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Remedies for European growth problem

Aboa Centre for Economics
Discussion paper No. 104
Turku 2015

The Aboa Centre for Economics is a joint initiative of the economics departments of the University of Turku and Åbo Akademi University.

ISSN 1796-3133

Printed in Uniprint
Turku 2015

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ABSTRACT

This paper deals with the slowdown of economic growth in Europe. For that purpose, we focus on factors that affect the long-run growth path of different economies. Special emphasis is paid to institutional and structural factors that are often assumed to affect aggregate growth: functioning of labor markets, availability of labor and capital, and the size of government. For more explicit measures, we use the data on profit rates, average working hours, various dependency ratio indexes, tax rates, other measures of the size of government, and measures of price competitiveness. Empirical analysis makes use of cross-country panel data from EU15 countries for 1971-2014. Estimation results suggest that profitability and competitiveness do indeed constitute the main determinants of growth. However, also other variables like average working hours and the size of government appear to affect growth in an important manner. All in all, slowdown of growth in Europe does not appear to be beyond reasonable explanations. Thus, more ambitious growth rates may be achieved with well-designed policies.

JEL Classification: O40, O43

Keywords: growth, working hours, taxes, competitiveness

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Acknowledgements

Johannes Räsänen's research assistance and Susanne Maidorn's comments at the EUROFRAME 2015 conference are gratefully acknowledged. I am also grateful to participants at the ACE workshop, Ministry of Finance (Finland) workshop and Bank of Finland seminar for helpful suggestions.

1. Introduction

Most people would likely agree that Europe suffers from a growth slowdown. The GDP growth in Europe has lagged behind the GDP growth in the US and has been far worse than the GDP growth in the NIC countries, particularly China. Quite clearly, there is a declining trend in economic growth rates for Europe during the post-WWII period; although there are substantial growth differences among European countries, the overall trend is similar for all of the EU countries (cf. Figure 1, cf. Figure 2 for the US-Europe comparison)). During 1998-2014, GDP has grown by 1.7 per cent annually in EU27 and 1.5 per cent annually in the Euro area. Moreover, these numbers are misleadingly high, given that in most EU/EMU countries, fiscal expansion exaggerates the true equilibrium growth rate[1]. The growth prospects appear no better; the estimates of annual GDP growth in Europe for the near future are in the one per cent range, and the long-term prospects are sometimes even worse due to poor demographic developments.

However, what is the reason for slow or rapid economic growth? Growth theory does not provide us with a clear answer to this question. To phrase this conclusion in a different manner, the story is far from simple, as one may agree after consulting, e.g., Acemoglu (2009). The classical Solow model states that it is (exogenous) technological progress that can keep output growing in the long run (in the short run, capital deepening can also produce output growth; however, diminishing returns will eventually make increased capital impotent). The new growth theory provides a somewhat more optimistic perspective for growth policies. However, alternative versions of this new growth theory generate different recommendations. In particular, according to the AK model, the way to sustain high growth rates is to save a large fraction of GDP, a portion of which will find its way into financing a higher rate of technological progress and thereby stimulate faster growth. By contrast, the Schumpeterian view states that innovation and therefore productivity growth and convergence can be fostered by the following measures: better protection of (intellectual) property rights, which will improve the extent to which successful innovators can appropriate the rents from their innovations; better financial development, which provides easier financing of new and innovative ideas; a higher stock of educated labour, which will improve the ability of individuals either to imitate more advanced technologies or to innovate; and macroeconomic stability, which ensures low (risk-adjusted) equilibrium interest rates and encourages individuals to engage in long-term growth-enhancing investments (cf., e.g., Aghinon and Durlauf 2007). These recommendations are sensible, and to a certain extent, they are incorporated into the various programs that have been created to stimulate

[1] See, e.g., Snower et al (2012) for an illustration of how to compute the impact of unsustainable fiscal policy on output growth and obtain an estimate of the corresponding equilibrium growth path.

growth in Europe (cf., e.g., EU Commission 2010).[2] However, the recommendations are rather abstract, and it is not easy to quantify the importance of different factors for the growth process.

Whatever is the role of technical change and innovations, the crucial element is capital growth. In the classical golden path formulation assume that the following identity holds: $f'(k) = \delta + g_A + g_N$, where $f'(k)$ denotes the marginal product of capital, δ the depreciation rate, g_A the growth rate technical progress and g_N the growth rate population. The marginal productivity of capital in in the EU15 area is general of the magnitude of 10 per cent or less (see e.g. Caselli and Feyrer 2005). Because the number is not far from the sum of rate of depreciation and technical change (opposite to countries like China where the gap could be more than 5 percent) there is no pressure for expanding the capital stock. Thus, the critical issue is how to increase the marginal productivity of capital. In simple terms of a CD production, function we have $Y = AK^{\alpha}N^{1-\alpha}$, and assuming that the rental rate of capital equals the marginal product of capital we have $\alpha = MPK*K/Y$, or $MPK = \alpha Y/K$. Clearly, the case boils down to the functional distribution of income. If the capital (profit) share falls, so will do the capital stock (investment) also. Therefore, in the subsequent analysis a lot of attention is paid to the function distribution of income – in practice to the labor share of income that is easier to measure than the capital income share.

The poor growth numbers have, however, prompted various attempts to quantify the importance of possible growth factors (see, e.g., Collingnon (2011) and Barro and Sala-i-Martin (1998)). The assessment of growth factor importance is also the purpose of this paper. What makes this paper somewhat different from most previous analyses is its emphasis on "deep" background variables. Thus, rather than examining the national accounts numbers to evaluate factors such as exports and investment, we attempt to discover the relationships between key institutional and structural variables and the growth of output.[3] To a certain extent, our variables correspond to those of the growth factors of the aforementioned "new growth theory", but one cannot really characterize the empirical analysis as a test of this theory. As mentioned, we focus only on the EU countries in this study, and therefore the special features of developing countries do not play a role in this investigation.

In the conventional "workhorses", that is DSGE models, the long-run growth trends are not actively considered. In their case, the data are basically de-trended and thus the factors behind long-run growth basically are set aside. This has some unpleasant consequences when the models are used in forecasting. Then the basic property of the models is a tendency to return to the steady state (growth) path and if the steady state is estimated incorrectly the forecast outcome is sometimes ridiculous. As an example of this problem we show the forecast performance of Bank of Finland where the forecast is

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[2] The Commission program attempts to incorporate all possible issues, and therefore it produces results that are not very concrete but are instead a collection of aims and intentions.

[3] Even if this is the case, we also estimate a traditional CD production function based model to scrutinize the performance of various research and development variables.

