

Government size and growth: Accounting for economic freedom and globalization

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Abstract

Several recent studies have found a negative relation between government size and economic growth in rich countries. Since countries with big government have experienced above average improvements in both the Economic freedom index and the KOF globalization index, we argue that existing studies suffer from an omitted variable problem. Using Bayesian Averaging over Classical Estimates (BACE) in a panel of OECD countries, we show that the negative effect from government size is very robust and may have been underestimated in previous studies. The dataset is an updated and extended version of the data used by Fölster and Henrekson (2001), covering the period 1970-1995. We find clear evidence that globalization has a positive effect on growth, but find no effect of economic freedom. Finally, we find that the negative effect of government size decreases substantially in size but remains significant when we add the period 1996-2005 to the sample. Our results support the idea that countries with big government can use institutional quality such as economic freedom and globalization to mitigate negative growth effects of taxes and public expenditure.

Keywords: Government size; growth; economic freedom; globalization; taxes

1. INTRODUCTION

Several recent studies have identified a negative correlation between government size and economic growth in rich countries, but the robustness of these results has been questioned. Furthermore, the good economic performance of the high-tax, Scandinavian welfare states after the crisis of the 1990s clearly suggest that our understanding of the relationship between government size and economic growth is far from complete.

In this paper we show that countries with bigger governments have experienced higher average increases in globalization and economic freedom between the 1970s and 2000. This means that existing studies of the relationship between government size and growth in rich countries suffer from an omitted variable bias in not controlling for these institutional reforms. Because existing research suggest that such reforms are growth promoting, we suggest that high tax welfare states can compensate for detrimental effects of big government through institutional quality, more specifically economic freedom and globalization.

We test our hypothesis on a dataset covering rich OECD countries from 1970 to 2005. The dataset is an updated version of the dataset for the period 1970-1995 used by Fölster and Henrekson (2001) as well as Agell et al. (2006). We have added data from the period 1996 to 2005, as well as the KOF globalization index and the Economic freedom index. We analyze the 1970-1995 and the 1970-2005 period using simple OLS and using Bayesian Averaging over Classical Estimates (BACE) in a panel setting with fixed country and period effects.

In general, our results indicate that there is a robust negative correlation between government size (measured as total taxes or expenditure relative to GDP) and growth. We also find that globalization as measured by the KOF index is positively associated with growth. Compared to the period 1970-1995, the negative effect of big government seems to have decreased. In support of our ‘compensation’ hypothesis, we find that if institutions are not controlled for, a simple OLS analysis will actually suggest a positive relation between government

size and growth over the 1970-2005 period. Curiously, the economic freedom index is rarely significant in our regressions.

2. BACKGROUND

2.1 BIG GOVERNMENT: GROWTH IMPEDING OR A FREE LUNCH?

The debate regarding the relation between government size and economic development has been going on intensively for decades. While scholars such as Lindert (2004) and Madrick (2008) argue that the welfare state is “a free lunch” (Lindert) and that research supports a “case for big government” (the title of Madrick’s book), most studies published in economics journals tend to find a negative correlation between government size and growth in rich countries. The causal interpretation, however, remains highly debated.

In general, the huge amount of research and the conflicting results are less surprising because they reflect different methodological choices regarding which countries to include (rich, poor or both), how to measure government size (taxes, expenditure or something else) and how to measure economic performance (growth, income levels or something else).

In a survey of the literature, Levine and Renelt (1992) conclude that more than 50 variables have been found to be significantly correlated with growth in at least some study. When it comes to the link between growth and the public sector, some studies find a strong negative relation while others do not.

Such conflicting results can now be handled using the so called BACE approach developed by Doppelhofer et al. (2004), and described further in section 3. In a cross-country study with 88 countries and 67 potential variables for explaining average growth rate of GDP per capita between 1960 and 1996, these authors identified 18 variables that were successful in the sense that the prior belief that these 18 variables belong in the regression was strengthened by the data. Among these 18, one was related to government size, namely the share of public consumption in GDP in 1961, negatively correlated with growth: Countries with 10 percent higher public consumption in 1961 had on average 0.44 percentage

units lower annual growth. To put the size of this effect into perspective, note that the average public consumption share in 1961 in their sample was 11 percent with a standard deviation of 7 percentage points.

Restricting focus to panel studies of rich countries that focus on the relationship between aggregate government size (measured as total tax revenue or total expenditure relative to GDP) and growth, leaves us with only a few studies, such as Romero-Avila and Strauch (2008), Agell et al. (2006) and Fölster and Henrekson (2001).

Romero-Avila and Strauch (2008) study 15 EU countries over the time period 1960-2001 and find a negative relation between growth and both public consumption as well as total government revenue. Similarly, Fölster and Henrekson (2001) analyze a sample of rich countries over the 1970-1995 period, and find a fairly robust negative correlation for total government expenditure and a slightly less robust negative correlation for total tax revenue (both measured as GDP shares). These results were questioned by Agell et al. (2006). The conclusion from the debate is that the correlation may be less robust when only OECD countries are included, and that the direction of causality is hard to establish using instrumental variables.

Our paper contributes to this line of research in several ways. First, we note that none of the studies mentioned above control for the institutional development, and as we demonstrate below, there are reasons to suspect that this affected the results. Secondly, we add ten more years of data, 1996-2005 to the dataset used by Fölster and Henrekson (2001). Third, we use the BACE algorithm to examine what variables are robust in explaining growth.

2.2 THE COMPENSATION HYPOTHESIS – A REINTERPRETATION

Several authors have suggested that open economies develop larger welfare states as a response to the volatility caused by economic openness. This argument is often referred to as the compensation hypothesis. Recently, the argument has been

attributed to Rodrik (1997), but its history can be traced to Katzenstein (1985), Cameron (1978) and Lindbeck (1975).

