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Searching for Keynesianism

Stanley L. Winer [a,*], J. Stephen Ferris [b]

[a] *School of Public Policy and Administration and Department of Economics, Carleton University, 1125 Colonel By Drive, Ottawa, Canada K1S5B6*

[b] *Department of Economics, Carleton University, 1125 Colonel By Drive, Ottawa, Canada K1S5B6*

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Abstract

While it is clear that Keynes' *General Theory of Employment, Interest and Money* (1936) has influenced macroeconomic theory, the extent to which his ideas about countercyclical stabilization have altered the course of public policy remains an open question. We develop a dynamic spatial voting model that allows the estimation of a counterfactual showing what planned public budgets would have been like over the cycle *if* Keynesianism (as interpreted by Leijonhufvud and Clower) had not had any impact on the course of public affairs. Comparison of the counterfactual with the estimated process describing ex ante policy choices after 1950 in Canada allows for the quantification of the changes in fiscal policy that can be attributed to the Keynesian revolution.
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1. Introduction

The idea that government can and should stabilize aggregate economic activity, introduced by John Maynard Keynes in his *General Theory of Employment, Interest and Money* (1936), has profoundly influenced the theory of economic policy.[1] This is well documented in the substantial body of work detailing the shift in thinking about stabilization within academic and government policy circles following Keynes' influential writing (e.g., Buchanan and Wagner, 1977; Hall, 1989; Skidelsky, 1992, and Romer and Romer, 2002). Yet with few exceptions, notably Barro (1986)[2], the extent to which Keynesianism has actually influenced the course of public affairs has not been studied empirically. In this paper we conduct such a 'search for Keynesianism' using Canadian data from 1870[3].

* Corresponding author. Tel.: +1 613 520 2547; fax: +1 613 520 2551.

E-mail addresses: stan_winer@carleton.ca (S.L. Winer), stephen_ferris@carleton.ca (J.S. Ferris).

[1] This is a more focused version of a longer working paper entitled "Searching for Keynes" which explores a number of alternative definitions of Keynesianism and compares our approach to more traditional ones including the automatic-discretionary decomposition of policy. Interested readers are referred to Ferris and Winer (2003).

[2] Barro models the process governing public debt of the U.S. government from 1916 and finds no change in this process before and after the Second World War.

[3] For interesting empirical studies of Canadian fiscal policy see, for example, Will (1967), Gillespie (1979) and Kneebone and McKenzie (1999). These authors do not tackle the issue addressed here directly however.

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To implement such a search we require, first, a theory of what Keynesianism meant for the welfare of individuals in a democracy. Our understanding of Keynesianism relies on the seminal reinterpretation by Clower (1967) and Leijonhufvud (1968) — wherein the government acts as a coordinating agent for society when decentralized markets lose their ability to coordinate individual behavior.[4] In this framework, transitory shocks in the face of sticky prices impact liquidity constrained individuals and their effective demands. In turn, the resulting demands impose deviation amplifying effects that constrain the market choices of non-liquidity constrained individuals. From this perspective, Keynesianism involves the recognition by *both* liquidity and non-liquidity constrained individuals that a systemic externality exists that can be countered by government action.

A second step is to connect this understanding of how Keynesianism works with ex ante policy choices. For this purpose, a model of electoral competition is essential. This model must allow for the *possibility* that Keynesian policy was politically profitable in a competitive political equilibrium; otherwise it would never persist in a mature democracy. We develop an intertemporal extension of the probabilistic spatial voting model developed by Coughlin and Nitzan (1981), Enelow and Hinich (1989), Hinich and Munger (1994), Hettich and Winer (1999), Adams, Merrill and Grofman (2005) and others. This version is designed to highlight the potential importance of government in the face of adverse aggregate shocks in a dynamic setting. Here competing parties are forced to continually balance the demands of liquidity constrained and unconstrained voters. In this setting, competition to enhance individual welfare drives political parties to adopt Keynesian policies.

Of necessity our investigation must also distinguish between short run policy choices – the realm of Keynesian policy – and the long run elements of planned government actions. Hence the dynamic character of our framework. This constitutes a third element in our search. The model we construct allows us to untangle the connections between long and shorter runs inherent in the process describing fiscal policy.

Fourth and finally, a quantitative assessment of the impact of new ideas such as Keynesianism on the course of public affairs must include an estimate, one way or another, of what would have happened had these ideas not had any substantial influence. We explicitly construct such a counterfactual by estimating the model over the period before Keynesian ideas could have influenced political platforms – that is, before 1939 – and forecast with this model into the post-World War II or Keynesian era.[5] A study of the differences between the counterfactual constructed in this way, and estimated ex ante policy actions based on data coming from the period following the widespread dissemination of Keynesian ideas, allows us to quantify those elements of fiscal policy that can reasonably be attributed to the Keynesian revolution.

The construction of a counterfactual requires a substantial time series from the pre-Keynesian era. The Canadian case we explore in this paper provides good data from the origin of the modern state (in 1867) through the beginning of the 21st century.[6] The Canadian case is also of much interest because Canadian policy-makers appear to have been among the first post-war converts to Keynesianism. The Federal Government *White Paper on Employment and Income* in 1945 signalled the acceptance of Keynesian ideas in senior Canadian policy circles, and R.B. Bryce, one of Keynes' earliest students, served for many years as a senior official in the Department of Finance.[7] His memoirs provide supporting evidence of the impact of Keynesianism on Canadian policy thinking.[8]

The steps involved in our search for Keynesianism are summarized conveniently in Fig. 1. Here planned fiscal policy responses are shown relative to transitory macroeconomic shocks both 'before' and 'after' the start of the Keynesian era. Although the underlying trend in policy actions may be volatile, we have, for simplicity, assumed the absence of any long run trend in order to focus on policy responses to the cycle. The left panel then illustrates that after removing an estimate of the long run in fiscal policy in the period before Keynes, we can estimate a model of shorter run, planned fiscal responses to the business cycle. This model is then projected into the post-World War Two period to

[4] To the best of our knowledge, this is the first time that Leijonhufvud/Clower's approach has been used as a basis for the empirical study of Keynesianism in policy processes.

[5] It should be noted here that by adopting the end of the Second World War as the start of the Keynesianism era, we do not mean to imply that Keynesian ideas were not circulating in various places before. Our concern, however, is not with theoretical developments but rather with implementation of policy by elected government.

[6] This is mainly due work by Urquhart (1993) on 19th century national accounts and Gillespie (1991, updated by the authors) on consistent measurement of the public finances.

[7] See Department of Reconstruction (1945).

[8] For histories of Keynesianism in Canada, see Gordon (1965), Campbell (1987, 1991), and Bryce (1986, 2005). See also Winer (1986). Bryce's lecture notes from Keynes' classes have been edited by Rymes (1990).

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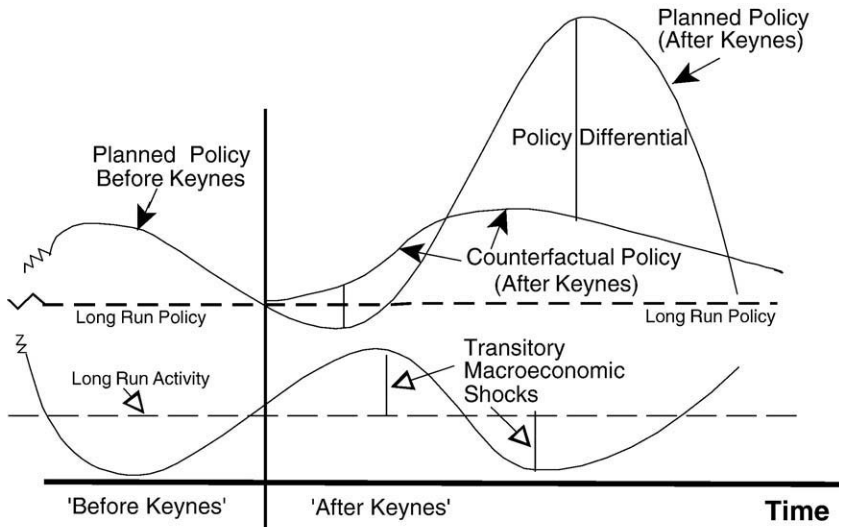

Fig. 1. Planned fiscal policy ‘before’ and ‘after Keynes’.

form our counterfactual — an estimate of what shorter run policy responses would have been like in the absence of Keynesianism. The difference between estimated short run policy actions using data from the Keynesian era only and this counterfactual provides what we call *policy differentials*. The policy differentials illustrated in the figure suggest that ex ante policy after the advent of Keynesianism is more countercyclical than in the counterfactual. Whether this is present in the actual data remains to be seen.