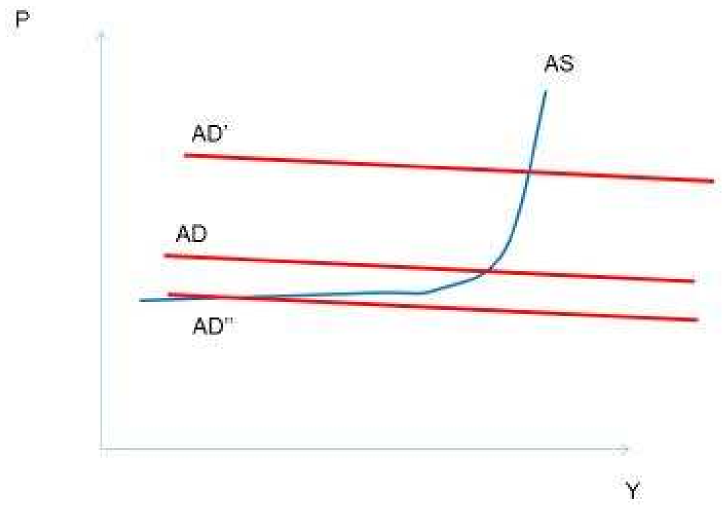
made with the active help of AINO DSGE model (Figure 1). Clearly, the model - not knowing the Nokia boom - fails for predict the growth in the early 2000 and subsequently attempts to return to the old growth path which after the financial crisis and several structural problems (including the disappearance of Nokia) is no more relevant.

Thus, we attempt to quantify the importance of several commonly presented explanations for the slowdown of growth in Europe, beginning with the (poor) functioning of the labor market, the (adverse) development of price competitiveness and the (excessive) growth of government. In many respects, the labour market plays the key role in the economy because it determines both the use of the labour input and the level of overall competitiveness of a nation. Obviously, the functioning of the labour market is not independent of the public sector. A large government is almost inevitably associated with a large tax wedge, and the functioning of the labor market appears to be critically dependent on the size of the tax wedge. It may be fair to say that the harmful consequences of a high tax wedge are exceptionally well and unambiguously documented in the literature (see, e.g., OECD (2006))[4].

The role of competitiveness could be illustrated with a simple AD/AS curve which in the case of small open economy could look like the graph below. The essential feature of the graph is the almost flat AD curve, which reflects the fact that foreign export demand is basically infinite and the price elasticity is very high. In a regime with nominal wage rigidity and fixed nominal exchange rates (typical situation for EMU countries) a country with the AD curve shifted to the position of AD" could face difficult adjustment problems. The level of production would fall dramatically. With flexible wages (labor market), we would obviously end up with a classical solution where output would be more or less constant. The graph illustrate the "Finnish disease" where a big part of export markets was lost in a matter of two-three years (due to the sales of mobile phone production of the Nokia Company). Thus, the AD curve would move from AD to AD" but if prices would still keep increasing that would create a big loss of output because no wage adjustment would take place. Somewhat similar episodes have taken place in southern Europe. The take hope message of this theorizing is strong emphasis on competitiveness, labor (and product) market flexibility and structural features of the economy.

In practical terms, the empirical model uses certain alternative indicators for these institutional and structural factors. The idea is that these factors affect growth via productive inputs and (total factor) productivity. Thus, we do not attempt to identify any behavioral relationships, and we therefore have

[4] The OECD study arrives at very high employment (and unemployment) estimates resulting from the size of the tax wedge. Thus, for prime-age males, the elasticity of this factor was 0.3 and for prime-age females, the elasticity of this factor was 0.5.



no (testable) parametric restrictions. Obviously, the estimates can be interpreted as the outcomes of a reduced form model; however, the “door is left open” for alternative interpretations and conclusions[5].

With respect to the structure of the remainder of the paper, the estimating equation is introduced in section 2, and the corresponding estimation results are reviewed in section 3. Finally, several concluding remarks are provided in section 4.

2. The model

As mentioned above, the key ingredients of the model are the functional distribution of income, the size of government and the competitiveness of the economy in global economy. In addition we have several variables which partly overlap these variables but also provide new insights to the growth problem. The first one is the dependency ratio which reflects the structure of populations. The basic idea is that an increase in the dependency ration lowers growth because of two reasons. First, it tends to increase overall tax wedge while the second channel comes via the labor input. An increased dependency ratio shows up in a lower employment, and in particular, is shows up in lower manufacturing employment. The smaller is employment, the lower is the marginal productivity of capital and hence the incentive to increase the capital stock. We have another indicator for development of employment, that is the annual working hours –variable. It may affect growth in many ways. It will, ceteris paribus, lower wage costs due to lower overtime wage compensations. But it may reflect the working of the labor market

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[5] For recent productivity developments, see OECD (2015).

also in other respects. It is typical for badly functioning labor markets that working-hour rules are strict and that there are long holidays and other free days (like the May 1 day). Needless to say, these create at least indirect costs for the employer. In technical terms, these kinds of factors would affect growth via the elasticity of substitution (see e.g. Klump (2000), Aquilina et al (2006) and Kilponen and Viren (2010) for more details).

As for cost variables, we include the real interest rate which obviously proxies the user cost of capital and hence reflects the ultimate investment incentive effect.

Finally, we include the terms of trade variable and a high-tech variable to account for the structure of trade and production. Both of those reflect the value-added intensity of production. So if the economy moves away from, say, primary production towards high-tech industries this shows up in the change of the industry shares but also relative prices (the price of an I-Pad is much higher than the price of an olive). Thus, the these variables may indicate how important it is make structural reforms in the economy and try move resources to more expansive industries.

In terms of empirical analysis, we proceed in a traditional way of estimating a linear reduced form equation in terms of the growth rate of GDP g (=Δlog(y)), which takes here the following from:

$$\mathbf{g}_{it} = \alpha_{i0} + \alpha_1\mathbf{ws}_t + \alpha_2\mathbf{fx}_t + \alpha_3\mathbf{tax}_t + \alpha_4\mathbf{dep}_t + \alpha_5\mathbf{hours}_t + \alpha_6\mathbf{tt}_t + \alpha_7\mathbf{rr}_t + \mathbf{u}_{it}, \qquad (1)$$

where the variables on the right-hand side of the equation are as follows:

The wage share, **ws** (the inverse of the profit share)

The real exchange rate, **fx** (an increase in **fx** implies an appreciation in the exchange rate)

The gross tax rate, **tax** (or gov. expenditures, **govexp**)

The (needs-weighted) dependency ratio, **dep**

Average working hours (HP trend), **hours**[6]

The terms of trade (**tt**)

The real interest rate, **rr** (in terms of bond yields)

The error term (**u**).

With respect to the coefficient values, we expect $\alpha_1 < 0$, $\alpha_2 < 0$, $\alpha_3 < 0$, $\alpha_4 < 0$, $\alpha_5 > 0$, $\alpha_6 > 0$ and $\alpha_7 < 0$.

