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REGIONAL AND INSTITUTIONAL INFLUENCES ON THE DETERMINANTS OF LONG-TERM ECONOMIC GROWTH IN THE OECD

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Abstract: This paper examines regional and institutional influences on the determinants of long-term economic growth in the OECD. We construct a growth equation based on the new growth model of Barro with a *catch-up* variable, *total investments*, *total tax revenues exclusive social security benefits*, *primary and secondary school enrolment ratio's* and *population growth*. We find that regional and institutional aspects have some substantial influences on determinants such as *catch up*, *population growth*, the *level of subsidies* and *tax revenues exclusive social security benefits*. So, next to direct effects of institutions on economic growth, there are also some indirect influences through economic determinants of growth.

Keywords: Economic growth, OECD, Barro, Olson, Corporatism

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Tiivistelmä: Tutkimuksessa selvitetään alueellisten ja institutionaalisten tekijöiden vaikutusta pitkän aikavälin kasvuun vaikuttaviin muuttujiin OECD-maissa. Käytetty kasvumalli perustuu Barron uuteen kasvumalliin, jossa selittävinä muuttujina ovat tuloeroja kuvaava muuttuja, investoinnit, verojen tuotto poislukien sosiaalivakuutusmaksut, koulutukseen osallistumista kuvaava muuttuja ja väestönkasvu. Tutkimuksen mukaan alueelliset ja institutionaaliset tekijät vaikuttavat joihinkin selittäviin muuttujiin, kuten tuloeroja kuvaavaan muuttujaan, väestönkasvuun, tukiaisten tasoon ja verojen tuottoon (poislukien sosiaalivakuutusmaksut). Siten instutionaalisilla tekijöillä on suorien vaikutusten lisäksi epäsuoria vaikutuksia kasvuun.

Asiasanat: Taloudellinen kasvu, OECD, Barro, Olson, korporatismi

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Contents

1 Introduction

1.1 Introduction

In my thesis "*Institutions and economic growth in the OECD; a quest for an institutional extension of the empirical explanation of economic growth*" (Hiddink 1995) I discuss the question whether differences in decision-making processes and labour market institutions can contribute to the explanation of long-term growth differences within the OECD. The concept of instability is often used as a theoretical concept if the dicision-making process is approached. This concept, however, does not seem applicable to the OECD. This concept rests on the assumption that instability influences economic growth negatively through insecurity, discontinuity and/or social-political unrest. The OECD countries, however, lack these aspects.

The theory of Olson (1983) supplies an alternative, more suitable, theoretical frame-work. This theory states that stable societies tend to accumulate more collusions and organisations for collective action over time. This accumulation increases the complexity of regulation, the role of government and inflexibility, which leads to a reduction of efficiency and aggregate income. Organisations can, however, have positive influences on economic prosperity if they are more or less encompassing. This concept of stability, and its negative influences on economic development, suits the OECD countries.

To formulate an adequate answer to the central question, regression equations are constructed with institutional- as well as economic variables. The economic variables are based on the growth-model of Barro (1991). I use variables such as investments, human capital, a 'catch-up' variable, population growth and the influence of government consumption on economic growth. This robust economic equation is capable of adequately explaining differences in economic growth for the period 1960 to 1985.

Because politics is a complex process which is hard to quantify, numerous approaches are used. As expected, variables such as the number of government crises, riots, constitutional changes and the number of government changes do not contribute to the explanation of economic growth. All other used variables seem to support the theory of Olson qualitatively. The average term of a government, the number of ideological changes of the prime-minister/president and the average parliamentary support of the government significantly contribute to the explanation of economic growth. The average number of political parties within a government, a dummy for the electoral system and the average fractionalization rate support the theory only qualitatively. For

the labour market an order of ranking is used, for which two different methods are employed. Next to the classification of Calmfors and Driffil (1988), which is completed with the missing countries, another order of ranking is used whose construction is based on different orders of ranking[1]. These two orders of ranking support robustly the 'hump-shape' hypothesis. This hypothesis states that highly centralised as well as highly decentralised structures of the labour market influence economic development positively. Countries which find themselves in between these extremes, like The Netherlands, lack the advantages which can be linked to both structures. It should be noted that the advantages of centralised structures erode when the openness of the economy increases.

An institutional extension of the economic equation seems to be a good idea. First of all, variables which are connected the political decision-making process and labour market structures are significant on the 90 to 95 percent level. Secondly, the added institutional variables contribute just as much to the explanation of economic growth as most of the economic variables separately. This insight can be obtained by expressing all variables in their own standard deviation. And thirdly, the extended model seems to explain the growth differences within the OECD much better than the equation which is just based on purely economic variables. The thesis shows that it is quite meaningful for economists to include political and institutional aspects in growth analyses.

1.2 Question

Central question in this study is whether the above mentioned political and institutional variables directly influence the economic determinants of economic growth. If these variables influence the economic determimants, then we have to take direct as well as indirect influences of political and institutional structures into account. In chapter 2 we discuss the economic model of Barro and re-estimate the equations for the OECD with O.L.S. by using cross-section time series data. This method will increase the numbers of freedom which makes a pooled regression possible. This different estimation method provide us with an instrument to test the robustness of the specified variables in the Barro-model. This model functions as point of departure for the empirical research. In chapter 3 we divide the economic determimants based on the political and institutional criteria. This way we allow different coefficients for different groups of countries. This approach will give us more insight on the complex relations that exist between the determinants of growth and the institutional environment. In chapter 4 we briefly sum up and discuss the findings of my analysis which lead to an answer on the central question.

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[1] *Bruno and Sachs (1985), Alverez et al. (1991), Schmitter (1981), Cameron (1984), Soskice (1990) and Calmfors and Driffil (1988).*

2 The Economic Model

2.1 Introduction

Since the mid-1980s research on economic growth has experienced a boom. One important reason for this is that the assumption of exogenous technological process from the neo-classical growth theory is considered to be incomplete. In the new growth theory the long-run growth rate is determined within the model, because of external benefits of human capital (innovations). But inventive activity tends not to be Pareto optimal, because of distortions related to the creation of new goods and processes. The outlook to the position of the government within the economy changed. This lead to research that focused more on governmental actions such as taxation, intellectual property rights, market structures and so on. So the new growth theory gives economic policy a new theoretical framework which is far more practical than previous growth models.

2.2 Barro

One of the most clear features of the new growth theory in the 1980s and 1990s is the attention that is paid to empirical implication of the theory. Barro (1991) is one of the leading contributors to this field of empirical research. He tries to explain with cross-sectional O.L.S. estimations the GDP growth per capita differences for 98 countries. The basis model can be formulated as followed:

$$Yt = F(Y0, It) + K(Vt, Gt, E0, Mt, Pt) + Z$$

Yt is the average growth of GDP per capita in period t. The function F represents the variables which have a more or less neo-classical base. $Y0$ is the initial level of GDP per capita and It the investments. The function K represents more recent growth variables such as the fertility rate Vt, Gt the government consumption, $E0$ the initial level of human capital market distortion Mt and political aspects Pt. Z stands for the regional dummy's.