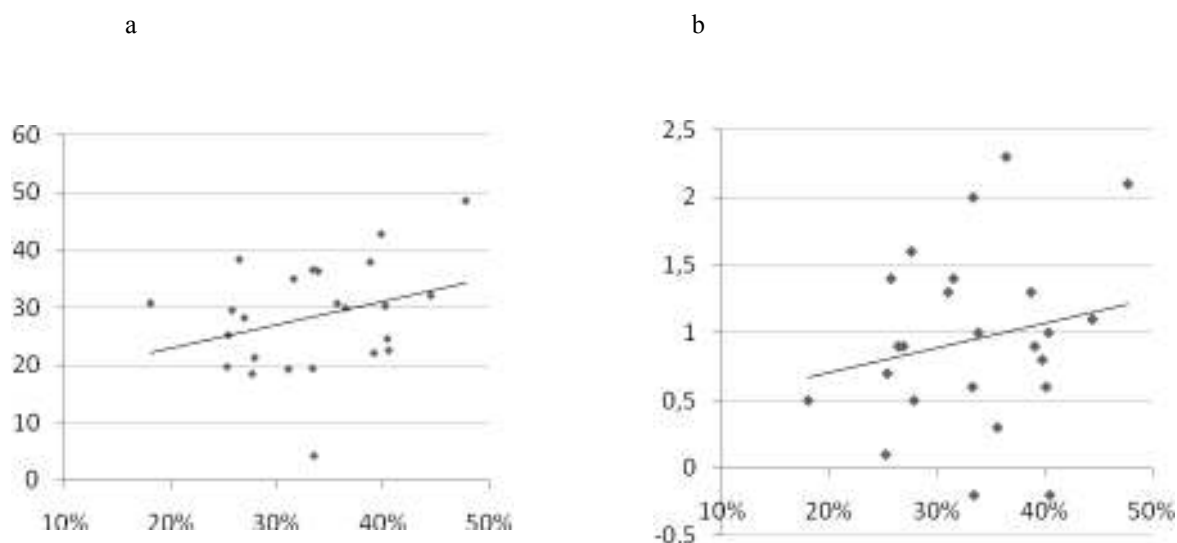
A more careful reading of Rodrik (1997), however, reveals no clear link from openness to government size. In fact the key factor is external risk rather than openness per se. Recent research has clarified this further: Kim (2007) notes that the relationship between economic openness and volatility is “not only theoretically ambiguous but empirically moot” (p. 210), and concludes that more open economies are not necessarily more volatile (externally or internally). Similar findings are presented by Down (2007).

In other words, economic volatility is a mistaken link in understanding the causal impact of economic openness on government size. The idea that more open economies need a larger welfare state to compensate for volatility induced by exposure to global markets is simply not supported by data.

In this paper, we suggest an alternative compensation hypothesis, by noting that countries with higher taxes have on average experienced bigger increases in both globalization and economic freedom between 1970 and 2000. If big government is not a result of economic openness, perhaps it is the other way round?

In figure 1, we show that countries with bigger government have on average experienced larger increases in economic freedom and globalization between 1970 and 2000. The correlations shown are robust to using expenditure rather than taxes as a measure of government size, and to using government size in 1970 or 2000 rather than average government size during the time period.

Figure 1. Increase in index values of globalization (a) and economic freedom (b) compared to average tax share of GDP, 1970-2000.



In other words: Countries with big government in the 1970s have increased their degrees of globalization and economic freedom more than other countries – and they still had big government in 2000.

Because several studies have shown both economic freedom and globalization to be positively linked to growth, failure to account for institutional reforms will cause an omitted variable problem in studies of the relation between government size and growth. The studies by Romero-Avila and Strauch (2008), Agell et al. (2006) and Fölster and Henrekson (2001) cover more or less the entire time period during which these institutional reforms took place without accounting for institutional development.

There are reasons for why economic freedom and globalization may be especially important for countries with big government. Due to trends like increasing mobility of the tax base, globalization has often been depicted as a potential threat to the welfare state – see for example Martin and Schumann (1997) and Strange (1996). It has often been overlooked that there are several mechanisms through which both globalization and economic freedom may positively affect the welfare state. Economic openness and free trade create more opportunities for a division of labor to arise. With openness comes not only access to new products, but also

access to knowledge and technologies. These two play a fundamental role in economic growth according to the so-called ‘endogenous’ or ‘new’ growth theory – see Romer (1986) and Romer (1990).

In line with these arguments, Iversen (2005) proposes that big welfare states might run into problems if they did not apply a policy of economic openness:

“[...] labor-intensive, low-productivity jobs do not thrive in the context of high social protection and intensive labor-market regulation, and without international trade countries cannot specialize in high value-added services. Lack of international trade and competition, therefore, not the growth of these, is the cause of current employment problems in high-protection countries.” [Iversen, p. 74]

According to this view, the negative effects of high transfers, high tax wedges and labor-market regulation can at least to some extent be compensated for by economic openness, because openness allows welfare states to specialize in high value-added services. Recently, Dreher (2006a) surveys the literature and presents results based on the KOF index (also used in this paper), showing that globalization as measured by the index is in fact positively related to economic growth.

A similar reasoning applies to the effect of economic freedom on the welfare state. The fundament for prosperity in a market economy is voluntary exchange of goods and services, as well as the free exchange of ideas and knowledge. The most basic theoretical reason for expecting a negative effect of taxes on economic development is that transactions that would take place without taxation, may not take place when buyers or sellers in addition to the price they agree upon must also pay taxes.

