A joint Initiative of Ludwig-Maximilians-Universität and Ifo Institute for Economic Research

Venice Summer Institute 2006

Perspectives on the Performance of the Continent's Economies

21 - 22 July 2006

Venice International University, San Servolo

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Preliminary version, 28 June 2006.
Perspectives on the Performance of the Continent's Economies
Joint Conference of CESifo and Center on Capitalism and Society

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This paper has the objective of providing a summary of some of the explanations proposed for the disappointing economic performance of many continental European economies. These will then be tested using data for the OECD countries. While this paper presents several departures, which by themselves are of interest, the goal specific to this paper is to investigate the degree to which the growth problem that has become manifest on the Continent can be ascribed to market forces or perhaps endowments rather than to a hypothesized deficiency in the dynamism of its system of economic institutions or its economic culture. To reach that goal, however, it is necessary to imbed the hypothesised market forces in a model that at the same time gives expression to the alternative hypotheses of innovational disabilities, disincentives and barriers.

The picture of growth drawn here is one of genuine innovations taking place in leading firms in different countries and these innovations then spreading to other domestic and foreign firms. I depart from standard endogenous growth models in emphasising the generation of new business ideas and the adoption of ideas generated elsewhere. In doing so, I leave out technical inventions such as the discovery of new and better inputs. This is not meant to diminish the role of such inventions but to emphasise that ideas about new applications of existing, technology – whether new or old – play a crucial role in economic growth. In contrast technological breakthroughs occur infrequently in discrete jumps while business ideas are generated continuously, some stillborn while others raise productivity and improve welfare. The ability to screen ideas and weed out bad ones is central to the functioning of a dynamic capitalist economy.

Another departure from the endogenous growth literature is to assume that genuinely original ideas may not require much input – in the form of labour or capital – on behalf of the entrepreneur. Instead, individuals have different intuitions about how the world works and which ideas are likely to generate profits. We can refer to this individual-specific attribute as "latent knowledge" reflecting the accumulated experience, education, and lessons learned by individuals, as well as personal attributes and the quality and perspectives of his or her social circles. It follows that the generation of new ideas cannot be described by a production function with fixed and known probabilities of success. Instead, ideas sometimes come without much effort and most often have an unknown probability of success; carry uncertainty in the Knightian sense. In contrast, the adoption of ideas is less risky but may require individuals with certain skills, education and aptitudes for taking on the new ideas.

We start by describing the adoption of existing ideas and then turn to genuine entrepreneurship.

1. Imitation

Let B^* denote the number of successful world innovations, B the number of innovations transferred (adopted) and implemented by the leading local firm and A the number of technologies adopted and implemented by follower firms. By assumption innovations are carried out by entrepreneurs (each with education E and creativity C) while managers alone (each also with education E) are involved with technology transfers and technology implementation.

Assume that each firm is owned and operated by a manager who lives for two periods, works in the first period, consumes and saves and then retires and consumes when old. Moreover, assume that his utility is of the CRRA type with coefficient of relative risk aversion ρ.

1.1 The Imitator at work

During the first period of the manager's two-period life he combines technology A with his education E and inputs X – which could be labour or, alternatively, intermediate inputs such as oil – in producing output Y. For simplicity, we abstract from physical capital. The problem facing the manager is to choose the fraction of time η he spends on actual production using existing technology A and the fraction 1-η spent studying, evaluating and adopting new technologies in order to maximise his lifetime consumption. The production function for firm i has the Cobb-Douglas form and technological progress is Harrod neutral

$$Y_{it} = \left(\eta E_i A_{it}\right)^{1-\alpha} X_{it}^{\alpha} . \tag{1}$$

Profits P can then be written as follows

$$P_{it} = \left(\eta E_i A_{it}\right)^{1-\alpha} X_{it}^{\alpha} - w_x X_{it} \tag{2}$$

where w_x denotes the (real) price of the input. Profit maximisation yields the following first-order-conditions with respect to the use of inputs X

$$\alpha \left(\eta E_i A_{it}\right)^{1-\alpha} X_{it}^{\alpha-1} = w_x \tag{3}$$

which gives a demand function for inputs:

$$X_{it} = \alpha^{\frac{1}{1-\alpha}} \eta E_i A_{it} w_x^{1-\alpha} \tag{4}$$

Combining equations (2) and (4) gives,

$$P_{i,t} = \Omega \eta w_x^{-\frac{\alpha}{1-\alpha}} E_i A_{it} \tag{5}$$

where $\Omega = \alpha^{\alpha/(1-\alpha)} - \alpha^{1/(1-\alpha)}$. Profits are increasing in the level of technology and the education of the manager and decreasing in the price of the inputs.