The paper proceeds as follows. In Section 2, the spatial voting model that connects the demands of citizens to fiscal policy is developed. In Section 3, a system of semi-reduced form estimating equations is derived, the meaning of Keynesianism (following Leijonhufvud/Clower) in this framework is described, and tests for the presence of Keynesianism using the policy differentials are derived. The model is estimated in Section 4 and behaviour before and after the Second World War is studied. In Section 5, the policy differentials are constructed and used to uncover the magnitude of the Keynesian element in Canadian fiscal policy. A brief conclusion completes the paper. Data sources and mathematical details referred to in the text are provided in an Appendix.

2. A dynamic spatial voting model

In this section a spatial voting model is developed that links government policy actions to individual preferences as a result of party competition. The model is novel on two accounts — it extends spatial voting to an intertemporal setting and it embodies Leijonhufvud’s interpretation of Keynesianism. We proceed by considering in turn: the platforms of opposing parties; the flow government budget constraints and the private economy; voting behaviour of liquidity and non-liquidity constrained voters[9]; the objectives of the parties and, finally; the political equilibrium. The model is solved and estimating equations are derived in the succeeding section.

2.1. Platforms, government budget constraints and the private economy

A policy platform $\{g, t, b\} = \{g_t, \ldots g_{t+s}, \ldots g_\infty; t_t, \ldots t_{t+s}, \ldots t_\infty; b_t, \ldots b_{t+s}, \ldots b_\infty\}$ offered by either of two parties is a set of fiscal policies for the current and all future periods that the parties think voters care about.[10] Here g is real per capita non-interest expenditure, t is real per capita current tax revenue, and b is real per capita public debt privately held. The

[9] See also Campbell and Mankiw (1990) and Holtz-Eakin et al. (1994).

[10] The set of feasible policies is assumed to be compact and convex.

horizon is infinite for convenience; the estimating equations allow us to remain agnostic about the politically relevant horizon. The flow government budget constraints applying to this common set of feasible policy platforms are

$$g_{t+s} = t_{t+s} + [(b_{t+s} - b_{t+s-1}) - r_{t+s}b_{t+s-1}]; \quad s = 0, 1, \dots \infty, \tag{1a}$$

and the general equilibrium structure of the private economy is represented by a function

$$H(g, t, b, \mathrm{x}, y) = 0, \tag{1b}$$

where x is a vector of factors (discussed below) determining the longer run evolution of policy, and y represents factors that impact the economy through the externality present in liquidity effects. Allowance for changes in the structure of the economy is made by estimating over subsamples in a manner indicated later.

2.2. Voting behaviour

As already noted, there are two types of voters: LC individuals face a liquidity constraint, and NC individuals are not liquidity constrained. The latter are distinguished by the fact that their (indirect) utility μ is unaffected by transitory income. Within types, individuals are homogeneous. The indirect expected utility of a NC type voter who is not liquidity constrained is

$$E_t U_{\mathrm{NC}} = \Sigma^{\infty} \beta^s E_t \mu^{\mathrm{NC}} \left[c^*_{t+s}(H(.)), \ell^*_{t+s}(H(.)); \{g, t, b\}_{t+s} \right], \quad s = 0, 1, \dots \infty \tag{2}$$

where a ‘*’ denotes the voter's optimal choice of private consumption c_{t+s} and leisure ℓ_{t+s}, and where $\beta^s = [1/(1+\rho)]^s$ is the subjective discount factor with rate of time preference, ρ. Similarly, the utility of a type LC voter who is liquidity constrained is

$$E_t U_{\mathrm{LC}} = \Sigma^{\infty} \beta^s E_t \mu^{\mathrm{LC}} \left[c^*_{t+s}(H(.), y_t), \ell^*_{t+s}(H(.); y_t), \{g, t, b\}_{t+s} \right], \quad s = 0, 1, \dots \infty. \tag{3}$$

$E_t U_{\mathrm{LC}}$ differs from $E_t U_{\mathrm{NC}}$ because the presence of a liquidity constraint means that the evaluation of government policy by voters depends directly upon the realization of stochastic current period variables y_t. Both types are, however, affected indirectly through the externality that liquidity constraints impose on the aggregate economy. Here y is defined as a deviation from the long run value that is *welfare improving* for liquidity constrained voters, such as an increase in expected current income above its long run level.

As is now common in the spatial voting literature, the individual voting decision as seen by political parties is based on two factors: the level of expected utility generated by a party's proposed platform compared to that offered by the opposition, and the voter's evaluation of the non-policy characteristics of the party (the party's valence) assumed to be distributed stochastically over the electorate.[11] The latter include candidate personalities, perceived competency, and reputation for carrying out promises. The party's view of the expected utility received by a voter of type j from the platform offered by party k, V_j^k, is the sum of these parts:

$$V_j^k = E_t U_j[g(k), t(k), b(k)] + \xi_j^k = E_t U_j(k) + \xi_j^k,$$

where ξ_j^k describes the utility generated by non-policy related characteristics of party k.

Since the party structure consists of an incumbent (i) and an opposition (o), we may define the non-policy *bias* of a representative voter of type j in favor of the opposition o as $\varphi_j^o = \xi_j^o - \xi_j^i$. By definition this non-policy bias is independent of policy choices. Following Coughlin, Mueller and Murrell (1990) and many others since, the probability that an individual of type j votes for the opposition rather than the incumbent then can be stated as:

$$p_j^o = \begin{pmatrix} 1 & \text{if}\{E_t U_j(o) - E_t U_j(i)\} > \phi_j^o \\ 0 & \text{otherwise} \end{pmatrix},$$

[11] Uncertainty can apply either at an aggregate level, as in Roemer (2001), or at a more disaggregated level.

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where $E_t[U_j(o)]$ and $E_t[U_j(i)]$ represent the levels of expected utility associated with the policy platforms of the opposition and the incumbent. To get a voter of either type on side, the opposition must deliver enough welfare to overcome the non-policy bias of the voter in favour of the incumbent.

We assume that the non-policy bias of a voter of either type is known to be uniformly distributed over the interval $(\varphi^j_{\min}, \varphi^j_{\max})$. Then the probability at time t that an individual of type j will vote for, say, the opposition, is equal to the probability that φ^j is less than the utility differential generated by the opposition:

$$F_{jt}\{E_tU_j(o) - E_tU_j(i)\} = \alpha_j \cdot \{E_tU_j(o) - E_tU_j(i) - \varphi^j_{\min}\}, \tag{4}$$

where F_j is the cumulative distribution function of φ^j, and where $\alpha_j = \partial F_{jt}/\partial E_tU_j(o) = 1/(\varphi^j_{\max} - \varphi^j_{\min})$ can be thought of as the sensitivity of j's voting probability to a change in his or her welfare.

Assuming that $[E_tU_j(o) - E_tU_j(i)]$ lies everywhere within the interval on which φ^j is defined ensures that parties believe that every voter has some positive probability of voting for it, even if that probability may be small. Consequently, no party will completely ignore any voter of either type. This last assumption plus the probabilistic nature of voting makes the objective function of each party globally continuous and differentiable in its policy instruments.

2.3. Party objectives and political equilibrium

Parties choose policies to maximize expected votes or, equivalently, their expected plurality. With $N_{\mathrm{LC},t}$ liquidity constrained voters and λ_t $(=N_{\mathrm{LC}}/N_t)$ equalling the fraction of the population that the parties expect to be liquidity constrained, the expected number of votes that the opposition party maximizes is

$$EV_t(o) = N_t\lambda_tF_{\mathrm{LC},t} + N_t(1-\lambda_t)F_{\mathrm{NC},t}. \tag{5}$$

Correspondingly, the expected vote for the incumbent is $EV_t(i) = N_t - EV_t(o)$.

