

Government size and growth: Accounting for economic freedom and globalization

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Abstract We examine the relationship between government size and economic growth, controlling for economic freedom and globalization, and using Bayesian Averaging over Classical Estimates in a panel of rich countries.

Countries with big government have experienced above average increases in the KOF globalization index and in the Fraser institute's Economic freedom index. To maintain comparability with earlier studies, we use two sample periods: 1970–1995 and 1970–2005. Government size robustly correlates negatively with growth. We also find some evidence that countries with big government can use economic openness and sound economic policies to mitigate negative effects of big government.

Keywords Government size · Growth · Economic freedom · Globalization · Taxes

1 Introduction

The debate on the relationship between government size and economic development has been going on intensively for decades. While scholars such as Lindert (2004) and Madrick (2009) 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.

The conflicting results reflect different methodological choices regarding what countries to include (rich, poor, or both), how to measure government size (taxes, expenditures, or

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something else), and how to measure economic performance (growth, income levels, or something else). Restricting the focus to panel studies of rich countries examining the relationship between aggregate government size (measured as total tax revenue or total expenditures as a share of GDP) and growth leaves us with only a few studies, such as those by 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 1960–2001 period and find a negative relationship between growth and both public consumption and 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 between growth and total government expenditures and a slightly less robust negative correlation between growth and total tax revenue (both measured as GDP shares). These results were, however, questioned by Agell et al. (2006). The conclusion of the debate is that the correlation may be less robust when only OECD countries are included, and that the direction of causality is difficult to establish using instrumental variables.

Our paper contributes in several ways. First, we note that none of the studies mentioned above controls for any measure of institutional quality, and there is strong reason to suspect that this affected the results. With the data used by Fölster and Henrekson (2001), we examine how the results change when we add the 2008 versions of the Economic Freedom Index from the Fraser Institute and the Globalization index from the KOF Institute to the regressions.

Second, instead of running a few regressions with selected control variables to examine the robustness of our results, we use the Bayesian averaging over classical estimates (BACE) algorithm (developed by Doppelhofer et al. 2004) to run all possible combinations of the 17 variables used by Fölster and Henrekson (2001) and four sub-dimensions of the Economic Freedom Index.

Finally, we examine how the results change when we update the dataset and add new data covering the 1970–2005 period.

Our results indicate that the negative effect of taxes on growth during the 1970–1995 period is highly robust and at least as big as indicated by previous studies. Expanding the sample period and updating the data strengthens the results, as government expenditures are also deemed robust by the BACE analysis. Furthermore, we also find that freedom to trade, as measured by the Economic Freedom Index, was positively related to growth during the 1970–2005 period. While our results do not settle the issue of causality, the analysis indicates that the negative relationship between government size and growth holds even when controlling for economic freedom and globalization. We also find support for the idea that countries with big government can use economic openness to mitigate the negative growth effects of taxes and public expenditures.

2 Why and how to control for economic freedom and globalization when analyzing growth

The most basic theoretical reason for expecting taxes to have a negative effect on economic development is that transactions that would take place without taxation might not take place when buyers or sellers must also pay taxes in addition to the price agreed upon. However, from institutional economics we know that the price of a good or a service (with or without taxes) is only part of the total cost of a transaction. Other transactions costs include the costs of buyers and sellers finding each other, reaching agreement, mutually and credibly assuring each other that they will in fact uphold the agreement, and possibly also agreeing on how

to resolve potential disputes. Well-defined property rights, a functioning legal system, and a stable currency are factors that lower transaction costs drastically. Such institutional qualities are often collectively referred to as economic freedom.

In countries where high-tax wedges dampen economic activity, it is crucial that institutions minimize non-monetary transaction costs. As recently noted by Dixit (2009), the effect of government inefficiency is similar to that of taxes. Similarly, Iversen (2005, p. 74) proposed that high-tax countries in particular benefit from 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.

According to this view, the negative effects of high welfare transfers and tax wedges can at least be somewhat compensated for by economic openness, because openness allows welfare states to specialize in high value-added services.

Recently, the amount of available empirical evidence on the economic consequences of economic freedom, economic openness, and globalization has increased drastically. Doucouliagos and Ulubasoglu (2006) conduct a meta-study of 52 studies dealing with the impact of economic freedom on economic growth, concluding that “economic freedom has a robust positive effect on economic growth regardless of how it is measured” (p. 68). Regarding the growth effects of economic openness and globalization, Lee Ha et al. (2004) demonstrate that economic openness has a causal positive effect of on growth.¹ Dreher (2006a) surveys the literature and presents results based on the KOF Index of Globalization (also used in this paper), finding globalization to have a positive growth effect as measured by the index.