The results of Barro's estimations are presented in the table below. $E0$ is divided in the primary school and the secondary school enrolment ratio. Government consumption is used as a percentage of GDP. It is divided in total investments and government investments. Market distortion is approached with the average deviation of investment prices in 1960 in PPP (Power Purchasing Parity). For Pt the number of revolutions, coups and political assassinations are used. Geographical dummy's are added for Africa and Latin America. Barro uses a data-set described in Heston and Summers

(1989) which later became famous as the Penn World Tables. This data set contains data based on international prices.

Table 1[2]**:** *The regression results of Barro (1991) for 98 countries for the period 1960 to 1985, the results of Englander and Gurney (1994) and the OECD (1991) for 24 OECD countries for the period 1960 to 1985 and the regression results of Hiddink (1995) for the same period for 24 OECD countries.*

Equation	Barro	Englander	OECD	Hiddink
number of countries	98	24	24	24
Variable				
GDP in 1960	-0.70 (-7.8)	-0.50 (-4.8)	-0.55 (-8.4)	-1.5[3] (-6.2)
Primary school enrolment	1.5 (2.4)	1.7 (1.8)		
Secondary school enrolment	0.04 (0.0)	1.5 (1.7)	1.2 (2.2)	1.8 (2.8)
Government consumption	-9.4 (-3.9)	-2.5 (-0.8)	-4.3 (-1.9)	-6.9 (-2.9)
Government investments				24.9 (2.3)
Total investments	6.1 (2.0)	5.9 (1.4)		
Fertility rate	-0.28 (-2.2)		-0.79 (-4.0)	
Population growth				-0.60 (2.8)
Market distortion	-1.1 (-2.0)	1.1 (1.0)		
Revolutions	-1.5 (-2.5)	-0.57 (-0.3)		
Assassinations	-1.8 (-1.2)	0.37 (1.0)		
Africa	-1.0 (-3.0)			
Latin America	-1.0 (-3.7)			
Constant	4.5 (3.6)	1.4 (0.7)	6.9 (10.4)	4.8 (6.7)
R2 (adj.)	0.66	0.61	0.80	0.72

[2] *All coefficients presented in this table are multiplied with 100 except fertility rate, population growth and market distortion.*

[3] *Here the logarithm value is used of the GDP in 1960*

2.3 The Variables

2.3.1 Initial GDP

'GDP in 1960' originates from the neo-classical growth theory. This theory states that relatively poor countries will grow faster than rich countries which will eventually lead to convergence of the growth rates. Relatively poor countries can benefit from a lower capital/labour ratio and the international mobility of capital. The new growth theory states that next to these neo-classical arguments the diffusion of technology should also be taken into account. Follower economies imitate, and since imitation is cheaper than innovation, this diffusion also leads to convergence. Abramovitz (1986) recalls that this 'catch-up' is no automatic mechanism. The use of this source of growth is dependent on human capital and institutional structures.

2.3.2 Human capital

First of all, human capital can act as a precondition for the accumulation of capital. And second, human capital can have a positive influence on the acceptance, development and use of new technologies. In the Barro estimation the secondary school enrolment ratio looses its significance level because of, as Barro states, the addition of the geographical dummy's. They seem to approach the same source of economic growth.

2.3.3 Government consumption

It is often stated (Klundert and Smulders 1992) that the distortion caused by the tax system outweighs any positive sides of government consumption, because there are no direct productivity gains involved. In the Barro equation government consumption is corrected for schooling and defence budgets. Barro holds the opinion that these expenditures must be seen as investments. The OECD is not able to find any significant influence of government consumption on economic growth. Hiddink, however, finds a robust coefficient for government consumption inclusive expenditure for schooling and defence.

2.3.4 Investments

Although theoretically investments must not be omitted from any growth equation, in empirical research this variable seem to cause some problems. The OECD only finds a marginal significant coefficient for investments and equation Hiddink presents a stable and significant coefficient for government investments.

2.3.5 Fertility rate

Barro introduced the fertility rate into the equation, because the neo-classical growth theory does not consider the effects of per capita income and wage rates on population growth and does not take account of the resources used up in child-rearing. A higher level per capita income generates a fall in the fertility rate which leads to a shift towards more human- and physical investments. This, again, leads to economic growth. Although Barro obtains reasonable results with this variable his equation, I have run into a lot of problems with this variable. First, this theoretical base considers the fertility rate to be endogenous, whereas the model is one-sided. Secondly, in my regressions these variable inter-correlates with the other variables specified in the model. And thirdly, it approaches the same dimension as population growth from the neo-classical theory. In my own equation I added population growth to the model. The results were more robust and fitted the one-sided model better.

2.3.6 Market distortion

To approach market distortion, Barro uses the deviations of the average prices on the capital market. Extraordinary high and low prices are considered to be indications for market distortion which influence economic growth negatively. Barro finds a significant negative coefficient, whereas Englander and Gurney (1994) can not find significant results. Furthermore, the construction of this variable is incorrect. Distortion on the capital market does not always have to have negative influences on economic growth. Bradford (1987) argues that the relatively low prices for investments in the Newly Industrialized Countries (NIC) were an important source of economic growth.

2.3.7 Political aspects and regional dummy's

Barro approaches political instability by adding the average number of revolutions and assassinations to the equation. Barro finds acceptable coefficients and t-values for this social unrest-approach. Englander and Gurney can not find significant results for the OECD. Within the OECD these variables were the product of a transformation process towards democracy. And if democracy influences economic growth positively, as Barro (1994) and Pourgerami and Assane (1992) state, these variables then have positive influences on growth. These effects, however, can not be detected in a cross-section regression.

2.4 The Results

In the following table the results of our own regressions are presented. These regressions are executed with Shazam. Contrary to the regressions of Barro, we use OECD cross-section time series data based on ten-years averages. The data is mosty acquired from the *OECD Economic Outlook* (OECD 1995-b). The school enrolment

ratio's, however, are obtained from the Barro and Wolf data-set (Barro and Wolf 1989) *and total tax revenue exclusive social benefits* are recovered from *Revenue Statistics of OECD Member Countries 1965-1994* (OECD 1995-a). For more information about the used data see appendix 1. By using pooled regression in stead of the cross-section method used by Hiddink (1995) and Barro (1991) we can also test the robustness of the Barro equation. The regressions are for 25 OECD countries for the period 1960 to 1990.