A pure strategy Nash equilibrium in this electoral game exists if, after the substitution of all constraints on policy choices, both expected vote functions are strictly concave in each policy instrument for every platform chosen by the opposition. The existence of an equilibrium and the concavity of expected vote functions are discussed at length in Enelow and Hinich (1989) and Lin, Enelow and Dorussen (1999). Here we note that concavity is equivalent to assuming that each party can design a vote-maximizing platform and assume that the concavity required for the existence of a Nash equilibrium is present.

In equilibrium, policy platforms converge. Strict concavity in the expected vote function and the fact that voting depends only on utility differences mean that no party gains a lasting advantage by adopting a platform that differs from its opposition (see Enelow and Hinich, 1989). Since party platforms converge in equilibrium, we shall drop the subscripts identifying the individual party and refer only to the governing party or government in what follows.

As shown by Coughlin and Nitzan (1981), Hettich and Winer (1999), and Chen (2000), a convenient feature of Nash equilibrium in the probabilistic voting framework is that platforms can be characterized by maximizing a political support function that is a particular weighted sum of individual expected utilities. Substituting from above into the expected vote function (5), this Representation Theorem indicates that the equilibrium platform is just the solution to the problem of maximizing the weighted sum of the expected indirect utilities of the two types of voters subject to constraints (1a) and (1b):

$$\begin{aligned}\underset{\{g_t,\ldots,g_{t+s},g_{t+s+1}\ldots,t_t,\ldots t_{t+s},t_{t+s+1}\ldots,b_t,\ldots b_{t+s},b_{t+s+1},\ldots\}}{\mathrm{Max}\,\mathscr{L}_t} = {} & \theta_{\mathrm{LC},t}\cdot\Sigma^{\infty}\beta^sE_t\mu^{\mathrm{LC}}\left[g_{t+s}(H(.)),c^*_{t+s}(H(.)),\ell^*_{t+s}(H(.)),y_{t+s}\right]\\ & + \theta_{\mathrm{NC},t}\cdot\Sigma^{\infty}\beta^sE_t\mu^{\mathrm{NC}}\left[g_{t+s}(H(.)),c^*_{t+s}(H(.)),\ell^*_{t+s}(H(.))\right]\\ & + \Sigma^{\infty}\psi_{t+s}\{\Pi^sR^s\}[t_{t+s} + (b_{t+s} - b_{t+s-1}) - r_{t+s}b_{t+s-1} - g_{t+s}],\end{aligned} \tag{6}$$

where the expectation E_t is conditional on the information available at time $t-1$, $R^s = 1/(1+r_{t+s})$ where r is the interest rate, and the summation runs from $s=0$ to $s=+\infty$. The political influence weights $\theta_{\mathrm{LC}} = N_t\lambda_t\alpha_{\mathrm{LC}}$ and $\theta_{\mathrm{NC}} = N_t(1-\lambda_t)\alpha_{\mathrm{NC}}$ incorporate the sensitivity of voters in each group (α_j) as defined in (4), weighted by the size of each group.

The basic idea behind the Representation Theorem is that unless this particular weighted sum of utilities is optimized, the opposition can find a platform that will improve its chances of electoral success by making someone better off without making others worse off.[12] Competition insures that in equilibrium, no such platform remains. This does not mean that all voters are treated equally as the parties search for maximum expected support however. Inspection of the problem in (6) shows that both parties will trade off support from politically insensitive voters for that from voters whose sensitivity or weight θ_j is relatively high. In the present context, this means that policy platforms will be designed to appropriately balance the short and longer run interests of liquidity and non-liquidity constrained individuals. This is a novel intertemporal extension of pluralist politics to a framework suitable for an investigation of Keynesianism.

3. The estimating equations: the appearance of Keynesianism and a test for its presence

We now explicitly solve the problem in (6) describing political equilibrium, and then proceed to derive estimating equations. To simplify notation, we temporarily ignore the distinction between expected and known quantities and treat the x's and y's as single variables, even though they refer to vectors of long run and transitory factors respectively. Using (6), the first order conditions describing equilibrium policy choices g_{t+s}, t_{t+s} and b_{t+s} at time $t+s$ can be stated as:

$$\partial \mathcal{L}_t/\partial g_{t+s} = \beta^s\left\{\theta_{\mathrm{LC}}E_t\left[\mu_g^{\mathrm{LC}}(H(x_{t+s},y_{t+s}),y_{t+s})\right] + \theta_{\mathrm{NC}}E_t\left[\mu_g^{\mathrm{NC}}(H(x_{t+s},y_{t+s}))\right]\right\} - \Pi^s R^s \psi_{t+s} = 0 \tag{7}$$

$$\partial \mathcal{L}_t/\partial t_{t+s} = \beta^s\left\{\theta_{\mathrm{LC}}E_t\left[\mu_t^{\mathrm{LC}}(H(x_{t+s},y_{t+s}),y_{t+s})\right] + \theta_{\mathrm{NC}}E_t\left[\mu_t^{\mathrm{NLC}}(H(x_{t+s},y_{t+s}))\right]\right\} + \Pi^s R^s \psi_{t+s} = 0 \tag{8}$$

$$\begin{aligned}\partial \mathcal{L}_t/\partial b_{t+s} = {} & \beta^s\left\{\theta_{\mathrm{LC}}E_t\left[\mu_b^{\mathrm{LC}}(H(x_{t+s},y_{t+s}),y_{t+s})\right] + \theta_{\mathrm{NC}}E_t\left[\mu_b^{\mathrm{NC}}(H(x_{t+s},y_{t+s}))\right]\right\} \\ & + \Pi^s R^s\left[\psi_{t+s} - \psi_{t+s+1}\right] = 0.\end{aligned} \tag{9}$$

where a subscript on μ denotes a partial derivative.

In equilibrium, planned spending, taxes and borrowing are adjusted until each is equally productive on the margin at generating expected votes.[13]

These first order conditions can be usefully reformulated in order to determine the planned changes in the policy variables over time in a political equilibrium. This reformulation provides our estimating equations. In what follows we concentrate on the government spending equation; the equations for taxation and the deficit are analogous and are stated later.

Predictions for the effects of a change in the level of government spending over time can be derived by first taking the ratio of first order conditions across adjacent time periods $t+s-1$ and $t+s$:

$$\left[\frac{E_t\left[\lambda\alpha_1\mu_t^{\mathrm{LC}}(x_{t+s};y_{t+s}) + (1-\lambda)\alpha_2\mu_t^{\mathrm{NC}}(x_{t+s})\right]}{E_t\left[\lambda\alpha_1\mu_t^{\mathrm{LC}}(x_{t+s-1};y_{t+s-1}) + (1-\lambda)\alpha_2\mu_t^{\mathrm{NC}}(x_{t+s-1})\right]}\right] = \left[\frac{(1+\rho)\psi_{t+s}}{(1+r_{t+s})\psi_{t+s-1}}\right] \tag{10}$$

To progress further, we must add specificity to the indirect utility functions and do so by assuming that utility is separable and that individuals are distinguished only by the direct impact of the liquidity constraint on their utility. Then, as shown in the Appendix, after taking the logarithm of (10) we can rewrite the first order conditions for g as:

$$\ln\left[\gamma E_t\mu_g^{\mathrm{LC}}(y_{t+s}) + E_t\mu_g^{\mathrm{NC}}(x_{t+s})\right] - \ln\left[\gamma E_t\mu_g^{\mathrm{LC}}(y_{t+s-1}) + E_t\mu_g^{\mathrm{NC}}(x_{t+s-1})\right] = \rho - r_{t+s}^e + D\left[\ln\psi_{t+s}\right], \tag{11}$$

where we use the approximation, $\ln(1+q)\approx q$ for $q=\{\rho, r\}$, and $D[\ln \psi_{t+s}]=\ln(\psi_{t+s})-\ln(\psi_{t+s-1})$. The weight $\gamma=[N_t\lambda\alpha_{\mathrm{LC}}/(N_t\lambda\alpha_{\mathrm{LC}}+N_t(1-\lambda)\alpha_{\mathrm{NC}})]$, assumed constant in (11), is the expected political weight of liquidity constrained

[12] One should note that the support function in (6) is not a welfare function, since the weights, θ, are determined *within* the model by voting behaviour and not on the basis of some exogenous social norm.

