E C O N O M I C S   B U L L E T I N

Human capital and growth under political uncertainty

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Abstract

In this paper we show how political uncertainty may impede economic growth by reducing public investment in the formation of human capital, and how this negative effect of political uncertainty can be offset by a government contract. We present a model of growth with accumulation of human capital and government investment in education. We show that in a country with an unstable political system the government is reluctant to invest in human capital. Low government spending on education negatively affects productivity and slows growth. Furthermore, a politically unstable economy may be trapped in a stagnant equilibrium. We also demonstrate the role of a government retirement contract. Public investment in education and economic growth are higher when the future retirement compensation of the government depends on the future national income, in comparison with investment under zero or fixed retirement compensation.

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1 Introduction

There is a considerable literature highlighting the role of human capital in the process of economic growth. The literature also highlights the deleterious effect of political instability on growth. In this paper we integrate these two ideas. We argue that an increase in political instability leads governments to invest less in infrastructure that supports human capital accumulation and thereby lowers economic growth. We also investigate public retirement compensation schemes that may alleviate the growth-reducing effect of instability.

The idea of using human capital accumulation to sustain growth goes back to the early 1960s (e.g. Schultz (1961)) and was developed by Lucas (1988), Stokey (1991), and others. One strand of these models features positive externalities to human capital or ideas, leading to too little growth in the absence of government intervention. Such externalities call for governmental actions, such as taxation, maintenance of law and order, provision of infrastructure services, protection of intellectual property rights, and regulation of international trade, financial markets, and other aspects of the economy. The government therefore has great potential for good or ill through its influence on the long-term rate of growth[1].

Recently, economists have begun to study the influence of government spending on consumption-savings decisions in models allowing the possibility of persistent growth. These studies have significant policy implications since government expenditures in dynamic general equilibrium models may influence long-run growth rates and welfare. In a meta-analysis of the empirical literature on the effect of fiscal policies on growth by Nijkamp and Poot (2004) government investment in education was found to be a significant factor in most of the studies. A negative relationship between growth and government instability has been found in many empirical studies (see a survey by Brunetti (1997)). Political instability may affect the economic growth of a country through various channels. The basic idea is that when the probability of losing office is high, the government has little incentive to commit itself to an activity with a long-run outcome and, hence, chooses policies that are not Pareto-efficient. For example, Hopenhayn and Muniagurria (1996) find that the lack of persistence in policies (government subsidies to investment) per se need not be welfare reducing but that it is likely to decrease growth. Darby et al. (2004), using a political economy model in an endogenous growth context, demonstrate that the existence of political uncertainty regarding re-election tends to reduce the amount of public investment by incumbent governments and underlies a switch from government investment to government consumption, thereby reducing growth. The authors find empirical support for this hypothesis using panel data for OECD. As shown by Gersbach (2004), inefficient decision making by short-term politicians can be alleviated by offering incentive contracts to politicians which become effective upon re-election.

In this paper we follow the approach of Glomm and Ravikumar (1997) in which the human capital component of the labour input in production is affected by public spending on

[1]A recent survey by Temple (1999) of the empirical literature on growth and its factors suggests that the accumulation of human capital is not a sufficient condition for growth: "*...a key challenge is to elicit the conditions in which expanding education is most beneficial*" (Temple (1999), p.140)

education.[2] We show how political uncertainty may impede economic growth by reducing public investment in the formation of human capital, and how this negative effect of political uncertainty can be offset by a government contract. Public investment in education and economic growth is higher when the future retirement compensation of the government depends on future national income, in comparison with investment under zero or fixed retirement compensation.

2 Model

Consider a Lucas-Uzawa type economy, in which the growth of per capita income is driven by accumulation of human capital. Production is linear in its single input, human capital. The output is taxed at rate τ. Net of tax output is consumed by private consumers. A fraction ω of tax revenues is invested in human capital (education), and the rest is consumed by the government. The population is constant and normalized to one. In every period one available unit of time is allocated between education (e) and production ($1-e$). There are two governments that randomly alternate in office. In every time period the incumbent government faces an exogenous probability π of being voted out and replaced by its competitor. For simplicity we assume that the two governments are identical, and π is the same for both governments and constant over time. At the beginning of time period t the incumbent government chooses ω_t to maximize the welfare function. The welfare function of the current government is the discounted stream of weighted sums of the utilities of private consumption and government consumption. When not in power the ex-government derives utility from retirement compensation. We will consider different cases for this "retirement" welfare and discuss the implications.