Table 2[4]: *Results of our own regressions for 25 OECD countries for the period 1960 to 1990*

Equation	(1)	(2)	(3)	(4)
Number of countries	25	25	20	18
Variables				
Catch up	-0.20 (-4.2)			
LOG Catch up		-2.7 (-8.3)	-2.7 (-8.6)	-3.1 (-8.2)
Total investments	7.0 (2.0)	5.3 (1.8)	8.3 (2.5)	0.066 (0.0)
Private investments				
Government consumption	2.2 (0.6)	1.8 (0.5)	3.1 (0.8)	-3.9 (-0.9)
Population growth	-0.61 (-2.4)	-0.35 (-1.6)	-0.45 (-2.1)	0.072 (0.3)
Primary education	-0.56 (-0.4)			
Secondary education	-0.64 (-0.8)			
Initial primary education		2.4 (3.2)	1.7 (1.8)	1.4 (1.5)
Initial secondary education		2.8 (2.9)	2.4 (3.2)	2.0 (2.6)
Openness	-0.57 (-1.3)			
Subsidies			-0.35 (-2.8)	
Social Security Benefits				-0.27 (-0.1)
Constant	4.7 (2.5)	3.4 (2.3)	4.5 (2.9)	8.1 (4.7)
R2 (adj.)	0.41	0.56	0.69	0.73

[4] *All coefficients presented in this table are multiplied with 100 except population growth.*

In equation (1) we try to reproduce the regressions of Barro as good as possible. Because we do not have data on price deviations[5] on the capital market and on the fertility rate we omit these variables. Instead, we add the population growth as a proxy for the supply of labour and we use the openness ratio (imports + exports divided by GDP). Government consumption seems to be insignificant, as well as both approaches for human capital.

In equation (2) an other approach is used for human capital. In stead of using the enrolment rate's in 1960, 1970 and 1980, we use the enrolment rate in 1960 for all these periods. This approach is along the line of a growth model in which certain characteristics are permanently linked to inputs of the production process. So in this case the level of education is linked to the people that enter the labour market in the 1960s. Although new 'better' educated people entered the labour market in the 1970s and 1980s, the implementation and spreading of new technologies is highly dependent on the level of education of groups that previously entered the labour market. So this approach seems theoretically more correct and produces significant results with expected signs. Next to this change, we also change the form of the catch up variable. By presenting the catch up variable in the logarithm-value, we can take the digressive relation of catching up into account. It is hard for countries that follow the most advanced closely to recognise catch up possibilities. But for the countries that are lacking behind substantially, sources of catching up are clear. The R2 benefits from both changes.

We would expect a higher coefficient for the *catch up* compared with Barro's study, since catching up is dependent on corresponding institutions. Barro (1994) finds a coefficient of 2.9 when he uses the logarithm value of GDP per capita in 1960. Table 2 and 3 find coefficients of approximately the same magnitude. We can conclude that the strength of catching up within the OECD does not seem to differ from the catch up in the rest of the world.

In equation (3) we use the *level of subsidies* as a percentage of GDP next to the variables from equation (2). Subsidies can be seen as a rough approach for market distortion by the government. Next to this, it can also be seen as a more fine-tuned approach of government consumption. In both cases we expect a negative sign. The results support the expectations. Unfortunately, we only have subsidy data for twenty countries. The exclusion of Turkey, The Netherlands, New Zealand, Iceland and Luxembourg has a positive influence on the R2. This is caused by the relatively bad

[5] *In earlier research, Englander and Gurney (1995) and Hiddink (1995), no significant result could be ottained for this variable. Hiddink (1995) gave some theoretical agruments for not using this approach for market distortion . Further research along this line is unfruitful.*

performance of the basic model for these countries. We prefer, however, a basic model which contains as many countries as possible.

In equation (4) we enclose the *social security benefits*. We enclose this variable as a proxy for the extent of redistribution of income. We can not find any significant results. In the following table we continue our search for a robust economic equation.

Table 3[6]**:** *Results of the regressions for 25 OECD countries for the period 1960 to 1990*

Estimations	(5)	In LOG (6)	In LOG (7)	In LOG (8)
Number of countries	24	24	24	21
Variables				
LOG Catch up	-2.6 (-8.5)	-2.5 (-7.4)	-2.4 (-7.0)	-2.8 (-8.5)
Total investments	4.5 (1.6)	0.93 (1.5)	0.89 (1.5)	
Private investments				0.93 (1.7)
Government consumption National Accounts	0.09 (0.4)			
Total tax revenue			-1.3 (-2.0)	-1.6 (-2.3)
total tax rev exclusive social security		-1.0 (-2.2)		
Population growth	-0.40 (-1.8)	-0.46 (-2.1)	-0.61 (-2.4)	-0.48 (-1.6)
Initial primary education	2.4 (2.4)	2.6 (2.5)	3.0 (3.0)	1.9 (1.6)
Initial secondary education	2.2 (3.1)	1.3 (4.3)	1.2 (4.2)	0.77 (2.1)
Constant	4.3 (3.2)	14 (8.0)	15 (6.6)	17 (6.3)
R2	0.57	0.62	0.62	0.66

[6] *All coefficients presented in this table are multiplied with 100 except population growth.*

In equation (5) we use a different data source for the government consumption, since this variable does not seem to contribute significantly. Unfortunately, this change of data-source does not contribute to more significant results.

Because *government consumption* does not seem to contribute significantly and because we have to omit 5 countries if we use the *level of subsidies*, we employ a different approach in equation (6). We use the *average total tax revenues of the government exclusive social security benefits*. This approach does not only give us an indication of the level of government consumption. It also takes the extent of government influence into account (see Van Sinderen 1990). So this can be seen as an approach for market distortion by the government as well. The coefficient of this variable has the expected negative sign and is significant.

In equation (6), (7) and (8) we express all used variables, except population growth and the dependent variable, in logarithm form so that we get a non-linear equation. This is benefitial the R2. Equation (7) tells us that it does not seem to matter if we use total *tax revenues exclusive or total tax revenues inclusive social security benefits*. In equation (8) we use another approach for the investment variable, because total investment is only marginally significant in all presented equations in table 3. Unfortunately, average private investments as a percentage of GDP does not lead to a substantial increase in significance.

2.5 Conclusion

Although certain modifications had to be made, we can conclude that the growth model of Barro, which is based on the new growth theory, is also applicable for the OECD. The R2 is somewhat disappointing compared with the results of the OECD (1991) and Barro (1989). The R2 is, however, of the same magnitude as in the research of Englander and Gurney (1995). The use of pooled regressions in stead of cross-section regressions does not seem to matter for the specification of the equation. Therefore, we can conclude that the specified variables in the Barro equation are rather robust for a change in regression method.

We choose equation (6) as the base for our further research. The variables in this equation have shown to be relatively robust during the regressions. All the variables are significant on the 95 percent uncertainty level, except the *total investments* which is significant on the 80 percent level. This equation entails 24 of the 25 OECD countries. Only Mexico is excluded, because no time serie data is available for the *total tax revenues excluding social security benefits*. Compared with the equation of Barro (1989), we exchanged the fertility rate for population growth and omitted the market distortion proxy. Next to this, we exchanged the *government consumption* for *total tax*

revenues excluding social security benefits, but the line of thought behind the model is kept the same. The model we use has the following basic structure:

$Yt = F(Y0, Lt, It) + K(E0, Gt)$

Yt is the average growth of GDP per capita in period *t*. The function *F* represents the variables of neo-classical origin, in which *Y0* is the initial level of GDP per capita, *Lt* the population growth and *It* the investments. And the function *K* represents variables such as the initial level of human capital *E0* and government influence *Gt*.