For the wage share, we have two proxies. One of these proxies is a simple income-share of (gross) wages, which is denoted by **ws**, and the other proxy is an adjusted wage share, **ws_a**, which accounts

[6] The HP trend is used to diminish the importance of the simultaneous cyclical (demand for labor) relationship between output and working hours.

for the difference between the total number of (paid) employees and total employment. Similarly, the size of government is measured both by the gross tax rate and by total expenditures with respect to GDP, **govexp**. Finally, competitiveness is measured not only by the real exchange rate **fx** but also by the (real) unit labour costs, **ulc**.

As a final check, we introduced several measures of technical advancement of the economy staring from the share of high tech industries in the economy. This **hightech** variable represents the share of high industries of the value added of total manufacturing industry. We would obviously expect that a more advanced structure of economy allows for higher growth rates of exports and total output. In addition to this variable we also consider the ratio of R&D expenditures to GDP (**R&D**) and the number of patents (**PAT**) in per capita terms. All these three variables are obviously correlated with the terms of trade variable and hence we also estimate a simpler model which just include a Cobb-Douglas production function the underlying estimating equation. In other words, the employment and capital represent the other independent variables (the results of this exercise are reported in Table 2).

We use annual data from 15 EU countries for this study. The data span the 1971-2014 period and include a total of 553 data points. With the **hightech** variable, only 253 data points were available. The main data source is the AMECO data bank, although **dep** values were obtained from the DICE data bank, values of the US GDP = **USg** (used as a control) were obtained from the NBER, the unadjusted ws values were obtained from OECD data bank while the adjusted wage share (**ws_a**) data were obtained from AMECO. The **hightech** variable was derived from the OECD Stan data base and it included the following ISIC categories: 3825 (office machinery & computers), 383 (electric machinery), 3845 (aerospace) and 385 (scientific industries); see Viren and Malkamäki (2002) for details.

The data for **dep** and **hours** (which are not frequently used in empirical analyses) are illustrated in Figure 4. Both of these variables show a great deal of variability over time and across countries. The average working hours -variable demonstrates more trend-like development, whereas the dependency ratio undergoes several long swings that correspond to various occurrences, such as demographic changes (large child cohort after the Second World War) and changes in pension systems.[7]

The estimates of the model are presented in Table 1. The model is estimated using OLS, or GMM in the case of dynamic panel settings (Arellano – Bond estimator). Additional variables in the model include the US GDP growth rate (US_g) and the lagged dependent variable (g_{-1}). In most cases, we have included cross-section fixed effects (in one instance, fixed time effects are also included), although these effects are not displayed. However, to indicate the flavor of the result, we report one set of estimates for the cross-section fixed effects in Figure 5 (which correspond to equation (5) in Table 1).

[7] Instead of the **dep** variable, we used the simple population/employment ratio and got more or less the same results.

It is only the unit labor cost variable that does not preform very well in the model probably due to the great cyclical sensitivity. Its coefficient is of correct sign but it cannot estimated precisely (see equation 4 in Table 1).

The stationarity of the data represents some sort of problem. Already with the GDP rates, the Dickey-Fuller tests suggest in half of the cases that the series are not stationary which is not surprising given the declining trend in growth rates that is quite visible in Figure 1. As for the explanatory variables, the test results are somewhat inconclusive so that it is hard to say how the model should be estimated. The problem is that there is no obvious interpretation to an error-correction model. Thus we did only "solve" the problem by using also first differences of al variables in estimating equation (1).

Another problem which may invalidate the results is the possible simultaneity bias with respect the right-hand-side variables. Although most of the variables do not cyclically sensitive some, such as the wage share, are. We tried to find how serious the problem is by using a cyclically adjusted wage share variable. That produced a somewhat smaller coefficient estimates but in qualitative terms the results remained the same.

Obviously, the cross-section fixed effects are not completely innocent because they capture most of the cross-sectional variance of output growth. Given the approach of the current paper, only the cross-sectional variation is of primary interest because we wish to know the determinants of the equilibrium growth rate, rather than the factors affecting cyclical (short-term) variations in output. It would therefore be useful to present at least one set of estimates that includes no fixed effects but only has a common constant term. Thus, we ask whether our explanatory variables can explain all of the changes (differences) in the examined GDP growth rates. This set of results is displayed below in Box 1. The magnitude of the coefficients is illustrated by computing the growth rate responses to an increase of one standard deviation in each right-hand-side variable (Figure 5)

Box 1 The estimates of the simplest equation

Growth rate of GDP =
- 0.013 (1.57) The wage share (t-ratio)
- 0.052 (5.71) The real exchange rate
- 0.046 (7.09) The government size (expenditures/GDP)
- 0.022 (2.63) The HP trend of average working hours (log)
- 0.047 (4.76) The needs-weighted dependency ratio
- 0.052 (2.16) The real interest rate
+ 0.078 (7.20) The terms of trade
+ 0.543 (9.35) US growth
R^2 = 0.425; SEE = 0.0193, DW = 1.36;
OLS with no fixed & random effects & no lagged values

In this study, we almost entirely report results that represent common coefficients for all countries (and years). However, we also estimate the models for individual countries but for space reasons we do not report the results here (see Figure 5 for the country fixed effects). Certain differences do arise that creates obvious problems for common economic policies (this issue is more thoroughly analyzed in Mayes and Viren (2011)).

3. Interpretation of the results

Overall, our simple model fits the data very well. In general, the coefficients have the correct signs and are of reasonable magnitude. Moreover, the results that are obtained are quite precise, which allows us to generate at least tentative policy conclusions. The model does even withhold differencing (se column 16 in Table 1).

The results also appear to be surprisingly robust in terms of various measures of the underlying variables. Thus, if we construct an extreme version of the model and include all alternative proxies of our variables, the only coefficient with an unexpected sign is the coefficient of the gross tax rate. This result clearly reflects the fact that the gross tax rate and the expenditures/GDP ratio are sufficiently similar that the coefficients of both variables cannot be correctly estimated from a single equation.

The reported cross-section fixed effects (Figure 5) demonstrate that Greece, Italy, Portugal and Spain are the poor performers among the 15 countries (even after controlling for the background variables). By contrast, the Nordic countries manage quite well. This finding may provide support for various interpretations of the observed differences, including distinctions in the quality of institutions, moral values and/or the credibility of economic policies.[8] As for the fixed time effects, we may conclude that our model is not able to explain the output drops during the (both) oil crises, the financial crisis (Lehman Bros.) and the Euro crisis, nor the subsequent jumps in output. But it looks that there is no longer period – perhaps except for the 1980s, during which the model would systematically deviate from the actual data.[9] If we make a dynamic simulation (forecast) with the model for the 2000-2014 period, it turns out that the simulated GDP data tracks the actual data very well until the 2008 but after that the model forecast exceeds the actual data by about 2.5 per cent (Figure 5c). One may question whether this “forecast error” just reflects the cost of the Euro crisis which is no incorporated into the basic model. As a point of comparison, we also show a dynamic simulation for a simple Cobb-Douglas

[8] These interpretations obviously enter a topic that is rather thoroughly analyzed by Barro and Sala-i-Martin (1998).

production function (Figure 5c). It also shows that 2009-2014 represents a growth failure. This time the failure is only much larger than using model (1). On balance, the forecast that is made using the production function slightly fails to predict the high growth numbers before the financial crisis. Equation (1) does much better in this respect.

