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Government Size and Growth: A Survey and Interpretation of the Evidence

Andreas Bergh and Magnus Henrekson

Research Institute of Industrial Economics
P.O. Box 55665
SE-102 15 Stockholm, Sweden
info@ifn.se
www.ifn.se

Government Size and Growth: A Survey and Interpretation of the Evidence*

Andreas Bergh[1,2] and Magnus Henrekson[1]

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Abstract: The literature on the relationship between the size of government and economic growth is full of seemingly contradictory findings. This conflict is largely explained by variations in definitions and the countries studied. An alternative approach—of limiting the focus to studies of the relationship in rich countries, measuring government size as total taxes or total expenditure relative to GDP and relying on panel data estimations with variation over time—reveals a more consistent picture. The most recent studies find a significant negative correlation: An increase in government size by 10 percentage points is associated with a 0.5 to 1 percent lower annual growth rate. We discuss efforts to make sense of this correlation, and note several pitfalls involved in giving it a causal interpretation. Against this background, we discuss two explanations of why several countries with high taxes seem able to enjoy above average growth: (i) that countries with higher social trust levels are able to develop larger government sectors without harming the economy, and (ii) that countries with large governments compensate for high taxes and spending by implementing market-friendly policies in other areas. Both explanations are supported by current research.

JEL *Classification*: E62; H11; H20; O23; O43.

Keywords: Government size; Government expenditure; Economic growth; Economic freedom; Globalization; Taxation; Cross-country regressions.

[1]Research Institute of Industrial Economics (IFN)
Box 55665
SE-102 15 Stockholm
Phone: +46-8-665 45 00
Fax: +46-8-665 45 99
e-mail: magnus.henrekson@ifn.se

[2]Department of Economics
Lund University
P.O. Box 7082
SE-220 07 Lund

e-mail: andreas.bergh@ifn.se

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1. Introduction

For decades there has been an intense debate regarding the relationship between government size and economic growth. The state of research is seemingly contradictory, with some scholars arguing big government decreases growth, and others denying this to be the case.

A close look at the literature reveals these arguments are not as conflicting as they at first appear. Two important differences in existing research concerns the measurement of government size and the type of countries studied (rich or poor). When we singularly focus on studies that examine the correlation between growth of real gross domestic product (GDP) per capita and total government size over time in rich countries (OECD and equally rich), the research is rather close to a consensus: the correlation is negative, and the sign seems not to be an unintended consequence of reverse causality in the sense that government generally expands during economic downturns.

The negative correlation has yet to be reconciled with the fact that big government is clearly correlated with higher levels of affluence. The aggregate correlation between government size and growth is also less policy relevant because political decisions are made on specific taxes and expenditure items, rather than aggregates. There are also strong theoretical reasons to expect different types of taxes and expenditures to have different growth effects.

In this survey, we review a wide body of literature on the subject and probe deeper into the debate. The focus is on the most recent papers that deal with the relationship between growth and government size. Our survey shows in general that it matters what governments actually do and how they finance their activities; and that the most recent studies typically find a negative correlation between total government size and economic growth.

Having established this, we turn to the issue of causality and note that the correlation seems not to be driven by the most obvious sources of reverse causality, such as automatic stabilizers increasing government expenditure in economic downturns. Finally, we turn to the record of the Scandinavian welfare states, which during the last ten to fifteen years have done reasonably well in terms of growth. Based on our survey, we propose two possibly complementary explanations: selection and compensation. The selection hypothesis suggests that countries that can successfully develop and maintain large government sectors are more likely to do so. The compensation hypothesis suggests that countries with big government can enjoy high growth by applying market-friendly policies in other areas. Looking specifically at the case of Sweden, we show that there is evidence for both explanations, but more research is needed.

2. Theoretical considerations

2.1 Neoclassical and endogenous growth theory

Over time, economists have accumulated considerable knowledge about what explains growth. Three main perspectives can be identified:

- Neoclassical growth models
- Endogenous growth theory
- Focus on institutions as fundamental determinants of growth

In neoclassical models (pioneered by Solow 1956 and Swan 1956), there are diminishing returns to capital and the long-term growth rate is exogenous. Novel or higher taxes will affect GDP by creating a distortion in the form of a wedge between supply and demand. As a result, some transactions that would take place without the tax will not take place when the tax is levied. However, this effect is static and when taxes are constant (at any level) the economy will grow at a rate determined by exogenous technological progress.[1]

Because neoclassical growth models omit the factors that explain long term growth they are sometimes viewed as at best less useful and at worst inadequate. Nevertheless, even static policy effects they pinpoint can be sizeable, affecting the level of savings or the level of employment. According to Feldstein (2006) considering that taxable income is probably more responsive than hours worked,[2] static welfare costs of taxation may be large. Also, effects that in the theoretical model appear as "temporary" may still last for twenty years or more as the economy adjusts to a new steady state.[3]

In endogenous growth models (pioneered by Romer 1986 and Barro 1990), the production function is specified without diminishing returns: as a consequence, anything that affects the level of technology also affects the long-run per capita growth rate. This means the growth effects of distortionary tax wedges are conceivably far more extensive than in neoclassical growth models. According to King and Rebelo (1990), the welfare cost of a 10 percent increase in the income tax rate can be forty times greater in basic endogenous growth models than in neoclassical growth models.

On the other hand, the potential growth gains from what Barro (1990) calls productive government spending is also higher in endogenous models. Hence, the negative effects of higher taxes may be partly or completely offset by government spending on, for example, education and health care, which may lead to higher long term growth as they enter growth models as higher levels of technology. In other words, as taxes cause dynamic efficiency losses through effects on occupational choice, schooling attainment, and other decisions that affect the accumulation of human capital, these effects may partly or completely be offset these by public expenditure on education.