In appendix 2 we divided equation (6) into three time periods: the sixties, the seventies and the eighties. The sixties produces approximately the same results as the model does for the whole period. For the seventies and eighties the equation collapses. We most take into account, however, that the persented model is constructed to explain long-term economic growth. By separating the model in three short-term equation, the model is bound to loose its explanatory value.

If we examine equation (6) more thoroughly, we see that it constantly overestimates economic growth strongly for New Zealand[7] and to a lesser extend for Portugal, Belgium and Germany. Numerous explanations can be given for this. In the OECD investigation of New Zealand (OECD 1993) for example, the overestimation of economic growth was put down to institutional factors[8]. The equation underestimates, on the other hand, economic growth for Italy. In figure 1 we present the difference between the observed and the predicted value in absolute terms as a percentage of the observed value. The model has some difficulties with predicting the magnitudes of economic growth for New Zealand, Greece and to a lesser extend for Canada, Turkey and the United Kingdom. For countries such as Finland, Austria and the United States, however, the equation predicts perfectly.

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[7] *The coefficients of the variables hardly change when New Zealand is omitted from the estimation. The R2, however, increases.*

[8] *New Zealand looses its extreme position when the institutional and political variables are added tot the economic equation (Hiddink 1995).*

Figure 1: *Difference between the observed and the predicted value in absolute term as a percentage of the observed value for equation (6).*

Country	Residue (%) of the observed value
United States	6 %
Finland	7 %
Belgium	8 %
Australia	11 %
Ireland	12 %
Italy	13 %
Portugal	13 %
Norway	14 %
Denmark	16 %
Sweden	21 %
Germany	21 %
France	21 %
Japan	22 %
Spain	23 %
Iceland	23 %
Luxembourg	24 %
The Netherlands	24 %
Switzerland	32 %
Turkey	35 %
United Kingdom	35 %
Canada	38 %
Greece	71 %
New Zealand	204%

3 The application

3.1 Introduction

In the last chapter we have constructed a economic equation which is based on the growth model of Barro. In this chapter we submit the determinants of economic growth in this equation to a test. Because the equations have enough degrees of freedom, the countries can be divided into groups. This means that we allow different coefficients for different groups of countries. First we use a more general approach and split the OECD countries into four geographical areas: North Europe, Central Europe, South Europe and the rest of the OECD (see appendix 1). Secondly, we use the Calmfors and Driffil rank ordering as a criteria to divide the OECD countries. And thirdly, we use a set of characteristics of the political decision making process.

3.2 Geographical ordering

The method is simple. We use four different dummy's, one for each region. These dummy's are multiplied with the different variables in the equation. The results of these multiplication's are presented in appendix 4. If differences in coefficients should occur, then we can conclude that regional institutional features alter the influence of the determinant on economic growth. To detect this difference, we use the F-test. We calculate the F-value under the restriction that the coefficients of the multiplied variables are equal to each other. If the F-value is above the critical value we can conclude with 95 percent certainty that regional dummy's generate coefficients which are not equal to each other (see appendix 5). If we multiply the regional dummy's with the different variables, we only find F-values which indicate substantially different coefficients with 90 to 95 percent certainty for *population growth*, *total investments* and *tax revenue exclusive social security benefits* .

We can conclude with 95 percent certainty that the coefficients which are a result of multiplication of *population growth* with geographical dummy's are different. Population growth restricts GDP per capita in South Europe, because the coefficient exceeds the value 1. If we only take account of population growth, the basic form of the model for South Europe is:

$(y/p) = -1.36\ p \quad \Rightarrow$

$y - p = -1.37\ p \quad \Rightarrow$

$y = -0.37\ p$

So population growth, an approach for the supply of labour, contributes negatively to production in South Europe, whereas it stimulates GDP growth in the other regions in the OECD. In the rest of the OECD exclusive South Europe, however, population growth is of less importance if we compare with the results of Levine and Renelt (1992)[9]. Population growth probably exceeds economic growth and productivity gains in these countries by which GDP growth per capita is repressed.

If we multiply the regional dummy's with *total investments*, we obtain a F-value which is higher than the critical 95 percent certainty value. Thus the coefficients are significantly different. Interpretation of these differences is, however, nearly impossible, because the coefficients lack significance.

The regional dummy's multiplied with *tax revenue exclusive social security benefits* generate different coefficients with 90 percent certainty. This leads to the astonishing conclusion that tax systems in North Europe and the Rest category of the OECD are less distortive than in Central- and South Europe. There is no direct obvious reason for this phenomenon. There is, however, a striking similarity between the countries in the group North Europe and the countries that are the most centralised countries within the OECD. This is also true for the decentralised countries and the Rest category of the OECD, but to a lesser extent (see appendix 1 and 3). Most likely, the geographical division approaches a division based on institutional characteristics, where the division into centralised and decentralised countries comes very close. Furthermore, the division into four regions instead of three groups contributes to the high F-value .

3.3 Calmfors and Driffil ordering

Next we arrange the OECD countries into groups on the base of the Calmfors and Driffil rank ordering. In this rank ordering countries are ranked based on the extend of centralisation of negotiations on the labour market (see appendix 1). This rank ordering can be seen as a general indication of the character of institutions.

The differences in macro-economic performance of countries with more or less centralised labour market structures and countries with decentralised negotiation structures is widely discussed[10]. Calmfors and Driffil introduced the 'hump-shape' hypothesis, which states that centralised and decentralised systems generate favourable economic performances[11]. Centralised systems can benefit from the fact that externalities are taken into account during wage negotiations and decentralised systems

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[9] *We find an average coefficient of approximately -0.30, wheras Levine and Renelt (1992) find a coefficient of -0.65.*

[10] *See Calmfors and Driffil (1988), Bruno and Sachs (1985), Cameron (1984), Alverez et al. (1991) and Heitger (1987).*

[11] *Although the hypotheses was formulated by Calmfors and Driffil, they admit that the idea originates from the theory of Olson.*

can profit from the free market which leads to optimal allocation. Intermediate systems do not have both advantages, so they will generate relatively less favourable macro-economic performances.

In my thesis this rank ordering resulted in a robust influence on economic growth if the rank ordering is transformed according to the 'hump-shape' hypothesis. But does the rank ordering also influences the determinants of growth?

Based on this rank ordering, we arrange the OECD countries into three groups. The first group contains the most centralised countries. The second group comprises the countries which can be seen as intermediate and the third group includes the most decentralised countries. Based on the 'hump-shape' hypothesis, we can make the following positions. The catch up can be of less importance in centralised systems. *"A labour union, for example, sometimes has an incentive to repress a labour-saving innovation that would reduce the demand for the workers it represents, or do demand featherbedding.."*(Olson 1982, p.62). Drago and Wooden (1994) even found some empirical evidence for this statement in Australia. So we could expect a smaller coefficient for the catch up for the group of countries with centralised systems. This test is in line with the proposition made by Abramovitz (1986) that the extent of catching up is dependent on institutional influences.