Here we will focus on the effect of political uncertainty on the investment decision, assuming that the tax rate and time allocation are fixed exogenously (the model easily extends to endogenous choice of τ and e, without affecting the main results). At the beginning of period t the only state variable is the current aggregate level of human capital in the economy, H_t. The level of human capital in the next period, H_{t+1}, is a function of H_t and government spending on education, E_t. There is no depreciation, so the law of motion of human capital is, therefore,

$$H_{t+1} = H_t + h(E_t, H_t) \tag{1}$$

Similar to Glomm and Ravikumar (1997) we assume the following form for the production function of human capital:

$$h(E_t, H_t) = \gamma e H_t^{\delta} E_t^{1-\delta} \tag{2}$$

[2] Blankenau and Simpson (2004) show, in the framework of an overlapping-generations model of growth, that the response of growth to public education expenditures may be nonmonotonic, depending on the level of government spending, the tax structure and the parameters of production technologies.

with $0 \leq \delta \leq 1$. The production function for the consumption good is

$$Y_t = A(1-e)H_t \tag{3}$$

Here, γ and A are the productivities in the education and production sectors, respectively.

The Bellman equation for the value function V_t of the government in power at the beginning of period t is

$$V_t = \max_{\omega_t} \left\{ \mu U(C_t^g) + (1-\mu)U(C_t^p) + \beta \left[(1-\pi)V_{t+1} + \pi W_{t+1} \right] \right\} \tag{4}$$

Here, μ is the relative weight the government puts on its own consumption (a measure of the government's "selfishness"), β is the time discount factor, $U(C_t^g)$ and $U(C_t^p)$ are utilities derived by the government from its own consumption and private consumption, respectively, and W is.the value function of the ex-government. The equation for the latter is:

$$W_t = U(R_t) + \beta \left[\pi V_{t+1} + (1-\pi)W_{t+1} \right].$$

This difference equation can be solved for W as

$$W_t = \sum_{k=0}^{\infty} \left[\beta(1-\pi) \right]^k \left[U(R_{t+k}) + \beta\pi V_{t+1+k} \right].$$

Using this in (4) we obtain

$$\begin{aligned} V_t &= \max_{\omega_t} \{ \mu U(C_t^g) + (1-\mu)U(C_t^p) \\ &\quad + \beta \left[(1-\pi)V_{t+1} + \pi \sum_{k=0}^{\infty} \left[\beta(1-\pi) \right]^k \left[U(R_{t+1+k}) + \beta\pi V_{t+2+k} \right] \right] \}. \end{aligned} \tag{5}$$

Two cases will be considered: (1) the retirement income is zero or constant and (2) the retirement income is a fixed positive share of the national income in each period in the future, $R_t = \epsilon Y_t$, $\epsilon > 0$.

The optimal investment maximizes the welfare function subject to the resource and technology constraints. Using the dynamic programming approach we solve (5) subject to (1)–(3), where $C_t^g = (1-\omega_t)\tau Y_t$, $C_t^p + R_t = (1-\tau)Y_t$, and $E_t = \omega_t \tau Y_t$. With a concave utility function and linear constraints, the objective function is concave, and the first-order condition is necessary and sufficient for the solution of the optimization problem:

$$\begin{aligned} 0 &= \frac{dV_t}{d\omega_t} = -\mu U'(C_t^g)\tau Y_t + \beta(1-\pi)\frac{\partial V_{t+1}}{\partial H_{t+1}}\frac{dH_{t+1}}{d\omega_t} \\ &\quad + \beta\pi \sum_{k=0}^{\infty} \left[\beta(1-\pi) \right]^k \left[U'(R_{t+1+k})\frac{dR_{t+1+k}}{d\omega_t} + \beta\pi \frac{\partial V_{t+2+k}}{\partial H_{t+2+k}}\frac{dH_{t+2+k}}{d\omega_t} \right] \end{aligned} \tag{6}$$

Since the governments are identical, they make the same choice, and so the economy converges to a balanced growth path, along which $\omega_t = \omega$ is constant, and per capita income and consumption grow at a constant rate, equal to the rate of growth of human capital,

$$g = \gamma e \left[\omega \tau A \left(1-e\right)\right]\right)^{1-\delta}. \tag{7}$$

We will focus on the balanced growth path solution. Along the balanced growth path $H_{t+1} = H_t(1+g)$ and, therefore,

$$\frac{dH_{t+1}}{d\omega} = H_t \frac{dg}{d\omega} = H_t(1-\delta)\frac{g}{\omega}.$$

Finally, $\dfrac{\partial V_{t+i}}{\partial H_{t+i}}$ is obtained by differentiating V_t in the Bellman equation (5) with respect to H_t and iterating i periods forward.