The idea that countries with big government can use economic freedom and globalization to compensate for the growth-impeding effects of big government can be viewed as an alternative to two other well-known hypotheses about the welfare state in the globalized economy: the race to the bottom hypothesis and the compensations hypothesis. Recent empirical evidence casts doubt on both these hypotheses.

According to the race to the bottom hypothesis, increased labor and capital mobility will cause problems for big welfare states as countries compete with each other for high-quality labor and capital by lowering taxes and welfare benefits—as described by, for example, Martin and Schumann (1997), Sinn (1997), and Gramlich (1982). Contrary to the hypothesis, recent empirical evidence suggests that globalization and big government are indeed compatible; see Dreher et al. (2008), Dreher (2006b), Castles (2004), and Mendoza et al. (1997). Actually, Rodrik (1998) noted that big government and economic openness are in fact positively correlated, supporting the idea that open economies develop larger welfare states in response to the volatility caused by economic openness. In addition to Rodrik (1998), this idea can be traced back to Katzenstein (1985), Cameron (1978), and Lindbeck (1975), and is known as the compensation hypothesis.

Recently, however, Kim (2007) and Down (2007) have noted that the link between economic openness and volatility is not there—neither theoretically nor empirically. While big government may still be a consequence of openness, there is currently no agreement on the theoretical mechanisms.

¹See, however, Rodriguez and Rodrik (1999) for a critical discussion.

In any case, there are strong reasons for including a measure of economic openness or globalization and some measure of institutional quality when studying the effects of government size on growth. Figure 1 shows that countries with big government in 1970 on average experienced larger increases in economic freedom and globalization between 1970 and 2000.²

Romero-Avila and Strauch (2008), Agell et al. (2006), and Fölster and Henrekson (2001) all cover more or less the entire period during which these institutional reforms took place, but without accounting for institutional development. If economic freedom and globalization are good for growth, there is an omitted variable bias in these studies. To illustrate this, we note that in 1975, economic freedom in the Nordic high-tax welfare states was 6.0, clearly

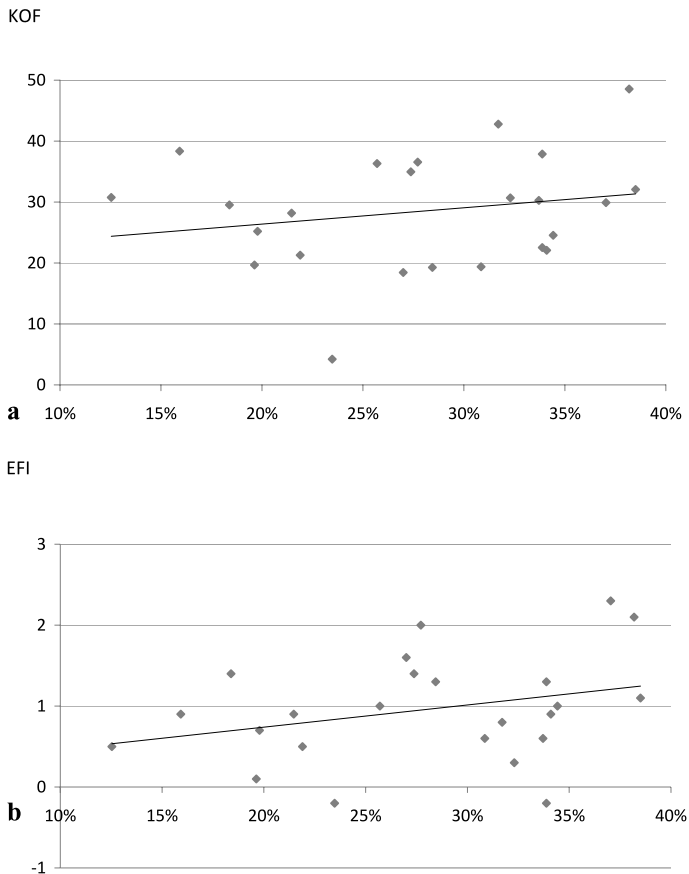


Fig. 1 Increase in the index values of globalization (a) and economic freedom (b) versus tax share of GDP in 1970³

²Though not shown, we have verified that the same holds between 1980 and 2000, and also if we replace taxes with total government expenditures.

³Source: OECD, the KOF index of Dreher (2006a) and the Economic freedom index of Gwartney et al. (2008).

below the sample average in 1975 of 6.3. Twenty years later, economic freedom in the same countries was 7.7 versus the average of 7.4.

If government size is less important for growth, the negative effect found in previous studies may partly be attributable to the fact that OECD countries with high taxes before the 1990s reforms were countries with relatively low levels of both economic freedom and globalization. On the other hand, if government size is negatively related to growth, accounting for both economic freedom and globalization should better estimate this effect.

