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Perspectives on the Performance of the Continental Economies

Market Forces and the Continent's Growth Problem

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Brand kindles brand till they burn out,
Flame is quickened by flame:
One man from another is known by his speech
The simpleton by his silence.
(Havamal, Snorra Edda)

Entrepreneurs are the inventors of business ideas and if successful generate followers who imitate their success. As so well captured in the old Icelandic poem above, novel ideas spread from one person to another and the faster this occurs the more rapid is the spread of knowledge and, in the economic context, economic growth. The cultural and institutional factors that affect entrepreneurship help explain economic growth and differences in economic performance between countries. But it is also important to study what determines the rate at which these ideas are transmitted from a world leader to each country's business leader and then from that leader to local followers within the country.

The economic performance of the larger continental European economies in recent decades has lagged behind that of the United States in terms of entrepreneurship. Productivity data reveal that the US productivity level fell relative to the average in a group of eighteen countries in the 1960s and the 1970s as Europe and Japan caught up with it. While Europe could benefit from unexploited business ideas in the first two decades following the war and enjoyed growth by learning about and adopting ideas that had been generated by American entrepreneurs in the pre-war decades, the pool of unexploited ideas diminished as the productivity gap between Europe and the U.S. became smaller. Continental Europe appears to lack dynamism, defined as the social factors that promote entrepreneurship, be they cultural, institutional or market forces.

In the model proposed in this paper, business innovations take place in leading firms in different countries and these innovations then spread to other domestic and foreign firms. It is assumed that genuinely original ideas do not require much input on behalf of the entrepreneur. Instead, individuals have different intuitions about how the world works and which ideas are likely to generate profits, which reflect the accumulated experience, education, and lessons learnt by individuals, as well as personal attributes and the quality and perspectives of his or her social circles. A model of this kind may shed light on the causes of the lack of dynamism observed in some of the European economies. The final section explores data on productivity growth and institutions.

1. Brand kindles brand

Most business people are not the inventors of new business ideas but instead adopt ideas conceived of by others. Managers of businesses spend part of their time supervising and organising the work of others and part of it learning, adapting and implementing business solutions learned from others. One problem facing the manager is to choose the fraction of time η he spends on actual production using existing knowledge A and the fraction 1-η spent studying, evaluating and adopting new ideas with the view of maximising profits.

1.1 Local adoption of ideas

Assume that each firm is owned and operated by a manager who combines business knowledge A with his education E and inputs X – which could be labour or, alternatively, intermediate inputs such as oil – in producing output Y. The fraction of his time spent producing is denoted by η, leaving the fraction 1-η for him to study and adopt new business ideas. Business knowledge is measured by the number of adopted ideas and this determines productivity. The production function for firm i has the Cobb-Douglas form and knowledge is Harrod neutral

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

Profits P can then be written as

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

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:

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

Combining equations (2) and (4) gives,

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

where $\Omega = \alpha^{\alpha/(1-\alpha)} - \alpha^{1/(1-\alpha)}$. Profits are increasing in business knowledge 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_j-A_i locally unexploited ideas that can potentially be adopted by managers where B_j denotes the number of innovations transferred (adopted) and implemented by the leading local firm in a given country j. 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

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

where $G_{it} = B_{jt} - A_{it}$ and $0 \le \beta \le 1$. The efficiency is determined by such factors as access to information within other firms that is the extent to which these other firms can protect the competitive advantage they have gained from the successful adoption of foreign ideas. The appearance of education in equation (6) is in the spirit of Nelson and Phelps (1966). They proposed the idea that individuals gain the ability to learn through education. The ability to learn then determines the rate at which they – and their country – can adapt foreign technologies. This contrasts with the later model of Lucas (1988) who emphasizes human capital accumulation as a source of growth; that by acquiring education people become more productive. In the Lucas framework, only improvements in the level of human capital can cause growth while in Nelson and Phelps it is the stock of human capital that determines growth rates. Clearly, equation (1) captures the idea that education is a factor of production while equation (6) is in the spirit of Nelson and Phelps; education helps managers adopt new ideas.

Inserting (6) into (5) gives,

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

We can now address the problem of allocating time between the two tasks performed by managers within the firm, which are managing production and learning about new business ideas. The first-order condition for profit maximization with respect to η is

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

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

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

The fraction of time spent managing production η depends on the level of knowledge A, the manager's education E and the size of the knowledge gap G. Taking the total differential of equation (9) gives partial derivatives of η with respect to the other variables in the equation. The fraction of time spent working η turns out to be increasing in the level of business knowledge A and decreasing in the level of education E, the gap G and the efficiency of the matching function Λ.[i] The manager of a firm approaching the productivity frontier B will hence spend less time studying and more time managing production the closer he gets to the frontier. An increase in the level of education will have the same effect.