[13] Note from (9) that $\psi_{t+s+1}\neq\psi_{t+s}$. Even when $\partial(E_t\mu^{\mathrm{NC}})/\partial b_t=0$ for NC voters (who are indifferent to the level of debt), LC voters remain liquidity constrained with $\partial(E_t\mu^{\mathrm{LC}})/\partial b_t\neq 0$. Government borrowing can then increase LC utilities by loosening individual budget constraints and thereby generate additional support. Such action is costly in terms of support from NC voters so that the liquidity constraint will not be completely eliminated. Note that in a model of the sort used by Hall (1978), the μ^{LC} component of utility is absent so that $\psi_{t+s}=\psi_{t+s-1}$.

voters in the political process. We note here that through the use of appropriate subsamples, λ is effectively allowed to differ in the empirical work before and after World War Two and, starting from 1952, before and after 1980.

Further progress can be made by linearizing (11) about its long run growth path, $\hat{g}$, defined as the level of government spending that would occur, given long run x, if all expected deviations from the long run path of the economy (the y's) were equal to zero. This is a natural choice as stabilization policy emphasizes responses to short run developments.[14]

Because our results concern government *plans*, we add back the superscript e to the policy instruments and to both the long run factors and transitory developments on which such plans are based. When the left side of the equivalent equations to (11) are linearized around $\hat{g}$ and the results equated to the equivalent of the right side of (11) and rearranged, the following appealing estimating equations emerge (as shown in the Appendix):

$$\Delta g_{t+s} = \Delta \hat{g}_{t+s} + \left[\gamma_1 + \gamma_2\left(r^e_{t+s}\right) + \gamma_3\left(\Delta y^e_{t+s}\right) + \gamma_4\left(\Delta x^e_{t+s}\right)\right] + \varepsilon^g_{t+s} \tag{12}$$

$$\Delta t_{t+s} = \Delta\, \hat{t}_{t+s} + \left[\tau_1 + \tau_2\left(r^e_{t+s}\right) + \tau_3\left(\Delta y^e_{t+s}\right) + \tau_4\left(\Delta x^e_{t+s}\right)\right] + \varepsilon^t_{t+s} \tag{13}$$

$$\Delta(\Delta b_{t+s} - r_{t+s} b_{t+s-1}) = \Delta\left(\Delta\, \hat{b}_{t+s} - r^e_{t+s}\, \hat{b}_{t+s-1}\right) + \left[\beta_1 + \beta_2\left(r^e_{t+s}\right) + \beta_3\left(\Delta y^e_{t+s}\right) + \beta_4\left(\Delta x^e_{t+s}\right)\right] + \varepsilon^b_{t+s} \tag{14}$$

Here a 'hat' denotes a permanent or long run value while the terms in square brackets constitute the transitory or shorter run components of policy changes. The term $\Delta(\Delta b_{t+s} - r_{t+s} b_{t+s-1})$ is the change in the real per capita primary deficit, and the ε's are error terms that reflect mistakes made by governments in forecasting relevant information that in turn lead to deviations in planned from actual changes in policy. Note that these equations are in first difference form.[15]

An implication of the government budget constraint (1a) is that $\beta_i = (\gamma_i - \tau_i)$ for all i. Since $\varepsilon^g_{t+s} = (\Delta g_{t+s} - \Delta g^e_{t+s})$ is the difference between actual and predicted government spending (permanent plus transitory), and ε^t_{t+s} and ε^b_{t+s} are defined analogously, the government budget restraint also implies that $\varepsilon^b_{t+s} = \varepsilon^g_{t+s} - \varepsilon^t_{t+s}$. Estimation must preserve these adding up restrictions.

While the details of this derivation can be found in the Appendix, here the intuition behind Eqs. (12–14) is explained. First note that the terms containing Δy^e_{t+s} reflect political concern with the consequences of liquidity constraints (initially affecting only liquidity constrained voters), while the terms that include Δx^e_{t+s} reflect the long run common concerns of all voters. The interest rate relative to a common, constant rate of time preference, reflects the intertemporal nature of the optimizing decisions undertaken by the political parties.

The meaning of the transitory components enclosed in square brackets in the estimating equations can now be understood by considering the reasons why Δg^e can differ from its long run value $\Delta \hat{g}$. This leads to our predictions for the signs of the estimated coefficients:

- The first reason for a departure between the planned change in spending in any period and its long run trend is a pure liquidity effect. This is the third term in square brackets in (12). Because an expected increase in transitory income diminishes the importance of the liquidity constraint, such an increase will reduce support for current government spending and so result in a smaller change in g. Consequently, the coefficient γ_3 on Δy^e_{t+s} in (12) is expected to be negative. Correspondingly, $\tau_3 > 0$ and $\beta_3 < 0$. Conversely, a temporary adverse shock (a fall in Δy^e_{t+s}) will lead to a temporary rise in spending and the deficit and to a fall in taxation.
- The second reason for a departure arises because current public spending will adjust today to expected changes in permanent variables. The fourth term in square brackets reflects optimal intertemporal political responses to an expected increase in permanent income x. Because government spending will rise in response to such a shock, with $(\partial y/\partial g_{t+s})^e > 0$ greater government consumption will reduce the magnitude of the liquidity problem as a by-product and moderate the need for spending to deal with liquidity concerns. Hence the coefficient γ_4 on Δx^e_{t+s} in (12) is expected to be negative. For similar reasons we expect $\tau_4 > 0$ and $\beta_4 < 0$.

[14] To distinguish clearly the role of liquidity constraints from the effects of longer run factors, the effects of wars are effectively treated separately — i.e., are dummied out so they do not affect estimates of the shorter run. Any Peacock–Weisman type displacement effect after the wars that may alter the longer run trend is considered part of the long run, so that the shorter run elements in non-war periods are more clearly delineated. The essential issue, after all, concerns the nature of shorter run policy in response to shocks once the trend and the wars have been allowed for.

[15] It is necessary to use first differences of levels rather than of logs because $\Delta b_{t+s} - r_{t+s} b_{t+s-1}$ can be negative, and to do so for the other equations as well in order to maintain the adding up property of Eqs. (12–14) discussed immediately below.

- The third reason for Δg^e departing from $\Delta\hat{g}$ is because of a change in r_{t+s} relative to the rate of time preference, ρ. Hence if the interest rate *falls* relative to ρ, individuals prefer consumption earlier. The resulting increase in government spending also reduces the need to spend in relation to liquidity. Hence the coefficient γ_2 on r_{t+s} in (12) is expected to be positive, and, for similar reasons $\tau_2<0$ and $\beta_2>0$. Because the coefficient on the interest rate will also pick up the short run effect on the net deficit of changes in the cost of carrying existing debt, we must remain agnostic about the sign of r_{t+s}.

3.1. Testing for Keynesianism

The model outlined above predicts policy responses to the competing demands of liquidity and non-liquidity constrained voters in a political equilibrium. The question now arises: what would (Leijonhufvud's) Keynesianism mean in this framework, and how could its strength be assessed? In answering this question, it must be emphasized that countercyclical policy, in itself, cannot be used to identify Keynesianism. The prediction that fiscal policy will be countercyclical is indicated by the third term in square brackets in (12), and corresponds to the political pressure that liquidity constrained voters exert in their quest for public support in hard times. This political pressure existed well before Keynesianism and hence is embedded in our estimate of the counterfactual. For evidence of Keynesianism, we must consider what (if anything) happened *relative to* this counterfactual.[16]

Because political parties in a competitive system will not undertake a new direction in policy unless that innovation has sufficient popular support, we must address the way in which individuals believe (rightly or wrongly) that a change in the nature of policy can improve their welfare.

As shown more formally in the Appendix, the recognition of a new role for government as an internalizing agent following transitory shocks will increase the expected marginal utility of public spending for all voters and this, in turn, increases the absolute size of the coefficients on Δy^e_{t+s} in Eqs. (12–14). Thus with $\gamma_3<0$ in (12) and $\tau_3>0$ in (13), the negative correlation between the planned short run change in spending $(\Delta g_t-\Delta\hat{g}_t)$ and Δy^e_{t+s}, and the positive correlation between $(\Delta t_t-\Delta\hat{t}_t)$ and Δy^e_{t+s} will now be stronger. Correspondingly, the negative correlation between the (net of interest) deficit and transitory shocks will be larger. It follows that Keynesianism in this sense will have influenced equilibrium policy choices if the coefficients on expected transitory income (Δy^e_{t+s}) 'after Keynesianism' became a factor in policy choices have the same sign as those from the model estimated using pre-Keynesianism data, but are larger in absolute size.