Based on the theory of Olson, we can also argue that the government influence through taxes or subsidies could be less distortive in centralised countries. The centralised negotiation structures can behave more or less encompassing. This means that they may redistribute with as little excess burden as possible. Next to this, workers accept high taxes more easily, because they participated actively in the negotiations. In this case, high taxes can be less distortive. So we could expect a smaller coefficient for the tax revenues and the subsidies for the group of countries with centralised systems. On the other hand, decentralised economies can also generate less distortive taxes and subsidies. Because the rule of the market as co-ordinating principle is so explicitly present in these countries, taxes and subsidies can be more in line with those market rules. So in this case, we expect a kind of reversed 'hump-shape'

In my thesis I used an extended rank ordering. Based on additional information of labour markets, I inserted five other OECD countries into the Calmfors and Driffil rank ordering (see appendix 1). Lack of clear comparable information on labour markets can make this extension less founded as desirable. So, this rank ordering can only be seen as a rough indication. There is, however, much effort put into making it as well founded as possible.

3.3.1 Multiplication

As we can see in appendix 4, the dummy's based on the Calmfors and Driffil rank ordering multiplied with *population growth* generate with 95 percent certainty different coefficients. Unfortunately, no conclusions can be drawn, because the coefficients for the centralised and for the decentralised countries lack significance. The multiplication also leads to different coefficients for *total investments* and *catch up* with 90 percent certainty. Again, no clear conclusions can be drawn from the multiplication with *total investments*, since the coefficients lack significance. The different coefficients for *catch up*, however, are clearly interpretable. The 'hump shape' hypothesis seems to be turned up side down. The *catch up* is stronger in the intermediate countries. Olson's theory already argued that catching up could be of less importance in countries with centralised institutions. In decentralised countries, surprisingly, the catch up influence on economic growth is also less strong. A possible explanation can be found in the nature of technological developments. Decentralised countries rely on market forces to obtain an optimal allocation. Knowledge, an important aspect of catching up, however, is often seen as a product where markets do not work adequately because of externalities. In the more market orientated countries inventions and innovations are often heavily protected, because otherwise the market would not generate these products. This, however, restricts the spill-of effects of technological developments. In centralised and intermediate countries, government activity through financing or direct participation in innovation is stronger. This stimulates the spreading of technological developments.

3.3.2 Data-analysis

The above used method investigates to what extent centralisation influences the coefficients of the determinants. The extent of centralisation does not seem to matter for the coefficient of tax revenues. It influences, however, the *level* of tax revenues. We confine ourselves to comparison of the mains. The main of total tax revenues is for group 1 is 32.1 percent, for group 2 23.9 percent and for group 3 22.6 percent. The main from group 1 deviates substantially from the mains of group 2 and 3[12]. The same applies to the subsidies. The main of the level of subsidies for group 1 is 0.33E-01 percent, for group 2 0.20E-01 percent and for group 3 0.16E-01 percent. Once again, the main of group 1 deviates substantially from the main of group 2 and 3[13].

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[12] *If we take the normal distribution into consideration, this conclusion stays unaltered. The 95 percent interval of the total tax revenues for group 1 is in between 26.3 percent and 37.9 percent. For group 2 the 95 percent interval is between 17.2 and 30.6 percent and for group 3 the interval is between 17.5 and 27.7 percent. Although the intervals of group 2 and 3 coincide, the interval of group 1 is substantially different*

[13] *The 95 percent interval in group 1 is from 2.1 to 4.5 percent, whereas in group 2 and 3 the intervals are respectively 1.0 to 3.0 percent and 0.8 to 2.5 percent.*

3.4 Politics

Next to the division based on the Calmfors and Driffil rank ordering, we use criteria which are linked to the process of political decision making. The character of this criteria make it rather nonsensical to investigate their influence on population growth, catch up, investments and education. So these determinants of economic growth are left out of consideration. In this section we only investigate the influence of these political criteria on *tax revenues*, *subsidies* and *social security benefits*.

In this study we use the average government durability, the fractionalization rate[14], the average number of parties within the government and the average percentage of socialist- and communist parties in parliament as selection criteria. These criteria are partly based on the theory of Olson (1982) and the coalition theories described by Lijphart (1984).

The average government durability is normally seen as an indicator for stability. Severe instability leads to short-sighted distortive policies. In the OECD we can, however, hardly speak of instability. Olson even goes so far in stating that in western democracies no such thing as instability exists (Olson 1982, p.55). But the average government durability can just as well be used as an indicator for stability. According to the theory of Olson stability has also its negative sides. Stability can lead to an accumulation of pressure groups in general, which leads to an increase in regulation and slows down the decision making process. This leads to an increase in the costs of policy adjustments (Alesina and Drazen 1991).

A high ideological diversity in parliament and a high average amount of parties within the government indicates the presence of numerous policy-preferences. The parties represent and serve mainly their grassroots support. Because of this the decision making process evolves to a battle of redistribution. The gains of redistribution go to a specific group, whereas the costs of redistribution are spread out over society. This 'battle' leads to more complex regulations, more government involvement and less flexibility and finally, it slows down the decision making process.. This process leads to a certain political-institutional framework, which effectuates a certain path-dependency for future policies (North 1990). Both variables also indirectly indicate the electoral system. If the F-rate is low and there is only one party in government, then the country probably has a majorital election system. Such a system can lead to encompassing parties, which redistribute income to their members with as little excess burden as possible, because society almost amounts to half of their members.

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[14] *The F-rate tells us what the change is that two random MP's are from two different ideologies. This F-rate approaches the ideological diversity in parliament*

We operationalise the 'partisan theory' (Alverez et. al 1991) with the average percentage of socialist- and communist parties in parliament. This theory states that left-wing governments do not oppose to market-intervention as a policy instrument. In general, they prefer low unemployment to low inflation. Contrary to left-wing governments right-wing governments have a far less interventionistic attitude and give preference to low inflation instead of low unemployment. So in countries with left-wing governments there will be a tendency to utilise policies which are relatively more distortive, because 'red' parties have a preference for more market intervention (Alverez et al. 1991).

If we recall the theoretical expoundation above, we can expect that in countries with a more than average durability of the government tax revenues and subsidies are more distortive. The same is applicable to countries which have a high fractionalization rate and a more than average number of political parties in government. Especially the path-dependency, as put forward by North (1990), contributes to this expectation. We also expect tax revenues and subsidies to be more distortive if countries have a high average of socialist- and communist parties in government.