Formally, endogenous growth models use production functions like $y = Ak$, where A is a parameter capturing the level of technology, y is output per capita, and k is capital per capita. Capital in these models is thought of in a broad sense that includes human capital. The corresponding neoclassical production function would be $y = Ak^{\alpha}$ with $0 < \alpha < 1$ resulting in diminishing returns.[4]

2.2 Institutions as fundamental determinants of growth

The most recent trend involves investigating the role of institutions on economic growth. Several studies, following works like North (1987), have tested and found strong support for the idea that

[1] As emphasized by Plosser (1992), capital formation is likely to be quantitatively more important for long-run growth rates than the original Solow (1956) model suggested. Hence, the crowding out of private investment in human and physical capital by government spending and taxation could have a sizeable effect on the rate of economic growth.
[2] For example, if the marginal tax rate is raised, a person may not only choose to work fewer hours, but also turn down an offer for promotion, learn fewer new productive skills, take longer breaks, or work at a lower intensity. All these adjustments may be at least as important as working fewer hours in inducing a lowering of taxable income when the marginal tax rate is raised.
[3] Barro and Sala-i-Martin (2004) estimate empirically, based on data at different levels of aggregation, that it takes 25 to 35 years to eliminate one-half of the deviation from the steady state.
[4] See Barro and Sala-i-Martin (2004) for further details.

certain fundamental institutional arrangements are crucial for economic growth – probably the most important being the rule of law and well-functioning property rights. The critical role of the latter as more important for growth than factors such as geography and trade was stressed in a famous paper by Rodrik *et al.* (2004).

Successive literature reviews by Armey (1995), Abdiweli (2003) and Asoni (2008) have confirmed the consensus that institutions matter for growth. In addition to the importance of well defined property rights, Abdiweli empirically confirmed that judicial efficiency, low levels of corruption and a well-organized public bureaucracy also co-vary positively with high levels of growth. The risks of a breach of contract or government expropriation have clear negative effects on growth, according to Abdiweli.

In another important survey, Doucouliagos and Ulubasoglu (2006) review and evaluate fifty-two other studies that examine the link between economic freedom (measured in several different ways) and growth. They conclude that economic freedom "has a robust positive effect on economic growth regardless of how it is measured" (p. 68). Berggren and Jordahl (2005) compare different types of economic freedom, and find the security of property rights and integrity of the legal system the conditions most closely related to growth.

In the economics literature the relationship between the concepts "institutional quality" and "economic freedom" is somewhat ambiguous. Institutional quality is the broader term, not clearly defined simply because we do not know exactly what types of institutions are beneficial. On the other hand, economic freedom typically refers to the Economic Freedom Index (EFI) of the Fraser Institute, a commonly used index that quantifies certain aspects of economic freedom. As Gwartney *et al.* (2004) point out, the EFI measures both longer-term institutional variables, such as the quality of the legal system, and shorter-term public policies, such as marginal tax rates. The term "institutional quality" is often used to refer to both.

Whether levels of or changes in (i.e. reforms) institutional quality matter more for growth is a source of disagreement. In two overlapping papers, De Haan and Sturm (2000) and Sturm and De Haan (2001) conduct a series of thorough analyses of the relationship between economic freedom and growth. Applying the method of extreme bounds analysis,[5] their overall finding is that the level of economic freedom is not robustly related to economic growth, but that changes in economic freedom have a robust impact on economic growth. On the other hand, Dawson (2003) uses so-called Granger tests to assess the relationship, finding that the level of economic freedom, especially the level of property rights, is an important cause of economic growth. So far, no consensus has emerged.

There has also been some critique of the institutional focus in growth research. While there is clearly a correlation between institutional indicators and growth, Glaeser *et al*. (2004) argue that the instrumental variable techniques used to establish causality are flawed. They also contend human capital is more important than institutions for explaining growth. For incisive discussions of the debate on institutions and growth, and views on how to best advance research, see, for example, Pande and Udry (2005) and Rodrik (2007).

It is critical to recognize that these three perspectives on growth do not contradict one another, but rather emphasize different aspects of the causes of growth. From neoclassical models we learn that

[5] The so-called extreme bounds analysis (EBA) was pioneered by Levine and Renelt (1992) in the context of cross-country growth regressions. The EBA is performed by systematically, but mechanically, running a large number of regressions with different combinations of conditioning variables among the regressors, to test whether all specifications yield a significant relationship between the main explanatory variable and the dependent variable. An extension of the EBA analysis was suggested by Sala-i-Martin (1997), the basic idea of which is to examine the distribution of coefficient estimates rather than use an absolute criterion of robustness.

government policies that affect savings or labor force participation have temporary effects on growth, but no effects on the long-run level of technological progress. From endogenous models, we learn that the effects may be permanent, and thus it matters crucially what governments do: Expenditure on education that increases the level of human capital may lead to permanently higher growth rates, but the taxes needed to finance them may have a negative impact on long-run growth levels.[6] From the recent focus on institutions we learn that in addition to what governments do, it is important how it is done: Transparent rules, rule of law and well-defined property rights seem to be conducive to growth regardless of government size.

2.3 Government size and economic development

We have seen that economic theory suggests several mechanisms by which government activity can affect growth. However, these mechanisms do not suggest an unambiguous link between government size and growth. In fact, there are many reasons to expect a relationship that is inversely U-shaped, a hypothesis sometimes referred to as the Armey-curve (Armey 1995).

At the bottom rung of less developed countries there appears to be a positive association between tax revenue and growth because a state typically succeeds in collecting taxes when successful at providing the stability necessary for economic activity to start growing (Besley and Persson 2009). The most basic tasks for government, such as protecting property rights and the rule of law, can be accomplished at low levels of taxation. When such a minimal Hobbesian state expands to providing things like infrastructure, basic health care and education, the effect of government size on growth is more likely positive than negative. However, if productive government expenditures are characterized by decreasing returns, the negative effect of taxes to finance public expenditure may at some point dominate the positive effect of growth-promoting government activities.

There are also reasons to expect the marginal negative effect of government size to increase in absolute terms as government grows. For example, Agell (1996) noted that the distortionary effect of taxation is proportional in size to the squared tax rate. Distortions are small for low levels of taxation, but as taxes increase they grow rapidly, beyond a certain point becoming extremely large. An additional reason to expect rich countries to show a negative correlation comes from the mechanism suggested by Olson (1982): Organized interest groups tend to evolve, and strive to obtain advantages for themselves in the form of legislation or transfers which have a side effect, retarding the normal functioning and growth of the market economy. The scope for interest group action of this kind is likely to be greater in countries with larger public sectors. This situation is compounded as the public sector grows, as the potential profits from rent-seeking activities are larger. This may lead to a greater diversion of resources into unproductive use (Buchanan 1980).

There are thus several theoretical reasons to uphold the following contrasting pattern:

- In poor countries, public sectors are typically small, and the relationship between government size and growth is positive.
- In rich countries, public sectors are typically big, and the relationship between government size and growth is less positive than in poor countries, and possibly negative.