1.2 Adoption of foreign ideas

New innovations are introduced through transfers to the leading firm – owned and operated by an entrepreneur, indexed by the letter j, with education E_j – from abroad as well as genuine innovations I_j. For simplicity we assume that there is only one leading firm in each country, hence the index j can also be used for the countries. Productivity growth in the leading firm is described by the following equation

$$B_{jt} - B_{jt-1} = \Lambda \left((1-\eta) E_j \right)^{\beta} G_{jt}^{*1-\beta} + I_{jt}^{\mu} B_{t-1}^{*\nu} \qquad (10)$$

where $G_j^* = B^* - B_j$ is the gap between the best domestic firm and best practice abroad where B^* denotes the number of successful business innovations in the world. 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. The equation implies that new ideas have a greater impact on productivity B the larger is the stock of accumulated knowledge B^* in the world. The parameter $\nu \geq 0$ describes the strength of this effect.[ii]

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

$$B_t^* - B_{t-1}^* = \sum_j I_{jt}^{\mu} B_{t-1}^{*\nu} \tag{11}$$

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.

What does a simple model of business innovation say about the gradual stagnation of the continental economies? Starting with a large gap in terms of business practices G at the end of the war, these countries could enjoy a rapid rate of growth of A even with a low level of education E and without spending too much time studying business ideas. As the gap diminished and productivity A improved, the optimal response was to increase η and spend less time studying foreign ideas and growth stagnated, both because the pool of unexploited ideas was becoming smaller and because the optimal time spent studying new ideas was falling.

1.3. Entrepreneurship

Entrepreneurship takes place in leading firms in different countries. Local banks have the capacity to finance F_j entrepreneurial projects in the country of entrepreneur j and the potential number of such projects is related to the creativity of the entrepreneur C_j. In particular, there are C_j entrepreneurial projects or potential innovations. Each potential innovation consists of a genuinely novel business idea and hence embodies a distinct view of the relevant markets.

The potential innovations differ along two dimensions. First, the probability of success differs between projects. Take the genuine innovations that take place in country j that we have denoted by I_j. These innovations can then be indexed by τ so that $\tau \in [0, I_j]$. We let the variable b denote the probability of failure and the expected probability of failure of project τ is then denoted by b_τ^e. Second, the projects give entrepreneurs non-pecuniary benefits that also differ between projects.[iii] Some ideas are more fun to carry out than others. As a result entrepreneurs may be willing to go ahead with projects that offer a low expected monetary return. In particular, we let the variable *u* denote the non-pecuniary benefit so that u_τ denotes the benefit from idea τ.

Financing of the different innovations is contingent on the entrepreneur finding a like-minded banker when it comes to the expectations about the probability of success of individual projects since each idea requires, by assumption, one unit of output for its implementation. This is the “innovation market” described by Phelps (2006). The number of such matches is given by the following equation

$$M = \Gamma C_j^{\eta} F_j^{1-\eta} \tag{12}$$

where Γ is a measure of the efficiency of the financial 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 *r**. The value of a successful project to the entrepreneur – that is one that does not fail – stems from its expected contributions to profits, which analogous to equation (2) can be written as

$$P_{jt} = \left[\eta E_j \left(B_{jt-1} + \Lambda \left((1-\eta) E_j \right)^{\beta} G_{jt}^{*1-\beta} + \ \ I_{jt}^{\mu} B_t^{*\nu} \right) \right]^{1-\alpha} X_t^{\alpha} - w_x X_t \tag{13}$$

Solving for *X* and substituting back into (13) gives an equation that is analogous to (7);

$$P_{jt} = \Omega \eta E_j \left(B_{jt-1} + \Lambda (1-\eta)^{\beta} E_j{}^{\beta} G_{jt}^{*1-\beta} + \ \ I_{jt}^{\mu} B_t^{*\nu} \right) w_x^{-\frac{\alpha}{1-\alpha}} \tag{14}$$

From equation (14) it follows that the payoff to the entrepreneur from a successful innovation is measured by the derivative of (15)

$$P_I \ = \ \mu \Omega \eta E_j I_{jt}^{\mu-1} B_{t-1}^{*\nu} w_x^{-\frac{\alpha}{1-\alpha}} \tag{15}$$

The total return from a marginal project τ – if financed – can then be written as $P_I + u_\tau$.