When not producing, a manager spends his time exploring, learning and adopting new ideas on how to produce more efficiently. There are B-A locally unexploited ideas that can potentially be adopted by managers. However, not all ideas can be adopted in any given period due to information frictions. The matching function (6) gives the number of successful adoptions of unexploited ideas. The efficiency of this matching process is captured by the parameter Λ

$$A_{it} - A_{it-1} = \Lambda\left(\left(1-\eta\right)E_i\right)^{\beta} G_{it-1}^{1-\beta} \tag{6}$$

where $G_{it} = B_t - A_{it}$ and $0 \leq \beta \leq 1$ .Inserting (6) into (5) gives,

$$P_{it} = \Omega\eta E_i\left[A_{it-1} + \Lambda\left(1-\eta\right)^{\beta} E_i^{\beta} G_{it-1}^{1-\beta}\right] w_x^{-\frac{\alpha}{1-\alpha}} \tag{7}$$

We can now address the problem of allocating time between the two tasks performed within the firm that is producing or learning about new technologies. The first-order condition for profit maximization with respect to η follows

$$P_{\eta} = \Omega E\left[A_{it-1} + \Lambda\left(1-\eta\right)^{\beta} E_i^{\beta} G_{it-1}^{1-\beta} - \eta\Lambda\left(1-\eta\right)^{\beta-1} E^{\beta} G_{it-1}^{1-\beta}\right] w_x^{-\frac{\alpha}{1-\alpha}} = 0 \tag{8}$$

Taking logs gives the following expression defining $\hat{\eta}$, the fraction of a manager's time spent producing

$$\hat{\eta} = \frac{1}{1-\beta}\left[\log A_{it-1} - \log\Lambda - \beta\log E_i - \left(1-\beta\right)\log G_{it-1} - \log\left\{\left(1+\beta\right)\hat{\eta} - 1\right\}\right] \tag{9}$$

This fraction depends on the level of technology *A*, the manager's education *E* and the size of the technology gap *G*.

2.2 The Imitator as a consumer

The imitator's income from learning and producing during the working life is P_i. He has to decide how much of this income to consume when young and how much to save for retirement. We assume that there is a world capital market where entrepreneurs borrow money from financial intermediaries to finance their prospective innovations and managers and successful entrepreneurs invest their savings to provide for retirement consumption. The world rate of interest r^* makes the supply of savings equal to the collective demand for capital by the world's entrepreneurs.

Each individual faces the common world rate of interest r^* when making saving decisions. Let θ denote the rate of pure time preference. The following equation – remember that utility is CRRA – then gives consumption when young Q_t^1 and when old Q_{t+1}^2:

$$\frac{\left(P_i - Q_{1t}\right)^{-\rho}}{Q_{1t}^{-\rho}} = \frac{1+r^*}{1+\theta} \tag{10}$$

The equation then defines a saving equation

$$S = s\left(P_i, r^*; \rho\right)P_i \tag{11}$$

for individual *i*. Since r^* and ρ are exogenous terms, it follows that savings S_i are monotonically increasing in profits P_i.

2. Entrepreneurship

New innovations are introduced into county *j* through transfers to the leading firm – owned and operated by an entrepreneur with education *E* and creativity *C* – from abroad as well as genuine innovations *I*. Technological progress is

$$B_{jt} - B_{jt-1} = \Lambda\left(\left(1-\eta\right)E_j\right)^{\beta} G_{jt}^{*1-\beta} + \; I_j^{1-\mu} B^{*\mu} \tag{12}$$

where $G_j^* = B^* - B_j$ is the gap between the best domestic firm and best practice abroad – the ideas in the world that have not yet been exploited (that is adopted) by the best local firm. The last term describes genuine innovations in country *j* where I_j denotes the number of entrepreneurial ideas that are successful at getting finance and B^* denotes the world productivity frontier.