To more insight of the nature of country differences we carried out an analysis of convergence and found that there appears to be unconditional (but not conditional) convergence in terms of GDP [10]. With respect to other variables, the evidence is rather inconclusive. In terms of unit labor costs, certain striking exceptions can be detected.

On the basis of the estimates derived in this study, the following guide for growth policies appears to be warranted: Keep the profit rate and the price competitiveness at a reasonable level, or rather improve them. Do not over-expand the welfare state: larger governments are associated with slower growth rates.[11] Secure a sufficient labor supply. Longer life-time working periods and longer workweeks (and more flexible labor markets in general) generate better economic growth. Do not allow interest rates to exceed equilibrium levels, but instead keep the risk premia as low as possible. Try to achieve more advanced structure of production and exports.

Clearly, these recommendations largely match the recommendations that are provided by the new growth theory, despite the fact that we do not directly control variables that directly affect innovative activities. The output share of high-tech industries (**hightech**) provides an exception. Including this variable does not, however, invalidate the other results and the variable makes a positive contribution to the explanation to differences in growth. The systematically positive and rather precise coefficient estimates suggest that countries that have managed to modernize their industries seem to perform better than countries that stick to their old structures of production. A similar type of results if we just use the valued added share of the whole manufacturing industry out of total value added. Thus, by and large, deindustrialization seems to be a bad thing from the point of economic growth.[12] The relationship between technology, research & development expenditures and structural developments, on the one hand, and growth, on the other hand, is not, however, completely straightforward as indicated by Figure 7. Pure growth performer are surely also low R&D expenditure countries but with the rest of countries

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[9] It is beyond the scope of the current paper to explain the growth performance of different time periods but as for the 1980s, one may at least mention the full-scale start of globalization, liberalization of financial markets and the collapse of OPEC oil cartel.

[10] The coefficient of $\log(y_{i,t-1}/y_{ge,t-1})$, where ge refers to Germany, was calculated to be -.052 (6.28) in the unconditional convergence regression; however, if this variable is inserted, to equation (5) in Table 1 as an additional regressor to get some idea of the importance conditional convergence, the resulting coefficient is -.024 (2.23). See Column 14 in Table 1.

[11] This conclusion may be motivated by the idea that the there is a type of Laffer curve in the productivity of public sector services, as discussed by Koskela and Viren (2000). This notion also arises in the analysis of the extensive empirical evidence that was produced by Tanzi and Shuhknecht (2000).

[12] The value-added share of manufacturing industry of total value-added is used just because recent data on the high-tech variable are not available. The result was quite similar (as can be guessed on the basis of Figure 8) so that the coefficient of the value-added share turned out to be 0.090 without really affecting the coefficients of the other variables (Table 1, column

the evidence is more diffuse.[13] Quite probably the average level of R&D expenditures does not tell the whole story. Also the distribution of expenditures is important (military vs. nonmilitary, manufacturing vs. services and so on). It may well be that the "productivity" of R&D expenditures depends on the markets are functioning (see Kilponen and Viren (2010) for some empirical evidence). Thus, if the markets function very poorly e.g. because of monopolies, trade restrictions and aggressive trade unions, even large R&D investments do not create growth.
The role of R&D expenditures (**rd**) and **patents** becomes a bit more obvious when we add these variables to a CD production function specification (Table 2). The function itself performs relatively well so that the values of share parameters (input elasticities) make sense at least in the sense that they roughly add up to one. The coefficient of the R&D variables can be estimated a bit more precisely. Along the lines of Kilponen and Viren (2010) we also added the openness variable (**open**) to this specification and it also performed in a meaningful way suggesting that countries, which are able to penetrate into the world markets growth faster than countries that turn inwards in their production and demand.[14]

Anyway, from a policy perspective, our explanatory variables provide a plethora of possibilities for growth programs. These possibilities may be illustrated using the following simple calculation, which will at least provide an idea of the relevant magnitudes of various effects. Using log transformation for all time-series (except for the real interest rate) and re-estimating the model, and using the respective elasticities (of equation 15 in Table 1) it turns out that the mean growth rate can be increased by 0.3 percentage points by increasing (i.e. improving the values of) all exogenous variables (except for the US output growth by one per cent at the same time. The effects of individual variables can be seen from Figure 6 where the impulse responses of different exogenous variables (for one standard deviation "shock" of these variables) is reported. Clearly, the key variable is wage share, which also makes sense thinking about its potential impact on marginal product of capital and capital accumulation.

This result implies that a revolution is not required to generate one per cent of additional growth each year: the "welfare state" does not need to be eliminated, wages do not need to be lowered to subsistence income levels, and working hours do not need to be increased to medieval levels. In fact, in most instances, significant improvements in economic growth could be produced by simply reverting to the conditions of approximately one decade ago. The changes that would be entailed in this reversion are still sufficiently great that they would not easily be sold to the general public within the median

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[13] RD expenditure's GDP -share is correlated quite weakly with the hightech -variable (0.36) and the manufacturing industry's (0.31) value-added share, while the two latter variables are more strongly correlated with each other (0.60). The problem with the RD variable is the data: the data cover only less than two decades.

[14] Even though the CD production function performs reasonably well it may not represent the final word, especially in terms of elasticity of substitution. Thus, when we estimated a CES production function (without control variables), the elasticity of substitution tuned out to be 0.8 for the panel data (using geometric means in normalizing the data). This suggests that in the sample countries markets do not function "perfectly", which may be one additional reason for slow growth. Unfortunately the CES framework is not very flexible for testing the role of additional control variables like the RD and therefore we just us the CD equation.

voter model. Given the gloomy prospects of most EU countries, however, the need for certain unpleasant reforms has become increasingly compelling.

4. Conclusions

This paper shows that accelerating growth in Europe is not completely unrealistic. However, several unpopular reforms would be required to increase the labor supply, alleviate tax burdens and increase competitiveness. Obviously, these phenomena are not unrelated. Thus, by reducing the growth of the public sector and decreasing tax rates, one may increase both the labor supply and the competitiveness of the private sector. The future development of the public sector is indeed the key aspect of determining the future development of the economy. If the public sector can be maintained in a reasonable fashion, one may manage to achieve low tax rates and low tax wedges in labor markets, and one can also avoid fiscal crises and keep the risk premia (of interest rates) low. Indeed, there are causal relationships in the opposite direction, as well; for instance, an increased labor supply (well-functioning labor markets) generates more tax revenues, allowing for lower tax rates and diminishes the risks of fiscal crises.

