Can Government Influence Long-Run Rate of Economic Growth?

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It has been customary in recent years for presidents of regional science organisations to reflect on the changing focus and future of regional science. There is already an excellent printed record of such deliberations in regional science journals such as Papers in Regional Science and International Regional Science Review, so I can probably add little to that. I just want to make one observation in this context from the perspective of my own discipline, which is economics. Trends in recent decades such as the information technology revolution, globalisation, regionalisation and financial and economic integration are forcing economists again to take space seriously in their modelling (mainstream economists having ignored geography and space for much of this century). This rediscovery is not only taking place among academic economists, but also among key policy makers. For example, in New Zealand which has had drastic economic reforms since the mid 1980s and which is arguably now one of the most liberal economies in the world, the Treasury and Reserve Bank policy makers have recently started to ask the question why the results, in terms of employment and economic growth, have been disappointing. Spatial issues such as the country’s relative remoteness, the low population density and the roles of agglomeration forces, networks, clusters and regional integration are now finally accepted as being highly relevant.

Consequently, I see a healthy future for regional scientists in advising key policy making institutions in your countries, given the global changes that are now taking place. For example, one of the themes of the conference is that cross-national linkages between cities and regions may provide better insights into global forces than traditional country perspectives that have been prevalent in the past. In addition, there will be, at this conference, exciting sessions on many of the other topics that regional scientists study, such as the location of firms, urban poverty, the environment, trade, regional and urban growth, clusters, transportation and spatial interaction and other non-linear models in regional science.

However, in my allocated time, I would like to share with you some of the insights obtained from one of the topics I have been researching in recent years, namely the relationship between long-run economic growth and economic policy. The extent to which a national, regional or local government can influence the long-run growth path of the economy has intrigued economists for a long time. The rewards from identifying policies which can permanently raise a country's, or region's, growth rate are potentially huge, due to the exponential nature of the growth process. A recent JEL survey of the empirical research on growth by Oxford economist Jonathan Temple¹, provides convincing evidence for a diversity in growth rates across countries, including the existence of clusters of “growth miracles” and “growth disasters”. These have major implications for human well-being in the countries concerned, and the local audience will be...
pleased to see that Korea was the biggest 1960-90 growth miracle of them all.\(^2\)

However, the conventional neoclassical growth theory formulated by Robert Solow and Trevor Swan in 1954 provided no guidance as to how governments could influence the long-run growth rate.\(^3\) As most of you will know, the Solow-Swan model describes how economies approach a long-run path of steady-state growth in income per capita, but not what actually determines this steady-state growth rate itself. Since this exogenous growth rate is traditionally called the rate of technological change, it is obvious that technological progress was considered the main driving force of per capita income growth.

Clearly, other factors - sometimes difficult to measure - were also believed to foster economic growth, such as education, cultural factors, institutional support systems and efficient business organisation. However, strategic behaviour, and product and process innovations are phenomena that are incompatible with the paradigm of perfect competition that characterised growth theorising in the 1950s. Consequently, few attempts were made at the time to endogenise the rate of technological change or to deal with other market externalities in the growth process.

From the policy perspective there was in fact no need to study technological change as long as it was primarily a private sector activity and diffusion of new advances spread readily across the world. In this case, and assuming similar preferences and open economies, countries and regions would converge to the same level and rate of change in income per head in the long run. From this perspective, policy would have the rather narrow role of "speeding up" this convergence process by ensuring that market forces would not be restricted. Hence, the removal of trade barriers, the protection of property rights, etc. would simply aid the catching-up process, but would have no consequence for the long-run growth rate. However, the evidence for long-run convergence is not very strong as the familiar scatter diagram of the relationship between initial income and the growth rate shows (see, for example, Jonathan Temple’s paper). There is clearly only evidence of convergence among OECD countries.

New developments in modelling dynamic general equilibrium and imperfect competition in the economy led to a wave of new models of growth, commencing with those described in the seminal articles by Paul Romer (1986) and Robert Lucas (1988).\(^4\) As Lucas said: “I do not see how one can look at figures like these without seeing them as representing possibilities. Is there some action a government of India could take that would lead the Indian economy to grow like Indonesia's or Egypt's? If so, what, exactly? If not, what is it about the "nature of India" that makes it so? The consequences for human welfare involved in questions like these are simply staggering: once one starts to think about them, it is hard to think about anything else.”