However, from institutional economics (also known as transaction cost economics) we know that the price for a good or a service (with or without taxes) is only one part of the total cost of a transaction. Other transactions costs include for example the costs for buyers and sellers to find each other, to reach an agreement and mutually and credibly ensure each other that they will in fact stick

to the agreement they make, and possibly also agree on how to solve potential disputes. Well-defined property rights, a functioning legal system and a stable currency are factors that lower transaction costs drastically.

Recently, the amount of empirical evidence available on the economic consequences of economic freedom has increased drastically. Doucouliagos and Ulubasoglu (2006) conduct a meta-study of 52 studies dealing with the impact of economic freedom on economic growth, and conclude that “economic freedom has a robust positive effect on economic growth regardless of how it is measured” (p. 68).

Against this background, a possible re-interpretation of the compensation hypothesis is the following: Countries do not develop big welfare states as a result of volatility induced by globalization. However, they can use institutional reforms to promote economic freedom and globalization, and by this avoid or mitigate the negative effects of big government.

If our re-interpretation of the compensation hypothesis is correct, including the KOF globalization index and the economic freedom index when analyzing the relation between growth and government size will reveal a more robust negative relation between government size and growth, while the indexes themselves should be positively related to growth. We may even expect globalization and economic freedom to be especially important for growth in countries with big government.

Before we continue with empirical testing, one question deserves some attention: Why have countries with big government on average increased economic freedom and globalization more than countries with smaller government? Clearly, nothing prevents countries with less extensive welfare states to imitate these policies. An important observation is that several high-tax countries had very low levels of economic freedom and globalization in the 1970s. This is part of the explanation why big increases have been possible. We further believe that the concept of state capacity is relevant – see Skocpol (1990). Countries with a high degree of state capacity will be more effective than others in all their activities – including

regulations during the 1970s and deregulations during the 1980s and the 1990s. Hence, the ability of the Scandinavian welfare states to reform their institutions may well be related to the same factors that enable them to collect high taxes and provide a wide range of public services.

We now turn to our empirical analysis of the relation between government size, institutions and growth.

3. EMPIRICAL ANALYSIS

In this section, we empirically analyze both the long (1970-2005) and the short (1970-1995) time period. The data set we use is an updated version of the data set used in Fölster and Henrekson (2001), which was kindly provided to us by the authors. This has been updated to cover the time period 1970 to 2005 and covers 25 OECD countries and Taiwan. We have also added the economic freedom index and the KOF globalization index. The appendix contains a complete description of the data and its sources. All values are 5-year averages, unless explicitly stated otherwise.

3.1 POOLED REGRESSIONS

Table 1 shows the results from a pooled OLS regression on 5-year averages over the period 1970-1995. The control variables are the same as those used in Fölster and Henrekson (2001). Column one and two show the results without controlling for globalization and economic freedom, column three and four includes the levels of the indices, and column five and six includes interaction terms: KOFG is defined as $KOF * TAX$ in column (5) and $KOF * GEXP$ in column (6).

Table 1. Pooled OLS. Period: 1970-1995.

Variable	(1)	(2)	(3)	(4)	(5)	(6)
TAX	-0.0400***		-0.0344*		-0.0404	
	0.0152		0.0174		0.0704	
GEXP		-0.0469***		-0.0509***		-0.0373
		0.0114		0.0135		0.0441
Y0	-0.0192***	-0.0200***	-0.0324***	-0.0320***	-0.0288***	-0.0296***
	0.00485	0.00460	0.00644	0.00616	0.00676	0.00657
INV	0.0901***	0.0645**	0.0933***	0.0691***	0.0977***	0.0721***
	0.0262	0.0260	0.0257	0.0254	0.0257	0.0256
DHUM	0.0298	0.0163	0.0437	0.0251	0.0419	0.0236
	0.0776	0.0757	0.0757	0.0739	0.0755	0.0742
DLAB	0.294**	0.255**	0.269**	0.200	0.262**	0.188
	0.129	0.121	0.130	0.121	0.129	0.125
KOF			0.00635*	0.00853**	-0.00783	-0.000363
			0.00355	0.00346	0.00891	0.00875
EFI			0.00109	-0.00111	0.00644	0.00325
			0.00197	0.00195	0.00462	0.00423
KOFG					0.0441*	0.0226
					0.0255	0.0203
EFIG					-0.0181	-0.0120
					0.0138	0.0103
R2	0.480	0.531	0.514	0.562	0.526	0.567
N	139	133	139	133	139	133

The results suggest that just by running a pooled OLS on 5 year averages, we find a negative effect of government size, measured both using TAX and GEXP.

Including KOF and EFI, changes little, but reveals a positive effect from globalization with some significance. Including interaction terms between the institutional indices and government size, we find for the specification with TAX as the dependent variable, that globalization is good for growth in ‘big government’ countries only; or, conversely, that big government is harmful to growth in non-globalised countries only. The results for the GEXP variables (6) are similar albeit not statistically significant. This gives some support to Iversen’s (2005) view mentioned above, but in general, the results are ambiguous.

Table 2 shows what happens when we add the period 1996 to 2005 to the analysis. As shown in columns 1 and 2, not controlling for EFI and KOF may actually lead to the conclusion that government expenditure is positively correlated with growth. This result remains when we include levels of KOF and EFI, but changes

when we also include interaction terms – which actually produce a negative effect of TAX on growth. Interestingly, EFI has a weak negative effect while EFIG is positive, again providing some support for the compensation hypothesis.

Table 2 Pooled OLS. Period: 1970-2005.