Before we continue with empirical testing, two more questions deserve attention. First, 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 from imitating these policies.

As already noted, high-tax countries had on average low levels of economic freedom and globalization in the 1970s. This partly explains why big increases have been possible. We further believe that the concept of *state capacity* is relevant (see Skocpol 1990).⁴ Countries high state capacity will be more effective than others in all their activities, including regulations in the 1970s and deregulations in the 1980s and 1990s. Hence, the ability of 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.

Finally, it should be noted that the literature on government size, growth, and institutions suffers from several endogeneity problems. In our study, there are two potentially big sources of error:

1. Do institutions cause growth, or is it the other way around?
2. Does government size affect growth, or is it the other way around?

The first question is related to the discussion of how economic freedom should be included in growth regressions. Using Granger causality tests, both Heckelman (2000) and Dawson (2003) find that the level of economic freedom Granger causes economic growth. Causality between growth and changes in economic freedom, however, works both ways, according to Dawson. On the other hand, de Haan and Sturm (2000) examine the average growth rate of GDP per capita over the 1975–1990 period and find that the level of economic freedom in 1975 is not robustly related to economic growth, but that the *change* in economic freedom from 1975 to 1990 is. Seemingly, including both initial level and period change in economic freedom might be a solution—but as pointed out by de Haan and Sturm (2006), this is equivalent to including only the end-period level.

We have chosen to follow the standard approach when using panel data, which is to include the level of economic freedom at the beginning of each period. In other words, the 1970 level is used to explain average growth in 1971–1975, and so on. In addition to avoiding possible endogeneity problems, the use of levels rather than changes is consistent with endogenous growth theory, where policy variables rather than only reforms are assumed to affect economic growth.

The second endogeneity issue is related to the question of what measure of government size to trust the most: taxes or government expenditures. In the short run, public expenditures will rise when GDP falls, due to automatic stabilizers such as unemployment insurance and other transfer payments. Surely, this is no evidence that government expenditures *cause* low growth, but rather a typical example of reverse causality. To some extent, this is handled

⁴Skocpol (1990) described state capacity as the ability of states to achieve official goals, especially over the opposition of powerful social groups or in the face of difficult economic circumstances.

using five-year averages, but the bias will still be towards expecting a negative correlation between expenditures and growth.

The good news is, however, that for taxes, the bias goes in the opposite direction—for several reasons. Higher growth will increase the ratio of tax revenue to GDP, both because most countries have at least slightly progressive tax schemes, and because of the taxation of capital gains and profits. In other words, reverse causality suggests a positive correlation between taxes and growth, meaning that a negative coefficient on taxes actually provides rather strong evidence that high taxes cause lower growth.⁵

3 Empirical analysis

3.1 Data

The data we use are those used in Fölster and Henrekson (2001), which were kindly provided by the authors. To maintain comparability with this study, we keep their dataset in our main setting and examine how the results change when we add economic freedom and globalization to the analysis.

The Economic Freedom Index developed by the Fraser Institute, frequently used in economic research, consists of five dimensions: size of government; legal structure and security of property rights; access to sound money; freedom to exchange with foreigners; and regulation of credit, labor, and business. Using several indicators in each dimension, the five dimensions are weighted together to form a composite index, where 0 indicates the lowest and 10 the highest economic freedom.

Because government size is by definition highly correlated with taxes and public expenditures as a share of GDP, and because our idea is that countries with big government have increased their economic freedom but kept a big public sector, we construct a measure of economic freedom that is an average of dimensions 2 to 5, thus excluding government size. The KOF Index of Globalization, developed by Dreher (2006b), aggregates several indicators of economic, political, and social globalization into a measure of total globalization, ranging from 0 to 100, higher numbers indicating more globalization. Because the two indices are highly correlated, we do not include them simultaneously in our OLS and fixed-effects regressions.⁶

The Appendix contains a complete description of the data and their sources, including the two indices. Table 1 contains a summary description of our data.

Our dataset is a panel of at most 29 OECD and equally rich countries (listed in the Appendix) from 1970 to 1995. The dependent variable is average annual growth over five-year periods. Government size is measured as total tax revenue (TAX) or total public expenditures (GEXP); both are measured as share of GDP and refer to the aggregate public sector.⁷

⁵Our reasoning here is very similar to that of Romero-Avila and Strauch (2008).

⁶Both indices are available on the web, at <http://globalization.kof.ethz.ch/> and <http://www.freetheworld.com/>. For both indices, we use the 2008 version.

⁷Using only central government expenditures would be misleading, because the degree of fiscal decentralization varies between countries.