There is a second, more general method of assessing the extent of Keynesianism that is available. Consider the differential government spending process, D_g, defined as

$$D_g=[(\Delta g-\Delta\hat{g})\text{`after Keynes'}]-[(\Delta g-\Delta\hat{g})\text{ in the counterfactual}], \tag{15}$$

where the counterfactual is the prediction of what ex ante short run policy would be if the pre-Keynesian data generating policy process continued to apply, and where D_g is the first difference of the policy differential shown in Fig. 1. If an increase in income engineered by expansionary policy does loosen liquidity constraints and generate higher welfare first to liquidity constrained and then to other voters – or, at least, if that's what parties believe that voters believe – our model implies that D_g will be negatively correlated with Δy^e. The exact opposite would be observed for the tax differential D_t. Finally, because D_g is predicted to move counter-cyclically and D_t pro-cyclically, $D_{\Delta b}(=D_g-D_t)$ is expected to move counter-cyclically like spending. Simple regression analysis can then be used to test for the existence of these effects and to assess their strength.

4. Estimation of the voting model and the policy differentials

Before implementing the model of planned fiscal policies and the associated tests for Keynesianism, it is of interest to look briefly at the history of the fiscal system that we shall explore.

At first glance, Fig. 2 suggests that the volatility of the fiscal system of the Government of Canada was greater after World War Two than before. However, as far as g and t are concerned, this appears to be an illusion. The coefficients of variation given in the table below Fig. 2 for 1871–1913, the interwar and 1950–2000 periods indicate that public

[16] Barro (1986) finds evidence that public debt moved counter cyclically in a way not entirely consistent with the tax smoothing model on which he bases his estimating equation (Barro, 1979). This suggests the existence of Keynesian-like polices over a period (from 1916) before Keynes ideas could have been important in policy circles.

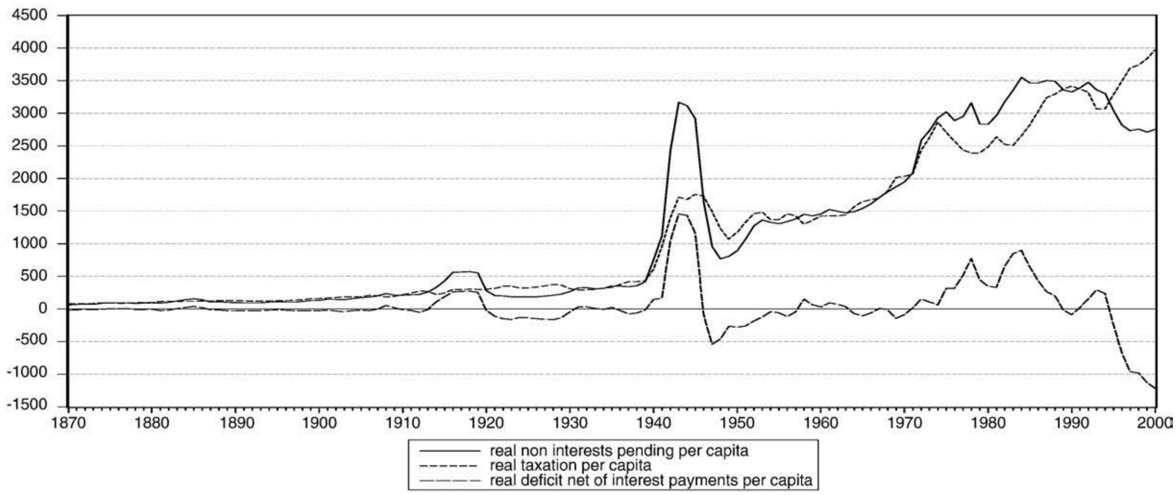

Fig. 2.

Fiscal history, Government of Canada, 1870–2000*

Variable	1871–1913		1920–1938		1950–2000	
	mean	coef of var	mean	coef of var	mean	coef of var
growth of real income per capita ($\dot{x}/x$)	0.022	2.35	0.006	13.97	0.024	1.02
real non-interest spending per capita (g)	130.61	0.38	263.66	0.26	2407.79	0.35
real tax revenue per capita (t)	142.27	0.35	339.06	0.11	2376.86	0.35
real deficit net of interest payments per capita ($\Delta b - rb_{-1}$)	−11.66	−1.75	−75.40	−0.97	30.07	12.18

*Notes: coef of var = coefficient of variation.

spending and taxation are just about as volatile after the second war as they were before the first.[17] On the other hand, the volatility of the net deficit is about 7 times larger after 1950 as before 1914. Since the volatility of the growth of real income per capita after 1950 is less than half of what it was prior to World War One, it is tempting to conclude that Keynesianism via deficit financing played a major role in stabilizing the real economy. Whether or not our results confirm that such stabilization was *attempted* remains to be seen.

4.1. Three steps

It is convenient to summarize the estimation of the model in three steps. Step one deals with the specification of the longer run trend in fiscal policy, as part of which we require estimates of expected permanent income x^e. In step two, the full (short run plus long run) model of equilibrium fiscal policy is estimated, and the coefficients on the transitory shocks in the short run components of fiscal policy before and after Keynes are compared. Step three involves construction of the counterfactual and derivation of the policy differentials. These policy differentials are used to quantify the Keynesian elements (if any) in spending, taxation and the net deficit in a separate section.

4.1.1. Step one: construct the estimates of permanent income x^e, transitory income $y^e = x - x^e$ and of long run fiscal policy

Since we wish to capture the interrelationship between the long run and short run in our estimation procedure, neither the expected long run level of economic activity (and its implied short run or transitory component) nor the model of the long run trend in fiscal policy is estimated separately from the short run. However, it is convenient to discuss the model of expected income and long run policy separately from the short run in order to identify the information set upon which the long run estimates will be based. Our choice of variables here is colored both by theory and by the need for data series that extend back into the 19th century.

[17] It should be kept in mind that although different time series have similar coefficients of variation over a long period of time, they may exhibit quite different detailed patterns of adjustments over the business cycle.

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Table 1a
Some descriptive statistics, 1870–2000

	Log(g)	Log(t)	Log(x)	Log(AGRIC)	Log(OPEN)	Log(IMMRATIO)	Log(%YOUNG)	Log(POP)	Log(USCON)
Mean	−2.362	6.33	8.668	−1.635	−0.830	−4.90	3.59	9.29	8.48
Std. Dev.	0.625	1.29	0.809	1.02	0.219	0.880	0.191	0.670	0.730
ADF (4 lags) levels	−1.766	−0.545	0.144	1.65	−0.739	−2.88	−0.186	0.641	0.100
ADF (4 lags) 1st dif	−6.69*	−4.68*	−5.95*	−3.11**	−5.13*	−5.90*	−2.56	−2.50	−4.96*
							−3.78*(6 lags)		
ADF (4 lags) 2nd dif								−7.00*	

Notes: * (**) = significant at 1% (10%) with constant and no trend (MacKinnon, 1996). Critical value at 0.10=−2.58 with n=130. g = real non-interest public expenditure per capita, t = real taxation per capita, x =real income (GNP) per capita.

Political parties are assumed to use the same information sets when forming their estimates of expected permanent income and long run fiscal structure, although the weights placed on each element of this set may vary with the variable being forecast. A useful way of choosing what should be included in the information set is to rely on the literature on the size of government, since the determinants of size are relatively well-established there. The variables thus identified are used as the basis for our modelling of permanent income as well as the long run components of fiscal structure.

Turning then to the specification of a long run model of government spending, perhaps the most prominent hypothesis associated with long run government size is Wagner's Law — the hypothesis that increasing social complexity will result in an expanding role for government. Following Mueller (2003, 509), we incorporate Wagner's Law by including both an income variable and urbanization as determinants of public spending. Since our model is specified in per capita terms, the standard prediction is that the income elasticity will be greater than one ~~zero.~~ Because urbanization is unavailable for our full time period, we utilize its mirror image — the percentage of the population in agriculture (AGRIC). A negative sign on the coefficient of AGRIC is expected in the long run part of the full model of government spending presented in the next step.