Variable	(1)	(2)	(3)	(4)	(5)	(6)
TAX	0.0141		0.00965		-0.263**	
	0.0173		0.0180		0.119	
GEXP		0.0216**		0.0199**		0.0601
		0.00861		0.00870		0.0510
Y0	-0.0197***	-0.0196***	-0.0219***	-0.0236***	-0.0164***	-0.0234***
	0.00434	0.00495	0.00527	0.00568	0.00568	0.00569
INV	0.0814**	0.109***	0.102***	0.129***	0.105***	0.111***
	0.0329	0.0307	0.0360	0.0345	0.0359	0.0363
DHUM	-0.0815	-0.0756	-0.0662	-0.0514	-0.0712	-0.0542
	0.0890	0.0942	0.0904	0.0954	0.0893	0.0951
DLAB	0.508***	0.496***	0.474***	0.480***	0.435***	0.507***
	0.125	0.124	0.127	0.125	0.127	0.127
KOF			0.00296	0.00298	-0.00333	-0.00387
			0.00209	0.00207	0.00668	0.00556
EFI			-0.000673	0.000202	-0.0118*	0.00611
			0.00183	0.00169	0.00705	0.00391
KOFG					0.0194	0.0157
					0.0178	0.0122
EFIG					0.0332*	-0.0147
					0.0193	0.00915
R2	0.299	0.293	0.308	0.306	0.335	0.320
N	161	159	161	159	161	159

In short, the pooled regressions indicate the following: firstly, the relationship between government size and growth is not robust to different specifications. Including the two institutional indices KOF and EFI affect the sign and size of the government size variable. Secondly, the two indices interact with government size in an interesting manner, suggesting that the effects of government size on growth depend on the degree of globalisation and economic freedom – or conversely, that the effects of globalisation and economic freedom depend on the size of government.

We have thus shown that simple OLS regressions can yield estimates of the government size effect with different results regarding both sign and significance,

depending on the time period and what control variables are included. This is indeed nothing new, but rather exactly what was to be expected. We therefore apply the BACE algorithm to examine what variables are more robust in explaining growth in our sample.

3.2 BAYESIAN AVERAGING OF CLASSICAL ESTIMATES

The estimates presented so far were based on a certain model, assuming that a fixed number of independent variables should be included. However, in reality there is model uncertainty as there is a large number of variables which can potentially be relevant for explaining economic growth. In order to account for this problem, we applied the Bayesian Averaging of Classical Estimates (BACE) approach developed by Doppelhofer et al (2004).

The BACE approach is useful when the researcher is unable to specify prior beliefs concerning the probabilities of different models – maybe due to too many possible variables being considered. The outcome of the estimation is a posterior probability assigned to each possible model, which is based on the limit as the relative variance of the prior density approaches infinity. Taking this limit, and comparing to all other possible models, we get the following expression:

$$(1) \quad P(M_j|y) = \frac{P(M_j)T^{-k_j}SSE_j^{-T/2}}{\sum_{i=1}^{2^K} P(M_i)T^{-k_i}SSE_i^{-T/2}}$$

Where $P(M_j|y)$ is the posterior probability of model M_j given the dataset y , $P(M_j)$ is the prior probability assigned to model M_j , T is the sample size, k_j is the number of variables included in model M_j , and SSE_j is the sum of squared errors in model M_j .

Our dataset contains a total of 17-21 variables – depending on whether subindices of the economic freedom index are used or not. This means we can estimate all the 2^K possible models and need not rely on the sampling algorithm used by Doppelhofer et al (2004). In total, we considered 12 different specifications for the BACE algorithm. Firstly, we allowed the prior expectation concerning the

model size vary between 3 and 7 additional variables apart from fixed country and time effects. Secondly, the variables GEXP and TAX are highly collinear so we used them in separate specifications, thus providing additional sensitivity analysis. Finally, we carried out separate estimations with and without the subindices of the EFI index. Hence, we carried out 12 different estimations in total. As a sensitivity analysis, we allowed the prior inclusion probabilities to vary and estimated all models for an expected model size of three and seven variables, respectively. These results are available from the authors upon request, but they do not produce qualitatively different results from these presented in the following.

BACE RESULTS, SHORT SAMPLE

Results from our baseline model applied to data from 1970-1995 are presented in Table 3. Fixed country and time effects are suppressed, since these variables were included in each specification. In column one, the posterior inclusion probability is reported, i.e. the probability a variable should be included in the model according to equation (1) above. Column 2 reports the estimated mean of the parameter, conditional on inclusion and column 3 reports the corresponding standard deviation. Column 4 reports the sign certainty probability and the three last columns report the corresponding OLS estimates for a model where all 17 variables have been included.

Table 3. BACE-analysis, Taxes and growth. Period: 1970-1995. Prior model size: 5.

Rank	Variable	Posterior inclusion probability (1)	Posterior mean conditional on inclusion (2)	Posterior s.d. conditional on inclusion (3)	BACE sign certainty probability (4)	OLS Estimate (5)	OLS <i>p</i> -value (5)	OLS sign certainty probability (6)
1	Y0	0.999	-0.068873	0.016133	1.000	-0.083	0.000	1.00
2	FERT	0.761	-0.014611	0.005265	0.877	-0.008	0.123	0.88
3	TAX	0.656	-0.130101	0.049746	0.823	-0.070	0.217	0.82
4	DEPPPOP	0.488	-0.192652	0.085117	0.737	-0.143	0.121	0.74
5	URBAN	0.247	0.092213	0.051348	0.614	0.123	0.034	0.61
6	UNEMPL	0.226	-0.087050	0.049816	0.603	-0.073	0.186	0.60
7	EXP	0.173	0.063953	0.046324	0.577	0.091	0.035	0.58
8	DHUM	0.159	0.107726	0.069598	0.569	0.082	0.310	0.57
9	IMP	0.129	-0.060154	0.044799	0.550	-0.074	0.084	0.55
10	TYR	0.069	0.002654	0.002797	0.523	-0.001	0.815	0.50
11	SAV	0.065	0.041660	0.043864	0.521	0.028	0.537	0.52
12	POP	0.064	0.000000	0.000000	0.504	0.000	0.365	0.50
13	DLAB	0.054	0.111977	0.142391	0.515	0.139	0.330	0.52
14	INV	0.050	0.017956	0.054751	0.509	0.022	0.671	0.51
15	EFI	0.041	0.000064	0.001977	0.504	0.001	0.634	0.50
16	INFL	0.039	-0.002008	0.007129	0.504	-0.003	0.665	0.50
17	KOF	0.037	0.002695	0.010491	0.504	-0.002	0.870	0.50