The new growth literature mattered from the policy perspective because it gave prominence to the external benefits associated with the accumulation of knowledge through education or innovation.

Facilitated by the emergence of large data sets on macroeconomic characteristics of most countries of the world, a parallel development has been a new wave of empirical studies of the determinants of growth. In contrast with the growth accounting methods used by Denison and others during the 1960s, the new growth studies employed almost exclusively regression models to identify the determinants of growth.

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\(^2\)\(^\text{Victoria Economic Commentaries, October 1999}\)
historians and social scientists taking a more meso or micro perspective of the growth process have been rather sceptical of what this research programme has achieved. As Arnold Harberger said, "Cross-country growth regressions seem hopelessly naive to longtime observers of the growth process.....".\(^5\)

While much of the empirical research on growth during the last decade used cross-country data, in recent years there has been a rapidly expanding literature on regional growth and convergence. Of course, many of you are aware of a long-standing tradition in regional science of models and techniques to study regional growth and divergence, but this issue has only recently attracted the attention of the economics profession in general.

Many of the empirical studies of the "engines of growth" include government-related variables such as tax rates, government size, indicators of law and order, etc. However, this huge pool of empirical findings does not seem to have generated simple prescriptions for policy makers. A recent article in the influential magazine *The Economist* concluded "What is the main thing governments must do to spur economic growth? Ah, well, that remains a mystery."\(^6\)

In the remaining minutes, I would like to assess therefore whether there are any robust findings from this vast literature that would be of benefit for gaining new perspectives on policies for regional development. With this aim, I will not address the impact of the removal of trade barriers, the implications of monetary policy, social security programs, law and order measures and the institutional structure. Instead the focus is solely on traditional *fiscal* policies, i.e. public consumption and investment and the revenues required to finance such activities. Moreover, most empirical analyses of endogenous growth literature take a purely *macroeconomic* perspective and this is therefore also the approach I adopt here.

In most market-oriented economies, there has been during the last two decades a trend towards greater reliance on market forces and less government involvement in the economy. This trend towards greater economic liberalism resulted from the widespread belief that the extent of government intervention in the economy had become detrimental to the objectives of allocative efficiency and long-run growth.

Hence, the role of government as a “pure” regulator of the economy has considerably diminished in recent years. We observe more diffuse roles of government departments and agencies at the interface of the private sector and the public sector. The effectiveness of the interaction between these two sectors may in itself form a critical success factor for (regional) economic policy.

An important issue in this context is that government policy itself is likely to be *endogenous*. The endogeneity of government may also be due to the “taste” for public spending. The demand for public services is likely to be income elastic. This is referred to in the literature as Wagner’s Law.\(^7\) This law, combined with the price-inelastic demand for public services is responsible for the growth in the share of government spending as a proportion of income (also referred to as the “size” of government) that has been commonly observed among developed economies during the post-war period.

The impact of government spending in endogenous growth models can be easily illustrated by means of the very simple \(y = A k\) model. Consider an economy with a consumption, investment and public sector. Let’s assume that government spending evolves according to Wagner’s
Law, but that the government does raise taxes to maintain a balanced budget. A possible relationship of how the government tax and spending rate $\tau$ would vary with income $y$ is shown by Figure 1.

Let’s now assume that the productivity of private capital has a concave relationship with the tax rate $\tau(y)$. A possible relationship is depicted in Figure 2. Where is the maximum of this pseudo-Laffer curve? Research by James Gwartney and others, prepared for the US Congress, suggests that it may be at a rate of government expenditure of less than 25% of Gross Domestic Product. However, others, such as Joel Slemrod, show that the relationship between public expenditure ratios and growth is rather ambiguous.

A problem with this conceptualisation in any case is that government expenditures are often designed to enhance public welfare rather than measured national income. For example, the relationship shown may well be different if the impact of government expenditures on environmental protection would be included in the measure of national output.