[6] Endogenous growth models also demonstrate the theoretical possibility of poverty traps, as a result of multiple equilibria.

Let us now turn to the empirical question: Have western democracies reached a point where government becomes an impediment to growth?

3. What do existing studies show?

While we may infer from the theoretical discussion that different types of expenditure and taxes are likely to have different growth effects, we will start by describing studies that examine the aggregate correlation between total government size and growth in rich countries. We first briefly survey some of the pioneering studies that measure government size as the sum of all public expenditure or taxes (local, regional, and central) in all areas, and then move on to more recent work.

3.1 Early cross-country studies

A number of early cross-country studies have found a negative relationship between government size and economic growth, summarized in table 1.

Table 1. Early cross-country studies

Study	Measure of government size	Number of countries and time period	Result—summary
Cameron (1982)	Public consumption	19 countries, 1960–79	Negative
Landau (1983)	Public expenditure	48 countries, 1961–76	Negative
Marlow (1986)	Total expenditure, social expenditure (both levels and growth)	19 countries, 1960–80	Negative
Saunders (1986)	Same as Marlow (1986)	14–21 countries, 1960–73 and 1975–82	Previous results sensitive to the choice of time period and countries
Saunders (1988)	Same as Marlow (1986)	15–17 countries, 1960–1980	Previous results sensitive to the choice of time period and countries
Agell *et al*. (1997)	Tax and expenditure as a share of GDP	22–23 OECD countries, 1970–90	The negative correlation not robust to controlling for initial GDP and demography

Cameron (1982) is an early simple study, presenting a negative bivariate correlation between the average percentage of GDP spent by government and the average rate of growth in real GDP over the period 1960–79. Cameron argued the size of the effect was not very large, noting that "a very dramatic increase in spending, in the range of 20 percentage points of GDP—a magnitude of increase that occurred in a few nations such as Sweden, the Netherlands, and Denmark—would have reduced the rate of economic growth by only one percent[age point]."

Landau (1983), after increasing the number of countries, adding control variables for education and energy consumption and some geographic dummies, confirmed the negative correlation. Marlow (1986, p. 152), controlling only for level and growth of social expenditure, concluded that "[a]nalysis

of government expenditure data of 19 industrialized countries over the period 1960–1980 supports the view that public sector size retards overall economic growth."

The evidence and arguments generated in early studies, typically strictly limited to cross-country regressions with no (or occasionally very few) control variables, is at most merely indicative of what is going on. It was Saunders (1986) who originally noted that the existing cross-country evidence was not sufficiently robust to incorporate *variations* in the measure of government size selected, the time-period investigated or the countries included in the sample. Subsequently Saunders (1988) criticized Marlow (1986) by pointedly noting "the extreme sensitivity of Marlow's results to the countries included in the sample (particularly Japan), to the time period, and to the other variables included in the analysis" (p. 284).

3.2 Fixed effects panel studies

Eventually as more data became available research moved to panel data where effects are estimated using information representing changes within countries over time; Table 2 summarizes seven such studies. By assuming that omitted variables that cause variation in growth among countries are constant within each country, we can remain ignorant about what these variables are inasmuch as their influence on growth is picked up by the country fixed effect.

The so-called fixed effects methodology of course has an obvious potential downside, namely the sheer inefficiency of not using cross-sectional information in the data. If only little variation occurs in government size within countries over time, studies of fixed effects may falsely claim they are phantoms, arguing there are very few if any negative growth effects from government size. In some cases, estimates using only within-country variation do not significantly differ from estimates also using cross-country variation. In this case, when a random effects model where between-country variation is also used,[7] data is exploited more efficiently. Table 2 shows one study where the preferred specification is random effects: Dar and AmirKhalkhali (2002).

To our knowledge, the seven studies in table 2 are the only reports that satisfy the following criteria:

- Published in peer-reviewed scientific journals after 2000.
- Use panel data.
- Focus on rich countries (i.e. EU, OECD or equally rich countries).
- Measure total government size (i.e. total taxes or total expenditure).
- Examine the effect of government size on growth of real GDP per capita.

As can be seen, five out of seven studies find a negative correlation between government size and growth. While the longest time period is covered by Romero-Avila and Strauch (2008), the total number of country years is highest in the studies by Afonso and Furceri (2010) and Bergh and Karlsson (2010). We will return to these studies below, but first some words on the two studies that deviate in their results.

[7] Typically, the Hausman test is used to examine if the RE and FE estimates are very different, in which case the RE assumption is probably invalid and FE should be used.

Table 2. Recent panel data studies

Study	Measure of government size	Number of countries and time period	Conclusion
Fölster and Henrekson (2001)	Total tax revenue, total government expenditure	22–29 rich countries (7 rich non-OECD countries used as robustness test), 1970–95.	Robust and significant negative effect from government expenditure. Less robust negative effect for total tax revenue.
Dar and AmirKhalkhali (2002)	Total government expenditure	19 OECD countries, 1971–99.	Significant negative effect for the entire period, as well as separately for the 1970s and the 1980s. For the 1990s separately, no significant effect is found. The authors also run country-specific regressions, finding a significant negative effect for 16 of 19 countries.*
Agell *et al*. (2006)	Total tax revenue, total government expenditure	22–23 OECD countries, 1970–95.	Results in Fölster and Henrekson (2001) are weaker when only including OECD countries and cannot be given a causal interpretation due to simultaneity.
Romero-Avila and Strauch (2008)	Total and disaggregated revenue, total and disaggregated expenditure	15 EU countries, 1960–2001, annual data.	For total revenue and total expenditure: negative and significant effect. Negative and significant for direct taxes, insignificant for indirect taxes and social security contributions. Negative and significant effect from government consumption and transfers, significant positive effect from government investments.
Colombier (2009)	Total tax revenue, total government expenditure	21 OECD countries, 1970–2001.	Finds "a stable positive, albeit small, growth effect of government size" (p. 910); result rebutted by Bergh and Öhrn (2011).
Afonso and Furceri (2010)	Total public revenue and expenditure	28 OECD and EU countries, 1970–2004.	Both the share and volatility of government revenue and spending is detrimental for growth.
Bergh and Karlsson (2010)	Total public revenue and expenditure	24–27 OECD countries 1970–1995, and 1970–2005.	Negative effect of taxes and expenditure robust in a BACE-analysis (see section 3.4).