Finally, the world frontier moves out when genuine innovations take place in different countries:

$$B_t^* - B_{t-1}^* = \sum_{\kappa} I_{\kappa}^{1-\mu} B^{*\mu} \tag{13}$$

The entrepreneurial firm is also engaged in production and equations (1)-(9) describe its decisions – with *B* now denoting productivity instead of *A* – when it comes to allocating time between producing and adopting ideas from abroad.

Let us now turn to genuine entrepreneurship that takes place in leading firms in different countries. Assume that local financial intermediaries – banks from now on – have the capacity to finance F_j entrepreneurial projects – assuming that they are sufficiently profitable – and that the potential number of such projects is related to the creativity of the entrepreneur *C*. In particular, assume that there are *C* entrepreneurial projects that could potentially be financed.

Each entrepreneurial project consists of a genuinely novel business idea and hence embodies a different model of the world. Financing is contingent on the entrepreneur finding a like-minded banker. The number of such matches is given by the following equation

$$M = \Gamma C^{\eta} F_j^{1-\eta} \tag{14}$$

where Γ is a measure of the efficiency of the banking system. However, it is not sufficient to find a like-minded banker, the expected return from the idea has to cover the required rate of return, determined by the exogenous world rate of interest. The value of a project to the entrepreneur stems from its expected contributions to profits, which analogous to equation (2) can be written as

$$P_{jt}^{e} = \left[\eta E_j \left(B_{jt-1} + \Lambda\left(\left(1-\eta\right)E_j\right)^{\beta} G_{jt-1}^{*1-\beta} + \; I_{jt-1}^{1-\mu} B_{t-1}^{*\mu}\right)\right]^{1-\alpha} X_t^{\alpha} - w_x X_t \tag{15}$$

Solving for *X* and substituting back into (15) gives an equation that is analogous to (7);

$$P_{jt}^{e} = \Omega \eta E_j \left(B_{jt-1} + \Lambda\left(\left(1-\eta\right)E_j\right)^{\beta} G_{jt-1}^{*1-\beta} + \; I_{jt-1}^{1-\mu} B_{t-1}^{*\mu}\right) w_x^{-\frac{\alpha}{1-\alpha}} \tag{15'}$$

From equation (15’) it follows that the expected payoff to the entrepreneur from a genuine innovation p is then

$$P_p^e = (1-\mu)\Omega\eta E_j \left(B_{t-1}^* / \, I_{jt-1}\right)^{\mu} w_x^{-\frac{\alpha}{1-\alpha}} \tag{16}$$

Moreover, assume that the entrepreneur also enjoys coming up with new ideas, in particular he gets utility U_p from project p.[1] The total return from a project – if financed – can then be written as $P_p^e + U_p$. The bank receives r_i if it finances a project and zero if not where r_i is the interest paid by the entrepreneur.

When the entrepreneur has found a like-minded banker who is potentially willing to finance his project, the two have to decide on the terms of their transaction. The rate of interest is, by assumption, determined such that the surplus from a successful match between an entrepreneur and a bank is split equally

$$V_P = V_L \tag{17}$$

where V_P and V_L are given by equations (18) and (19) below.

$$\left(1+r^*\right)V_p = (1-b)\left[P_p^e + U_p - r_i\right] \tag{18}$$

$$\left(1+r^*\right)V_L = (1-b)r_i \tag{19}$$

where r^* is the world rate of interest and b denotes the probability that he project fails.[2] This gives the following solution for the interest charged to entrepreneur i:

$$r_p = \frac{1}{2}\left[P_p^e + U_p\right] \tag{20}$$

The number of projects financed is then determined by the condition

$$\frac{1}{2}(1-b)\left(P_p^e + U_p\right) \geq 1 + r^* \tag{21}$$

which implies a lower bound on the sum of the pecuniary and the non-pecuniary benefit from a project to the entrepreneur:

$$P_p^e + U_p \geq 2\frac{1+r^*}{1-b} \tag{21'}$$

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[1] Schumpeter (1911) wrote extensively on the non-pecuniary benefits and costs. Recently, Phelps (2006) has shown the non-pecuniary benefits to be necessary for the existence of equilibrium in the market for innovations. Moskowitz and Vissing-Jörgensen (2002) provide empirical support. They find investment in private equity to be very concentrated so that households with entrepreneurial equity invest on average in excess of 70 percent of their assets in a single company where they have a management interest. However, they find that in spite of this lack of diversification, the average annual return to private equity is no higher than the market return on public equity. This finding suggests that there may be substantial non-pecuniary gains from investing in private equity, which often comes to entrepreneurship. Hamilton (2000) found similar results.