Inserting this government sector into a formal growth model, it will be clear to you that the effect of an increase in the steady-state tax rate $\tau^*$ can be positive or negative. A higher tax rate lowers the growth rate due to the crowding out of private investment, but the productivity gains effect resulting from public expenditures may be stronger for relatively high tax rates.

Against a background of frequently inconclusive empirical results, the question therefore emerges whether regularities and generalisations can be made by means of comparative cross-country or cross-region research findings. Modern meta-analysis may in this case be helpful to pinpoint commonalities in explanatory frameworks, not only theoretically or methodologically, but also empirically and in terms of policy analysis.

Let me now turn to such a meta-analysis by categorising, and assessing the relative strengths of, empirical findings on the relationship between government and growth.

The relationship between government and growth can not be studied properly without a formal theoretical framework, suitable cross-section and/or time series data and appropriate econometric methods. Empirical research in this area has been a relatively recent phenomenon. As David Landau remarked 13 years ago, "(t)here are virtually no empirical studies of the general impact of government on economic growth. An extensive literature search turned up only three papers" (p.35). However, since the mid 1980s there have been many empirical analyses of the relationship between government and growth, either as a by-product of tests of conditional convergence between countries or regions, or to address the issue explicitly. From this vast literature of several hundred published and unpublished papers, I made a selection of 93 published articles from the period 1983-98 and categorized these articles in certain ways.

All the selected articles were published in refereed international journals in the English literature. Being cited in later research was also a criterion for inclusion. By focusing specifically on relatively high-quality commonly cited papers, it was felt that useful generalisations could be made from this body of knowledge. The synthesis attempted here undoubtedly suffers from so-called publication bias in that significant findings are likely to be more prominent in the papers summarised here than in the excluded papers. However, the ultimate objective of the exercise is to assess the difference in robustness of the
findings across different areas of government behaviour and it is not clear that publication bias would systematically differ across these different areas.

The articles were classified in three different ways: the spatial level (national or regional), the method of analysis and the area of government activity. With respect to the method of analysis, there are four categories: cross-section regression analysis (CS), time-series regression analysis (TS), pooled cross-section time-series regression analysis (CSTS) and other methods. With respect to the impact of government on growth, five types of effects were considered: general government consumption in relation to overall GDP (also referred to as government size), tax effects, educational and health effects, defence effects and infrastructure effects. For each study, I also considered the time period of the study and the number of countries or regions included in the analysis.

Before a discussion of specific results, it is useful to point out some general features in this body of research. Firstly, the vast majority of studies have used standard regression techniques. Ordinary Least Squares (OLS) has been the most commonly adopted technique. The suitability of this method was rarely tested by means of diagnostic statistics.

There has been an increasing use of pooled cross-section time-series data, as the availability of such data has improved. This is a welcome trend, as the CSTS studies show that region and period effects are important. In TS studies, we see in recent years a growing use of vector autoregressions, Granger causality tests and the cointegration framework.

The dearth of studies that adopt a dynamic simulation modeling approach is rather surprising. My sample of 93 studies included only two studies that have adopted a calibration/simulation approach. There appear to be also few studies that have adopted a computable general equilibrium (CGE) model approach.

An additional weakness of many past regression studies is that these purport to provide information on long-run growth, but use only observations over a relatively short time span of 5 to 30 years. For example, it is possible that public infrastructure does raise the (local) long-run growth rate, *ceteris paribus*, but that the effect only emerges very gradually over time, e.g. because of a complementarity with certain types of private capital that may for various reasons only be undertaken at a slow rate. It this case it may be very hard to detect the effect of an additional amount of public investment compared with the (unobservable) counterfactual.

In an influential 1992 paper, Levine and Renelt use Extreme Bounds Analysis (EBA) to show that many of the results from CS regression analyses of the determinants of long-run growth are not robust. However, their conclusion does not appear to have discouraged others from continuing to carry out CS regression analyses, although TS and CSTS analyses have become far more prominent in recent years. Indeed, Xavier Sala-i-Martin argued recently that the EBA criterion of fragility is too tough to be of any use. Assessing instead the robustness of a variable by the probability that the coefficient is on one side of zero in the cumulative distribution function of the regressions which include this variable, Sala-i-Martin finds that 22 out of 59 possible determinants of growth are "significant". Interestingly, no measure of government spending (including investment) is among these 22 variables.