Table 1 Variable description; all values are 5-year averages, unless explicitly stated otherwise

Variable	Obs	Mean	Std	Mean	Max	Description
DGDP	145	0.028	0.020	−0.010	0.089	Average annual growth rate over the five-year period
TAX	145	0.323	0.106	0.072	0.548	Total tax revenue as share of GDP
GEXP	139	0.396	0.132	0.126	0.750	Government expenditures, share of GDP
Y0	145	0.898	0.294	0.189	1.540	Initial GDP per capita in current prices and PPPs. OECD = 1. Initial GDP is the initial year of each subperiod
INV	145	0.232	0.049	0.152	0.457	Investment, share of GDP, current prices
DHUM	145	0.014	0.016	−0.034	0.081	Annual growth rate of average years of schooling
DLAB	145	0.014	0.011	−0.011	0.049	Average annual growth rate of the labor force
DEPPPOP	145	0.354	0.033	0.292	0.462	Population aged 0–15 and >65 as share of total population
EXP	145	0.392	0.281	0.071	1.417	Export of goods and services as fraction of GDP, current prices
FERT	145	1.944	0.522	1.232	4.110	Fertility rate (births per woman)
IMP	145	0.407	0.306	0.070	1.740	Import of goods and services as fraction of GDP, current prices
INFL	145	0.104	0.188	0.007	2.123	Annual percentage change in the consumer price index
POP	145	28411	47950	212	257988	Total population (1000s)
SAV	139	0.241	0.076	0.134	0.493	Gross national saving share of GDP, current prices
TYR	145	7.552	2.098	2.440	12.000	Average years of schooling for total population
UNEMPL	120	0.058	0.042	0.001	0.210	Unemployment as share of labor force
URBAN	139	0.739	0.166	0.270	1.000	Urban population as fraction of total population
KOF	135	62.722	12.925	27.230	83.280	Index of Globalization, initial period value
EFI25	145	7.197	1.162	4.190	9.140	Economic freedom according to Fraser Institute index, excluding dimension 1 (government size). Initial period value.
EFI2	137	8.243	1.540	1.580	9.890	Legal structure and security of property rights
EFI3	144	7.232	1.835	1.250	9.710	Access to sound money
EFI4	143	7.084	1.306	3.620	9.760	Freedom to trade internationally
EFI5	140	6.366	1.191	3.710	8.850	Regulation of credit, labor, and business

3.2 Analysis using OLS and fixed effects

Following Fölster and Henrekson (2001), our main specification controls for initial income level (Y0), measured relative the OECD average at the beginning of each five-year period.

Table 2 The effect of including economic freedom (EFI25) and globalization (KOF) in regressions of growth on government size and controls
 Dependent variable: Growth rate, five-year average
 Sample period: 1970–1995
 Method: OLS

TAX	−0.0224 0.0163	−0.0239 0.0165	−0.0336* 0.0177			
GEXP				−0.0364*** 0.0120	−0.0369*** 0.0122	−0.0492*** 0.0130
Y0	−0.0202*** 0.00470	−0.0197*** 0.00480	−0.0237*** 0.00516	−0.0203*** 0.00446	−0.0201*** 0.00458	−0.0257*** 0.00493
INV	0.112*** 0.0265	0.111*** 0.0266	0.109*** 0.0264	0.0854*** 0.0266	0.0850*** 0.0267	0.0773*** 0.0263
DHUM	0.0301 0.0745	0.0271 0.0748	0.0360 0.0741	0.0159 0.0731	0.0150 0.0735	0.0205 0.0718
DLAB	0.247* 0.128	0.260** 0.130	0.245* 0.127	0.201* 0.121	0.207* 0.123	0.208* 0.118
EFI25		−0.000649 0.00102			−0.000312 0.00100	
KOF			0.000190 0.000121			0.000276** 0.000115
Constant	0.0223** 0.0104	0.0270** 0.0127	0.0180* 0.0107	0.0371*** 0.0104	0.0392*** 0.0126	0.0318*** 0.0105
Observations	135	135	135	129	129	129
R-squared	0.479	0.481	0.489	0.525	0.526	0.546

This is included to capture a catching-up effect in countries with lower initial income. The other three control variables in the main specification are investment (INV), human capital growth (DHUM), and growth of the labor force (DLAB). To this setting we add the 2008 version of the KOF Index of Globalization and EFI25, the Economic freedom index excluding government size as described above, calculated from Gwartney et al. (2008). As described in the previous section, economic freedom and globalization enter the regressions as initial period values.

In many ways, our model specification should be seen as conservative. First, because investments are included, we only capture the growth effect of economic freedom and globalization if they influence total factor productivity. Furthermore, as Dawson (1998) points out, institutions are likely to affect growth more in the long run, in which case a five-year average may be too short a period. In fact, most studies that find a growth effect of economic freedom rely on cross-country variation.