3.4.1 Multiplication

Our propositions in the previous section are operationalised with the same method as used with the geographical division. All results of multiplication can be found in appendix 4. First, we construct dummy's that are based on the fractionalization rate (F-rate). Dummy 1 activates the countries with a high F-rate, dummy 2 activates the countries with an intermediate F-rate and dummy 3 activates the countries with a low F-rate. This approach yields with 90 percent certainty different coefficients if multiplied with the *level of subsidies*. In accordance with the theoretical assumptions, subsidies seem to be more distortive in countries with a higher level of ideological diversity. That the distortiveness of subsidies is stronger in countries with low F-rates than the countries with intermediate F-rates is not in accordance with this theoretical assumption. Popper (1988) and Olson (1982) pass us a possible explanation. The countries with low F-rates are mostly countries with one party in government. Normally this is seen as an advantage. Policies can be implemented quite quickly without much interference from other parties. This, however, has a big disadvantage. If the F-rate is low, the diversity and the 'checks' on 'wrong policies' is low. This can lead to more distortive subsidies.

Second, we construct dummy's which are based on the average number of parties within the government. Dummy 1 activates the countries with a higher number of parties in government than average and dummy 2 activates the countries with a lower

than average number of parties. This approach also does not produce substantially different coefficients. Third, we construct dummy's which are based on the average percentage of socialist- and communist parties in parliament. Dummy 1 activates the countries with a higher percentage of 'red' parties in parliament than average and dummy 2 activates the countries with a lower than average percentage of 'red' parties. No substantially different coefficients can be found. And fourth, we construct dummy's which are based on the average government durability. Dummy 1 activates the countries which have a higher government durability than average and dummy 2 activates the countries with a lower government durability. Again, no substantially different coefficients can be found.

3.4.2 Data-analysis

If we take a closer look at the data, we can make some interesting observations. In the countries with a high frationalization rate, tax revenues seem to be substantially higher. The main of tax revenues for group 1 is 28.0 percent, for group 2 21.3 percent and for group 3 24.6 percent. The main for group 1 deviates substantially from the main of group 2 and 3 [15].

Countries which have more political parties in government than average have an average level of social security benefits of 0.13 percent, whereas the countries with less political parties in government than average have an average level of social security benefits of 0.09 percent. So there is a positive relationship between the number of parties in government and the level of social security benefits [16]. There seems to be a negative relationship between the level of subsidies and average government durability. Countries with a high government durability have an average level of subsidies of 0.19E-01 percent and countries with a low government durability have an average level of subsidies of 0.24E-01 percent[17].

So the political variables do not generate different coefficients for the various economic determinants, but they more or less influence the level of the different economic variables.

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[15] *If we take the normal distribution into consideration, then we can calculate a 95 percent interval for countries with high F-rate from 20.0 to 36.0 percent, and an interval for countries with intermediate F-rates from 13.7 to 28.9 percent. So the level of taxes is substantially higher in countries with more ideological diversity in parliament.*

[16] *Taking the normal distribution into account, the value of social security benefits for countries with a higher number of parties in government than average is between the 9.2 and 17.6 percent on the 95 percent interval, whereas the countries with less political parties in government than average have a level of social security benefits in between 5.9 and 12.5 percent.*

[17] *The level of subsidies for countries with a high government durability is between the 0.08E-01 and 0.30E-01 percent on the 95 percent interval, whereas the level of subsidies for countries with a low government durability is situated between 0.12E-01 and 0.36E-01 percent.*

4 Conclusion

4.1 Conclusion

We can conclude that institutions influence the determinants of economic growth. Although these institutional influences on the determinants are not on a large scale, they are in accordance with the theoretical frames presented in this paper. Hiddink (1995) came to the conclusion that for long-term economic growth institutional structures in society are just as important as economic determinants. This paper shows that next to direct influences there are also indirect influences of institutions on economic growth through the economic determinants. These indirect effects lead to the conclusion that institutional aspects are more important than previously thought.

A division based on geographical ordering generates different coefficients for *tax revenues exclusive social security benefits*, *total investments* and *population growth* with 90 to 95 percent certainty. No conclusions can be drawn from the different coefficients for *total investments*, since the coefficients are not significant. The most obvious conclusion for the different coefficients *for tax revenues exclusive social security benefits* is based on the assumption that the geographical dummy's approach a division based on institutional characteristics. The less distortive tax systems in North Europe and the Rest of the OECD can be linked to the fact that Nordic countries are the most centralised countries within the OECD and the Rest of the OECD are the countries which are the more or less decentralised countries in the OECD. Multiplication of the regional dummy's with *population growth* only generates a different coefficient for South Europe. Contrary to the neo-classical growth theory, population growth seems to restrict economic growth. So population growth in South Europe probably exceeds economic growth and productivity gains in these countries by which GDP growth per capita is repressed.

No direct conclusions can be drawn from the different coefficients which result from multiplication of *total investments* and *population growth* with the dummy's based on the Calmfors and Driffil ordering, since most of the coefficients are not significant. The different coefficients for the *catch up* variable, however, leads to some remarkable conclusions. Catch up seems to be strongest in the intermediate countries. Decentralised and centralised systems have certain characteristics which inhibit the development and spreading of innovations. Within the intermediate countries, these restricting characteristics are not so clearly present.

From the tested political variables, only the fractionalisation rate (F-rate) influences a economic determinant. Multiplication of the F-rate based dummy's with the *level of subsidies* leads to the conclusion that in countries with high and low ideological diversity the negative influence of subsidies on economic growth is slightly higher than in countries with an intermediate level of ideological diversity. That a high diversity generates more distortive policies, is in accordance with the theoretical assumptions as stated in chapter 3. Low diversity, however, should not be more distortive in this theoretical frame. It is possible that in these countries, which often have one-party governments, a lack of 'checks' is the cause of more distortive subsidy-policies. Although the political variables do not influence the coefficients of the determinants of economic growth, they seem to influence the level of the different economic variables.

4.2 Policy Implications

Is it possible to draw some policy implications from this research? Results of empirical research within political economy should be carefully dealt with. The proxies used, are still approaches. If instability seems to influence economic growth negatively, that does not mean that wars are necessary (Mueller 1983, p. 276). And if Olson detects negative influences of pressure groups, that does not mean that pressure groups need to be forbidden (Crouch 1983). My thesis and this paper demonstrate, however, that political and institutional aspects in long-term growth analysis and policies are essential.

One of the main advantages of the new growth theory, is that it supplies direct instruments for the stimulation of long-term economic growth. Take the catch up variable for example. Although the importance of catch up seems to decline (see appendix 2), it is still a very important determinant of economic growth within the OECD. Therefore, institutional structures which support the spreading and adaptation of new technologies are important. This also stresses the importance of education. Government investments can also be of great importance for long term economic prosperity. In my thesis this variable generated a stable coefficient. These investments, especially in infrastructure, can function as a precondition for profitable private investments.

The size of the government, proxied by total tax revenues exclusive social security benefits, influences economic growth negatively. Less government can be a fruitful policy line, especially if the decrease is concentrated on policies which disturb market forces such as subsidies. For the size of the social security system, however, no significant results could be found.