[2] Dunne et al. (1988) used the Census of Manufacturers to calculate that on average 61.5 percent of firms disappear in their first five years and 79.6 percent in the first ten years.

Denote the fraction of all entrepreneurial projects that fall below this critical level by $H\left(2\frac{1+r^*}{1-b}\right)$. It follows from (18) and (21) that the number of projects financed is

$$I = \left(1 - H\left(2\frac{1+r^*}{1-b}\right)\right)\Gamma C^{\eta} F_j^{1-\eta} \tag{22}$$

The number of projects financed is increasing in the creativity of the entrepreneur C – which determines the number of ideas that he has – increasing in the supply of loans by the banking system F, increasing in the efficiency of the matching process between banks and entrepreneurs Γ and, finally, increasing in the share of all entrepreneurial project that offer pecuniary and non-pecuniary benefits above the critical level demanded by banks' required rate of return. From equation (15) it follows that this is increasing in the world frontier B^*, decreasing in the cost of the input w_x and increasing in the level of education E.

Finally, an equation analogous to equation (10) describes the entrepreneur's savings decision, which shows how he divides the income from producing, learning and inventing between his two periods.

3. Market forces and economic performance

The rate of productivity growth depends on a multitude of market and institutional variables. We can distinguish between domestic and world factors. We start with the former.

An improvement in the performance of domestic *financial institutions* – embodied in an increase in the value of the parameter Γ in equation (14) – will increase the number of matches between like-minded entrepreneurs and the suppliers of funds I, which will raise the rate of growth of leading productivity in the country which then makes average productivity grow as shown by equation (6). A positive domestic shock could also take the form of an improvement in the *expected profitability of innovations* (P_P); higher non-pecuniary benefits from embarking on new entrepreneurial projects (U_p); a fall in the price of the input (w_x); and an improvement in the creativity C or the level of education of entrepreneurs E. The effect of these changes would be similar to those of an improvement in the operation of the financial system.

The price of inputs w_x can measure factors such as the effect of labour unions, employment protection and other labour market regulation – i.e. all factors that raise the cost of labour as an input. Increased labour market rigidities can then be shown to have the effect of reducing the expected profitability of innovations with consequences described above; fewer entrepreneurial projects will be financed and carried out and growth of leading productivity will fall.

Education has a positive effect on productivity growth. Far from the frontier, higher education implies more rapid learning and hence a higher rate of growth of A. The rate of growth of leading productivity B is also positively influenced by education because it raises the expected profits from entrepreneurial projects and hence the number that gets financing.

We now turn to the global shocks; the world interest rate r^* and the world price of oil, which can be modeled as w_x in the equations above. Hence the impact of change in these two variables can be described in the model. An increase in *interest rates* r^* will decrease the number of entrepreneurial projects financed locally as well as worldwide. A rise in the price of oil could be modeled as a rise in the price of inputs w_x. An increase in this price will reduce the expected profitability of new technologies and have an effect identical to the rise in world interest rates.

4. Empirical tests

4.1 Empirical equations

We test for the effect of different institutions using the framework of Vandenbussche, Aghion and Meghir (2004)[3]. Their empirical equation has the rate of growth of productivity as the dependent variable but this is measured in several ways. The innovation is to interact the many right-hand side variables with the productivity gap between each country and a leading country, which they take to be the United States. Denote average productivity in country *j* by *A*, US – or frontier – productivity by B^* and then use *Z* to denote any of the variables which may have an effect on growth.[4] The estimated equation will then take the following form:

$$\begin{aligned} \log A_{j,t} - \log A_{j,t-1} = \alpha_{0,j} + \alpha_1 \left(\log B^*_{t-1} - \log A_{j,t-1} \right) \\ + \alpha_2 Z_{j,t-1} + \alpha_3 \left(\log B^*_{t-1} - \log A_{j,t-1} \right) Z_{j,t-1} + \varepsilon_{j,t} \end{aligned} \tag{23}$$