* For 3 of 19 countries, the authors report a non-significant relationship: negative but insignificant for Norway and Sweden, positive but insignificant for the United States.

Agell's *et al*. (2006) replication and critique of Fölster and Henrekson (2001) led to a sharp rejoinder by Fölster and Henrekson (2006). The conclusion to be drawn from the debate is that the correlation may be significantly less robust when only OECD-countries are investigated, a point that deserves to be taken seriously. The OECD countries are not a random sample of rich countries. They are, in fact, unified by their commitment to democracy and a liberal market economic system, working consciously to boost growth and living standards. Thus, the fact that adding seven equally wealthy

non-OECD/non-OPEC countries to the analysis gives a more robust *negative* correlation strengthens the view that such a correlation actually exists.

Furthermore, the controversy is centered on regressions using first differences. As pointed out by Barro (1997), first differencing tends to emphasize measurement error over signal, and measurement error when using first differences of explanatory variables in the regression tends to bias the estimated coefficient of these variables toward zero.

However, to be entirely fair, what is beyond dispute is that the main thrust of the Agell *et al*. (2006) critique did not concern the sign of the partial correlation, but rather the issue of whether or not the results can be given a causal interpretation. We return to the issue of causality below.

The study by Colombier (2009) stands out in arguing again that government size has not been detrimental to growth among OECD countries. Colombier claims to have found a small positive effect, and explains this strongly divergent result by maintaining other studies that use least square estimators are "biased and inefficient" (p. 910) in contrast to the robust modified M-estimator of Yohai *et al*. (1991) that he puts to work . However, Bergh and Öhrn (2011) in a thorough attempt to replicate this study conclude the results are in fact not driven by the econometric method, but depend rather on the unique dataset and specification used. Colombier claims to control for labor-force potential, defined as the growth rate of the population aged 15–64, but the variable actually used is the growth rate of the ratio of the population aged 15–64 and total population. Furthermore, Colombier only includes one additional control variable, namely investment. Bergh and Öhrn demonstrate that adding time fixed effects and using a standard measure of labor-force size produces the standard results, even with the alternative estimator deployed by Colombier. Adding controls for inflation, unemployment and economic openness typically does not change this and often tends to increase the size of the negative coefficient on total tax revenue.

3.3 Disaggregating the effects

Some of the papers described in table 2 probe deeper into the issue by disaggregating government revenues and expenditure. Afonso and Furceri (2010) analyze how several revenue and expenditure sources, measured as a percentage of GDP and in terms of their business-cycle volatility, directly relate to growth. They find that indirect taxes, social contributions, and government consumption have a sizeable, negative and statistically significant effect on growth, both in terms of size and volatility. Whereas for subsidies only their size matters for growth, for government investment only volatility matters. Thus, government investments *per se* are not bad for growth, but if they are highly volatile, growth on average suffers.

Romero-Avila and Strauch (2008) analyze data representing a smaller set of countries (EU15) dating from 1960. They find direct taxes have negative and significant effects for, but indirect taxes and social security contributions have no significant effects. These findings are in line with other studies looking at the relationship between tax structure and growth. For example, Widmalm (2001) finds that taxes on personal income as a share of total tax revenue and more progressive taxes impede growth. For expenditure, Romero-Avila and Strauch (2008) find government consumption and transfers have a negative significant effect, and government investments have a significant positive effect.

Bergh and Öhrn (2011) use Colombier's data to argue that direct (rather than indirect) taxes drive a negative correlation between taxes and growth. The effects found in these studies are consistent with

older evidence. Hansson and Henrekson (1994) examined fourteen rich countries over the 1970–1987 period, and concluded that government transfers, consumption, and total expenditure are consistently negatively related to growth of total factor productivity, whereas educational expenditure has a positive effect.

3.4 Using BACE to handle the model selection problem

As already noted, an important methodological lesson from early cross-country studies is that results are highly sensitive to what other variables are included in the model. Ideally, a theoretical approach gives sufficient guidance regarding the empirical specification, but in practice there is no theoretical agreement on how growth regressions should be specified and what variables should be included.

A bold take on the model selection problem in growth regressions is the method called Bayesian averaging of classical estimates (BACE), developed and first used by Doppelhofer *et al*. (2004). They noted that while several variables have been said to affect growth, many of these are significant only in some regressions. The authors therefore constructed an algorithm to automatically run tens of thousands of different regressions, each of which selects a subset of variables from a set of sixty-seven factors that potentially explain economic growth. There are of course 2^{67} different possible models. Using a standard approach, any researcher would have the time and patience to run perhaps at most a thousand of these, and then select a few regressions suitable for the study. Needless to say, one might expect a researcher wishing to find a negative effect of a particular variable to be more inclined to opportunistically include this variable in the regression, and to show results that had the desired sign.

The BACE algorithm handles the problem by requiring the researcher to supply one single parameter: the number of explanatory variables to be included in the model. The algorithm then runs regressions and generates the average coefficient for each variable, weighted by the goodness-of-fit of each model. The Bayesian algorithm initially treats all variables as equally likely to be included in the model, but the inclusion probability of each variable is updated based on the goodness of fit for regressions with the variable included. Conditional on inclusion, the BACE algorithm will give the coefficient based on a weighted average, where weights are determined by how well each possible model explains the data. According to the BACE-algorithm, variables that increase their inclusion probability during the process are considered robust. The researcher can test the robustness of results by simply varying the model size, typically from three to seven variables, and checking if the same variables increase their inclusion probability.

Doppelhofer *et al*. applied the BACE method to a sample of 88 countries with growth averaged over the time period 1960–96. Among the sixty-seven variables, fourteen were robust in the sense just described. Large effects were found for life expectancy, education, initial GDP and a number of geographic dummy variables. Among the variables with a negative effect, they found a small negative effect of the initial level of government consumption, but not of the total government spending share of GDP. These comparative findings are noteworthy, but not of primary significance here because the sample incorporated data from both rich and poor countries.

However, Bergh and Karlsson (2010) adapt the BACE method to panel data, applying it to the dataset used by Fölster and Henrekson (2001) which they update by adding ten years of observations. They run the algorithm on the original (1970–95) and updated datasets (1970–2005), finding four variables robust in both: Total tax revenue, initial GDP per capita, inflation, and gross savings as a share of GDP (all variables except savings were negatively correlated with growth).