Population size (POP) often appears as a test of the 'publicness' of government services. If there is 'publicness' in government services, a larger population can be provided for with a less than a proportionate expansion in expenditure, implying a negative ~~positive~~ coefficient with elasticity less than zero ~~one~~. Alternatively, publicness means that a larger population lowers the marginal tax price of both current and future taxation and may induce larger expenditure. Hence a positive sign would be expected. For a country like Canada where immigration flows have been substantial, the immigration to population ratio (IMMRATIO) is another demographic characteristic that may shape long run government size, especially in the period before the first world war. Here however, offsetting effects on demand and supply mean that the sign cannot easily be predicted.

Many studies of the long run size of government also find that the age structure of the population, measured by the proportion of the population that is old, has a positive effect on government size. We have available from 1870 only the proportion of the population that is less than 17 years (%YOUNG), which is expected to exert pressure in the opposite direction. In addition, age structure may influence the choice between debt and current taxation (see, for example, Cukierman and Meltzer, 1989), with older populations preferring more debt for future generations and less taxation, though such self-interest will be tempered by concern with one's children. Thus we may expect %YOUNG to be associated with less spending and debt and more taxation.

Another variable that has come into prominence in studies of government size is the degree to which an economy is exposed to foreign shocks. Greater openness, measured by the sum of exports and imports relative to GDP (OPEN), is believed to measure the exposure of the economy to external shocks and hence result in a larger size of government as a form of insurance (see, for example, Rodrik, 1998). Others, on the other hand, see greater openness as enforcing greater fiscal discipline in order to maintain international competitiveness (Borcherding et al., 2004). This would lead to the opposite sign in the long run spending equation.

We also include a set of dummy variables to incorporate the permanent influence of three important external shocks in our time period: World War One (WWI), World War Two (WWII) and the oil shock of the mid 1970s (OILPERM, =1 from 1974 on).[18] We also include dummies WWI aftermath (=1 for 1919–22) and WWII aftermath (=1 for 1946–49) to allow for the restoration of a peacetime economy in Eqs. (12–14) that deal with *the change* in public policy.

[18] The oil shock in Canada is treated as being (potentially) of long run importance for two reasons: It led to the realization in policy circles that Canada is a net oil exporter, and hence might respond differently than the U.S.; and the accelerated development of the tar sands initiated a shift of political power westward in the federation.

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Table 1b
Long run real per capita income, Canada, various periods (OLS estimation. *t*-statistics in brackets)

Dependent variable: log (real income per capita)	1871–2000 with Newey–West *t*'s	1873–1998 with Saikkonen *t*'s[(b)]	1871–1938	1947–2000
log(AGRIC)	−0.20 (−4.23*)	−0.22 (4.62*)	−1.66	−0.37
log(IMMRATIO)	0.06 (2.72*)	0.07 (3.29*)	0.12	−0.01
log(%YOUNG)	0.26 (1.37)	0.11 (0.56)	−1.49	−0.11
log(OPEN)	0.05 (0.67)	−0.01 (−0.14)	0.19	0.07
D[log(POP)]	2.53 (2.18*)	4.92 (2.90*)	−2.48	−0.01
log (USCON)	0.32 (1.36)	0.03 (0.14)	−0.19	0.67
WWI	0.15 (3.50*)	0.24 (4.71*)	0.10	
WWI aftermath (1919–21)	−0.06 (−2.47*)	−0.05 (−1.24)	−0.06	
WWII	0.26 (4.28*)	0.25 (6.46*)		
WWII aftermath (1946–49)	0.06 (2.00*)	0.06 (1.31)		−0.04
OILPERM (1974 on)	0.07 (1.21)	0.08 (1.39)		0.05
Trend	0.01 (2.87*)	0.02 (4.48*)	−0.0004	−0.01
Constant	4.30 (3.05*)	−21.74 (4.49*)	14.46	3.76
Obs.	130	126	68	54
R^2	0.99	0.99	0.98	0.99
DW	0.89	1.15	1.39	1.35
ADF(residuals)[(a)]	−5.12 (1 lag)	−5.87 (1 lag)	−4.00 (1 lag)	−5.21 (1 lag)
	−4.27 (2 lags)	−5.38 (2 lags)	−3.34 (2 lags)	−4.56 (2 lags)
P-value for shift			0.00	

Notes: * (**)=significant at 5% (10%). *D*=indicates a first difference. R^2 is unadjusted. DW=Durbin–Watson.
(a) ADF for 6 variables, without constant or trend, using indicated lags of first difference terms. MacKinnon (1996) critical value with n=130 at 0.10=−4.53; at 0.05=4.51. Critical value with 4 variables (e.g., excluding also %YOUNG and POP) at 0.10=−3.48; at 0.05=−3.78. (b) *t*-statistics in col. 2 may not be correct if right side variables are correlated with the error term in the cointegrating regressions, and are not reported for cols 4–5. Col. 3 reports *t*-statistics adjusted by the Saikkonen (1991) method to allow for this correlation. One lead and lag (two produce similar results) of the first differences of the first six explanatory variables are used (not reported), along with 5 lags in the autoregressive model of the error from which the estimate of the long run standard error is derived (see Hamilton, 1994, 610). *P*-value for shift=*P*-value for *F* test of null that equations as a whole are not different across time. Variable definitions: see Appendix. All estimation uses Shazam (2001).

Finally, when choosing a dataset to use in forecasting both the long run size of government and permanent income, Canadian politicians will take into account concomitant developments in the United States economy, which we model using U.S. real consumption per capita (USCON). Consumption is used on the grounds that it is more closely related to American permanent income than is current income. U.S. consumption is obviously exogenous to Canada.

The statistical properties of the logarithms of the variables identified above are given in Table 1a.[19] In terms of their time series properties, virtually all are integrated of order 1 and become stationary only after first differencing. The exception is the log of population (POP), in the second last column, which is I(2). Although such time series properties would suggest that a model in first differences is required, a long run model for real per capita income in the levels of the log-transformed variables will be appropriate if the residuals of those regressions are stationary. Again population is an exception and must be first differenced to be present in this equation.

The cointegrating regression for the log of real income per capita is presented in Table 1b for the entire time period 1871–2000.[20] Table 1b also presents the model estimated over the two sub-periods – before and after the Second World War – on which the forecasts of permanent income x will be based. This allows for a structural shift, the presence of which is confirmed by the usual F test.[21]

An unconstrained distributed lag on changes in the forecast of (unlogged) real per capita income from the model in Table 1b, is used in the model of policy actions to represent expected long run income as seen by political parties.[22] Similarly, a distributed lag of changes in expected transitory income, $y^e=x-x^e$, is used to model transitory developments on which policy-makers act in formulating their stabilization and other short run policies, actions which

[19] The log of the net deficit does not appear here because the net deficit is often negative.

[20] Table 1b also presents the equation for the whole period estimated via Saikkonen's (1991) method which includes leads and lags of right side variables. However, the original cointegrating regressions in columns 2, 4 and 5 are used in subsequent steps as the basis for forecasts.

[21] It also appears that g and t can also be described as stationary in levels with a shift in constant and slope. Following Perron (1997, 358, model 2 — using minimization of the t-statistic), the shifts appear to occur during WWII. This provides ancillary support for estimating the model in two pieces.

[22] Note that the reason for switching back from logarithms to levels is that our system of policy variables includes the deficit that is often negative.

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may take some time to develop. Finally, changes in the expected rate of interest r^e are proxied by a distributed lag on changes in real interest rates r.[23]

4.1.2. Step two: estimate the full model in Eqs. (12–14) as a system over two periods, one 'before Keynesianism' (1875–1938) and one 'after' (1950–2000). Use the results to estimate the ex ante shorter run components of fiscal structure

After the estimates of the long and shorter run levels of expected economic activity have been calculated, the full model (12–14) that contains both the permanent and transitory components of fiscal policy can be estimated over the two periods, one before and one after the start of the Keynesian era. The counterfactual illustrated in Fig. 1 can then be constructed.