The interest paid by the entrepreneur is innovation specific, in particular the bank receives r_τ if it finances a project τ. 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 interest payment is, by assumption, determined such that the surplus from a successful match between an entrepreneur and a bank is split evenly

$$V_\tau^E = V_\tau^B \tag{16}$$

where V_τ^E – how much the entrepreneur values the match – and V_τ^B – how much the bank values it – are given by equations (17) and (18) below

$$\left(1+r^*\right)V_\tau^E = \left(1-b_\tau^e\right)\left[P_I + u_\tau - r_\tau\right] \quad (17)$$

$$\left(1+r^*\right)V_\tau^B = \left(1-b_\tau^e\right)r_\tau \quad (18)$$

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

$$r_\tau = \frac{1}{2}\left[P_I + u_\tau\right] \quad (19)$$

The number of projects financed is then determined by the condition

$$\frac{1}{2}\left(1-b_\tau^e\right)\left(P_I + u_\tau\right) \geq 1+r^* \quad (20)$$

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

$$P_I + u_\tau \geq 2\frac{1+r^*}{1-b_\tau^e} \quad (21)$$

Denote the fraction of all entrepreneurial projects that fall below this critical level by $H\left(r^*, E_j, w_x, B^*\right)$**.** It follows from (12) and (21) that the number of projects financed is

$$I_j = \left[1-H\left(r^*, E_j, w_x, B^*\right)\right]\Gamma C_j^\eta F_j^{1-\eta} \quad (22)$$

The number of projects financed is increasing in the creativity of the entrepreneur $C_{j,}$, increasing in the supply of loans by the banking system F_j, increasing in the efficiency of the matching process between banks and entrepreneurs Γ and, finally, increasing in the share of all entrepreneurial projects that offer pecuniary and non-pecuniary benefits above the required rate of return. From equation (15) and (21) it follows that this is increasing in the world frontier B^*, decreasing in the cost of the input w_x and the required rate of return $r*$ and increasing in the level of education E.

2. The flames of growth

The rate of productivity growth depends on a multitude of market and institutional variables. We can distinguish between domestic and world factors. Combining equations (6), (10) and (22) gives equation (23) below:

$$A_{it} - A_{it-1} =$$

$$\Lambda\left[(1-\eta)E_j\right]^{\beta}\left\{B_{it-2} + \Lambda\left[(1-\eta)E_j\right]^{\beta}\left(B^{*}_{t-1} - B_{jt-1}\right)^{1-\beta} + \left(\left(1-H(\bullet)\right)\Gamma C_j^{\eta} F_j^{1-\eta}\right)^{\mu} B^{*\nu}_{t-1} - A_{it-1}\right\}^{1-\beta} \quad (23)$$

An improvement in the performance of domestic financial institutions – embodied in an increase in the value of the parameter Γ – will increase the number of matches between like-minded entrepreneurs and the suppliers of funds, which will raise the rate of growth of leading productivity.

A positive domestic shock could take the form of an improvement in the expected profitability of innovations or higher non-pecuniary benefits from embarking on new entrepreneurial projects and an improvement in the creativity of entrepreneurs, all of which raises the number of innovative business ideas that receive financing in the banking system. The effect of this change would then depend on the efficiency of financial institutions, embodied in the parameter Γ; only with financial institutions that are able to match entrepreneurs and like-minded financiers do these positive developments have an effect on growth.

Education has a positive effect on productivity growth. A higher level of education raises the growth effects of all productivity improvements, whether through domestic adoption, adoption by the leading firm of foreign ideas or entrepreneurship. Higher education will, moreover, facilitate learning from the best local firm, as well as learning by the leading firm from foreign firms. Finally, education raises the expected profitability of new entrepreneurial projects and hence has the effect of raising the proportion of projects that receive financing from the banks.

A rise in the price of inputs would reduce the expected profitability of new technologies and lower the rate of productivity growth. Various institutions affect the cost of labour, such as labour unions, employment protection legislation and the real price of oil. The effect of an increase in interest rates is somewhat more complicated. If world interest rates rise because of a fall in world savings, the consequence would be fewer entrepreneurial projects receiving financing. If, in contrast, the increase was caused by a rise in the world level of entrepreneurial activity, then the effect would be more complex; the world theoretical level of productivity B^* would advance – increasing the rate of learning from abroad – but higher interest rates would mean that fewer new business ideas would be funded.