There are two reasons for placing greater reliance on the results from the updated dataset in the Bergh and Karlsson (2010) study. First, this period includes the growth period that several high tax countries experienced after the crisis of the early 1990s, while the period 1970 to 1995 coincides with a period when some high tax countries such as Sweden were lagging behind. Second, this dataset uses updated data for all years, not only adding the years 1996–2005.[8] During the 1970 to 2005 period, two further variables are deemed robust when using both taxes and expenditure to measure government size: The average annual growth rate of the labor force and exports as a share of GDP. Also, unemployment and freedom to trade as measured by the economic freedom index (Gwartney *et al*. 2008) are robust when government size is measured by total tax revenue (but not when total expenditure is used).

3.5 Is the negative correlation due to reverse causality?

A negative correlation between government size and economic growth does not imply that big government causes low growth. In fact, the most obvious reason (among many) to suspect reverse causality a problem is that in welfare states social insurance schemes act as automatic stabilizers. For example, in Sweden total public expenditure peaked at the extremely high level of approximately 70 percent of GDP in 1993. This resulted from record high expenditures for unemployment benefits, which in turn were caused by high layoffs. In general, in times of economic downturn social expenditure provides stabilizers that automatically undermine the government's balanced budget. On the other hand, in boom years when growth rates are higher, fewer people will be unemployed, and public expenditure shares will be lower. For this reason, a negative correlation between public expenditure and economic growth is to be expected in the short run. Consequently, finding a negative correlation is therefore no proof that high expenditure causes low growth.

Attempts are made to avoid the problem of capturing effects caused by business cycle fluctuations and automatic stabilizers by designing specific regressions for the analysis. To some extent this is done by averaging growth over several years, or by controlling for the business cycle itself by including some measure of it such as rates of unemployment or capacity utilization.

There is, however, another approach noted by several authors: The reverse causality bias described above for public expenditure runs in the opposite direction for tax revenue. This is the case for several reasons. Given that most countries have at least slightly progressive tax schedules, the elasticity of tax revenue with respect to GDP is necessarily above unity. When growth increases, tax revenue will increase disproportionately, and the ratio of tax revenue to GDP will rise. Moreover, when the economy is booming, the taxation of capital gains and profits results in higher revenue. While both of these effects imply high taxes tend to correlate positively with rapid growth, in fact causality runs from growth to tax revenue, not the other way around.

The main lesson to be learned from exploring these important mechanisms is of course that a negative coefficient on government expenditure in growth regressions need not imply that large government causes slower growth. On the other hand, a negative coefficient on taxes actually provides rather strong evidence that high taxes cause lower growth, because reverse causality leads us to expect a positive correlation. Bergh and Karlsson (2010) discuss this issue at some length, and noting in their

[8] The picture of the growth of a particular country in the 1970s, when viewed in terms of OECD data from the 1990s, in some cases differs from the growth according to more recently revised data sets. Presumably, data quality increases over time as a result of such revisions.

analysis that taxes are actually more robust than expenditure.[9] Romero-Avila and Strauch (2008) also discuss this potential problem, and test the robustness by using annual data that are cyclically adjusted in several ways. They find no evidence of a systematic bias due to automatic stabilizers, even though the results are sensitive to the method used for creating cyclically adjusted data: Applying a HP-filter actually yields a significant positive effect on direct taxes as well as a significant negative effect on social transfers. These are precisely the results that should occur when automatic stabilizers are in action.

There are other reasons beyond automatic stabilizers for expecting problems of endogeneity bias in this literature. Most studies thus use instrumental variables to create a variation in government size that ideally can be used to properly identify the causal effect. In this case the task is to find some variable or variables that are correlated with government size, but not with economic growth, and then use the variation in these instrumental variables to predict government size. Finally, a second-stage regression examines whether these predicted values have a negative effect on growth.

Fölster and Henrekson (2001), Romero-Avila and Strauch (2008) and Afonso and Furceri (2010) check their results using some type of instrumental variable estimation. The lack of good instruments for government size, however, means the issue has not yet been completely settled— and is perhaps not likely to ever be so.[10] This problem plagues many econometric studies of important phenomena, inhibiting researchers from giving reasonable causal interpretations even to strong correlations.

Afonso and Furceri (2010) instrument the share of government spending and revenue by its lagged value, openness and country size (measured as total population). They motivate this by noting that country size is one of the most robust determinants of government size (referring to Alesina and Wacziarg 1998), although as argued by Rose (2006) it has no statistically significant effect on growth. Using these instruments, the size of the coefficients decrease somewhat, but both taxes and revenue remain negative and significant for both the EU and the OECD.

In the absence of satisfactory instruments for government size, many authors derive instruments from the information already available in their datasets. Romero-Avila and Strauch (2008) employ the Generalized Method of Moments (GMM) of Arellano and Bond (1991). This approach estimates effects using first differences and then lagged levels are used as instruments for the first-differenced data. The GMM results in Romero-Avila and Strauch (2008) do not apply to aggregate government size, but do confirm a significant negative growth effect of social transfers and government consumption, and a small but significant positive effect of public investments.

A similar attempt to correct for endogeneity is made by Fölster and Henriksson (2001) who run a two stage least squares regression (2SLS) using first differences, where the first difference of the tax and public expenditure variables are instrumented by their lagged levels, and also by fixed country effects,

[9] A similar discussion appears in Romero-Avila and Strauch (2008). See also Durevall and Henrekson (2010), who test for such asymmetric effects on annual data from the early 19th century until the present in Sweden and the UK. They find no evidence in the post-war period of an increase in government spending as a share of GDP resulting from expansionary fiscal policy in recessions.

[10] Recently, techniques have been developed that use variables already existing in the dataset as instruments by transforming them in various ways. One such estimator that is currently very popular is the GMM (generalized method of moment) system estimator that jointly estimates the system with first-difference equations instrumented by lagged levels, and level equations instrumented by first-differences; see Arellano and Bover (1995) and Blundell and Bond (1998). On the other hand, Roodman (2009) cautions that flawed use of this estimator may produce erroneous results.

levels and differences of the population and initial GDP variables. These regressions confirm the significant negative effects for both taxes and expenditure.