Although the message of this paper is clear and the results of the empirical analysis are quite unambiguous, there are several caveats that merit mention. Above all, it is worth noting that in this study, we have not considered either capital deepening (increasing investment and saving activity) or various other factors that may underlie total factor productivity, such as innovative activity and the adaptation of innovations, in any detail (cf. Kilponen and Viren (2010) for an assessment of the importance of these factors). It is only the capital productivity channel which we have somewhat indirectly considered. Similarly, financial factors related to economic growth must be more deeply analyzed (in accordance with the approach of e.g., Beck et al. (2005)). We also have not considered the implications of global developments, although these developments obviously affect the economic position of European countries relative to other countries. Our rather crude institutional and structural explanatory variables do not capture any of these considerations particularly well, and thus further analysis is certainly required.

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Table 1 Estimation results

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
ws_a		-.053							-.052	-.057						
		(2.51)							(2.57)	(2.85)						
ws	-.137		-.095	-.162	-.107	-.134	-.060	-.125			-.207	-.213	-.102	-.101	-.076	-.328
	(4.33)		(3.04)	(4.40)	(3.36)	(5.27)	(2.04)	(3.86)			(3.23)	(3.23)	(2.28)	(3.10)	(4.08)	(5.18)
fx	-.058	-.074	-.037	-.031[c)]	-.054	-.044	-.055	-.056	-.048	-.069	-.115	-.019	-.047	-.048	-.050	-.072
	(5.45)	(6.26)	(3.63)	(0.28)	(5.12)	(4.63)	(5.81)	(5.11)	(4.22)	(2.85)	(2.02)	(1.23)	(2.93)	(4.44)	(4.86)	(2.85)
tax							-.060	-.037	-.061	-.030		-.116				
							(1.78)	(1.21)	(1.87)	(1.20)		(2.22)				
govexp	-.109	-.130	-.090	-.089	-.079	-.083					-.213		-.077	-.085	-.037	-.168
	(5.87)	(6.98)	(4.75)	(4.16)	(4.06)	(4.59)					(3.12)		(2.95)	(4.22)	(3.98)	(5.12)
hours	.040	.063	.030	.037	.026	.038	.021	.035	.067	.065		.057	.012	.057	0.031	-.084
	(2.29)	(3.23)	(1.73)	(1.92)	(1.50)	(2.62)	(1.01)	(2.00)	(3.20)	(3.26)		(1.91)	(2.38)	(0.03)	(1.88)	(0.46)
rr	-.050	-.059	-.022	-.026	-.037	-.020	-.032	-.057	-.057	-.060	-.005	-.131	.085	-.049	-.035	-.018
	(2.34)	(2.49)	(1.09)	(1.20)	(1.74)	(1.16)	(1.46)	(2.67)	(2.62)	(2.61)	(0.18)	(1.76)	(3.08)	(2.17)	(1.58)	(0.76)
dep	-.266	-201		-.177	-.176	-.188	-.116	.202		-.123		-.286	-.163	-.210	-.041	-.083
	(5.11)	(3.60)		(3.07)	(3.34)	(3.79)	(1.89)	(3.66)		(2.04)		(2.24)	(2.15)	(3.76)	(3.16)	(0.10)
tt	.041	0.48		-.002	.038	.033	.044	.042		.050	.072		.027	.029	.036	.003
	(2.91)	(3.17)		(0.24)	(2.63)	(2.61)	(3.09)	(2.85)		(3.27)	(3.05)		(1.02)	(2.04)	(2.89)	(0.01)
USg	.467	.497	.515	.472	.480	.428		.481	.546	.510	.453	.345	.543	.457	.457	.247
	(8.40)	(8.77)	(9.38)	(8.32)	(8.69)	(11.74)		(8.57)	(9.87)	(9.03)	(7.52)	(4.46)	(8.21)	(8.45)	(8.63)	(5.38)
hightech												.303	0.090[e)]	-.026[f)]		
												(1.90)	(1.56)	(2.26)		
g_{-1}			.247	.209	.202	.181	.331	.243	.334	.288	.107		.196	.204	.198	-.320
			(4.96)	(3.96)	(3.97)	(4.97)	(6.08)	(4.95)	(6.87)	(5.65	(1.12)		(3.09)	(3.96)	(3.95)	(7.81)
panel	CS	CS	CS	CS	CS	CS	CS&TS	CS	CS	CS	dif.	CS	CS	CS	CS	dif.
R^2	0.533	0.521	0.543	0.540	0.559	0.555	0.740	0.547	0.528	0.545	..	0.410	0.627	0.567	0.563	0.517
100*SEE	1.76	1.79	1.75	1.78	1.71	1.71	1.37	1.74	1.78	1.75	2.07	1.33	1.62	1.71	1.71	1.82
DW	1.51	1.47	1.92	1.87	1.90	1.91	1.89	1.97	2.05	2.02	..[d)]	1.30	1.80	1.91	1.90	2.21

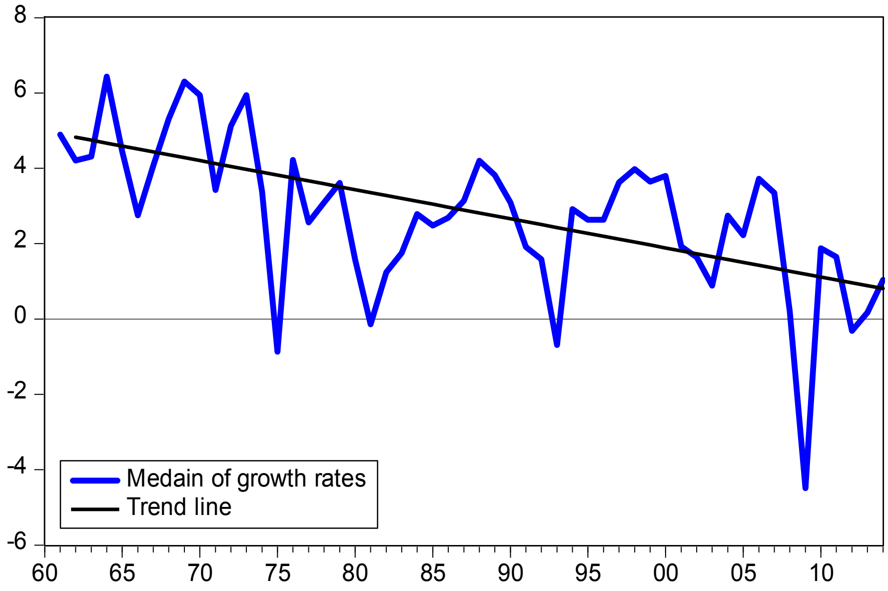
Numbers inside parentheses are corrected t-ratios. CS denotes cross-section fixed effects and TS period fixed effects (test statistics for the cross-section fixed effects always exceed conventional critical values). Estimates in column (6) are GLS and in column (11) GMM estimates. The number of data points is 553. However, with equation 10 it is only 253. [c)] ULC is used instead of FX. [d)] The value of the J-test is 10.98 (0.203). [e)] Share of manufacturing. [f)] Coefficient of $\log(y_{i,t-1}/y_{ge,t-1})$. In (15) all except rr are in logs. In (16), all variables have ben differenced, thus the dependent variables is Δg.