3. Empirical evidence

In this section, data from: Australia, Austria, Belgium, Canada, Denmark, Finland, France, Greece, Ireland, Italy, Japan, Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, United Kingdom, United States will be analysed with a view of detecting patterns that relate growth performance to different institutional variables.[v]

Productivity A is calculated as total factor productivity from a Cobb-Douglas production with capital and employed labour as factors of production. 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. Productivity growth is calculated as the proportional change in the average level of productivity between half-decades – from 1960-64 to 1965-69 and so on – with the last observation on growth rates being the rate of growth between the first half and the second half of the 1990s. The growth rates are shown in Appendix A1. Total factor productivity in the U.S. is then taken to be a proxy for the world technology frontier B^* and the country frontier A^*.

In order to explain differences in productivity growth several variables are explored. They include a measure of education levels, financial-market variables, and labour market variables.[vi] Education is measured as the fraction of the population with some university education. The financial markets variables include deposits (commercial and savings) as a ratio to GDP, the number of listed companies per million inhabitants, and stock market capitalisation as a fraction of GDP. 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 stock market capitalisation are meant to proxy for capital market development. This could be expected to affect the efficiency of the matching process, captured by the parameter Γ in the model above. The labour market variable is a measure of employment protection and is intended to affect the cost of labour.

There have been several attempts at explaining differences in the growth performance of OECD countries using education data. While Benhabib and Spiegel found a statistically significant effect of human capital on growth in a cross-country regression that included both developing and developed countries,[vii] Krueger and Lindahl (2001) found that the relationship ceases to be significant once we remove non-OECD countries from the sample. A recent paper by Vandenbussche, Aghion and Meghir (2006) uses a pooled cross-section, time-series analysis and finds a statistically significant relationship between the level of education and productivity growth for the OECD countries by, first, measuring education by the proportion of the population with some university education and, second, by interacting the education variable with a variable measuring the (log) difference between U.S. productivity (the frontier) and each country's productivity. Column (1) replicates their results when fixed effects are not included using our data set. The estimated coefficients then become statistically insignificant when (country) fixed effects are included as shown in column (2). Vandenbussche et al. defined group fixed effects and reported a positive effect of tertiary education on growth that becomes stronger the closer a country gets to the productivity frontier (U.S. productivity level). These results are confirmed in column (3).

Table 1. Education and technological progress

Variables	(1)	(2)	(3)
log(*A(-1)/A*(-1)*)	-8.18 (2.43)	-21.28 (1.63)	-12.69 (14.80)
E(-1)	-0.005 (0.08)	0.03 (0.29)	0.15 (3.45)
E·log(*A(-1)/A*(-1)*)	0.28 (2.71)	-0.18 (0.87)	0.33 (2.05)
R-squared	0.49	0.73	0.62
Observations	137	137	137

t-statistics in parentheses. Time dummies not reported. Column (1) has no fixed effects, column (2) country fixed effects and column (3) group fixed effects. The right-had side variables are lagged one period.

Note that the equation does suffer from a lack of robustness in that it does not survive the inclusion of country fixed effects.[viii] Experimenting with the other variables included in this study, we found that estimating the equation gave non-robust results in many cases. One reason for this problem is that the equation has a stationary left-hand side variable, which is the rate of growth of total factor productivity, while the right-hand side has mostly non-stationary variables, such as the level of education, stock market capitalisation, the size of deposits and the number of listed companies. For this reason the regression results are not reported in this paper. Instead, we focus on broader and more robust patterns in the data set.

One robust feature of the data is the slowdown of productivity growth as a country approaches the productivity frontier (the level of U.S. total factor productivity). When the variable log(*A/A**) is included in the equation above it acquires a negative and statistically significant coefficient – such as in the first line of Table 1 – and this result is not sensitive to the inclusion or exclusion of other variables. However, looking at the country data we find that we can group the countries so that the slowdown in productivity growth is seen in group and not in the other. The first group has countries from the European continent – Austria, Belgium, France, Greece, Italy, the Netherlands, Portugal and Spain – in addition to Japan. As shown in Figure 1 below, the rate of growth of productivity falls as these countries approach the U.S. productivity frontier. Note that productivity growth is measured as the proportional growth of total factor productivity between half-decades starting with the growth of productivity between the first and the second half of the 1960s and ending with the growth between the first and the second half of the 1990s. We call these countries the "bad performers" in that they were incapable of maintaining the same rate of growth as the pool of business ideas was gradually depleted – the productivity gap became smaller.

