.

Projet MADIO (1997a) : « L'emploi, le chômage et les conditions d'activité dans l'agglomération d'Antananarivo. Premiers résultats de l'enquête emploi 1997 », Etude MADIO n°9728/E, Juin.

Roubaud F. (1994) : « L'économie informelle au Mexique. De la sphère domestique à la dynamique macro-économique », Karthala – ORSTOM, Paris.

Sadoulet E. et de Janvry A. (1995) : « Quantitative Development Policy Analysis », The John Hopkins University Press, Baltimore.

Saint-Paul G. and Verdier T. (1993) : « Education, Democracy and Growth », Journal of Development Economics, Vol.42, pp.399-407.

Saïp Sy O. (1994) : « Des entrepreneurs omniprésents : le secteur informel à la rescousse de l'économie sénégalaise » dans « Entrepreneurs du Tiers-Monde », de Ph. Béraud et J.L. Perrault, Editions Maisonneuve et Larose et Les Editions de l'Orient, Série Economies en Développement.

Samuelson P.A. (1958) : « An Exact Consumption-Loan Model of Interest with ou without the Social Contrivance of Money », Journal of Political Economy, Vol.66, n°6, pp.467-482.

Schneider F. (2006) : "Shadow Economies and Corruption all over the World: What do we really know?", Paper to be presented at the Conference "Research on the Informal Economy", CRIMPREV Workpackage 5, Buxton, Derbyshire, 20-22 September.

Schultz T.W. (1963) : « The Economic Value of Education », Columbia University Press, New York.

Stiglitz J.E. (1974) : « The Demand for Education in Public and Private School Systems », Journal of Public Economics, Vol.3, n°4, pp.349-385.