According to our estimates, four independent variables increase their inclusion probability compared with the prior probability (at 29.4 per cent). Initial GDP seems to be the strongest one, followed by the fertility rate, the tax burden and the dependent population. The ranking is similar for the sign certainty probability. Compared to OLS estimates, we find that three of the selected variables fail to be significant even at the ten per cent level, whereas Exports and Imports, which are significant according to classical OLS estimates, fail to qualify according to the BACE estimator.

Our two main variables of interest, the globalization index KOF and the economic freedom index EFI, are both amongst the least significant variables according to the BACE estimates.

Next, in Table 4, we report estimates when we have replaced the total tax burden with overall government expenditure as our measure of government size. The results are similar to those in Table 5 above in most relevant aspects. However, five different variables now increase their inclusion probability compared with the baseline. These are: initial GDP, government expenditure, the fertility rate, the

degree of urbanization, and the dependent population. Moreover, the ‘government expenditure’ variable seems to have stronger explanatory power than the tax burden variable according to most indicators. This might be due to the fact that reverse causality is potentially a problem for this variable.

Table 4. BACE analysis. Government expenditure and growth. Period: 1970-1995. Prior model size: 5.

Rank	Variable	Posterior inclusion probability (1)	Posterior mean conditional on inclusion (2)	Posterior s.d. conditional on inclusion (3)	BACE sign certainty probability (4)	OLS Estimate (5)	OLS <i>p</i> -value (5)	OLS sign certainty probability (6)
1	Y0	1.000	-0.070745	0.014591	1.000	-0.088	0.000	1.00
2	GEXP	1.000	-0.115565	0.026075	1.000	-0.101	0.004	1.00
3	FERT	0.870	-0.012850	0.004372	0.933	-0.008	0.115	0.93
4	URBAN	0.403	0.100780	0.049073	0.693	0.143	0.012	0.69
5	DEPPPOP	0.197	-0.125016	0.075047	0.589	-0.112	0.195	0.59
6	EXP	0.165	0.043150	0.034115	0.572	0.073	0.071	0.57
7	DHUM	0.161	0.100947	0.064938	0.570	0.101	0.191	0.57
8	IMP	0.079	-0.034704	0.038650	0.524	-0.057	0.153	0.52
9	UNEMPL	0.077	-0.052190	0.047941	0.528	-0.052	0.327	0.53
10	INFL	0.062	0.006234	0.006738	0.520	0.004	0.563	0.52
11	TYR	0.047	0.001338	0.002722	0.510	-0.002	0.500	0.50
12	EFI	0.041	0.000518	0.001777	0.506	0.001	0.500	0.51
13	INV	0.041	-0.000170	0.042575	0.503	0.011	0.820	0.50
14	SAV	0.038	0.011964	0.041656	0.504	0.006	0.886	0.50
15	POP	0.037	0.000000	0.000000	0.500	0.000	0.784	0.50
16	DLAB	0.036	-0.003452	0.135487	0.501	0.028	0.842	0.50
17	KOF	0.035	0.001109	0.009720	0.502	0.000	0.967	0.50

Again, two of the selected variables – fertility and dependent population – are insignificant at the ten per cent level according to OLS estimates. On the other hand, the exports variable is significant at the ten per cent level but has an inclusion probability lower than the baseline. Finally, the two institutional indices are insignificant according to BACE.

BACE RESULTS, LONG SAMPLE

The two following tables repeat the analysis for the longer 1970-2005 time period. Interestingly, a different set of variables now increase their inclusion probability. The estimated correlation between government size and growth remains but is substantially reduced in its size.

Table 5. BACE-analysis. Taxes and growth. Period 1970-2005. Prior model size: 5.

Rank	Variable	Posterior inclusion probability (1)	Posterior mean conditional on inclusion (2)	Posterior s.d. conditional on inclusion (3)	BACE sign certainty probability (4)	OLS Estimate (5)	OLS <i>p</i> -value (5)	OLS sign certainty probability (6)
1	TAX	1.000	-0.043018	0.040572	0.855	-0.050	0.255	0.86
2	Y0	1.000	-0.066052	0.009976	1.000	-0.072	0.000	1.00
3	SAV	0.997	0.175188	0.035638	0.998	0.092	0.105	1.00
4	INFL	0.980	-0.074556	0.021551	0.990	-0.072	0.003	0.99
5	DLAB	0.969	0.360027	0.108059	0.984	0.300	0.012	0.98
6	KOF	0.332	0.011972	0.005946	0.658	0.008	0.166	0.66
7	FERT	0.293	-0.007366	0.003905	0.638	-0.011	0.015	0.64
8	UNEMPL	0.170	-0.085290	0.052530	0.576	-0.079	0.179	0.58
9	EXP	0.147	0.032794	0.028457	0.564	0.080	0.116	0.56
10	pop	0.087	0.000000	0.000000	0.505	0.000	0.352	0.51
11	DHUM	0.083	-0.087888	0.074720	0.531	-0.142	0.074	0.53
12	IMP	0.075	0.012642	0.050118	0.524	-0.072	0.260	0.50
13	URBAN	0.064	-0.036790	0.041565	0.520	-0.062	0.134	0.52
14	DEPPOP	0.061	0.064313	0.078305	0.518	0.111	0.162	0.52
15	INV	0.049	0.034537	0.058636	0.511	0.088	0.200	0.51
16	TYR	0.038	0.000533	0.001777	0.505	0.002	0.249	0.50
17	EFI	0.038	0.000394	0.003094	0.503	0.001	0.863	0.50

Table 6. BACE-analysis. Public expenditure and growth. Period 1970-2005. Prior model size: 5.