One approach to estimating Eqs. (12–14) would be to use the forecasts from a separately estimated long run model of the fiscal structure (as discussed above) to measure the permanent components of policy, and then estimate the transitory parts in a second stage using the differences $[\Delta g_{t+s}-\Delta\hat{g}_{t+s}]$, $[\Delta t_{t+s}-\Delta\hat{t}_{t+s}]$, and $[\Delta(\Delta b_{t+s}-r_{t+s}b_{t+s-1})-\Delta(\Delta\hat{b}_{t+s}-r_{t+s}\hat{b}_{t+s-1})]$. However, a better approach, in our view, is to estimate the long run and short run components together, allowing the two parts to interact and also avoiding the use of generated regressors (apart from the estimates of long run and transitory incomes). This should produce better estimates of the total effect on policy arising from each component and better equation statistics.

We then extract the transitory components from this more comprehensive model to construct the counterfactual and policy differentials D_g, D_t and $D_{\Delta b}$. To allow the extraction to proceed in a clean fashion, it is convenient that expected long run income x^e enter *only* the transitory part of the model even though it is used to explain long run government policy choices as outlined earlier. For this reason, we think of x^e as being solved out of the model of the long run components using the long run model of income specified earlier. The short run elements in policy are then estimated using the coefficients on the first three terms in Table 2. (The constant term is allowed for in the policy differential equations below).

Table 2 presents system estimation of the full model for 1875–1938 on which the counterfactual is based, and for the Keynesian period 1950–2000.[24] Because the equations are the result of political optimization, they are symmetric on the right side. This symmetry means that the government budget restraints (1a) are automatically enforced and that two and three stage estimation yields identical results provided the same instruments are used (as they are) in all equations.

Here the contemporaneous values of changes in the real interest rate and in transitory income are treated as endogenous. Given our use of annual data, they may depend to some extent on current policy choices.[25] The estimates of income are those derived from estimation over the two periods given in Table 1b. Our use of unconstrained distributed lags on changes in interest rates, permanent income and transitory shocks allow for expectations formation by the government and for lags in policy implementation. We use the longest lags possible given available degrees of freedom.

Consider first the estimated coefficients in the transitory part of the model, beginning with the signs on Δy^e and on Δx^e in the shaded part of Table 2. These are as predicted for the 1950–2000 period. The signs on significant variables for the 1875–1938 period are of the opposite sign, indicating (as do the *F*-tests in the last row of the table) that policy processes differ significantly before and after the second world war. Hence it appears that governments before the war did respond to expected short and longer run changes in aggregate activity, and did so pro-cyclically. Moreover, judging by the size of significant coefficients, the responsiveness was substantially less (in absolute value) before the Keynesian era than after 1950, especially with respect to transitory changes.[26] One interpretation of these results is that governments before WWII placed little weight on the interests of liquidity constrained voters, while the coefficients on Δy^e are picking up responses to changes in economic activity that reflect some concern with the short run that is not strictly in accord with a pure theory of long run policy.

[23] We note that the unemployment rate cannot be used as a basis for transitory shocks at this stage because it is available only from 1919 onwards and estimation must begin at an earlier data (here 1870) to provide sufficient degrees of freedom. This also avoids the need to deal with any spurious volatility in the unemployment rate before 1939 (See Romer, 1986).

[24] The time periods differ from those in Table 1b due to lags. These equations are somewhat related to model 5 in Pagan (1984). They differ in that the generated regressors on the right side are in first differences and because Δy^e is a forecast of shorter run changes in activity and not a surprise. The two-step procedure – estimate Δx^e and Δy^e and then (12–14) – yields consistent estimates, but not full efficiency so that care must be taken in relying upon t-statistics. In that respect, we note that our main interest is to use the equations to construct the 'before' and 'after Keynes' estimates of ex ante transitory policy used in step four.

[25] Instruments used in estimation are stated in Table 2. We note that use of OLS estimation leads to essentially the same general conclusions as stated below.

[26] Comparing the 1875–1938 and the 1950–2000 periods, the absolute value of the sum of significant coefficients on Δy^e increases more than do the sum of coefficients on Δx^e.

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Table 2
Transitory and permanent components of fiscal structure: Government of Canada, 1875–1938 and 1950–2000 (system estimation)

Variables (expected signs)	Lag	Non-interest expend. (Δg) 1875–1938	Non-interest expend. (Δg) 1950–2000	Variables (expected signs)[a]	Taxation (Δt) 1875–1938	Taxation (Δt) 1950–2000	Variables (expected signs)[a]	Net deficit $\Delta[\Delta b - rb^{-1}]$ 1875–1938	Net deficit $\Delta[\Delta b - rb^{-1}]$ 1950–2000
r^e (?)[a]	0	7.10 (5.49*)	−6.31 (−0.44)	r^e (?)	0.20 (0.40)	28.86 (2.40*)	r^e (?)	6.90 (4.59*)	−35.16 (−2.22*)
	1	−0.39 (−0.43)	−13.07 (−1.30)		−0.68 (−1.91**)	−0.98 (−0.12)		0.29 (0.27)	−12.09 (−1.08)
	2	−1.00 (−1.07)	10.61 (1.65**)		−0.17 (−0.46)	4.74 (0.88)		−0.83 (−0.77)	5.86 (0.82)
Δy^e (−)[b]	0	0.05 (1.11)	−0.24 (−2.02*)	Δy^e (+)	.02 (1.49)	0.24 (2.42*)	Δy^e (−)	0.02 (0.45)	−0.48 (−3.66*)
	1	0.10 (2.59*)	−0.11 (−1.10)		−.004 (−.31)	−.06 (−0.68)		0.10 (2.33*)	−0.05 (−0.49)
	2	0.03 (1.14)	−0.26 (−2.64*)		−.001 (−1.10)	0.15 (1.78**)		0.04 (1.35)	−0.40 (−3.74*)
Δx^e (−)[c]	0	−0.18 (−0.59)	−0.06 (−0.39)	Δx^e (+)	0.01 (1.06)	0.39 (2.89*)	Δx^e (−)	−0.03 (−0.87)	−0.46 (−2.54*)
	1	0.03 (1.37)	0.0009 (0.01)		−0.17 (−1.68*)	0.005 (0.08)		0.05 (1.74**)	−.004 (−.05)
	2	0.04 (1.72**)	−0.11 (−1.75**)		.01 (1.13)	0.11 (2.23*)		0.03 (1.10)	−0.22 (−3.10*)
D(AGRIC)		−2300.6 (−2.74*)	−1276.6 (−0.21)		−3.01 (−.009)	−5775.8 (−1.00)		−2297.6 (−2.35*)	4299.2 (0.56)
D(IMMRATIO)		1394.40 (1.88*)	−1602.9 (−0.16)		1005.7 (3.48*)	16042.0 (1.91*)		388.71 (0.45)	−17645 (−1.60)
D(%YOUNG)		−28.05 (−0.77)	−135.38 (−2.66*)		−42.75 (−3.01*)	−44.58 (−1.04)		14.70 (0.35)	−90.80 (−1.61**)
D(OPEN)		622.70 (3.82*)	−1573.7 (−1.61**)		203.07 (3.20*)	−406.94 (−0.50)		419.63 (2.22*)	−1166.7 (−1.08)
D(POP)		0.06 (1.13)	−0.23 (−1.11)		0.01 (0.54)	−0.50 (−2.87*)		0.05 (0.78)	0.27 (1.18)
D(USCON)		−0.07 (−2.20*)	0.07 (0.31)		0.03 (2.63*)	−0.55 (−3.00*)		−0.11 (−2.78*)	0.62 (2.52*)
WWI or OILPERM		101.86 (4.32*)	−87.78 (−1.97*)		22.27 (2.43*)	−88.54 (−2.37*)		79.59 (2.91*)	0.76 (0.02)
WWI aftermath		−72.42 (−3.04*)			19.6 (2.11*)			−92.02 (−3.32*)	
Constant		−37.35 (−2.52*)	207.53 (1.99*)		−7.44 (−1.28)	126.47 (1.45)		−29.90 (−1.73**)	81.06 (0.70)
Obsv		64	51	Obsv	64	51	Obsv	64	51
R^2		0.70	0.40	R^2	0.70	0.48	R^2	0.65	0.53
DW		1.97	2.03	DW	1.93	1.61	DW	1.97	2.16
ADF		−6.53*	−4.01*	ADF	−3.26*	−3.81*	ADF	−4.29*	−4.00*
ADF (1875–2000)		−8.97*			−7.08*			−7.66*	
P-value for shift		0.002			0.003			.00004	

Notes: * (**) significant at 5% (at 10%). *P*-value for shift = *P*-value for *F* test of null that equations as a whole are not different across time. R^2 is between observed and predicted. ADF = univariate unit root test on equation residuals with no constant and no trend, (Mackinnon, 1996). ADF (1875–2000) = ADF test on residuals for combined model estimated over entire sample. (a) Expected signs on coefficients refer to sum of coefficients. (b) x^e = the predicted value of (permanent) real income per capita from Table 1b. Δy^e = [the actual change in real GNP per capita − Δx^e]. (c) r^e = [the actual long term government bond rate − the actual rate of inflation]. Endogenous variables are r^e, y^e and Δx^e. Instruments for all equations include all exogenous variables and {third lags of r^e, Δy^e and Δx^e, first lags of variables in long run model for income (except for dummies), two lags of U.S. industrial production, and three lags of the inflation rate}. Variable definitions: see Appendix.