Another group did much better in that the rate of productivity growth did not slow down when they approached the frontier. These countries include the "Anglo-Saxon countries of Australia, Canada, Ireland, New Zealand and the U.K.; the Scandinavian countries of Denmark, Finland, Norway and Sweden; and, finally, Switzerland. The relationship between their productivity growth rates and the productivity gap is shown in Figure 2 below. We call these countries the "good performers."

Figure 1. Bad performers

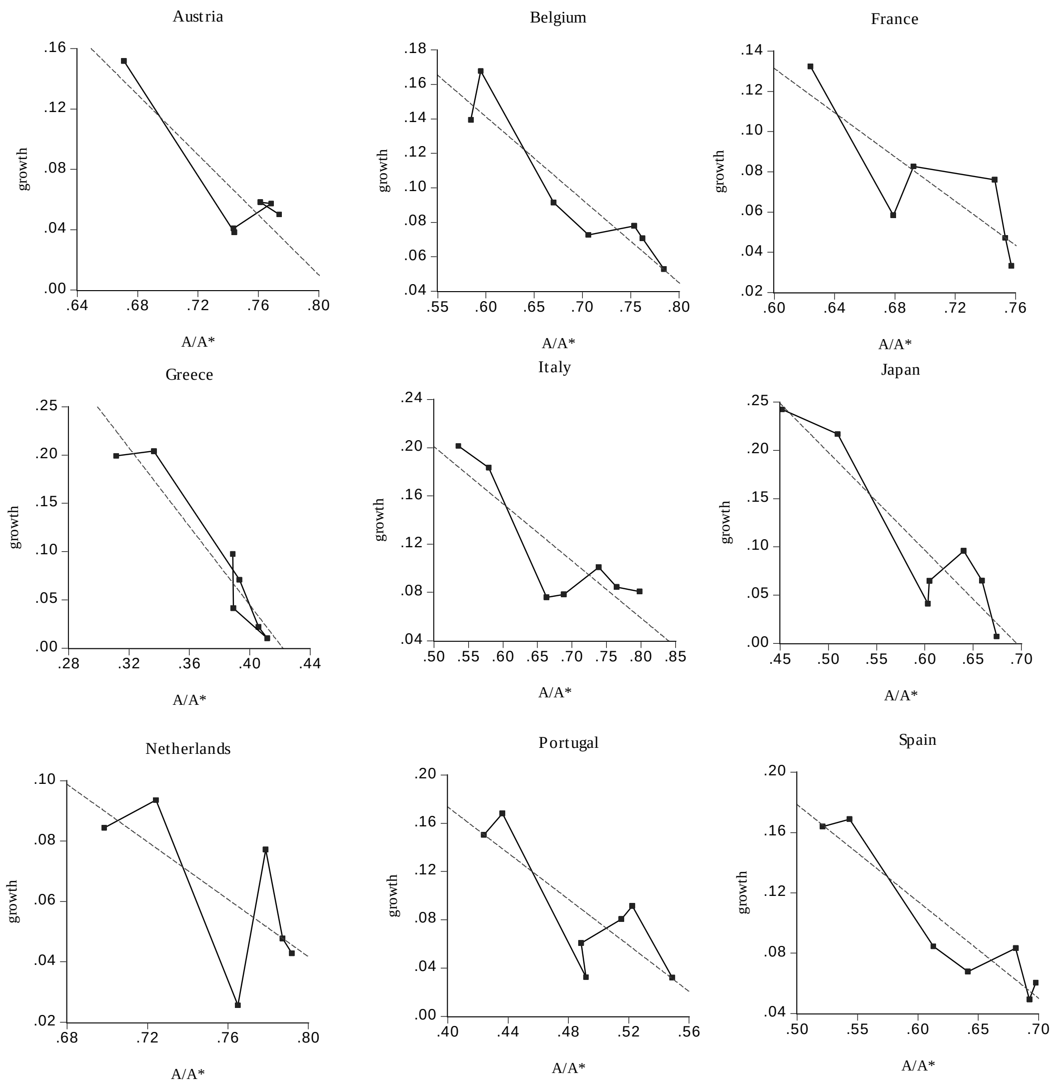
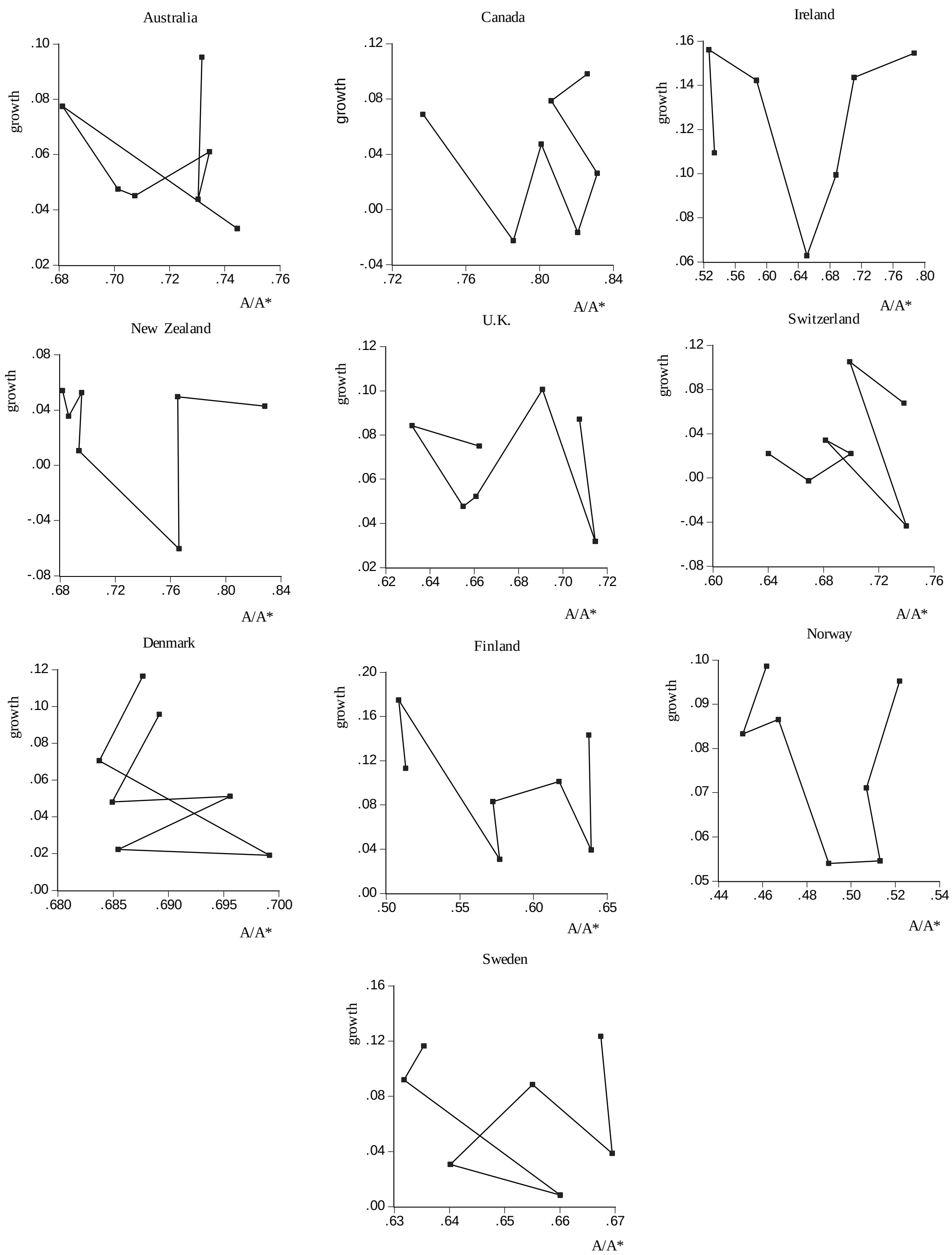