Note that the estimated coefficient of *Z* in the equation will be a linear function of the productivity gap between country *j* and the US:

$$\hat{\alpha}_X = \hat{\alpha}_2 + \hat{\alpha}_3 \left(\log B^*_{t-1} - \log A_{j,t-1} \right)$$

It follows that the sign and significance of α_3 tells us whether the effect *Z* has on productivity growth becomes smaller or larger when the productivity gap is closed. In particular, a positive sign of α_3 tells us that the term is important when country *j* is far from the productivity frontier while a negative sign implies that its importance grows as we come closer to the frontier.

Philippe Aghion a number of his co-authors have estimated an equation of this kind for several variables, such as tertiary education, the degree of competition, openness to trade and financial market development. They find that in the case of education

[3] Other contributions include Benhabib and Spiegel (1994) who find that the initial level of schooling affects subsequent growth in the poorest segment of the sample (non OECD!). However, growth is unrelated to increases in educational attainment. In contrast, Temple (1999) finds support for the Lucas model when controlling for outliers. Engelbrecht (2001) finds support for both Lucas and Nelson-Phelps in OECD data when controlling for outliers. Vandenbussche, Aghion and Meghir (2004) find that education is better for innovation than imitation; its importance grows as a country approaches the productivity frontier.

[4] Note that we do not distinguish between leading-edge productivity in the US and average productivity. Instead we use average US productivity as a proxy for the productivity frontier B^* facing other countries.

$\alpha_3<0$ which implies that the importance of education grows as we get closer to the productivity education. Their hypothesis is that while imitation – what countries do far from the frontier – is intensive in less skilled labour, innovation – what countries have to do when they have closed the productivity gap – is intensive in skilled labour, i.e. individuals with university education.[5] In contrast, financial market development is particularly important when a country finds itself far from the productivity frontier. In that case there are large gains to be expected from the adoption of new technology. Financial market underdevelopment can slow down the rate of technological adoption while a technologically backward country that enjoys relatively developed financial markets can expect rapid growth and convergence.

Estimating equation (23) imposes a restriction on the data, which is that the numerical value of the coefficient of own productivity is made to equal the coefficient of US productivity. Instead of imposing the restrictions to begin with I estimate the unrestricted version and then test for the restriction and only impose it if it is not rejected. Thus, my estimated equation is the following:

$$\begin{aligned}\log A_{j,t} - \log A_{j,t-1} = \alpha_{0,j} + \alpha_1 \log B^*_{t-1} + \alpha_2 \log A_{j,t-1} + \alpha_3 Z_{j,t-1} + \alpha_4 \log A_{j,t-1} Z_{j,t-1} \\ + \alpha_5 \log B^*_{t-1} Z_{j,t-1} + \varepsilon_{j,t}\end{aligned} \tag{24}$$

The (Wald) tests would then test the hypotheses $\alpha_1 = -\alpha_2$, $\alpha_4 = -\alpha_5$.

4.2 The data

Productivity *A* is calculated as total factor productivity from a Cobb-Douglas production with capital and employed labour as factors of production.[6] In order to remove business cycle frequencies from the data, the equation is estimated using five-year period averages, the first one being 1960-1964 and the last one 1995-1999. The growth rate on the left-hand side of equation (24) is then the proportional change in total factor productivity between half-decades.

The variables included in the equation are taken from Section 3 above. They fall into four groups: demographic variables, labour market institutions, financial market institutions, and macroeconomic variables.[7]

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[5] Other possible reasons for the relationship between growth and education include: i) schooling may proxy for steady state income ii) schooling helps people adopt new technologies and business practices (Nelson and Phelps), iii) schooling helps countries invent new technologies and innovate, iv) anticipated increases in growth could cause schooling to rise (Bils and Klenow, 1998).

[6] The capital stock series is calculated using the perpetual inventory method assuming a 6% depreciation rate. The value of the stock of capital in year 1949 is first calculated by assuming a steady state in a neoclassical growth model with depreciation 6% and a growth rate that equals the average rate of growth of output between 1950 and 1960. The capital stock series 1951-2000 is then calculated using investment data and the assumed depreciation rate. Finally, the total factor productivity series are derived annually from 1960 to 2000 assuming that labour's share of output is 0.7.