Tables 2 (using pooled OLS) and 3 (using panel regression with country and year fixed effects) show the effects of adding EFI25 and KOF to the main specification.

Together, Tables 2 and 3 show—as expected—that government size is negatively correlated with growth. This correlation holds in a pooled OLS driven by cross-country differences, and in the fixed-effects model, where results are driven only by differences within countries over time. In general, control variables have the expected sign, but only initial income is highly significant in both the OLS and fixed-effects estimation.

Table 3 The effect of including economic freedom (EFI25) and globalization (KOF) in regressions of growth on government size and controls

Dependent variable: Growth rate, five-year average

Sample period: 1970–1995

Method: Panel estimation with country and year fixed effects

TAX	−0.105**	−0.103**	−0.103**			
	0.0417	0.0417	0.0416			
GEXP				−0.0968***	−0.0959***	−0.0951***
				0.0229	0.0229	0.0233
Y0	−0.0489***	−0.0470***	−0.0479***	−0.0566***	−0.0546***	−0.0556***
	0.0162	0.0163	0.0161	0.0158	0.0159	0.0160
INV	0.0526	0.0471	0.0592	0.0299	0.0249	0.0327
	0.0371	0.0374	0.0373	0.0346	0.0348	0.0352
DHUM	0.0725	0.0709	0.0744	0.0993	0.0980	0.100
	0.0697	0.0697	0.0695	0.0659	0.0658	0.0662
DLAB	0.187	0.200	0.175	−0.00630	0.00641	−0.00708
	0.142	0.142	0.142	0.138	0.138	0.138
EFI25		0.00295			0.00284	
		0.00268			0.00246	
KOF			−0.000579			−0.000221
			0.000430			0.000422
Constant	0.0889***	0.0668**	0.119***	0.105***	0.0841***	0.116***
	0.0216	0.0295	0.0307	0.0192	0.0266	0.0275
Observations	135	135	135	129	129	129
R-squared	0.401	0.409	0.412	0.501	0.508	0.503
Number of countries	27	27	27	26	26	26

In the OLS estimation, including the KOF measure of globalization does seem to strengthen the negative effect of both taxes and government expenditures. In the fixed-effects model, however, the effect of government size is remarkably stable and the indices are never significant.

The regressions presented in Tables 2 and 3 suggest that the negative relationship between government size and growth survives the inclusion of economic freedom and globalization indices. But how robust is the effect? After running OLS and fixed-effects regressions, Fölster and Henrekson (2001) check for robustness by adding various control variables to see how their results change. Having the advantage of modern computing power, we can instead use the BACE algorithm to run all possible combinations of the variables included in their dataset, including four sub-dimensions of economic freedom. The BACE algorithm and our results are described in the next section.

3.3 Panel regressions using Bayesian averaging of classical estimates (BACE)

Table 1 contains a number of variables that may or may not be related to growth in a correct specification. Dividing economic freedom into its sub-dimensions, we have 21 variables to choose from. Rather than presenting a handful regressions selected from all possible ones, we used the Bayesian averaging of classical estimates (BACE) approach developed by Doppelhofer et al. (2004) to cope with model uncertainty: with 21 potential explanatory

variables, there are 2^{21} possible regressions to run. Assuming that we select five variables at random to include in our regression, each variable has an inclusion probability of $5/21$. Our BACE algorithm runs all 2^{21} regressions and updates the probability of all possible models based on their goodness of fit (corrected for the degrees of freedom).

Simply put, a variable increases its inclusion probability if the models including it tend to have above average goodness of fit. Each possible specification is weighted according to its informativeness, and inference is based on the weighted sum of estimates.

Formally, the outcome of the BACE approach is a posterior probability of each specification:

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

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 .

Using these outcomes, we may construct two distinct indicators of a variable's relative importance in explaining variations in growth rates. The first is the posterior inclusion probability, which is simply the sum of the probabilities $P(M_j|y)$ for all the models, M_j , that include a certain variable. If this inclusion probability is higher than the corresponding prior inclusion probability (in our example case, $5/21$), the variable is considered an important determinant of economic growth according to the BACE algorithm.

The second indicator is the estimate of a certain variable conditional on its inclusion. This is directly comparable to parameter estimates from ordinary regressions. Hence, to conclude that taxes are harmful to growth, we require that TAX increases its inclusion probability and that the estimated coefficient, conditional on inclusion, has the expected sign and is of considerable magnitude.

Finally, it is customary to test the robustness of BACE results by varying the model size. Therefore, we have run regressions with models including 3 and 7 variables—apart from fixed country and time effects, which are always included. In general, the different specifications do not produce qualitatively different results from those presented below.