Rank	Variable	Posterior inclusion probability (1)	Posterior mean conditional on inclusion (2)	Posterior s.d. conditional on inclusion (3)	BACE sign certainty probability (4)	OLS Estimate (5)	OLS <i>p</i> -value (5)	OLS sign certainty probability (6)
1	GEXP	1.000	-0.035853	0.029099	0.891	-0.021	0.524	0.89
2	Y0	1.000	-0.064350	0.009936	1.000	-0.072	0.000	1.00
3	SAV	0.994	0.160908	0.038701	0.997	0.086	0.144	1.00
4	INFL	0.973	-0.072313	0.021151	0.986	-0.069	0.004	0.99
5	DLAB	0.925	0.333581	0.108968	0.961	0.294	0.014	0.96
6	KOF	0.362	0.012263	0.005934	0.674	0.009	0.151	0.67
7	FERT	0.219	-0.006585	0.003809	0.601	-0.010	0.024	0.60
8	EXP	0.140	0.032946	0.029345	0.561	0.083	0.103	0.56
9	UNEMPL	0.126	-0.080441	0.055584	0.554	-0.084	0.178	0.55
10	pop	0.086	0.000000	0.000000	0.505	0.000	0.305	0.51
11	DHUM	0.078	-0.084965	0.074766	0.529	-0.138	0.085	0.53
12	IMP	0.072	0.009877	0.052066	0.522	-0.075	0.248	0.50
13	DEPPOP	0.056	0.058468	0.076063	0.515	0.101	0.202	0.52
14	URBAN	0.050	-0.025445	0.040554	0.512	-0.053	0.194	0.51
15	INV	0.046	0.031798	0.059649	0.510	0.077	0.254	0.51
16	TYR	0.042	0.000882	0.001823	0.508	0.002	0.276	0.51
17	EFI	0.038	0.000350	0.003093	0.502	0.000	0.928	0.50

3.3 SUMMARY AND COMPARISON WITH EXISTING RESEARCH

Having run the BACE algorithm on both the short (1970-1995) and the long time (1970-2005) period, using both tax revenue and public expenditure as measures of government size we find that there are three variables that very robustly correlate with growth: TAX, GEXP and Y0. We emphasize that this holds true also for a prior model size of 3 and 7 variables. In addition to these, there are four additional variables that increase their inclusion probability in the longer sample (also regardless of model size): Globalization (KOF), savings (SAV) and labor force growth (DLAB) all have positive coefficients, while inflation (INFL) is negatively correlated with growth.

So far, our results indicate that government size is negatively correlated with growth and that globalization probably is good for growth. But part of our hypothesis was that existing research suffered from an omitted variable bias when not controlling for institutions. If correct, we should be able to see that the size of the negative effect from government size on growth is bigger in our study than in

earlier studies. In table 7 we compare our estimates to those obtained by other scholars.

Table 7. Comparison of coefficients in growth regressions for some recent comparable studies.

Study	Coefficient on TAX	Coefficient on GEXP
Our study (BACE, OECD, 1970-1995).	-.13	-.12
Our study, (BACE, OECD, 1970-2005).	-.043	-.036
Fölster and Henrekson (2001) (Fixed effects panel, OECD, 1970-1995). Table 2.	-0.05 (not sig.)	-0.07 (sig. at 5%)
Romero-Avila and Strauch (2008) (Fixed effects panel, EU countries, 1960-2001). Table 5.	-0,06 to -0,07 (sig. at 5% or 1%)	-0.05 (sig. at 1%)
Dar and AmirKhalkhali (2002) ¹ (random effects panel, 19 OECD, 1971-1999). Table 3.	n.a.	Significant negative effects in 16 of 19 countries: from -0.05 in Finland and Belgium to -0.16 in Portugal. ²

This comparison suggest two things: First, our coefficients for the period 1970 to 1995 are approximately twice as big as those obtained by Fölster and Henrekson (2001). Given that the only difference between our study and theirs is the use of BACE and allowing inclusion of institutional indices, this clearly support our idea that the omission of institutional quality in their study lead to a bias. Our coefficients are also bigger than those obtained in Romero-Avila and Strauch (2008), though here differs also the sample and the time period studied.

Secondly, we find that the size of the negative effect is much smaller when the long panel is considered. This can be interpreted as evidence that the negative effects from big government on growth still apply – but the size has decreased substantially. This interesting result is consistent with Dar and AmirKhalkhali (2002), who show that size of government has a statistically significant negative impact on total factor productivity growth through the 1970s and 1980s – but not during the 1990s.

¹ For 3 of 19 countries in these study, the authors report a non-significant relation: Negative but insignificant in Norway and Sweden, positive but insignificant in US.

² In US, the coefficient

4. CONCLUSIONS

We have shown that existing studies of the relation between government size and growth in rich countries suffer from an omitted variable problem by not accounting for institutional quality such as economic freedom and globalization – both areas where countries with big government have experienced above average increases during the 1980s and the 1990s. Using the BACE-algorithm, we have shown that the negative correlation between government size and growth is robust to including the economic freedom index and the KOF globalization index in the empirical analysis, and we have found some support for a modified version of compensation hypothesis, according to which countries with big government compensate negative effects of big government with institutional quality.