[7] See appendix for a description of variables and their sources.

The demographic variables include the fraction of the population with some tertiary education and the share of prime-aged adults of total population. Education appears in the model as the variable E since clearly the ability of managers to adopt new technologies and the ability of entrepreneurs to emulate the best overseas ideas. The size of the prime-aged workforce is also important in that the more people there are producing, imitating and innovating, the greater the rate of growth.

The labour market variables include an OECD index of employment protection; a measure of the coordination of unions and employers; union membership as a share of the labour force. Employment protection, union coordination and union membership can be thought of as affecting the cost of inputs w_x in the model in Section 2. An increase in this variable reduces the profitability of new entrepreneurial projects and hence the number of innovations taking place. However, this does not affect the way managers share their time between production and imitation. Hence, these labour market rigidities would be expected to affect growth when we approach the productivity frontier B^* but less when we are far from it.

The financial markets variables include deposits (commercial and savings) as a ratio to GDP; the number of listed companies per million inhabitants; and the amount of funds raised through public equity offerings by domestic companies as a ratio to gross fixed investment. The first enters through the supply of capital F in Section 2. More capital implies that more projects will be financed. The number of listed companies and the share raised though the issuing of equity are meant to proxy for capital market development. This could be expected to affect the efficiency of the matching process, captured by the parameter Λ in the model above. In the model, financial market development and the supply of loans should become more important as we approach the frontier.

Finally, we have two macroeconomic variables: the real price of oil and the world real rate of interest (weighted real interest rates in G7). An increase in the price of oil would reduce profits through the w_x variable and hence the number of entrepreneurial innovations. An increase in world interest rates could be expected to raise the required rate of return r in the model, which would also lower the number of innovations. In the model these variables become more important the closer we get to the frontier B^*.

4.3 Empirical results

We proceed by adding one variable at a time to the empirical equation. Each explanatory variable is first added in levels, and then as a product of B^* and A. In the first column we report results of the estimation when productivity growth is only explained by lagged own productivity (A) and lagged productivity in the US (B^*). We then add in column (2) the fraction of the population with some university degree and in column (3) the share of the population between 15 and 64. In columns (4)-(6) we add the three labour-market variables; employment protection, coordination and unionization and the, finally, columns (7)-(9) have the capital market variables added; deposits (ratio to GDP) which provides a measure of the size of the banking system; the number of listed companies (per million inhabitants) which measures the development of the stock markets; and stock market capitalisation (as a share of GDP) which provides an alternative measure of the development of the stock market. Finally, we add the two global macroeconomic variables in columns (10) and (11).

These are the world real rate of interest (average of real interest rates in the G7 countries) and the world real price of oil.

In column (12) we test for the equality of the numerical value of the terms multiplying A and B*, i.e. whether it is only the gap in productivity that matters for the growth effect of the different variables or whether the levels of productivity matter as such. As shown in the table, this homogeneity restriction is sometimes rejected; sometimes we can reject the hypothesis that only the gap matters and sometimes we cannot.

The overall impression from the table is that there are few robust results, i.e. results that do not change between columns when variables are added to the equation. A possible reason for this lack of robustness is the fact that while the dependent variable – rate of growth of productivity – is mean reverting, the right-hand variables are mostly not mean reverting. There are, however, a few notable results.

The positive effect of university education on growth appears to be increasing in the size of the productivity gap. It helps countries more, the further they are from the frontier B^*. This is supportive of Nelson and Phelps (1966). In terms of the model above, this suggests that university education helps mostly by facilitating the adoption of existing ideas instead of encouraging entrepreneurs to come up with new ones. This is in contrast to the results of Aghion et al. (2004).

Union density appears with a significantly negative coefficient, while the interaction with the productivity gap has an insignificant coefficient. So unions lower the rate of productivity growth; both away as well as close to the frontier. This is also consistent with the model above, in that stronger unions can increase costs which reduces the profitability of innovations.

Stock market capitalisation has a positive and significant coefficient that becomes larger the closer we are to the frontier. In terms of the model, a high value of this variable could imply that expected profitability of different projects was high. Alternatively, the variable could be measuring the development of the stock market and so, perhaps, the efficiency of the matching process between entrepreneurs and banks. The number of listed companies also seems to have a greater positive effect on growth the closer we get to the productivity frontier. In contrast, deposits appear to have a greater effect on growth far from the frontier which does not square well with the model.