Virtually all studies of government and growth are primary analyses. Each study has rather unique features in terms of the
specification of the model, the sample of countries or regions considered, the time period of observation and the range and definitions of the variables used. Few authors have carried out replications or extensions of earlier research (so-called secondary analysis), although tertiary analysis in the form of a survey is more common. Among the articles included in my sample, there is only one example of meta-regression analysis, namely research by Ken Button on infrastructure and growth. 13

A final general finding from my data base of publications is that most of the studies on the relationship between government and growth have focused on government at the national level and have consequently used country data. Only about one fifth of the studies use regional data.

The most commonly studied issue in this context is the impact of government consumption on economic growth. I analysed 38 studies of this type. The usual measure of government consumption or “size” is the ratio of public expenditure to GDP. A weakness of the studies is that it is not always clear that the measured government expenditure represents government’s consumption of resources, that is net of public financial transfers (social security payments and subsidies). Net and gross measures of expenditure may be expected to have quite different impacts on growth.

A broad conclusion is that “big government” appears to be detrimental to growth. The next transparency provides a comparative probability statement (based on frequencies in the data base) of this hypothesis in relation to the others considered and shows that the evidence for this conclusion is rather weak compared with other areas of government influence (see Table 1). 34% of all relevant studies showed that higher government consumption had a negative effect on growth, but for cross-section regression analyses the probability was somewhat higher, namely 44%. 14

Studies of tax effects are rather less common than studies of expenditure effects on growth. Among the 9 studies analysed, there were no studies that found higher tax rates to be associated with higher economic growth. Instead, there appears to be empirical support for the hypothesis that higher taxes lower growth (with an overall 67 percent probability) and this is particularly true for studies that focus on marginal rather than average tax rates. However, the small sample size indicates that this conclusion must remain rather tentative.

I also considered the impact of education and/or health expenditure on long-run growth. The impact of health expenditure on growth and productivity of the work force appears to be a rather neglected area. Most of the 13 studies included in the table provide support for the hypothesis that education has a positive impact on growth. Despite this, it is very hard to derive a quantitative generalisation of the impact of education due to the fact that the studies use a wide range of statistical proxies to measure the level of education of the work force or actual educational expenditure by government.

Another relatively well-researched topic is the impact of defence expenditure on growth. The process of (nuclear) disarmament, the break-up of the Soviet Union and the emerging new global order have provided a new impetus for research on the relationship between defence spending and growth. The central question is whether the end of the arms race generated a so-called peace dividend in the form of higher economic growth, particularly in developing countries. However, the balance of the evidence of the
Let me now sum up. I reviewed some of the mechanisms through which government policies can potentially influence a regional or national economy’s transition towards a steady-state growth path and the steady-state rate of growth itself. The empirical evidence for the link between government and growth was assessed by a synthesis of a sample of 93 published post-1983 articles in refereed journals. I considered five policy areas: general government consumption, tax rates, education and health expenditures, defence and public infrastructure. I found that the most conclusive results in the literature relate to the positive impact of education expenditures on growth. Public infrastructure also appears important.

However, a major weakness of many studies in this area is the highly aggregative nature of the research. Future research should endeavour to distinguish between different types of government expenditure and provide a better link between theory and the empirical research. For example, several models have been developed that describe explicitly the impact of R&D expenditure and the diffusion and adoption of innovations in a multi-regional context, but these and the so-called Schumpeterian models of endogenous growth developed by Philippe Aghion and Peter Howitt still require rigorous empirical scrutiny. Research at the industry level may also be a promising avenue. For example, there have been recent case studies of critical success factors in innovation and growth of the chemicals industry. Such studies suggest that issues such as the encouragement of free enterprise, and the protection of law and order may play an important role.