Table 4 shows the results of applying the BACE analysis to our sample. Because the variables GEXP and TAX are highly collinear, we used them in separate specifications, shown in Tables 4a (TAX) and 4b (GEXP).

Five variables are robust in explaining growth according to our BACE analysis, and they all have the expected sign: savings rate (SAV), initial income (Y0), inflation (INFL), fertility (FERT), and government size as measured by tax revenue as a share of GDP (TAX). Government expenditures has a negative sign conditioned on inclusion, but its inclusion probability is lowered when confronted with data, so it is not considered robust according to the BACE analysis.

Given the effect of automatic stabilizers as discussed in the previous section, the fact that TAX increases its inclusion probability and has a higher mean coefficient than does GEXP is reassuring.⁸

The idea that economic freedom and globalization matter is, however, given little support: the indices have low inclusion probability and often the wrong sign conditioned on inclusion. Note, however, that this sample ends in 1995, and that the levels of economic freedom and

⁸The coefficient on tax is indeed very similar to that obtained by Fölster and Henrekson (2001), Table 5, indicating that their results were not very sensitive to their model specification.

Table 4 BACE analysis of all possible explanatory variables; variables in bold are robust, increasing their inclusion probability

Dependent variable: Growth rate, five-year average

Sample period: 1970–1995

Method: BACE with country and year fixed effects

a) TAX				b) GEXP			
Variable	Inclusion probability	Mean	Standard deviation	Variable	Inclusion probability	Mean	Standard deviation
Y0	1.000	-0.078	0.018	Y0	1.000	-0.080	0.018
SAV	1.000	0.160	0.039	SAV	0.992	0.169	0.041
INFL	0.994	-0.119	0.033	INFL	0.988	-0.118	0.034
FERT	0.875	-0.013	0.005	FERT	0.710	-0.010	0.004
TAX	0.643	-0.113	0.047	KOF	0.207	-0.001	0.000
KOF	0.177	-0.001	0.000	GEXP	0.176	-0.058	0.037
EFI2	0.157	-0.001	0.001	EFI2	0.161	-0.001	0.001
EFI4	0.117	-0.002	0.002	INV	0.145	-0.065	0.044
DEPPPOP	0.110	0.124	0.096	EFI4	0.121	-0.002	0.002
INV	0.109	-0.057	0.044	UNEMPL	0.113	-0.069	0.054
UNEMPL	0.099	-0.063	0.051	EFI5	0.111	0.005	0.004
DLAB	0.073	0.120	0.114	EXP	0.092	0.039	0.033
EFI5	0.070	0.004	0.004	EFI3	0.082	0.001	0.001
EFI3	0.068	0.001	0.001	DLAB	0.079	0.130	0.118
EXP	0.066	0.031	0.033	DEPPPOP	0.062	0.089	0.100
DHUM	0.065	0.073	0.075	DHUM	0.051	0.060	0.078
POP	0.043	0.000	0.000	POP	0.050	0.000	0.000
IMP	0.037	0.005	0.036	URBAN	0.042	-0.023	0.083
URBAN	0.037	-0.013	0.077	IMP	0.037	-0.002	0.039
TYR	0.035	-0.001	0.002	TYR	0.037	-0.001	0.003

globalization in 1990 are the most recent values included in the regressions. In the next section, we instead analyze the entire 1970–2005 period.

3.4 Adding and updating data

We have updated the data to the most recent sources and also added data for the 1996–2005 period. A complete description of the sources is found in the [Appendix](#). Table 5 shows the results of running a fixed-effects regression on the longer panel with the standard set of control variables (Y0, INV, DHUM, and DLAB). The results indicate that government size is no longer bad for growth. TAX loses significance and is sometimes positive. GEXP is negative and significant, but as discussed before, if GEXP is negative while TAX is not, we have most likely picked up a reverse causality effect due to automatic stabilizers. In other words, it seems possible to question the findings of Fölster and Henrekson (2001) by just adding 10 more years of data and rerunning the fixed-effects regression (or, for that matter, a pooled OLS regression, not shown here but available from the authors upon request).