Table 2 Estimation results with a production-function-based model

	1	2	3	4	5
Δlog(L)	.637	.682	.610	.553	.600
	(9.19)	(7.79)	(6.37)	(11.80)	(4.91)
Δlog(K)	.343	.180	.303	.239	.377
	(3.15)	(1.40)	(2.09)	(2.64)	(6.75)
Δrd		.175[a)]	.701	.751	.736
		(2.20)	(1.84)	(3.55)	(2.54)
Δpatent		.014[a)]	.017	.038	.015
		(1.88)	(0.46)	(1.60)	(0.47)
Δopen		.081[a)]	.075	.071	.070
		(1.62)	(3.86)	(5.59)	(4.26)
trend	-.0004	-.0006	-.0005	-.0006	-.0006
	(5.08)	(5.15)	(5.27)	(8.21)	(4.97)
panel	CS	CS	CS	CS, GLS	none
R^2	0.467	0.529	0.598	0.594	0.561
100*SEE	1.79	1.74	1.69	1.63	1.69
DW	1.70	1.71	1.59	1.59	1.45

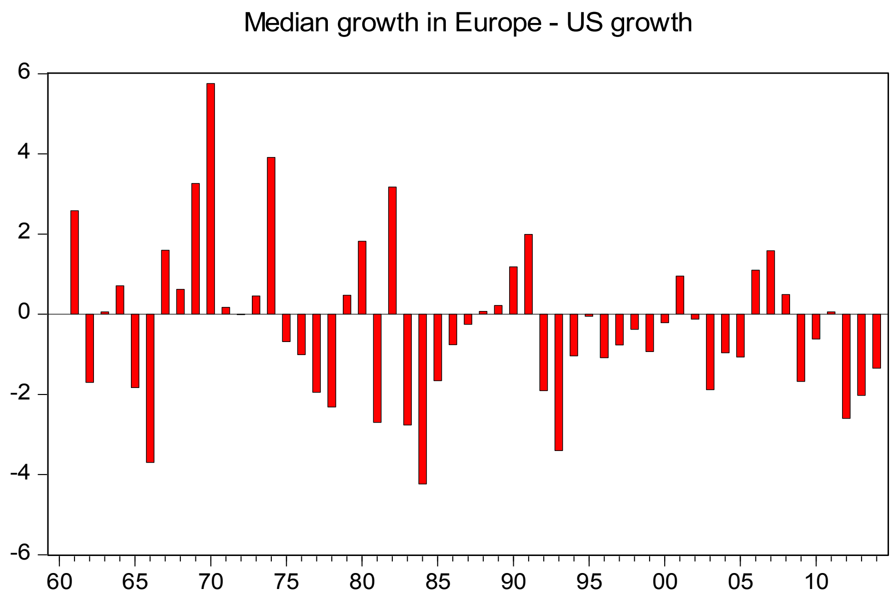
Numbers inside parentheses are corrected t-ratios. All estimates except for eq. 4 are OLS estimates. CS denotes cross-section fixed effects. The estimation period is 1961-2014 and the maximum number of data points 651. [a)] Here these RHS variables are in the level form.

Figure 1 GDP growth rates in the EU



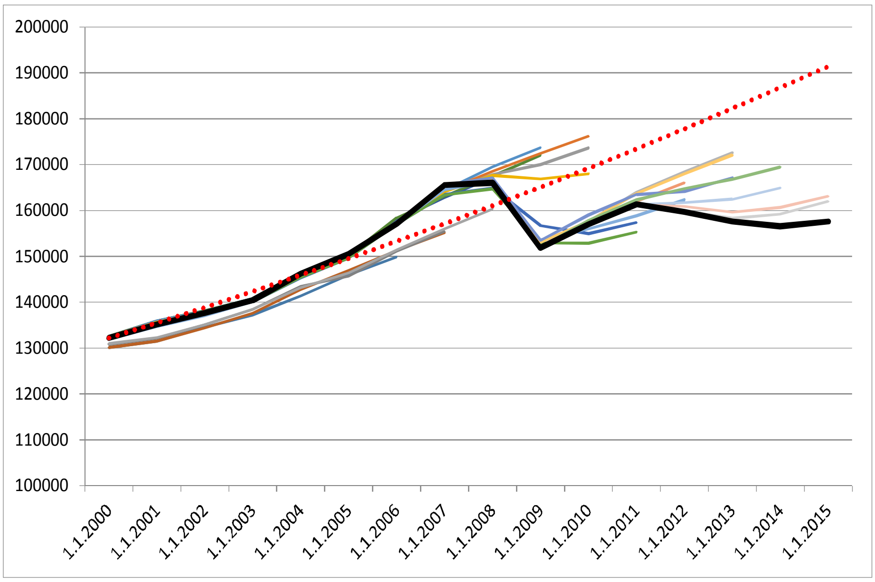
Data source: Ameco data base.

Figure 2 EU – USA comparison



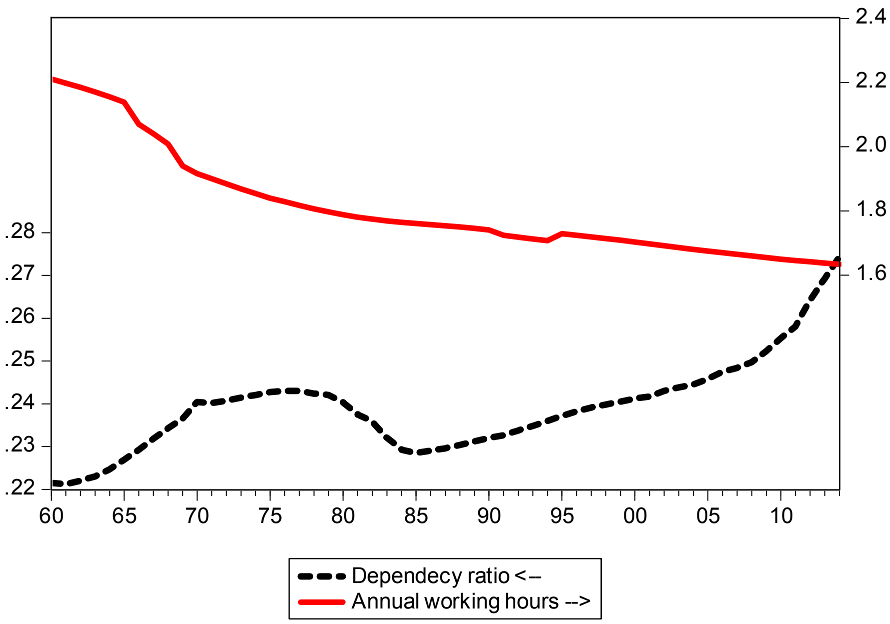
Data source: Ameco data base.