In the search for good instruments, a conference paper by Karlsson and Bergh (2008) shows that tax credits and basic deductions are in fact correlated with government size, but uncorrelated with growth, implying they can legitimately be used as instruments. However, given that detailed data on deductions and tax credits are available only from 1996, it will still take a number of years before a reasonably long time series can be constructed.

3.6 How big is the effect?

Ziliak and McCloskey (2004) emphasize that the issue of statistical significance may well be of less interest if the size of the effect is not economically significant. Table 3 compares the magnitudes of the four most robust factors in the Bergh and Karlsson study, showing how much annual growth would change if the variable were to increase by one standard deviation.

We see that among the countries in the sample inflation varies substantially and seems detrimental to growth. We also notice that the relative income of a country is important: Those richer than the OECD average grow more slowly, and those poorer grow more rapidly.

More interestingly, one standard deviation higher tax revenue is associated with an annual growth rate that is nine-tenths of a percentage point lower. Given that a standard deviation in this sample is nine percentage points, we could simply say countries where tax revenue is ten percentage points higher on average experience an average growth rate that is one percentage point lower. As shown in table 4, the five studies that find a negative effect are in relative agreement about size: 10 percentage points higher taxes (or public expenditure) is associated with 0.5 to 1 percentage point lower annual growth. It is noteworthy that the size of the effect is very similar to the simplistic early Cameron (1982) study.

Table 3. The growth effects of four variables found robust by Bergh and Karlsson (2010)

Variable	Mean	Standard deviation	Effect
Tax revenue, share of GDP (%)	33.6	8.7	−0.9
Initial per-capita income relative to the OECD average	1	0.29	−2.0
Inflation	0.08	0.16	−2.7
Gross national saving, share of GDP	0.24	0.08	0.2

Note: Effect measures the estimated growth effect (in percentage points) of an increase of one standard deviation in the variable in question.

Table 4. Comparison of estimates in different studies—Dependent variable: Annual growth rate of real GDP per capita

Study	Coefficient on total taxes/GDP	Coefficient on total expenditure/GDP
Afonso and Furceri (2010)		
IV-estimates, OECD (table 10)	0.09 (significance 1%)	0.09 (significance 1%)
IV-estimates, EU (table 10)	0.09 (significance 10%)	−0.06 (significance 5%)
Bergh and Karlsson (2010)* (BACE, OECD, 1970–95).	−0.11	Not robust
Bergh and Karlsson (2010)* (BACE, OECD, 1970–2005).	−0.10	−0.09
Fölster and Henrekson (2001, table 2) (Fixed effects panel, OECD, 1970–95)	−0.05 (not significant)	−0.07 (significant at 5%)
Romero-Avila and Strauch (2008, table 5) (Fixed effects panel, EU15, 1960–2001)	−0.06 to −0.07 (significant at 5% or 1%)	−0.05 (significant at 1%)
Dar and AmirKhalkhali (2002, table 3) (Random effects panel, 19 OECD countries, 1971–99)	n.a.	Significant negative effects in 16 out of 19 countries: from −0.05 in Finland and Belgium to −0.16 in Portugal**

* The BACE-method in this paper is focused on inclusion probability, not statistical significance (section 3.4).

** The authors report for 3 of the 19 countries surveyed a non-significant relationship: negative but insignificant in Norway and Sweden, positive but insignificant in the United States.

3.7 Conclusion—towards a consensus?

In our view, the most convincing studies are those most recently published. Romero-Avila and Strauch (2008), Afonso and Furceri (2010) and Bergh and Karlsson (2010) use long time periods, examine similar countries, use recent data and check the robustness of their results in several ways. Romero-Avila and Strauch (2008) and Afonso and Furcini (2010) also check their results for reverse causality. In general, research has come very close to a consensus that in rich countries there is a negative correlation between total government size and growth. It appears fair to say that an increase in total government size of ten percentage points in tax revenue or expenditure as a share of GDP is on average associated with an annual lower growth rate of between one-half and one percentage point.

The fact that many scholars still describe the debate as lacking consensus can be attributed to the way they routinely ignore the fact the studies they rely on use a variety of different measures of government size. For example, Lindert (2004) discusses the size of the welfare state according to a very specific definition, without taking into account total government size. Another example is the survey by Gordon and Wang (2004) who describe the literature as conflicting, noting that Agell *et al*. (1997), Ayal and Karras (1998), and Nelson and Singh (1998) have not found statistically significant relationships between the rate of economic growth and government size. However, a closer look suggests Gordon and Wang have not actually done a survey inasmuch as only the Agell *et al.* study is relevant here. Agell *et al.* show that the negative bivariate correlation between government size and growth disappears when controlling for initial GDP and demography, as described above. The others should not be included in this class of studies. Nelson and Singh (1998) look only at less developed countries; and Ayal and Karras (1998) study the correlation between various components of economic freedom and the annual growth rate of GDP per capita over the period 1975–90, thereby testing the

relationship between government size and economic growth only implicitly, because some measures of government size are included in the economic freedom index they use.[11]

Finally, while there is close to a consensus on the sign of the correlation, there is also consensus on the fact that causality is very hard to establish with certainty using the method of instrumental variable estimation—or any other method currently available. In fact, it is close to conceptually meaningless to discuss a causal effect from an aggregate such as government size on economic growth. Thus, several scholars in our view have rightly concluded it is more fruitful to analyze separately the mechanisms through which different taxes and expenditure affect growth. Not all taxes are equally harmful, and some studies identify public spending on education and public investment to be positively related to growth.

4. How can Sweden combine high growth and high taxes? Explaining the flight of the bumblebee

Given the negative correlation between government size and growth, the fact that many countries with high taxes have experienced above average growth rates from the mid 1990s onwards is sometimes described as a puzzle. Sweden particularly is often mentioned as a puzzle or paradox, demonstrated for example by the IMF-report entitled "Sweden's Welfare State: Can the Bumblebee Keep Flying?" (Thakur *et al*. 2003), or the way Lindert (2004) uses the case of Sweden to argue the welfare state is a free lunch.

Table 5 reports average annual growth of GDP per capita for the period 1995–2004 as well as total tax revenue as a share of GDP in 1995 for the fourteen OECD countries that typically are used in welfare state research.[12] Clearly, Sweden and the Scandinavian countries stand out by combining high growth and high taxes. This pattern does not depend on the time period chosen.