Table 1.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	Wald
Constant	0.21	**1.48**	0.85	0.30	0.32	1.59	**4.52**	2.78	2.88	**7.92**	**-214.56**	
	(0.45)	**(2.42)**	(1.07)	(0.43)	(0.47)	(1.16)	**(2.49)**	(0.91)	(0.86)	**(1.88)**	**(5.42)**	
A*	**0.26**	0.01	0.23	0.19	0.13	-0.12	-0.43	1.46	0.83	-0.22	**29.98**	
	(2.19)	(0.07)	(1.08)	(0.85)	(0.67)	(0.52)	(0.92)	(1.71)	(1.46)	(0.25)	**(5.29)**	**29.5**
A	**-0.30**	**-0.22**	**-0.39**	-0.25	-0.19	-0.07	-0.16	**-1.92**	**-1.27**	**-0.89**	-1.03	
	(4.33)	**(2.52)**	**(3.34)**	(1.61)	(1.33)	(0.52)	(0.47)	**(3.26)**	**(3.10)**	**(1.89)**	(1.59)	
Schooling		-0.05	-0.02	0.00	0.02	0.06	-0.02	**0.19**	0.14	0.08	0.16	
		(0.86)	(0.30)	(0.08)	(0.58)	(1.63)	(0.31)	**(2.33)**	(1.66)	(1.09)	(1.53)	
School.*A*		0.01	0.00	0.00	-0.00	-0.01	0.01	-0.01	0.00	0.01	0.02	
		(1.16)	(0.26)	(0.20)	(0.64)	(1.93)	(1.40)	(0.45)	(0.26)	(0.54)	(1.04)	2.76
School.*A		**-0.004**	0.00	-0.00	0.00	**0.004**	**-0.01**	**-0.02**	**-0.02**	**-0.02**	**-0.04**	
		(2.21)	(0.03)	(0.59)	(0.63)	**(2.40)**	**(2.41)**	**(2.67)**	**(3.34)**	**(2.51)**	**(3.68)**	
Prime age			-10.39	-3.28	-17.45	-11.20	113.24	-57.51	-2.18	**138.46**	**297.50**	
			(0.33)	(0.09)	(0.34)	(0.29)	(0.56)	(0.34)	(0.02)	**(2.15)**	**(2.79)**	
Prime*A*			-11.63	-9.94	-15.54	-14.62	-4.46	**103.87**	**73.71**	7.83	26.72	
			(1.32)	(0.89)	(1.19)	(1.44)	(0.08)	**(2.67)**	**(2.98)**	(0.46)	(0.60)	**6.53**
Prime*A			**16.77**	**13.79**	**21.63**	**17.58**	-9.22	**-95.66**	**-70.44**	-24.27	**-62.82**	
			(3.49)	**(2.12)**	**(3.12)**	**(3.04)**	(0.28)	**(4.57)**	**(5.45)**	(1.40)	**(1.69)**	
EPL				0.16	0.03	-0.25	-0.57	0.73	0.36	-0.25	-0.32	
				(0.23)	(0.03)	(0.32)	(0.36)	(0.83)	(0.60)	(0.28)	(0.26)	
EPL*A*				0.02	0.01	0.01	0.18	-0.55	-0.12	0.13	0.19	
				(0.18)	(0.09)	(0.05)	(0.57)	(1.70)	(0.40)	(0.38)	(0.47)	0.04
EPL*A				-0.05	-0.02	0.02	-0.12	**0.47**	0.07	-0.11	-0.16	
				(1.47)	(0.54)	(0.39)	(1.00)	**(1.93)**	(0.29)	(0.46)	(0.57)	

