The effect of federal government size on private economic performance in Canada: 1870–2011 [☆]

J. Stephen Ferris [*,1], Marcel C. Voia [1,2]

Economics Department and Centre for Monetary and Financial Economics (CMFE), Carleton University, Canada

ABSTRACT

This paper asks whether government size is complementary to or a substitute for private economic activity and whether that effect is a function of its size. It does so by testing the hypothesis that the growth of federal government size in Canada over the long 1870–2011 period has had an inverted U shape with a tipping point in relation to private output. Its contribution is three fold: first it argues that historical size should be linked to the level rather than the growth rate of private performance; second it incorporates formal controls for endogeneity; and third, nonparametric techniques assess whether the quadratic form most often used to test this hypothesis is appropriate. The empirical work finds the inverted U shape to be consistent with the data for Canada, but only for the 1870–1936 time period. In the post WW2 time period when federal size is above peak size, the data suggest that increases have imposed constant rather than increasing cost. The policy implication is that while government size complemented the growth of the Canadian private economy in its early stages, recent experience is more consistent with the hypothesis that increases in government size have decreased rather than increased private per capita output.

© 2015 Elsevier B.V. All rights reserved.

1. Introduction

In Canada, as elsewhere, a considerable literature exists on the relationship between government size and economic performance.[3] While much of that discussion relates historically to the question of how government size responds to changes in income and output – *Wagner's Law* – the strand of the literature we are interested in reverses causality to ask whether government complements or discourages private economic performance. A primary reason for the latter interest is because most developed economies have experienced long periods of growth in the size and scope of government so that periods of contraction trigger a concern that government size may have become excessive, unduly constraining private performance. More recently, in part in response to the development of endogenous growth theory, analysis has focused on the effect of government size in relation to growth (Armey, 1995; Barro, 1990). Here the consensus view is that larger size has a negative effect on the growth rate (at least in developed economies). For example, Afonso and Furceri (2010, p. 527) investigate the effect of government size and its volatility on economic growth in OECD and European Union countries and conclude that "both dimensions tend to hamper growth".[4] Similarly Bergh and Henrekson (2011, p. 1) conclude that "most recent studies typically find a negative correlation between total government size and economic growth". Finally, Facchini and Melki (2013, p. 2) survey sixty investigations of the relation between government size and economic outcomes and find that "66.6% of the studies find a negative effect from government size while only 8.3% find the opposite effect and 25.1% are inconclusive."

In this paper we re-examine this issue in relation to the size of the Canadian federal government over the long time period since

[3] Important contributions to the general literature on the effect of government size on output include: Landau, 1983; Kormendi and Maguire, 1985; Ram, 1986; Grossman, 1987. Contributions relating government size and output in Canada include Scully, 1989; Afxentiou and Serletis, 1991; Chao and Grubel, 1998; Petry et al., 2000; Voia and Ferris, 2013. Chao and Grubel (following Scully's methodology) find the optimal long run size of all governments in Canada to be about 34% of GDP.

[4] Afonso and Furceri (2010) find that a one percent increase in government size decreases output growth by .12% for OECD countries and .13% for European Union countries.

Confederation (1870–2011). Federal size is particularly important since the federal government remains responsible for the most basic levels of individual and state security and because it is charged with counter-cyclical fiscal policy responsibilities.[5] Our analysis begins by asking that if government size did affect economic performance, what would be the appropriate performance measure that could be linked meaningfully to government size. Second we ask whether the expected effect of government size on performance would be linear. Arguing first that in the long run it is the level rather than the growth rate of economic performance that can be related meaningfully to government size and, second, that that relationship should be nonlinear with a tipping point, we test for the shape of that relationship using the quadratic form. Robustness checks on the size and significance of the implied tipping point indicate the need to correct both for correlations arising among the covariates across time and for potential endogeneity arising between government size and private output. Although doing so confirms the quadratic form, the size of the confidence interval about the tipping point and the compatibility of the data with the cubic form lead us to adopt nonparametric modeling methods that generalize the nonlinear form in ways that do not require imposing symmetry. These investigations also lead to the discovery of a likely break in the form of the time series around 1937. This serves to reconcile the plausibility of the divergent forms suggested by the earlier parametric tests done over the entire period.

Our nonparametric method uses the spline-based method developed by Ma and Racine (2013) and Nie and Racine (2012) to describe the forms of the unconstrained relationship arising in the data. They allow the unconstrained patterns of response to different control variables to be illustrated in a convenient graphical way and in a form that allows for the incorporation of endogenous regressors through the generation of instrumental variable (IV) nonparametric plots. The enhancement of the analysis of tipping points by surrounding the point estimate with an appropriate confidence interval allows assessment of whether or not a quadratic model estimate of optimal size is meaningful and thus relevant for policy analysis.