There is no agreement in the literature about how to best explain the growth performance of the Scandinavian welfare states. Yet to a degree the explanation can be found in the empirical research examined in the previous section. Welfare states with high taxes can compensate negative growth effects from large government by applying other growth-promoting policies. The validity of this explanation may be hinted at by the way Scandinavian welfare states since the mid 1990s have been characterized by very market oriented policies and institutions, as evidenced by the values of the economic freedom index shown in table 5. This is an especially promising line of inquiry if the first dimension of the economic freedom index, measuring size of government, is excluded. This is shown in the column labels EFI2–5, indicating a summary statistic of legal quality, monetary policy, freedom to trade and regulations of the economy

[11] They do find various aspects of economic freedom linked to growth when controlling for initial income, investment, and population growth. Six elements of economic freedom are shown to be significantly correlated with multifactor productivity and capital accumulation: Low money growth rate, a small role played by government enterprises, rare negative real interest rates, small difference between official and black market exchange rates, large size of the traded-goods sector, and freedom of citizens to engage in capital transactions with foreigners.
[12] We follow Bradley *et al*. (2003) who stay close to Esping-Andersen's (1990) classification by using three categories. This is standard in welfare state research, though there is much less agreement on the appropriate labels of different categories. In particular, the labels Scandinavian, universal, institutional, encompassing and social democratic all refer to the same countries.

Table 5. Average annual growth of GDP per capita 1995–2004, taxes and economic freedom in different types of welfare states

Welfare state type	Growth (%)	Taxes (% of GDP)	EFI	EFI2–5
Scandinavian				
Sweden	2.70	47.5	7.14	8.28
Finland	3.40	45.7	7.32	8.48
Norway	2.30	40.9	7.34	8.39
Denmark	1.70	48.8	7.46	8.56
Average	*2.50*	*45.7*	*7.32*	*8.43*
Continental				
Germany	1.20	37.2	7.52	8.30
France	1.70	42.9	6.80	7.69
Belgium	1.80	43.6	7.26	8.06
Netherlands	2.10	41.5	7.80	8.55
Italy	1.10	40.1	6.50	7.19
Switzerland	1.10	27.7	7.96	8.35
Average	*1.50*	*38.8*	*7.30*	*8.02*
Anglo-Saxon				
Canada	2.30	35.6	7.90	8.42
Australia	2.40	28.8	7.80	8.33
UK	2.50	34.0	8.04	8.69
US	2.10	27.9	8.32	8.68
Average	*2.30*	*31.6*	*8.01*	*8.53*

Source: Growth from OECD (2009a) and taxes from OECD (2009b). Taxes and economic freedom refer to 1995 levels. The Economic Freedom Index (EFI) indicates how market-friendly institutions and policies are on a scale from 0 to 10. Data are taken from the 2010 dataset available with documentation at http://www.freetheworld.com/. EFI2–5 excludes government size from the index, thereby acting as a summary of legal quality, monetary policy, freedom to trade and regulations of the economy

Another possibility is that countries with the capacity to successfully develop and sustain large government sectors are actually more likely to do so, and that some background factors are requisite for these countries to sustain larger government sectors. Recent research points to norms like social trust as one such factor explaining why some countries can successfully develop larger welfare states. These two explanations are not mutually exclusive, and below we will show both together seem to contribute to building an adequate explanation.

4.2 Compensating for high taxes using other policies

The idea that countries with large governments compensate for negative growth effects of high taxes and of public spending. by applying growth-friendly policies in other areas, fits well with the development in the Scandinavian countries during the 1980s and the 1990s. To illustrate this point, table 6 compares Sweden and the US based on data and coefficients from Bergh and Karlsson (2010).

For the variables found to robustly explain growth during the 1970–2005 period, the table reports the quantified growth effects of the changes in Sweden and the US between 1980 and 2000.[13]

Table 6. The growth effects of changes in key factors in Sweden and the US between 1980 and 2000

Factor	Sweden 1980	Sweden 2000	Effect of change on avg. growth	US 1980	US 2000	Effect of change on avg. growth
Inflation (%)	10.5	0.5	1.7	8.9	2.5	1.1
Savings (% of GDP)	21.5	21.1	−0.06	19.5	17.4	−0.3
Labor force growth (%)	0.9	0.1	−0.2	2.7	1.5	−0.3
Taxes (% of GDP)	47	52	−0.5	25.8	29.1	−0.3
Unemployment (%)	2.0	6.6	−0.5	6.8	4.6	0.2
Exports (% of GDP)	28	42	0.6	8.7	11.1	0.1
EFI4 (index, 0–10)	6.8	8.6	0.005	7.8	8.0	0.0006

Sweden seems to have benefitted substantially from reducing inflation, and also from increasing exports. These two factors together increase the annual growth rate by 2.3 percentage points, according to the estimates. Despite being robust in the BACE-analysis, the economic freedom index measure of free trade appears economically insignificant. This is because the index weighs trade flows (picked up by exports) together with trade policies (adding little explanatory value once exports are controlled for).

Higher taxes, higher unemployment and lower labor force growth on average decreased annual growth by 1.2 percentage points between 1980 and 2000. A marginally lower savings is also associated with a small decrease in growth. In all, the analysis suggests Sweden in 2000 increased annual growth by about 1 percentage point due to changes in the variables found robustly related to growth in the study.[14] The corresponding number for the US is 0.5 percentage points. The difference is explained mainly by the US over the same time period having had a smaller decrease in inflation and a smaller increase in exports.

Naturally, these interpretations of regression coefficients serve only an illustrative purpose and need to be interpreted with caution. Still, to improve our understanding of growth differences between rich countries, it is useful to put estimated coefficients in perspective by looking at how important variables have changed in specific countries over time. In this specific case, it seems part of Sweden's recent growth can be explained by drastically lower inflation. It also seems plausible that since 1980 Sweden as a small and open economy has benefitted from increasing economic integration.