Table 1 continued.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	Wald
Coord					-0.08	**1.16**	0.36	1.70	1.51	1.94	0.29	
					(0.06)	**(2.39)**	(0.51)	(1.38)	(0.95)	(1.67)	(0.30)	
Coord*A*					0.08	-0.15	-0.13	-0.86	**-0.77**	**-0.51**	-0.38	
					(0.78)	(1.61)	(0.69)	(2.90)	**(2.77)**	**(2.07)**	(1.55)	0.05
Coord*A					-0.08	-0.01	0.09	**0.66**	**0.59**	0.26	0.35	
					(1.43)	(0.13)	(0.57)	**(3.67)**	**(4.96)**	(1.32)	(1.19)	
Density						**-0.09**	-0.07	**-0.07**	**-0.07**	-0.06	**-0.08**	
						(4.14)	(1.70)	**(1.99)**	**(1.98)**	(3.10)	**(2.76)**	
Density*A*						**0.02**	0.01	0.01	0.00	0.00	0.00	
						(3.94)	(0.70)	(0.75)	(0.27)	(0.26)	(0.30)	**8.62**
Density*A						**-0.01**	0.00	0.00	0.01	0.01	0.01	
						(3.09)	(0.30)	(0.48)	(1.01)	(1.48)	(1.34)	
Deposits							**-5.05**	**-7.45**	**-6.23**	**-7.66**	-1.43	
							(2.01)	**(2.95)**	**(1.92)**	**(3.34)**	(0.72)	
Deposits *A*							**0.91**	**1.50**	**1.17**	**1.32**	-0.06	
							(1.96)	**(3.18)**	**(2.31)**	**(3.54)**	(0.21)	0.58
Deposits *A							-0.24	**-0.53**	**-0.35**	**-0.31**	0.27	
							(1.30)	**(2.62)**	**(2.24)**	**(2.23)**	(1.54)	
Listed								**-0.05**	**-0.05**	**-0.03**	**-0.06**	
								(3.65)	**(3.11)**	**(2.32)**	**(2.39)**	
Listed*A*								-0.01	0.00	0.00	0.00	
								(1.71)	(0.70)	(0.53)	(0.42)	**5.83**
Listed*A								**0.01**	**0.00**	**0.00**	**0.01**	
								(3.53)	**(0.82)**	**(0.82)**	**(1.94)**	

Table 1 continued.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	Wald
Smcap.									0.09 (0.05)	1.53 (1.45)	1.12 (0.94)	
Smcap..*A*									-0.12 (0.60)	**-0.27** **(2.77)**	**-0.28** **(2.68)**	0.77
Smcap..*A									0.11 (0.79)	0.07 (0.55)	0.14 (1.55)	
Oil										-17.28 (1.81)	**478.10** **(5.87)**	
Oil*A*										2.07 (1.62)	**-64.79** **(5.89)**	**34.34**
Oil*A										**0.28** **(6.55)**	**0.13** **(1.80)**	
Interest											0.81 (0.49)	
Interest*A*											-0.11 (0.49)	0.18
Interest*A											0.02 (0.84)	
R-squared	0.79	0.79	0.81	0.83	0.80	0.81	0.87	0.94	0.96	0.97	0.96	

Estimation method. Panel estimation with fixed (country) effects and White heteroskedasticity-consistent covariance matrix. t-statistics in parentheses. Bold letters indicate statistically significant coefficient estimates and (in last column) the rejection of the hypothesis of equality of coefficients.

5. Concluding remarks

TO BE CONCLUDED.

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Appendix

The Data

Productivity	TFP calculated using capital stock data, labour force, participation and unemployment rate data and assuming a factor share of 0.7 for labour.	Penn World Tables
Demographics		
Schooling	Fraction of population with some tertiary education	Barro and Lee(2000)
Population growth	Rate of growth of total population.	IMF (IFS)
Prime age	Prime aged adults as a share of total population	
Labour market institutions		
Employment protection	Index of employment protection.	OECD.
Coordination	The coordination of union and employers.	OECD
Union density	Share of employed workers that belong to a labour union.	OECD.
Financial markets institutions		
Deposits	The ratio of commercial and savings deposits to GDP	Rajan and Zingales (2001)
Stock market capitalization	Number of listed companies	Rajan and Zingales (2001)
Fraction of fixed capital formation raised via equity	Amount of funds raised through public equity offerings by domestic companies divided by gross fixed capital formation.	Rajan and Zingales (2001)
Macroeconomic variables		
Oil prices	The real price of oil	Andrew Oswald.
Real interest rates	The average real rate of interest in the G7 (GDP used as weights)	IMF and Penn World Tables