Figure 3 Forecasts errors from a DSGE model



Forecasts are made bi-annually for Finland by means of a DSGE model AINO. The solid line represents actual data.

Figure 4 Mean values for the dependency ratio and annual hours variables

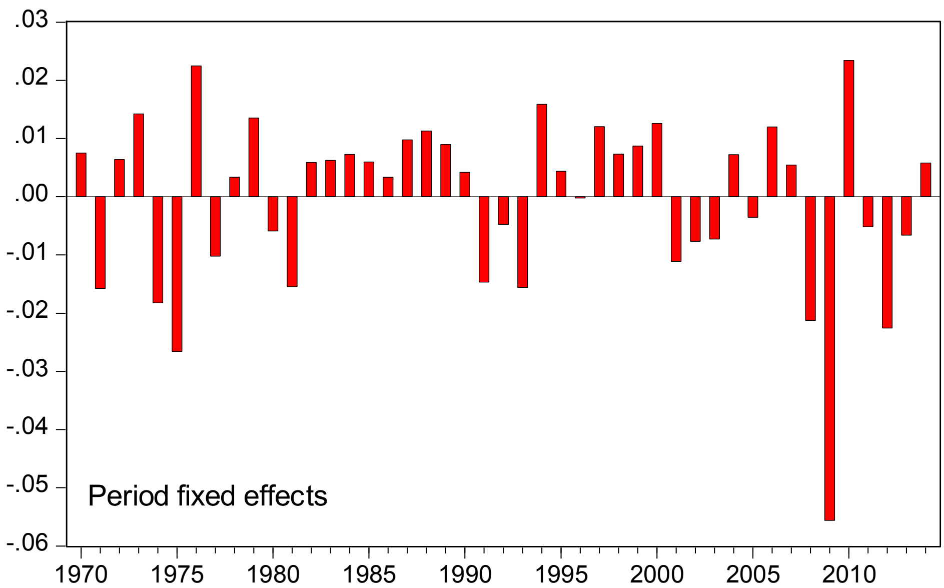


Data sources: AMECO, OECD and DICE.

Figure 5 Panel regression results

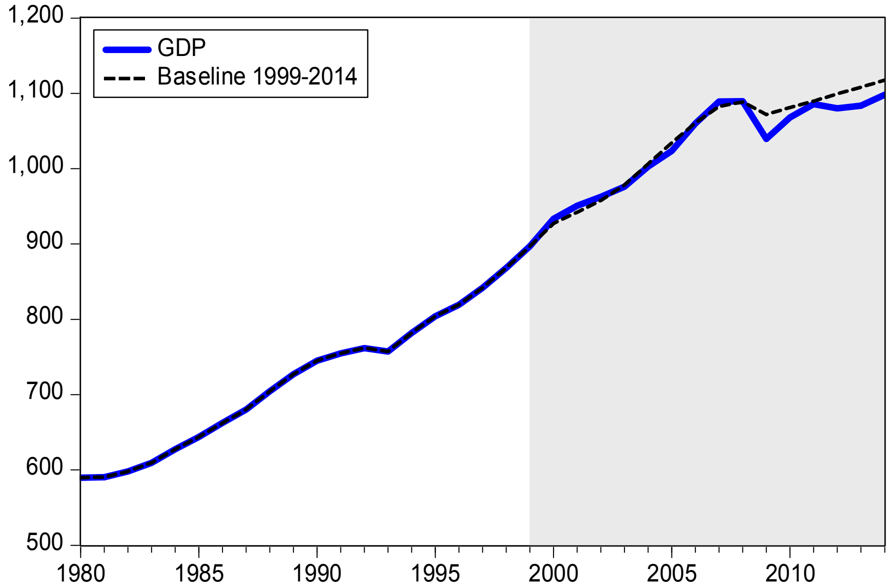
(a) Fixed cross-section effects

(b) Fixed time effects



The estimates come from equation 5 in Table 1. Period fixed effects are derived from a model which does not include USg.

(c) Dynamic simulation (forecast)



(d) Dynamic simulation with a CD production function

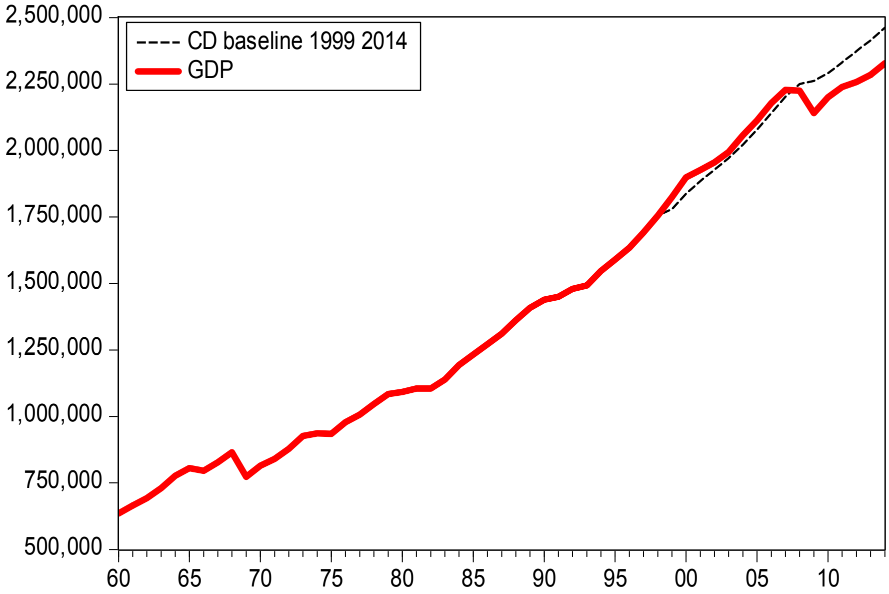
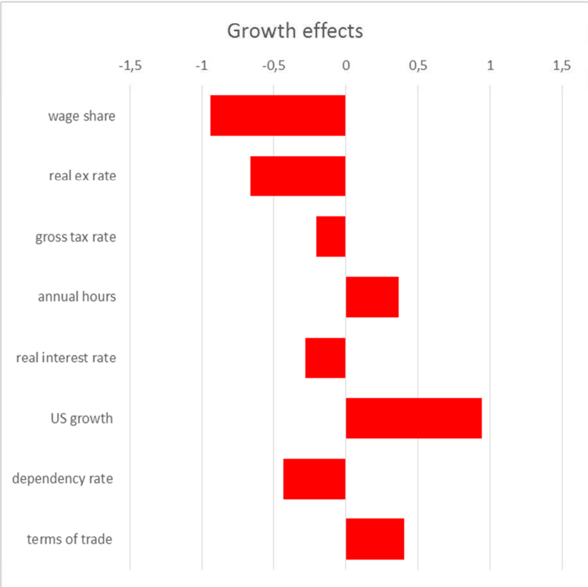
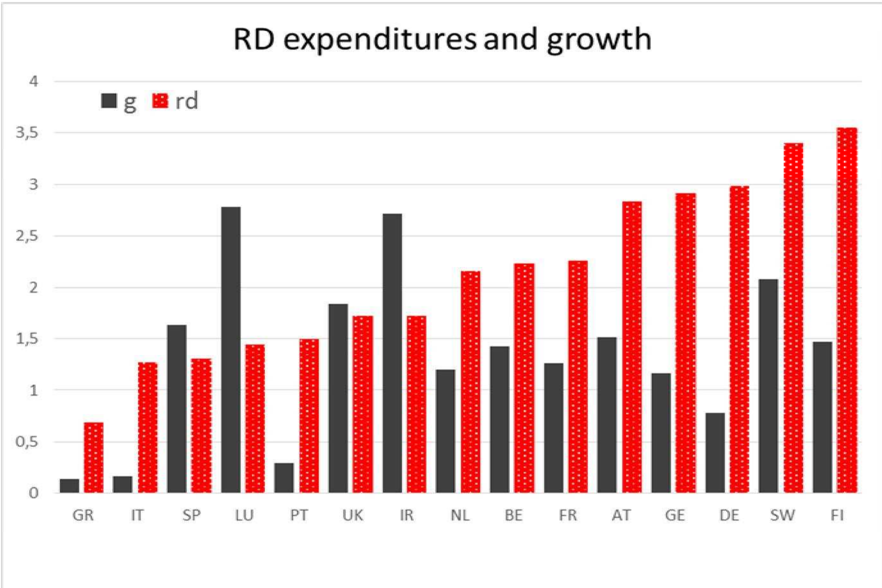