While economic openness and free trade are routinely stereotyped as a threat against the welfare state,[15] there are a number of theoretical reasons why they may be especially important for countries

[13] We omit the policy irrelevant initial relative income variable from the table. The coefficients are taken from table 6 in Bergh and Karlsson (2010) with tax income as the measure of government size.
[14] It is also worth noting that the results suggest that Sweden can increase growth even more if the functioning of the labor market is improved, as both higher unemployment and lower labor force growth retard growth.
[15] See, for example, Martin and Schumann (1997), Strange (1996) and Sinn (1997).

with big governments. Openness creates greater opportunities for division of labor, enabling not only access to new products, but also to knowledge, technologies, and larger markets. Iversen (2005) is sympathetic to these arguments, warning that extensive welfare states are likely to run into problems should they 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. (p. 74)

In this view, the negative effects of extensive transfers, high tax wedges, and stringent labor market regulations can, at least to some extent, be offset by economic openness which encourages welfare states to specialize in high value-added services.

It seems likely that many reforms in Sweden in the 1980s and the 1990s compensated for the negative effects of high taxes. The Scandinavian countries, as shown in table 5, also have relatively high levels of economic freedom, as measured by the economic freedom index of Gwartney *et al*. (2008). This is particularly so if the first dimension of the index, measuring size of government, is excluded; but there are essentially different views of what precisely is involved. If De Haan and Sturm (2000) are correct in their contention that only changes in economic freedom promote growth, this means that the Scandinavian welfare states have benefitted from reforms during the 1980s and 1990s, but must continue to implement reforms to maintain high rates of growth. On the other hand, if Dawson (2003) is correct in claiming that it is the level (rather than increases) of economic freedom that is a cause of growth, the high level attained by Scandinavian welfare states by the mid-1990s probably contributed to the relatively high growth in these countries.

4.3 Trust, government size and growth

Social trust, assumed to be a reflection of a deeper social norm, is often quantified using the share of the population in different countries who agree with the proposition "most people can be trusted." Recent comparative research findings suggest social trust may be an important reason why the Scandinavian countries can successfully combine growth and high taxes. Simply put, trust demonstrably positively affects both government size and growth.

The strong correlation between social trust and government size is well-known in the literature. Nannestad (2008) claims high trust levels enable countries to solve the collective action dilemma created by their welfare systems. Nannestad's hypothesis is that trust makes universal welfare systems sustainable because people in countries with higher trust are less worried about free riding problems linked to extensive welfare policies. Consequently, trust and trustworthiness of citizens and public bureaucrats minimize problems of tax evasion and public sector inefficiencies. Conversely, countries with lower levels of trust have developed less extensive welfare systems.

Nannestad's position seems tenable when we take into account recent empirical investigations of Bergh and Bjørnskov (2011). They use instrumental variables based on linguistics, constitutional monarchies and temperature in the coldest month of the year to create a measure of "historical trust." Their basic idea is that the cross-country variation in trust explained by these instruments cannot be caused alone by the relatively recent variation in welfare state size. A correlation between historical trust and current welfare state size can therefore not be a result of universal welfare states causing higher trust (as suggested, for example, by Kumlin and Rothstein 2005), but rather suggests that

trusting populations are more prone to creating large welfare states. Empirically, the measure of historical trust predicts current variation in both total government size and welfare state size; it is in fact a more robust predictor than other factors such as government ideology and economic openness.

In other words, historical trust levels can be seen as a determinant of the feasibility frontier for government size, explaining why some countries can maintain larger government sectors without detrimental growth effects. Importantly, this does not exclude the possibility that government can become too large—in the sense the benefits on the margin no longer exceed the costs. In panel data studies with country fixed effects, factors like historical trust levels are picked up by the country fixed effect.

Many studies have also identified a link between trust and growth, with lower transaction costs, lower corruption and higher innovation as plausible and substantively important mechanisms (Knack 1999; Uslaner 2008; Knack and Keefer 1995). The consensus in the trust-cum-growth literature is not complete, but the overview by Bjørnskov (2009) points persuasively towards a sizeable effect in cross-country regressions. [16] According to Bjørnskov, the size of the effect in most studies is such that 10 percentage points higher trust is associated with half a percentage point higher annual growth rate. In the Scandinavian countries, about 60 percent agree that most people can be trusted, which can be compared to the OECD average of about just 40 percent.

A third reason why the condition of trust may be central importance is furnished by Aghion *et al*. (2010b) in an article entitled "Regulations and Distrust". The authors argue that low trust plays a pivotal role, leading voters to demand more detailed regulation of the economy, since they do not trust bureaucrats with discretionary power. This mechanism is verified and extended by Bergh and Bjørnskov (2011) who demonstrate that countries with higher historical trust levels also have lower business and credit market regulations. Conversely, higher trust in the Scandinavian countries may well be an important explanation both for the size of their public sectors as well as for their economic growth.

5. Concluding remarks

We have shown that most recent studies published in scientific journals tend to find a negative relationship between total government size and economic growth in rich countries. This stands in stark contrast to scholars such as Lindert (2004) and Madrick (2009), who have argued in book length treatments that there is no tradeoff between economic growth and government size. Studies that disaggregate taxes and expenditure typically seem to find that if the policy objective is economic growth there are two consequences: First, that direct taxes on income are worse than indirect taxes, and second, that social transfers are worse than public expenditure on investment including human capital, which, if anything, increases growth.

Hence, our results do not imply that government must shrink for growth to increase. There is potential for increasing growth by restructuring taxes and expenditure so that the negative effects on growth for a given government size are minimized. Furthermore, countries tend to cluster to institutions that go well together. As stressed by many observers (e.g. Freeman 1995), the Swedish welfare state can be

[16] It is standard in the literature to check for endogeneity by instrumenting trust. For example, Knack and Keefer (1997) instrument for trust with the share of a country's population belonging to the largest ethnic group, while Dincer *and* Uslaner (2010) use the share of Nordic, British, and German populations in a state as instruments.

seen as an economic model defined by a unique mix of institutions. The specific mix of institutions and the emergent idiosyncratic interactions among them are key determinants of economic performance.

Both the Scandinavian and the Anglo-Saxon welfare states seem able to deliver high growth rates for very different levels of government size. This does not mean low-tax countries can increase taxes without expecting negative effects on growth, nor that the various mechanisms by which high taxes distort the economy do not apply in Scandinavia. A more incisive interpretation is that there is something omitted from the analysis that explains how Scandinavian countries combine high taxes and high economic growth. We have suggested two such explanations—compensation using growth friendly policies and benefits from high historical trust (lack of apprehension) levels—but these at best remain only speculative, with ambiguous policy implications. Even if the debate regarding the existence of a correlation between growth and aggregate government size in rich countries now seems more or less settled, the research on policy change, institutions and growth is progressing rapidly.

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