In any case, it is possible that more can be learnt from parameter calibration methods for micro-foundations based models than from parameter estimation of regression models with ad hoc specifications.
However, there remain severe limitations on what can be learned for policy from highly aggregative models of endogenous growth. Better data are needed at the regional macro and meso levels to complement the commonly used pooled cross-section time-series country data of macro economic conditions and growth.

Another area that needs further attention is the potential endogeneity of government expenditure itself. It was noted earlier that the size of government is related to the stage of development and the openness of the economy. In addition, the size and nature of government will depend on political, institutional and cultural aspects of society. If growth regressions continue to have policy variables on the right hand side, special efforts should be made to find suitable instrumental variables to avoid biased policy variable coefficients. Potential candidates could be certain demographic, geographic or political features of countries and regions.

Finally, there are at least two, less conventional, avenues for research that potentially could provide new insights into the links between government and growth. The first of these is a more in-depth meta-analytic assessment of the type of data contained in a literature. While there may be difficulties in carrying out conventional meta-regression with this type of data (given the wide variety of policy measures, as I mentioned earlier in the case of human capital), other meta-analytic techniques, e.g. rough set analysis, may provide a promising new avenue.

Alternatively, it has been found in micro-economic research that so-called natural experiments may be a useful means of deriving new results. It may be fruitful to search for case studies of relatively large policy shocks at the local or regional levels and to assess the impact on growth of such shocks by comparison with a “control group” of regions which were not exposed to the shock, but which are otherwise similar. For example, with respect to public consumption or investment, one could consider the local or national impact of government expenditure induced by natural disasters.

In summary, the commonly observed observational equivalence of competing theoretical models of the macro-economy, make it unlikely - as many authors have noted - that much can be learned from additional cross-country growth regressions. However, alternative approaches such as those outlined above may shed more light on ways in which a public claim on resources and other forms of intervention in the market economy remain essential for sustainable growth in the standard of living. VEC
Figure 1  Wagner’s Law

![Graph of Wagner’s Law]

Figure 2  The Likely Relationship between the Average Tax Rate and the Productivity of Private Capital

![Graph of the relationship between average tax rate and productivity of private capital]
Table 1  A Probability Measure of Empirical Support for Conventional Hypotheses Regarding the Impact of Fiscal Policies on Long-Run Economic Growth

<table>
<thead>
<tr>
<th>Type of fiscal policy</th>
<th>Hypothesis</th>
<th>CS</th>
<th>TS</th>
<th>CSTS</th>
<th>Other</th>
<th>Total</th>
<th>95% confidence interval</th>
<th>n</th>
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<tr>
<td>EH</td>
<td>+</td>
<td>0.80</td>
<td>0.66</td>
<td>1.00</td>
<td>1.00</td>
<td>0.79</td>
<td>(0.47, 0.97)</td>
<td>13</td>
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<tr>
<td>I</td>
<td>+</td>
<td>0.70</td>
<td>1.00</td>
<td>0.50</td>
<td>0.60</td>
<td>0.74</td>
<td>(0.59, 0.89)</td>
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<td>T</td>
<td>-</td>
<td>0.50</td>
<td>0.67</td>
<td>1.00</td>
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<td>(0.31, 0.93)</td>
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<td>0.29</td>
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<td>0.75</td>
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<td>0.13</td>
<td>0.38</td>
<td>0.00</td>
<td>0.34</td>
<td>(0.19, 0.49)</td>
<td>38</td>
</tr>
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Endnotes

* Presidential address delivered on July 13, 1999, at the 16th Pacific Regional Science Conference held at the Seoul Education and Cultural Center, Seoul, Korea. This address is based on a research paper entitled “A meta-analytic study of the role of government in long-run economic growth”, which is available upon request. Research assistance from Katja Kleinveld and comments from Peter Nijkamp are gratefully acknowledged.


2 The Economist of the week of the conference, July 10-16, 1999, contained a survey of the Koreas.


6 *The Economist*, March 6th, 1999, p. 84.


14 Table 1 shows that, if the 38 studies had been randomly drawn from a large sample, the 95% confidence interval for the proportion of studies showing a negative effect of higher government consumption would be between 19% and 49%.


16 Button K (1998), op cit. Table 2, p. 152.