As the BACE analysis in Table 6 indicates, such a conclusion would be premature. Because they include updated data covering a longer period, the results in Table 6 are our preferred specification, from which a number of conclusions can be drawn:

Table 5 The effect of using updated data for the 1970–2005 period

Dependent variable: Growth rate, five-year average

Sample period: 1970–2005

Method: Panel estimation with country and year fixed effects. Same control variables as in Tables 2 and 3 included but not shown

TAX	0.00445	−0.0107	0.0391			
	0.0321	0.0339	0.0439			
GEXP				−0.0526**	−0.0577**	−0.0600**
				0.0255	0.0256	0.0284
EFI25		0.00265			0.00277	
		0.00197			0.00175	
KOF			−0.000217			8.98e−05
			0.000187			0.000149
Observations	166	166	166	164	164	164
R-squared	0.354	0.363	0.361	0.442	0.452	0.443
Number of countries	24	24	24	25	25	25

Table 6 BACE analysis of all possible explanatory variables; variables in bold are robust, increasing their inclusion probability

Dependent variable: Growth rate, five-year average

Sample period: 1970–2005

Method: BACE

a) TAX				b) GEXP			
Variable	Inclusion probability	Mean	Standard deviation	Variable	Inclusion probability	Mean	Standard deviation
Y0	1.000	−0.069	0.011	Y0	1.000	−0.067	0.011
INFL	1.000	−0.175	0.037	INFL	1.000	−0.167	0.034
SAV	0.997	0.164	0.037	SAV	0.946	0.137	0.045
DLAB	0.673	0.293	0.112	GEXP	0.706	−0.089	0.034
TAX	0.562	−0.102	0.042	DLAB	0.425	0.251	0.112
UNEMPL	0.373	−0.113	0.052	EXP	0.271	0.042	0.025
EXP	0.304	0.042	0.024	UNEMPL	0.235	−0.110	0.056
EFI4	0.260	0.003	0.002	EFI4	0.175	0.003	0.002
URBAN	0.199	−0.076	0.043	URBAN	0.131	−0.063	0.041
IMP	0.119	0.029	0.047	IMP	0.085	0.015	0.054
FERT	0.111	−0.007	0.005	FERT	0.082	−0.005	0.004
POP	0.090	0.000	0.000	POP	0.067	0.000	0.000
DHUM	0.070	−0.100	0.083	DHUM	0.062	−0.094	0.084
EFI2	0.067	−0.001	0.001	EFI2	0.053	−0.001	0.001
KOF	0.044	0.000	0.000	TYR	0.049	0.002	0.002
INV	0.039	0.017	0.060	KOF	0.041	0.000	0.000
EFI5	0.039	0.002	0.003	INV	0.036	0.014	0.060
EFI3	0.035	0.000	0.001	EFI5	0.034	0.001	0.003
TYR	0.033	0.001	0.002	EFI3	0.033	0.000	0.001
DEPPPOP	0.033	0.027	0.070	DEPPPOP	0.032	0.019	0.069

First, the robustness of Y_0 , SAV, and INFL in explaining growth is confirmed.

Second, tax revenue is robustly negatively related to growth, and the coefficient is almost as large as in the 1970–1995 sample.

Third, government expenditures increases its inclusion probability, and the coefficient is larger than in the 1970–1995 sample.

Fourth, freedom to trade as measured by the Economic Freedom Index is robust in the TAX specification, and exports are robust in both specifications, supporting the view that countries can compensate for the negative growth effects of big government through economic openness.

4 Conclusions

We have demonstrated that countries with higher taxes have experienced above average increases in economic freedom and globalization, and argued that these factors should be included when analyzing the effect of government size on growth. Using Bayesian averaging over classical estimates (BACE) adapted to a panel data setting, we found that the negative effect of government size, measured as taxes as a share of GDP, was robust for the 1970–1995 period and also when considering updated data for the 1970–2005 period. In our view, it is natural to put more weight on the longer panel with updated data.

Notably, we have also demonstrated that without the inclusion of proper control variables, one might erroneously conclude that the negative relationship between government size and growth is not robust when adding data for the years 1996–2005. Our BACE analysis of the long sample indicated the importance of controlling for inflation and unemployment (negatively related to growth) and for exports and freedom to trade (positively related to growth). Our findings support the idea that countries with big government can use economic openness to mitigate the negative growth effects of taxes and public expenditures.

To illustrate the size of the estimated effects, increasing taxes by one standard deviation (11 percentage points) lowers annual growth by 1.1 percentage point, while a one standard deviation increase in EFI4 increases growth by 0.4 percentage points.

For a high-tax country such as Sweden, our estimates potentially explain what is sometimes called the “bumble-bee paradox,” as described by, for example, Thakur et al. (2003). As the argument goes, a country with Sweden’s high taxes should not be able to grow as fast as the USA. Lindert (2004) relies heavily on the case of Sweden when arguing that the welfare state represents a “free lunch”. However, looking, for example, at the 1980–2000 period, Sweden increased its EFI4 value from 6.8 to 8.4, thereby increasing annual growth by 0.5 percent, according to our estimates. Over the same period, Sweden lowered annual inflation from 10 to 1 percent, roughly adding another percentage point to average annual growth. The USA, in contrast, only marginally increased EFI4 from 7.9 to 8 and lowered inflation from 7.2 to 2.5 over the same period. Sweden not only improved more than the USA did over the period, but actually had lower inflation and a higher EFI4 value than the USA in 2000. Factors such as these may well play an important part in explaining the perhaps surprisingly good growth record of a high-tax country such as Sweden.