Figure 6 Growth effects of one standard deviation increase in exogenous variables



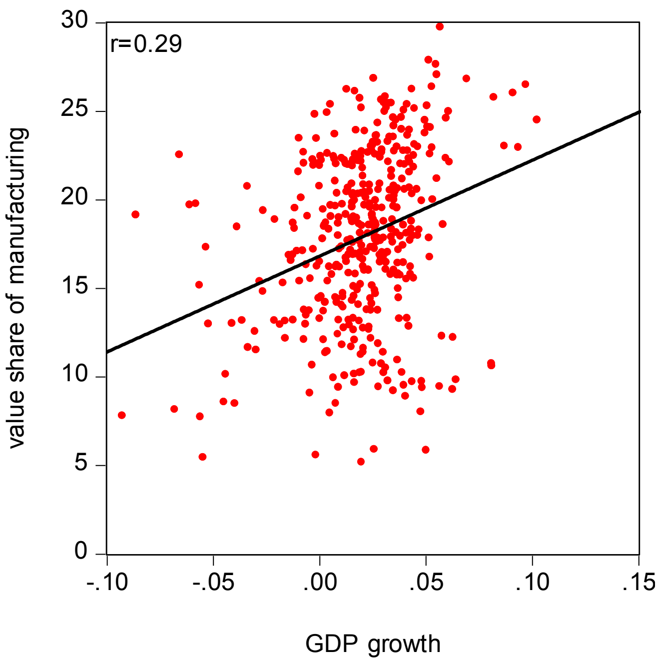
These estimates are derived from equation 5 in Table 1 and they correspond to one standard deviation of the respective variabled for the whole panel data.

Figure 7 RD Expenditures and growth 2000-2014.



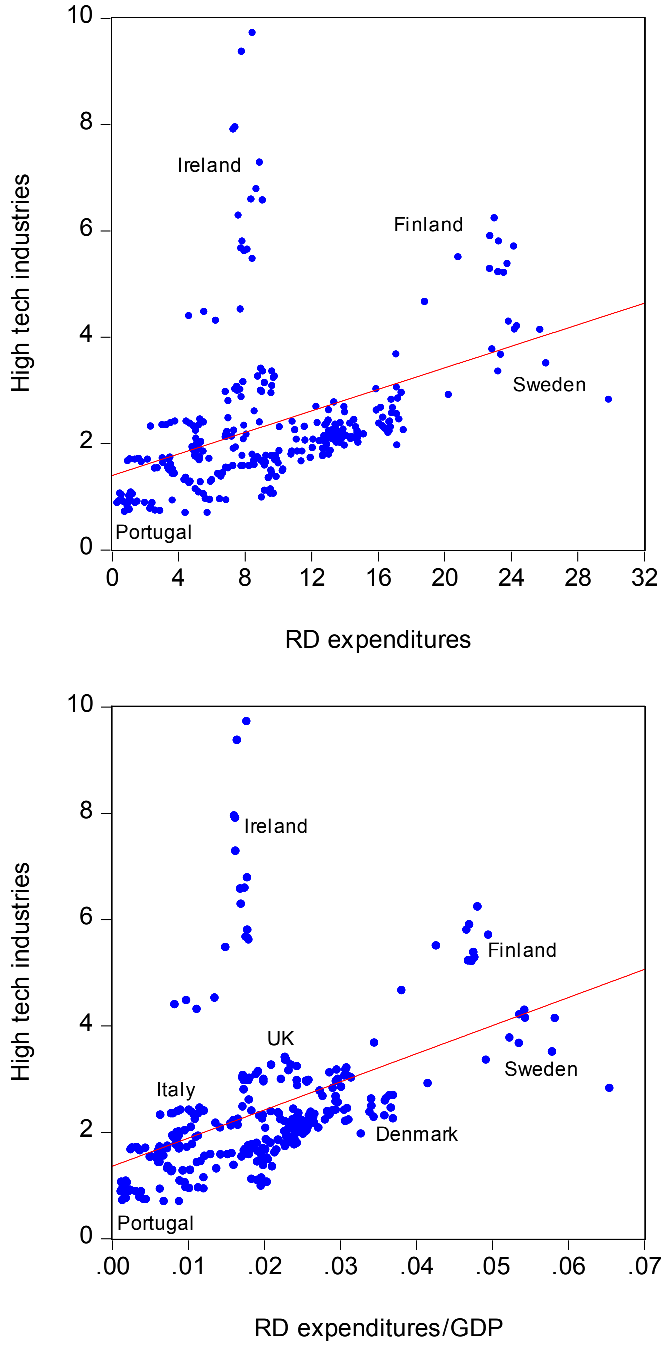
Source: OECD Main Science and Technology Indicators

Figure 8 Share of manufacturing industry and GDP growth



Source: OECD

Figure 9 RD expenditures and share high tech industries



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ISSN 1796-3133