Figure 2. Good performers



Before taking a look at the factors that separate the two groups, we focus on two global variables that play a role in the proposed model. These are the real price of oil (*rpoil*) – which affects the cost of production and hence the expected profitability of innovations – and the world real rate of interest (*rworld*). Replacing education in Table 1 with oil prices and interest rates gives the results shown in Table 2.

Table 2. Oil prices, interest rates and technology growth

Variables	(1)	(2)
Constant	-13.50 (5.39)	-2.07 (1.46)
log(*A/A**)	-44.61 (10.32)	-32.17 (12.03)
rpoil(-1)	4.71 (2.13)	
rpoil(-1)·log(*A(-1)/A*(-1)*)	12.94 (3.66)	
rpoil		-7.68 (6.36)
rworld(-1)	0.63 (1.72)	
rworld(-1)·log(*A(-1)/A*(-1)*)	-0.48 (1.09)	
R-squared	0.76	0.74
Observations	137	137

t-statistics in parentheses. The right-hand side variables in column (1) are lagged one period while oil prices in column (2) are not lagged.

The only coefficient that is statistically significant is for the lagged productivity gap. However, as can be seen from Appendix A1, the rise in oil prices in the late 1970s, early 1980 and their fall in the late 1980s coincided with changes in the rate of productivity growth. In column (2) we see that the contemporaneous value of oil prices turns out to have a negative and a significant coefficient. However, changing oil prices can only be a part of the story because both groups of countries faced the same oil prices.

Table 3 reports the value of our explanatory variables – tertiary education, financial market variables and employment protection for the two groups of countries.

Table 3. Education, financial market institutions and employment protection in 1970

	No slowdown					Growth slowdown					
	University degrees	Stock market capitalisation	Number of listed comp.	Size of bank deposits	Employment protection	University degrees	Stock market capitalisation	Number of listed comp.	Size of bank deposits	Employment protection	
Australia	21.5	0.76	93.72	0.38	0.5	2.6	0.09	12.05	0.31	0.65	Austria
Canada	20.4	1.75	55.20	0.37	0.3	5.2	0.23	38.39	0.40	1.24	Belgium
Denmark	15.5	0.17	52.14	0.25	0.98	3.0	0.16	15.98	0.33	0.68	France
Norway	7.4	0.23	37.9	0.49	1.55	2.6	0.14	2.46	0.54	1.99	Italy
Sweden	8.3	0.14	13.18	0.50	0.23	5.5	0.23	15.19	0.33	1.4	Japan
Switzerland	9.0	0.50	58.72	0.69	0.55	7.2	0.42	15.95	0.26	1.35	Netherlands
U.K.	7.9	1.63	47.22	0.22	0.21	3.7	0.17	25.20	0.53	2	Spain
Average	12.86	0.74	51.15	0.41	0.62	4.26	0.21	17.89	0.39	1.33	Average

University degrees measures the fraction of population with some tertiary education; *stock market capitalisation* is the ratio of the aggregate market value of equity of domestic companies to GDP; the *number of listed companies* is the number of domestic companies whose equity is publicly traded in a domestic stock exchange divided by the population in millions; *size of bank deposits* measures the ratio of commercial and savings deposits to GDP.

A stark difference emerges in that the good performers have a higher level of university education, larger stock market capitalisation and a large number of listed companies. In addition, the cost of labour should be lower because of less stringent employment protection. The only variable that does not differ much between the two groups is the size of bank deposits.

These results fit well with the observation that the continental European economies benefited from being far behind in terms of productivity levels at the beginning of the post-war period, which made it possible to sustain high growth rates in spite of relatively low levels of university education, an underdeveloped stock market and labour market rigidities. However, when they started to close in on the U.S. productivity frontier and the pool of unexploited businesses ideas started to dry up, growth could not be sustained due to a combination of a low fraction of the population having entered university, capital market being not sufficiently developed and the labour market infested with rigidities making labour a more expensive factor of production.

4. Concluding remarks

Business innovations play a fundamental role in economic growth. However, traditional models of endogenous growth emphasize technical innovations. This paper is an attempt to focus on the process of growth through business innovations and to study the role education and market forces play in this regard. Growth was shown to depend crucially on the ability of managers to study, understand and adopt innovations already adopted by the local leader, as well as the ability of the local leader to learn from foreign business practices and the creativity of local entrepreneurs and the ability of the local financial system to separate good business ideas from bad ones.

The empirical results suggest that the continental European economies could sustain growth in the first decades following the war because of the large productivity gap that existed between them and the United States. However, their lack of dynamism became all too apparent as the pool of unexploited ideas was gradually depleted when they caught up with the United States.