2.1 Zero or fixed retirement compensation.

If the retirement payment is zero or a constant , $\dfrac{dR_t}{d\omega} = 0$, and (6) after some manipulations becomes

$$\begin{aligned}
\frac{\omega}{\beta(1-\delta)g}\frac{U'(C_t^g)}{U'(C_{t+1}^g)} &= (1-\pi)\left(1-\omega+\frac{1-\mu}{\mu}\frac{1-\tau}{\tau}\frac{U'(C_{t+1}^p)}{U'(C_{t+1}^g)}\right) \\
&\quad +\pi\sum_{k=0}^{\infty}\left[\beta(1-\pi)\right]^k \beta\pi\left(1+g\right)\left(k+2\right) \\
&\quad \times\left[(1-\omega)\frac{U'(C_{t+2+k}^g)}{U'(C_{t+1}^g)}+\frac{1-\mu}{\mu}\frac{1-\tau}{\tau}\frac{U'(C_{t+2+k}^p)}{U'(C_{t+1}^g)}\right]
\end{aligned} \tag{8}$$

Assuming a CES utility

$$U(C) = \frac{C^{1-\sigma}-1}{1-\sigma}, \quad \sigma > 0,$$

we rewrite (8) as

$$\frac{\omega(1+g)^{\sigma}}{\beta(1-\delta)g} = \left[1-\omega+\frac{1-\mu}{\mu}\left(\frac{1-\tau}{\tau}\right)^{1-\sigma}(1-\omega)^{\sigma}\right]F\left(\pi;\sigma\right) \tag{9}$$

where

$$F\left(\pi;\sigma\right) = 1-\pi+\beta\pi^2\left(1+g\right)^{1-\sigma}\frac{2-\beta\left(1-\pi\right)\left(1+g\right)^{1-\sigma}}{\left[1-\beta\left(1-\pi\right)\left(1+g\right)^{1-\sigma}\right]^2}. \tag{10}$$

assuming $\beta(1-\pi)(1+g)^{1-\sigma} < 1$ and $R_t/C_t^p \ll 1$. Equations (9)-(10) can be further simplified for logarithmic utility ($\sigma = 1$) and a production function of human capital that is linear in public investment in education ($\delta = 0$):

$$\frac{1+\xi\omega}{1-\omega} = \frac{\beta\xi}{\mu}F(\pi),$$

where $\xi = \gamma(1-e)\tau Ae$ and

$$F(\pi) \equiv F(\pi;1) = 1 - \pi + \beta\pi^2 \frac{2-\beta(1-\pi)}{[1-\beta(1-\pi)]^2}. \tag{11}$$

Hence the optimal investment in education is defined by

$$\omega_0 = \max\left\{0, \frac{F(\pi)\beta/\mu - \xi^{-1}}{F(\pi)\beta/\mu + 1}\right\}. \tag{12}$$

In Fig. 1 ω_0 is plotted as a function of π for $\mu = 1/2$, $\beta = 1/3$, and $\xi = 2.0; 2.2; 2.4$.[3] The optimal government spending in education, and, therefore, the growth rate in the economy is lower, the higher is the degree of political uncertainty π, the lower are the productivities γ and A in human capital and consumption good sectors, and the higher is the government's "selfishness" μ. Furthermore, if the degree of political uncertainty exceeds a threshold π_0 determined by $F(\pi_0) = \mu/(\beta\xi)$, government investment in education is zero, and the economy falls into stagnation ($g = 0$). This threshold is lower (no growth even in a relatively stable political environment), the higher is the degree of the government's "selfishness" (μ), the lower weight it puts on future welfare (β), and the lower is the level of technology in either sector (A and γ). When production function of human capital has diminishing returns to investment (δ between 0 and 1), for every level of investment the growth rate is lower compared to the linear case. The optimal investment is then lower, the more the government discounts future income, so that the negative effect of political uncertainty remains.