Using the same data set as Fölster and Henrekson (1999), we obtained a stronger negative correlation between government size and growth by using the BACE-algorithm and allowing the inclusion of institutional quality as measured by the indices. We also found globalization to be positively related to growth during the longer time period 1970-2005, and that the negative correlation between government size and growth decreased substantially during the 1990s.

Our results are not without question marks. A simple OLS analysis produced rather unclear results. More surprising is perhaps that we failed to find positive effects of the economic freedom index when using BACE. A closer examination of our data reveals that several of the countries have identical index values for economic freedom for several consecutive years. This limits the variation in our sample, and is a good candidate for explaining the lack of clear results. On the other hand, the KOF index actually does better than imports and exports in the BACE-analysis, indicating that the index captures globalization in a broader sense that better explains growth.

It bears emphasizing that the economic freedom index was developed mainly to make possible worldwide comparisons of institutions in countries ranging from completely planned economies to highly capitalist societies. Most likely, this index does not work equally well when it comes to capturing institutional differences among the richest countries in the western civilization.

Another plausible and related explanation for the lack of clear results is that institutional reforms affect growth with a substantial time lag. The channels through which economic freedom and globalization affect growth are easy to describe in a cross-country setting: Stable property rights, a stable currency and low transaction costs all clearly promote economic exchange and investments. But how much time is required for institutional changes to affect the economy in a particular country? Clearly, this time span may be likely to be long, and it may well differ between countries. Furthermore, the size of the effect should vary depending on whether the change is perceived to be permanent or temporary. None of these factors are captured by the index.

Finally, it is plausible that institutional reforms towards higher degrees of economic freedom and globalization have different effects in the long and the short term. It is reasonable to expect that the positive effects of institutional reforms towards economic freedom comes at a short term cost, when the country has been characterised by low economic freedom for a long time – similar to Ralph Dahrendorf's well-known 'valley of tears'-argument. To handle such issues, it is probably advisable to replace the 5-year average approach by using yearly data, and take the endogeneity problem more explicitly into account, preferably by finding good instruments for potentially endogenous variables such as the tax ratio.

Appendix: Descriptive statistics, variable description and sources.

<i>Variable</i>	<i>Obs</i>	<i>Mean</i>	<i>Std. Dev.</i>	<i>Min</i>	<i>Max</i>	<i>Definition</i>
DGDP	159	0,024	0,016	-0,012	0,086	Period growth in GDP, annual rate.
TAX	159	0,349	0,078	0,132	0,519	Total tax revenues in proportion to GDP
GEXP	159	0,420	0,133	0,000	0,695	Total government expenditure in proportion to GDP
Y0	159	1,046	0,245	0,220	2,005	Initial relative GDP per capita (OECD=1)
INV	159	0,228	0,040	0,165	0,372	Gross Fixed Capital Formation in proportion to GDP
DHUM	159	0,011	0,012	-0,013	0,063	Annual growth of average years of schooling
DLAB	159	0,012	0,009	-0,011	0,049	Annual growth in total labour force
DEPPOP	159	0,346	0,028	0,282	0,454	Population aged 0-15 and 65 as a fraction of total population
EXP	159	0,338	0,210	0,071	1,457	Exports of goods and services as a fraction of GDP
FERT	159	1,795	0,416	1,180	4,012	Fertility rate, total (births per woman)
IMP	159	0,332	0,179	0,069	1,251	Import of goods and services as a fraction of GDP
INFL	159	0,067	0,068	-0,004	0,494	Inflation consumer prices (annual %)
OPEN	159	0,671	0,387	0,140	2,709	The sum of EXP and IMP
POP	159	36 008	54 986	212	290 913	Total population (thousands)
SAV	158	0,230	0,063	0,135	0,503	Gross National Saving in proportion to GDP
TYR	159	8,448	1,901	2,790	12,250	Average years of schooling
UNEMPL	159	0,060	0,034	0,003	0,162	Unemployment as a proportion of the labor force
URBAN	159	0,736	0,122	0,420	0,972	Urban population as a fraction of total population
KOF	159	3,128	0,768	1,451	5,381	KOF globalization index.
EFI	159	6,488	0,764	3,970	8,200	Economic freedom index

Variable	Definition	Source
DGDP	Average annual growth rate	OECD3 WDI, IMF1,
TAX	Total tax revenue as a share of GDP, current	OECD ₄ , WDI, IMF ₁
GEXP	Government Expenditure, share of GDP	OECD ₂
Y0	Initial GDP per capita in current prices and PPP, OECD, 1990 GDP in initial	OECD ₁ , WDI, Taiwan from PWT
INV	Investment, share of GDP, current prices.	OECD ₁ , IMF ₁
DHUM	Annual growth rate of average years of	Barro and Lee (2000)
DLAB	Average annual growth rate of the labor force.	OECD ₂ , WDI
DEPOP	Population aged 0-15 and 65- as a share of	WDI
EXP	Export of goods and services as a fraction of	WDI, IMF ₁
IMP	Import of goods and services as a fraction of	WDI, IMF ₁
OPEN	The sum of EXP and IMP.	WDI, IMF ₁
FERT	Fertility rate, births per woman.	WDI
INFL	Annual percentage change in the consumer	WDI, Taiwan, Germany from IMF ₂
POP	Total population.	WDI, Taiwan PWT
SAV	Gross national saving share of GDP, current	OECD ₁
PSAV	Gross private saving as a fraction of GDP,	OECD ₂
TYR	Average years of schooling in the total	Barro and Lee (2000)
UNEMPL	Unemployment as a share of the labor force.	OECD ₂ , WDI
URBAN	Urban population as a fraction of total	WDI
KOF	Globalization index	Dreher (2006b)
EFI	Economic freedom index	Gwartney et al. (2008)
<p>Publications Taiwan Statistical Yearbook, 2007, issued by Council for Economic Planning and Development, Taiwan. IMF1 = IMF, International Financial Statistics, October 2006, CD-rom.</p> <p>Online Databases IMF2 = IMF, World Economic Outlook Database, April 2007 and September 2000. OECD1 = OECD, National Accounts Main Aggregates – detailed tables, Vol. 2007, release 01 OECD2 = OECD, Economic Outlook, Vol. 2007, release 01. OECD3 = OECD, National Accounts Main Aggregates – comparative tables, Vol. 2007, release 02. OECD4 = OECD Revenue Statistics, Vol 2006, release 01. PWT = Alan Heston, Robert Summers and Bettina Aten, Penn World Table Version 6.2, Center for International Comparisons of Production, Income and Prices at the University of Pennsylvania, September 2006. WDI = World Bank (2007), World Development Indicators</p>		