Perhaps more surprisingly, we did not find the KOF Index of Globalization, or any dimension of the Economic Freedom Index, to be important in explaining growth in our sample. It bears emphasizing that in particular the Economic Freedom Index was developed mainly to enable worldwide comparisons of institutions between 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 developed Western world, which constitute a relatively homogeneous sample.

It is also possible that institutional reforms promoting economic freedom and globalization have different effects in the long and short terms. The positive effects of economic reforms may well come at a short-term cost, as in Ralph Dahrendorf's well-known "valley of tears" argument. To handle such issues, it is probably advisable to replace the 5-year average approach and instead use 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. We leave these issues for future research.

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Appendix: Descriptive statistics for the 1970–2005 long sample, variable description, sources, and country list

Descriptive statistics for the 1970–2005 long sample

Variable	Obs	Mean	Std. Dev.	Min	Max
DGDP	203	0.028	0.021	−0.012	0.155
TAX	175	0.336	0.087	0.124	0.519
GEXP	175	0.394	0.155	0.000	0.695
Y0	203	0.997	0.294	0.220	2.005
INV	203	0.235	0.046	0.165	0.457
DHUM	203	0.013	0.014	−0.034	0.072
DLAB	193	0.013	0.010	−0.011	0.049
DEPPPOP	203	0.348	0.033	0.271	0.463
EXP	203	0.421	0.317	0.071	1.695
FERT	203	1.862	0.508	0.933	4.012
IMP	203	0.424	0.317	0.069	1.740
INFL	203	0.081	0.164	−0.013	2.123
POP	203	29872	50181	212	290913
SAV	199	0.240	0.075	0.056	0.504
TYR	203	8.054	2.071	2.440	12.250
UNEMPL	195	0.056	0.035	0.001	0.162
URBAN	196	0.744	0.147	0.400	1.000
KOF	189	67.244	14.252	27.230	93.460
EFI2	195	8.244	1.416	1.580	9.890
EFI3	201	7.769	1.845	1.250	9.840
EFI4	201	7.367	1.260	3.620	9.780
EFI5	198	6.491	1.151	3.710	8.850
EFI25	203	7.440	1.121	4.193	9.140

Variable description and sources

Variable	Definition	Source
DGDP	Average annual growth rate	OECD3 WDI, IMF1,
TAX	Total tax revenue as a share of GDP, current prices	OECD4, WDI, IMF1
GEXP	Government expenditures, share of GDP	OECD2
Y0	Initial GDP per capita in current prices and PPPs, OECD = 1, Initial GDP is the initial year of each subperiod	OECD1, WDI, Taiwan from PWT
INV	Investment share of GDP, current prices	OECD1, IMF1
DHUM	Annual growth rate of average years of schooling	Barro and Lee (2000)
DLAB	Average annual growth rate of the labor force	OECD2, WDI
DEPOP	Population aged 0–15 and >65 as share of total population	WDI
EXP	Export of goods and services as fraction of GDP, current prices	WDI, IMF1
IMP	Import of goods and services as fraction of GDP, current prices	WDI, IMF1
OPEN	The sum of EXP and IMP	WDI, IMF1
FERT	Fertility rate, births per woman	WDI
INFL	Annual percentage change in the consumer price index	WDI, Taiwan, Germany from IMF2
POP	Total population	WDI, Taiwan PWT
SAV	Gross national saving share of GDP, current prices	OECD1
PSAV	Gross private saving as a fraction of GDP, current prices	OECD2
TYR	Average years of schooling for total population	Barro and Lee (2000)
UNEMPL	Unemployment as share of labor force	OECD2, WDI
URBAN	Urban population as fraction of total population	WDI
KOF	Index of Globalization	Dreher (2006b), 2008 version.
EFI	Economic Freedom Index	Gwartney et al. (2008)

Publications

Taiwan Statistical Yearbook, 2007, issued by Council for Economic Planning and Development, Taiwan.
IMF1 = IMF, International Financial Statistics, October 2006, CD-ROM

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 = Heston, A., Summers, R., and Aten, B., 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

Country list

Australia	Finland	Iceland	Korea	Norway	Switzerland
Austria	France	Ireland	Luxembourg	Portugal	Taiwan
Belgium	Germany	Israel	Mauritius	Singapore	United Kingdom
Canada	Greece	Italy	Netherlands	Spain	United States
Denmark	Hong Kong	Japan	New Zealand	Sweden	

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 outlets (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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