2.2 Government contract.

As we have seen above, political uncertainty and the possibility of losing power in the future induces the government to consume more and invest less in the present, which can slow down economic growth. One way to reduce this barrier to growth is to enter a contract with the government, under which the compensation to an ex-government is tied to future national income.[4] Assuming $R_t = \epsilon Y_t$, upon substitution and some manipulations, the Euler equation

[3] Assuming 5-year time between elections, these parameter values correspond to annual discount factor of about 0.8 and annual growth rate of about 2 to 4 per cent.

[4] This is to some extent similar to the theory of executive compensation. E.g., McConaughy and Mishra (1997) show that managers of the firms with abundant growth opportunities tend to underinvest in available growth opportunities; this effect can be offset by increased long-term pay-performance sensitivity.

for the problem becomes:

$$
\begin{aligned}
&\frac{\omega}{\beta(1-\delta)g}\frac{U'(C_t^g)}{U'(C_{t+1}^g)} \\
= \;& (1-\pi)\left(1-\omega+\frac{1-\mu}{\mu}\frac{1-\tau-\epsilon}{\tau}\frac{U'(C_{t+1}^p)}{U'(C_{t+1}^g)}+\beta\pi\frac{(1+g)\,\epsilon}{\mu\tau}\sum_{k=0}^{\infty}[\beta(1-\pi)]^k\frac{U'(R_{t+2+k}^g)}{U'(C_{t+1}^g)}\right) \\
& +\pi\sum_{k=0}^{\infty}[\beta(1-\pi)]^k\left((k+1)\,\frac{\epsilon}{\mu\tau}\frac{U'(R_{t+1+k}^g)}{U'(C_{t+1}^g)}+\beta\pi\,(1+g)\,(k+2)\right. \\
& \qquad\times\left[(1-\omega)\,\frac{U'(C_{t+2+k}^g)}{U'(C_{t+1}^g)}+\frac{1-\mu}{\mu}\frac{1-\tau-\epsilon}{\tau}\frac{U'(C_{t+2+k}^p)}{U'(C_{t+1}^g)}\right. \\
& \qquad\left.\left.+\beta\pi\frac{(1+g)\,\epsilon}{\mu\tau}\sum_{j=0}^{\infty}[\beta(1-\pi)]^j\,\frac{U'(R_{t+1+k+2+j}^g)}{U'(C_{t+1}^g)}\right]\right)
\end{aligned}
\tag{13}
$$

With CES utility this can be rewritten as

$$
\begin{aligned}
\frac{\omega(1+g)^\sigma}{\beta(1-\delta)g} \;=\; & \left[1-\omega+\frac{1-\mu}{\mu}\left(\frac{1-\tau-\epsilon}{\tau}\right)^{1-\sigma}(1-\omega)^\sigma\right]F\left(\pi;\sigma\right) \\
& +\frac{\beta\pi}{\mu}\frac{(1-\omega)^\sigma}{1-\beta\left(1-\pi\right)\left(1+g\right)^{1-\sigma}}\left(\frac{\epsilon}{\tau}\right)^{1-\sigma}\left(F\left(\pi;\sigma\right)+\frac{\pi/\beta}{1-\beta\left(1-\pi\right)\left(1+g\right)^{1-\sigma}}\right)
\end{aligned}
$$

with $F\left(\pi;\sigma\right)$ given by (10). For $\sigma=1$ and $\delta=0$ this simplifies to

$$
\frac{1+\xi\omega}{1-\omega}=\frac{\beta\xi}{\mu}F^*(\pi)\left[\left(1+\theta_1\left(\pi\right)\right)+\theta_2\left(\pi\right)\right] \tag{14}
$$

where

$$
F^*(\pi)=F(\pi)\left(1+\frac{\beta\pi}{1-\beta\left(1-\pi\right)}\right)+\left(\frac{\pi}{1-\beta\left(1-\pi\right)}\right)^2,
$$

and $F(\pi)$ given by (11). Then for the optimal investment in education we obtain

$$
\omega_0^*=\max\left\{0,\frac{\beta F^*(\pi)/\mu-\xi^{-1}}{\beta F^*(\pi)/\mu+1}\right\}. \tag{15}
$$