The political variables used in this paper create some difficulties with distracting sound policy implication. They approach the structure of political decision making, which can not be submitted to economic policies easily. The economic deficits of the political process, however, should be taken into account if structural changes are proposed. More research into this field is necessary, however, proposals are to be well founded.

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Appendix 1: Data appendix

Table 1
Economic growth: Average growth rate of GDP per capita in the period 1960 tot 1985, 1980 base year international prices, Heston and Summers (1988)
Catch up: Gross Domestic Product per capita in 1960, 1980 as base year in international prices, Heston and Summers (1988).
Primary school enrolment: Enrolment in primary education as a percentage of the age group 7 to 11 years in 1960, UNESCO and ILO
Secondary school enrolment: Enrolment in secondary education as a percentage of the age group 12 to 17 years in 1960, UNESCO and ILO
Government consumption: Average government consumption in real terms as a percentage of GDP in the period 1960 to 1985 exclusive expenditure of defence and education, Heston and Summers (1988)
Government investment: Average government investments as a percentage of GDP in the period 1970 to 1985, Heston and Summers (1988)
Total investments: Average total investments as a percentage of GDP in the period 1960 to 1985, Heston and Summers (1988)
Fertility rate: Average number of children per woman from 1965 to 1985, World Bank World Tables
Market distortion: Deviation of the average Power Purchasing Parity value of the investment deflator in 1960 (US is 1), Heston and Summers (1988)
Revolutions: Average number of revolutions per year in the period 1960 to 1985, Banks (1979), update
Assassinations: Average number of assassinations per million population per year in the period 1960 to 1985, Banks (1979), update

Table 2, table 3 and table 4
Economic growth: Average growth rates of GDP per capita for the periods 1960-69, 1970-79 and 1980-89, 1991 base year in PPP, volume, divided by population, OECD (1995-b)
Catch up: Gross Domestic Product per capita for 1960, 1970 and 1980, 1991 base year in PPP, volume, divided by population, OECD (1995-b)
Total investments: Average total fixed investments (excluding stockbuilding), volume, as a percentage of GDP for the periods 1960-69, 1970-79 and 1980-89, OECD (1995-b)
Private investments: Average total investments by the business sector (exc. stockbuilding), volume, as a percentage of GDP for the periods 1960-69 1970-79 and 1980-89, OECD (1995-b)
Government consumption: Average government consumption as a percentage of GDP for the periods 1960-69, 1970-79 and 1980-89, OECD (1995-b)
Government consumption national accounts: Average government consumption expenditure as a percentage of GDP, both in price level and exchange rate of 1985, for the periods 1960-69, 1970-79 and 1980-89, OECD (1992)
Total tax revenue: Average total tax revenue as a percentage of GDP for the periods 1965-1969, 1970-79 and 1980-89, missing country 20 (see list below), OECD (1995-a)
Total tax revenue exclusive social security: Average total tax revenue exclusive social security as a percentage of GDP for the years 1965, 1975 and 1985, missing country 20 (see list below), OECD (1995-a)
Population growth: Average population growth for the periods 1960-69, 1970-79 and 1980-89, OECD (1995-b)
Primary education: Enrolment in primary education as a percentage of the age group 7 to 11 years in 1960, 1970 and 1985, Barro and Wolf (1989)
Secondary education: Enrolment in secondary education as a percentage of the age group 12 to 17 years in 1960, 1970 and 1985, Barro and Wolf (1989)
Initial Primary education: Enrolment in primary education as a percentage of the age group 7 to 11 years only for 1960, Barro and Wolf (1989)
Initial Secondary education: Enrolment in secondary education as a percentage of the age group 12 to 17 years only for 1960, Barro and Wolf (1989)

Openness: Average of the sum of imports plus exports divided by GDP for the periods 1960-69, 1970-79 and 1980-89, OECD (1995-b)
Subsidies: Average level of subsidies as a percentage of GDP for the periods 1960-69, 1970-79 and 1980-89, missing countries: 1,4,8,11,21 (see list below), OECD (1995-b)
Social security benefits: Average level of social security as a percentage of GDP for the periods 1960-69, 1970-79 and 1980-89, missing countries: 1,4,8,11,20,21,24 (see list below), OECD (1995-b)

List of countries and variables

1	Turkey
2	United Kingdom
3	United States
4	The Netherlands
5	Sweden
6	Portugal
7	Norway
8	New Zealand
9	France
10	Greece
11	Iceland
12	Switzerland
13	Canada
14	Belgium
15	Austria
16	Australia
17	Finland
18	Denmark
19	Germany
20	Mexico
21	Luxembourg
22	Japan
23	Italy
24	Ireland
25	Spain

Appendix 2: Periods

In the regressions we used three inputs per country, one for the 1960s, one for the 1970s and one for the 1980s. This gives us also the possibility to divide an equation into three periods. In the following table this is done for regression (6).

Table A[18]: *Regression (6) from table 3 divided into three periods; the 1960s, 1970s and the 1980s. In these regressions Mexico is excluded..*

Equation	(A)	(B)	(C)
Period	*1960s*	*1970s*	*1980s*
Number of countries	24	24	24
Variable			
LOG Catch up	-1.8 (-2.3)	-1.9 (-1.8)	-0.79 (-1.3)
Total investments	1.7 (1.7)	1.4 (1.0)	0.9 (1.0)
Total tax revenue exclusive social security	-0.04 (-3.6)	-0.25 (-0.3)	-0.076 (-0.1)
Population growth	-0.72 (-1.7)	-0.28 (-0.6)	-0.26 (-0.8)
Initial primary education	1.9 (0.9)	2.2 (1.0)	0.019 (0.1)
Initial secondary education	2.2 (3.7)	1.1 (1.6)	-0.041 (-0.1)
Constant	24 (6.6)	11 (2.9)	0.058 (2.0)
R2	0.72	0.14	0.02

Equation (A) for the 1960s produces approximately the same results as equation (6). Although primary education has no significant influence, the influence of the total tax revenue exclusive social security is significantly stronger. For the 1970s and the 1980s the equation collapses. Most of the variables loose their significance. Only the catch up variable explains growth differences in the different periods, although the influence of this variable on economic growth deteriorates as time passes by. The influence of this variable in the 1980s is, for example, significantly less strong as in the 1960s.

[18] *All coefficients presented in this table are multiplied with 100 except population growth.*

Appendix 3: Geographical division and rank orderings

Geographical division
North Europe: Sweden, Norway, Iceland, Denmark, Finland
Central Europe: United Kingdom, The Netherlands, France, Switzerland, Belgium, Austria, Germany, Luxembourg, Ireland.
South Europe: Turkey, Portugal, Greece, Italy, Spain
Rest of the OECD: United States, New Zealand, Canada, Australia, Mexico, Japan

The Calmfors and Driffil rank-ordering:

1 Austria
2 Norway
3 Sweden
4 Denmark
5 Finland
6 Germany
7 The Netherlands
8 Belgium
9 New Zealand
10 Australia
11 France
12 United Kingdom
13 Italy
14 Japan
15 Switzerland
16 United States
17 Canada

Based on this rank ordering, this group of countries will be divided into three groups. The first group will be countries 1 to 5. The second group will be the countries 6 to 11. And the third group will be the countries 12 to 17.