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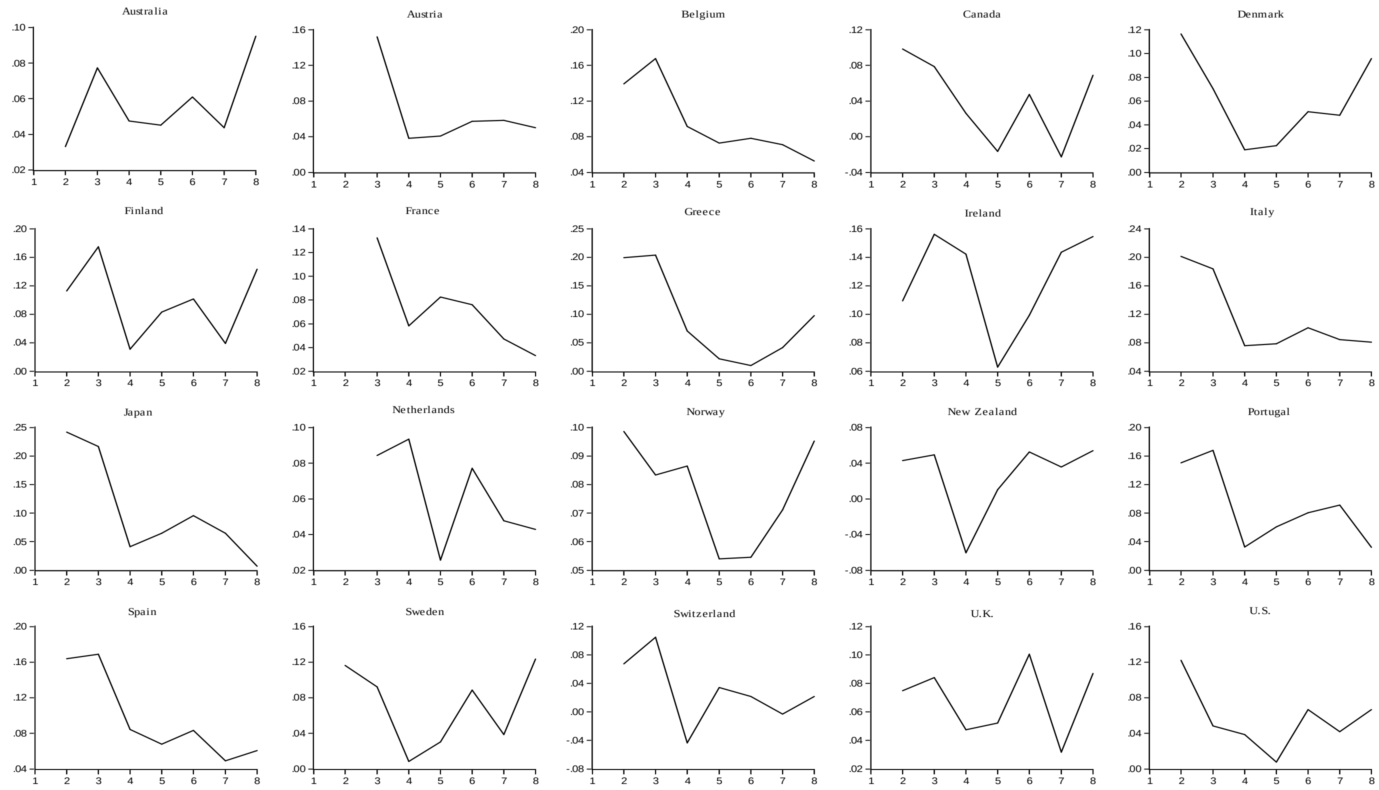
Appendix A1
Total factor productivity growth



The horizontal axis has numbers indicating periods so that period 1 is 1960-1964 and period 8 1995-1999 while the vertical axis has the growth rates of total factor productivity.

Appendix A2 – The Data

Productivity	TFP calculated using data on investment, labour force, participation and unemployment rate and assuming a factor share of 0.7 for labour.	Penn World Tables
Schooling	Fraction of population with some tertiary education	Barro and Lee(2000)
Employment protection	Index of employment protection.	OECD
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)
Number of listed companies per million people	The number of listed companies per million people is the number of domestic companies whose equity is publicly traded in a domestic stock exchange divided by the population in millions.	Rajan and Zingales (2001)
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

[i] For a solution we need $\eta \geq 1/(1+\beta)$ which is also the condition necessary for the derivatives to have the signs described in the text.

[ii] See also Benhabib and Spiegel (1994).

[iii] See Hamilton (2000).

[iv] 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.

[v] Germany is excluded because of the effect of its unification in 1990 on average productivity. Data on financial market variables is available for Australia, Austria, Belgium, Canada, Denmark, France, Italy, Japan, the Netherlands, Norway, Spain, Sweden, Switzerland, United Kingdom and the United States. In addition, productivity performance is explored for Finland, Greece, Ireland, New Zealand and Portugal.

[vi] See Appendix A2 for a description of variables and their sources.

[vii] They did not find support for the hypothesis that changes in human capital cause growth. However Temple (1999) finds support for the Lucas model when controlling for outliers.

[viii] Moreover, the country grouping used for the group fixed effects is quite non-intuitive, see Vandenbussche et al. (2006). The groups are: 1. Belgium, France, Italy, Netherlands; 2. Denmark, Finland, Norway, Sweden, Austria, the U.K., Switzerland; 3. Canada and the U.S.; 4. Australia, New Zealand; 5. Portugal, Spain; 6. Greece; 7. Ireland.

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