The Areas and Components of the Economic Freedom Index

1: Size of Government: Expenditures, Taxes, and Enterprises

- A. General government consumption spending as a percentage of total consumption.
- B. Transfers and subsidies as a percentage of GDP.
- C. Government enterprises and investment as a percentage of GDP.
- D. Top marginal tax rate (and income threshold to which it applies).
 - i. Top marginal income tax rate (and income threshold at which it applies)
 - ii. Top marginal income and payroll tax rate (and income threshold at which it applies)

2: Legal Structure and Security of Property Rights

- A. Judicial independence: the judiciary is independent and not subject to interference by the government or parties in disputes.
- B. Impartial courts: A trusted legal framework exists for private businesses to challenge the legality of government actions or regulation.
- C. Protection of intellectual property.
- D. Military interference in rule of law and the political process.
- E. Integrity of the legal system.

3: Access to Sound Money

- A. Average annual growth of the money supply in the last five years minus average annual growth of real GDP in the last ten years
- B. Standard inflation variability in the last five years.
- C. Recent inflation rate.
- D. Freedom to own foreign currency bank accounts domestically and abroad.

4: Freedom to Trade Internationally

- A. Taxes on international trade.
 - i. Revenue from taxes on international trade as a percentage of exports plus imports.
 - ii. Mean tariff rate.
 - iii. Standard deviation of tariff rates.
- B. Regulatory trade barriers.
 - i. Hidden import barriers: No barriers other than published tariffs and quotas.
 - ii. Costs of importing: the combined effect of import tariffs, licence fees, bank fees, and the time required for administrative red-tape raises costs of importing equipment by (10 = 10% or less; 0 = more than 50%).
- C. Actual size of trade sector compared to expected size.
- D. Difference between official exchange rate and black market rate.
- E. International capital market controls
 - i. Access of citizens to foreign capital markets and foreign access to domestic capital markets.
 - ii. Restrictions on the freedom of citizens to engage in capital market exchange with foreigners—index of capital controls among 13 IMF categories.

5: Regulation of Credit, Labor, and Business

A. Credit Market Regulations

- i. Ownership of banks: percentage of deposits held in privately owned banks.
- ii. Competition: domestic banks face competition from foreign banks.
- iii. Extension of credit: percentage of credit extended to private sector.
- iv. Avoidance of interest rate controls and regulations that lead to negative real interest rates.
- v. Interest rate controls: interest rate controls on bank deposits and/or loans are freely determined by the market.

B. Labor Market Regulations

- i. Impact of minimum wage: the minimum wage, set by law, has little impact on wages because it is too low or not obeyed.
- ii. Hiring and firing practices: hiring and firing practices of companies are determined by private contract.
- iii. Share of labor force whose wages are set by centralized collective bargaining.
- iv. Unemployment Benefits: the unemployment benefits system preserves the incentive to work.
- v. Use of conscripts to obtain military personnel

C. Business Regulations

- i. Price controls: extent to which businesses are free to set their own prices.
- ii. Administrative conditions and new businesses: administrative procedures are an important obstacle to starting a new business.
- iii. Time with government bureaucracy: senior management spends a substantial amount of time dealing with government bureaucracy.
- iv. Starting a new business: starting a new business is generally easy.
- v. Irregular payments: irregular, additional payments connected with import and export permits, business licenses, exchange controls, tax assessments, police protection, or loan applications are very rare.

The KOF Index of Globalization.

A.Economic Globalization

i) Actual Flows

Trade (percent of GDP)
Foreign Direct Investment, flows (percent of GDP)
Foreign Direct Investment, stocks (percent of GDP)
Portfolio Investment (percent of GDP)
Income Payments to Foreign Nationals (percent of GDP)

ii) Restrictions

Hidden Import Barriers
Mean Tariff Rate
Taxes on International Trade (percent of current revenue)
Capital Account Restrictions

B.Social Globalization

i) Data on Personal Contact

Outgoing Telephone Traffic
Transfers (percent of GDP)
International Tourism
Foreign Population (percent of total population)
International letters (per capita)

ii) Data on Information Flows

Internet Hosts (per 1000 people)
Internet Users (per 1000 people)
Cable Television (per 1000 people)
Trade in Newspapers (percent of GDP)
Radios (per 1000 people)

iii) Data on Cultural Proximity

Number of McDonald's Restaurants (per capita)
Number of Ikea (per capita)
Trade in books (percent of GDP)

C.Political Globalization

Embassies in Country
Membership in International Organizations
Participation in U.N. Security Council Missions

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