To anticipate our final conclusion, a tipping point is discovered in Canada for the earliest (1870–1937) time period. Since that peak is roughly half the size to which the federal government had grown by the early 1990s, our analysis implies that recent efforts by successive Liberal and Conservative governments to halt the growth of government have helped remove some restraint that the government has been on the Canadian private economy and hence may explain why the Canadian economy has been relatively successful in avoiding some of the perverse effects arising from the recent financial crisis and following recession.

2. Time series and endogeneity concerns with government size and economic performance

The time series issue posed by the long run relationship between government size and the alternative measures of economic performance can be seen in the following diagrams. In Fig. 1 below we show government size, measured as the logarithm of the ratio of total non-interest federal government expenditures to GNP (ln $GSize$), in relation to both the level of private economic performance, measured as the logarithm of private output per capita (ln $PY\,PC$), and its rate of change, the growth rate of private output per capita ($PCGROWTH$).[6] As can be seen from the top right panel of Fig. 1, ln $PY\,PC$ has risen more or less

continuously over the past century and a half in Canada. In contrast the bottom panel shows that the growth rate of per capita output, $PCGROWTH$, does not increase, varying more or less randomly about a constant mean of 1.88% per year. In econometric terms, the level of private economic activity is non-stationary or integrated of order one, I(1), while its rate of growth is stationary or integrated of order zero, I(0).[7] When we turn to examine the long run growth of government size, ln $GSize$ (the left panel) it is immediately apparent that abstracting from the spikes associated with the two world wars, government size has increased continuously since 1870. Beginning from the low level of 3.5% of GNP in 1870, federal government size increased to over 20% of GNP by 1975, before falling back to 13.7% of GNP by 2011. In econometric terms, ln $GSize$ is I(1) or non-stationary.[8]

The significance of this time series issue is that when variables of different orders are regressed together, the resulting coefficient estimates can be interpreted erroneously. For example, a regression that finds no relationship between an upward trending level of government size and a stationary growth rate may lead to the rejection of a meaningful relationship arising between the two levels. Similarly variables that trend either directly or inversely through time are often misinterpreted as being causally related. Finally, stationary differences that are related through time are often misinterpreted as implying a permanent rather than transient relationship between their levels. This suggests that when putting together longer run time series in a hypothesis test, one should first look to their order of integration then, if relating I(1) variables, look for the presence of cointegration among the set of interrelated variables. In our case we begin by exploring the reasoning that would link together the two I(1) variables: government size and the level of private output per capita.[9]

The second significant econometric issue to be faced is endogeneity. That is, while our interest is on how government size affects private output, the literature investigating *Wagner's Law* argues that the increase in government size derives from an expansion in the scale and complexity of the private economy. It follows that the ability to interpret the correlation between government size and per capita output as a measure of government's effect on private output is somewhat problematic. To be more precise about any one of these causal routes, the analysis must control for the potential feedback that can come from induced changes to the other side. This we discuss at length in Section 4 below. Before turning to these empirical issues, however, we first motivate our empirical hypotheses through an overview of public choice theory on the effect of government size on private economic performance.

3. Public choice and the effect of federal government size on the private economy

Broadly speaking, public choice analysis views increases in government size as producing two opposing effects on the output of the private sector. First in terms of generated benefits, initial levels of government spending are viewed as providing basic levels of security and protection that keep individuals safe from physical threats (through collective

---

[5] The latter is important because counter-cyclical Keynesian fiscal intervention becomes embodied in the long run relationship linking government size and output. See Aguello et al. (2013) on the measurement of fiscal intervention relative to government size.

[6] Private output is defined as GNP minus total non-interest federal government expenditures.

[7] The order of integration refers to the number of times a time series must be differenced before finding stationarity. The adjusted Dickey Fuller test statistic for $lnPY\,PC$ is −0.091 (constant) and is −10.016 (constant) for $PCGROWTH$. The corresponding MacKinnon 1% critical value of −3.496 allows rejection of the hypothesis that the growth rate is nonstationary.

[8] The adjusted Dickey Fuller test statistic for $lnGSize$ is −1.886 (constant) and is −6.99 (constant) for its rate of change, $D \cdot lnGSize$. The corresponding MacKinnon 1% critical value is −3.497.

[9] While the analysis could begin by linking the two first differences, doing so loses the information that could arise from a relationship between the two levels. Similarly because the business cycle is stationary over time, transitory changes in government size that reflect purely countercyclical intervention may dominate the fewer permanent changes in government size that are of interest to this analysis. By initially looking for cointegration among levels we get a cleaner measure of the long run relationships (with the cyclical effects remaining in the residuals). See Ferris (2014) for an expansion of this idea in relation to government size in New Zealand.