Clearly, $\omega_0^*>\omega_0$ for any π, since $F^*(\pi)>F(\pi)$. When the retirement compensation is proportional to future national income, for any given level of political uncertainty government investment in education is higher. The same holds for the threshold probability (if the threshold occurs). In fact, the sign of $\partial\omega_0^*/\partial\pi$ may even reverse as π increases. This is shown in Fig. 2. Note that for log utility the optimal investment and threshold probability do not depend on ϵ; this is not the case for $\sigma\neq 1$. This is the result of the interaction of substitution and income effects. For $\sigma > 1$ the substitution effect dominates: if the present government contracts to get a higher share of national income when out of office in the future, it will tend to increase future output by investing more in the present. Similarly, for $\sigma < 1$ the income effect dominates, and the situation is reversed. For log utility, $\sigma = 1$, the two effects cancel each other.

3 Concluding remarks

In this paper we considered a model of endogenous growth driven by accumulation of human capital in an economy under political uncertainty. We showed that the deteriorating effect of the political uncertainty on the government's decision on investment in public education can be mitigated by the government retirement contract. We are to date unaware of such institutional arrangements: as a rule, the government retirement compensation is fixed. For example, the severance payment for the member of the UK Cabinet of Ministers is determined as three months final salary. As noted by Gersbach and Kleinschmidt (2004), incentive contracts for politicians are not in use in modern democracies.

As an alternative (or in addition) to the government contract, one could model the probability of losing office as a (decreasing) function of the private consumption in the previous period. Under this assumption higher investment in education, and, hence, higher income and private consumption improves the chances of staying in office. The trade-off here is, again, between present and future government consumption. The solution is complicated, however, by the problem of time-inconsistency of the government investment decision.

There is also a possibility of private investment in education. However, as long as investment in education has positive externalities, it will be undersupplied, and public investment will still play an important role. Furthermore, private decision on investment in education can be deteriorated by redistributive taxation (Boadway et al. (1996)). Inclusion of private investment in the model is not likely to affect the main conclusion regarding public investment, as political instability invariably distorts long-term decisions.

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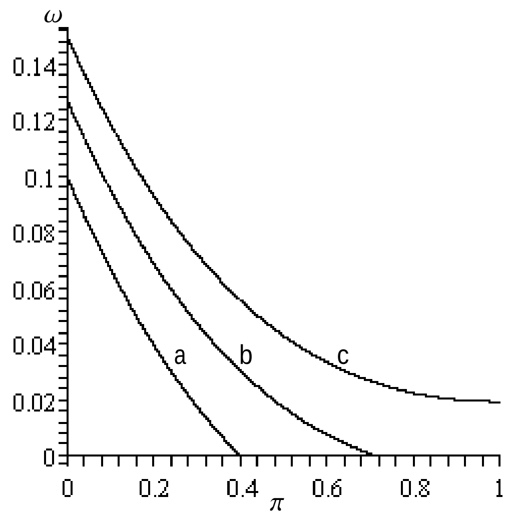

Figure 1: Investment without government contract: $\mu = 1/2$, $\beta = 1/3$, $\xi = 2.0(a); 2.2(b); 2.4(c)$.

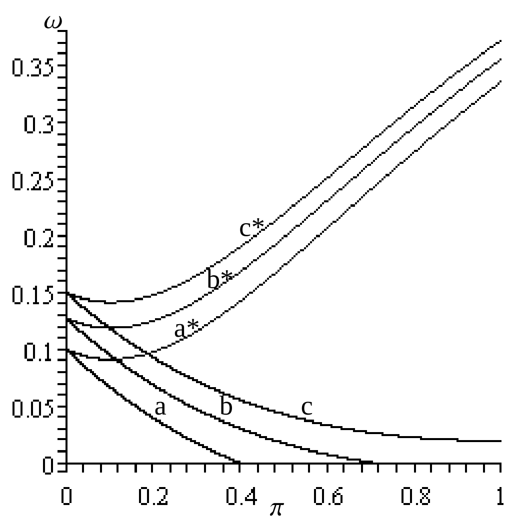

Figure 2: Investment without and with government contract: $\mu = 1/2$, $\beta = 1/3$, $\xi = 2.0$(a, a*); 2.2(b, b*); 2.4(c, c*).