The extended rank ordering:

1 Austria
2 Norway
3 Sweden
4 Iceland
5 Denmark
6 Finland
7 Portugal
8 Spain
9 Germany
10 Luxembourg
11 The Netherlands
12 Belgium
13 New Zealand
14 Australia
15 France
16 Ireland
17 United Kingdom
18 Italy
19 Japan
20 Switzerland
21 United States
22 Canada

Based on this extended rank ordering, the countries will be divided into three groups. The first group are the countries 1 to 6. The second group will be countries 7 to 14. The third group will be the countries 15 to 22.

The inserting of five new countries into the Calmfors and Driffil rank ordering is based on additional information found in Bean (1989), Boyer (1988), Layard et al. (1991), OECD (1994), Visser (1993) and Walsh and King (1986). The process is extensively described in Hiddink (1995).

Appendix 4: The multiplication results

Geographical ordering

Tax revenue exclusive social security benefits:
North Europe: -0.17E-01 (-3.1)
Central Europe: -0.19E-01 (-3.2)
South Europe: -0.22E-01 (-3.3)
Rest OECD: -0.17E-01 (-2.9)
Interval: -0.01E-01 < x < -0.20E-01
F-value: 2.56 with 3 and 62 D.F.
Tax revenues:
North Europe: -0.15E-01 (-1.7)
Central Europe: -0.16E-01 (-1.9)
South Europe: -0.17E-01 (-2.0)
Rest OECD: -0.15E-01 (-1.4)
Interval: -0.26E-01 < x < 0
F-value: 0.65 with 3 and 62 D.F.
Level of subsidies:
North Europe: -0.32E-02 (-1.3)
Central Europe: -0.29E-02 (-1.3)
South Europe: -0.21E-02 (-0.9)
Rest OECD: -0.40E-02 (-2.1)
Interval: -0.70E-02 < x < -0.08E-02
F-value: 0.46 with 3 and 47 D.F.
Total investments:
North Europe: 0.46E-01 (1.7)
Central Europe: 0.22E-01 (0.7)
South Europe: -0.24E-01 (-0.1)
Rest OECD: 0.42E-01 (1.5)
Interval: -0.03E-01 < x < 0.22E-01
F-value: 2.21 with 3 and 59 D.F.
Catch up:
North Europe: -0.22E-01 (-6.0)
Central Europe: -0.25E-01 (-2.1)
South Europe: -0.29E-01 (-2.1)
Rest OECD: -0.24E-01 (-1.4)
Interval: -0.32E-01 < x < -0.18E-01
F-value: 0.173 with 3 and 62 D.F.
Primary education:
North Europe: 0.28E-01 (2.6)
Central Europe: 0.21E-01 (2.2)
South Europe: 0.13E-01 (1.2)
Rest OECD: 0.27E-01 (2.7)
Interval: 0.05E-01 < x < 0.47E-01
F-value: 2.19 with 3 and 62 D.F.
Secondary education:
North Europe: 0.24E-01 (2.5)
Central Europe: 0.15E-01 (1.4)

South Europe: -0.20E-01 (-0.1)
Rest OECD: 0.22E-01 (2.9)
Interval: 0.07E-01 < x < 0.19E-01
F-value: 1.26 with 3 and 62 D.F.
Population growth:
North Europe: -0.37 (-1.1)
Central Europe: -0.37 (-1.1)
South Europe: -1.36 (-3.5)
Rest OECD: -0.26 (-1.1)
Interval: -0.90 < x < -0.02
F-value: 2.87 with 3 and 62 D.F.

Calmfors and Driffil ordering

Total tax revenue exclusive social benefits:
Group 1: -0.98E-02 (-2.1)
Group 2: -0.11E-01 (-2.3)
Group 3: -0.10E-01 (-1.9)
Interval: -0.01E-01 < x < -0.20E-01
F-value: 2.13 with 2 and 63 D.F.
Level of subsidies:
Group 1: -0.24E-02 (-1.7)
Group 2: -0.17E-02 (-1.3)
Group 3: -0.28E-02 (-2.6)
Interval: -0.70E-02 < x < -0.08E-02
F-value: 1.31 with 2 and 57 D.F.
Total investments:
Group 1: 0.44E-02 (0.6)
Group 2: 0.84E-02 (1.3)
Group 3: 0.52E-02 (0.8)
Interval: -0.03E-01 < x < 0.22E-01
F-value:2.67 with 2 and 57 D.F.
Catch up:
Group 1: -0.21E-01 (-6.7)
Group 2: -0.23E-01 (-8.1)
Group 3: -0.21E-01 (-7.7)
Interval: -0.32E-01 < x < -0.18E-01
F-value: 2.77 with 2 and 58 D.F.
Population growth
Group 1: -0.27E-01 (-0.1)
Group 2: -0.60 (-2.6)
Group 3: 0.20 (0.7)
Interval: -0.90 < x < -0.02
F-value: 4.94 with 2 and 58 D.F.

Fractionalisation rate

tax revenue exclusive social security:
Group 1: -0.10E-01 (-2.1)
Group 2: -0.12E-01 (-2.5)
Group 3: -0.11E-01 (-2.2)
Interval: -0.01E-01 < x < -0.20E-01
F-value: 2.17 with 2 and 63 D.F.
level of subsidies:
Group1: -0.44E-02 (-2.4)
Group2: -0.29E-02 (-2.2)

Group3: -0.38E-02 (-3.8)
Interval: -0.70E-02 < x < -0.08E-02
F-value: 3.08, with 2 and 48 D.F.

Average number of parties within the government
Tax revenue exclusive social security:
Group 1: -0.11E-01 (-2.2)
Group 2: -0.11E-01 (-2.3)
Interval: -0.01E-01 < x < -0.20E-01
F-value: 0.66 with 1 and 64 D.F.

Average percentage of socialist- and communist parties in parliament.
Total tax revenue exclusive social security
Group 1: -0.10E-01 (-2.0)
Group 2: -0.10E-01 (-2.1)
Interval: -0.01E-01 < x < -0.20E-01
F-value: 0.55 with 1 and 64 D.F.

Average government durability
Total tax revenue exclusive social security,
Group 1: -0.11E-01 (-2.2)
Group 2: -0.11E-01 (-2.1)
Interval: -0.01E-01 < x < -0.20E-01
F-value: 0.064 with 1 and 64 D.F.

Appendix 5: F-values

Table B: *The critical F-values with 90 percent and 95 percent certainty with different dominators and nummerators*

	with 90 percent certainty	with 95 percent certainty
With 1 and 60	2.79	4.00
With 1 and 40	2.44	3.23
With 2 and 60	2.39	3.15
With 3 and 60	2.18	2.76
With 3 and 40	2.23	2.84