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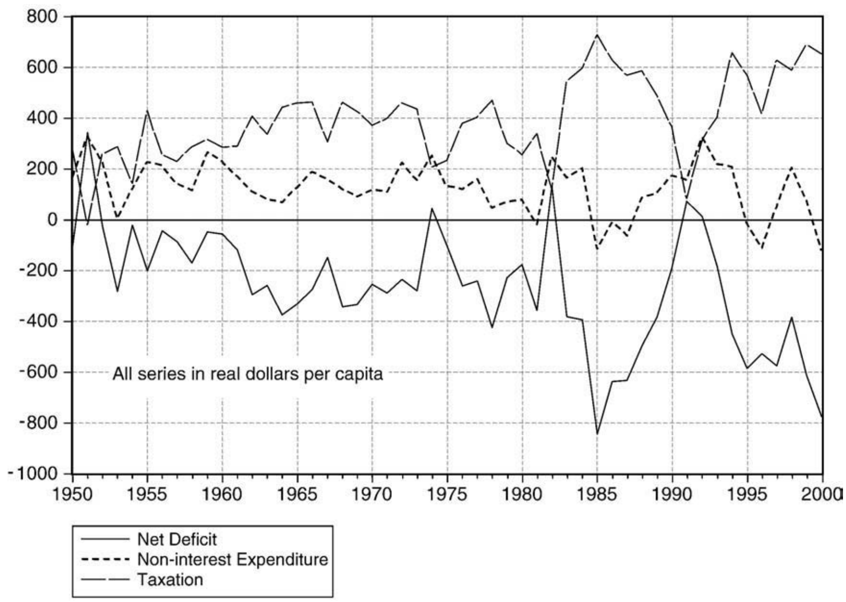

Fig. 3. Change in policy differentials, 1950–2000 (system estimation).

Consideration of the role of the factors underlying the long run size of government identified in step one provides another useful check on the results of estimation. The estimated long run components of the equations begin with D(AGRIC) in Table 2. Generally the implied model of the longer run components works well. Here we see that urbanization, proxied by AGRIC, has its predicted negative effect on spending in the early period when urbanization was most pronounced but no significant effect after the Second World War. This early finding is in contrast to Mueller (2003, chapter 21) who reports limited success with this variable in the literature as a whole. The proportion of young voters (%YOUNG) has its predicted negative sign for spending in the second period, accompanied by the issue of more debt, possibly as a result of the changes generated by the post-war baby boom and bust. As the population ages in the early sample period, only taxation responds significantly, rising as the population ages. (The effect of aging on taxation in the second period is also positive, but insignificant).

OPEN has a positive effect on spending before WWII – financed by a combination of taxation and debt – but after 1950 this effect is reversed, indicating that the forces of international competition may then be dominating the demands for social insurance. Another interpretation of these results, one not mutually exclusive with the one already suggested, begins by recognizing that OPEN is correlated with the size of the base for tariff revenue. The results for OPEN, then, may in part be driven by the fact that tariffs were an important revenue source before 1939, when large increases in the tariff base lowered the cost of government and hence lead to more public spending, while after 1945 reliance on tariff revenue declined quickly.[27]

The coefficients on the change in population *D*(POP) suggest that economies of scale in public services is weak — only the coefficient in the second period is negative in the spending and tax equations, and even it is significant only for taxation. Lastly, the immigration variable D(IMRATIO) is positive and significant for spending (in the early period) and for taxation (in both periods).

Before turning to the next step, we note that the estimates on the WWI and WWI aftermath dummy variables indicate that the readjustment of the fiscal system after 1918 was insufficient to offset wartime increases, implying the existence of a Peacock–Wiseman (1961) displacement effect. Dudley and Witt (2004) find a similar result concerning the First World War.[28] We also see that the OPEC oil shock of 1973 and its aftermath led to a contraction in the long run size of government and to a secular increase in public debt.

[27] We are indebted to a referee for reminding us of this interpretation. On 19th century Canadian revenue structure, see Winer and Hettich (1991).

[28] Note that this is more apparent in tax rather than expenditure size. See also Goff (1998).

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4.1.3. Step three: use the transitory part of each equation in Table 2 estimated with data before the Keynesian era to forecast into the period after 1945, in order to construct the counterfactual. Then compute changes in policy differentials, D_g, D_t, and $D_{\Delta b}$ which compare the counterfactual with the best model of ex ante transitory fiscal plans

The resulting changes in the policy differentials, D_g, D_t and $D_{\Delta b}=D_g-D_t$, based on the estimates in Table 2 are graphed in Fig. 3. Inspection of this interesting figure suggests the absence of trends with a shift in the volatility of the differentials about 1980.[29] (The shift is confirmed statistically below). The figure also hints at the existence of Keynesian stabilization. The serious Canadian recessions of 1981/82 and of 1990/91 appear to coincide with rising expenditure, declining taxation and rising debt *relative to the counterfactual*. We see a similar but less pronounced pattern arising during the period of relatively high unemployment between 1957 and 1960, a period that proceeded the effective firing of the Governor of the Bank of Canada in 1961.

In the four years following the first OPEC oil embargo in 1973 when unemployment rose continually, D_g declined, D_t rose, and the net deficit declined relative to the counterfactual. Here there is evidence that the government refrained from using expansionary policy to counteract the consequences of the oil price shock. A more pronounced period of what might be referred to as transitional structural adjustment is evident after the very severe recession of the early 1990s in central Canada, when the governments of the day engineered a series of very conservative budgets to deal with a serious debt problem that had accumulated since the oil shock.[30]

5. Using the policy differentials

We are now ready to test statistically for the presence of Keynesian elements in ex ante transitory policy using the calculated policy differentials, and to assess their quantitative importance.[31] We begin by regressing the calculated policy differentials on expected changes in transitory activity and a set of control variables left out of the model in Table 2 (introduced below). Unconstrained lags on the variable representing transitory activity allow for expectations formation and for decision and bureaucratic delays, leading to a sample that extends from 1952 to 2000.

Given the importance attached to unemployment in public policy debates, we now use unemployment rates to construct a time series to represent the expected change in transitory activity to which stabilization policy (if it exists) is tailored.[32] Thus we define Δy_u^e as the difference between the *change* in the current unemployment rate and the lagged value of the equally weighted, four year moving average of such changes. This variable and its lags is used to represent expected transitory shocks.

Unlike the change in transitory income, a positive value for Δy_u^e now represents a *tightening* of liquidity constraints. A *positive* sign on the sum of lags of Δy_u^e in the policy differential equation for spending now implies that spending expands when the increase in unemployment is expected to be large. Together with a *negative* sign for taxation, and/or a *positive* sign in the deficit equation, this pattern would imply Keynesian stabilization is present in the data.

Visual inspection of the pattern revealed in Fig. 3, reinforced by preliminary exploration of the regressions of the change in the policy differentials on current and lagged shocks using Hansen's (1992) procedure, and sequential Chow tests on the ordinary least square versions of these equations, all suggest that we should allow for shifts in the constant and in the slopes of the regressions in 1980.[33] We do so in what follows. In addition, we control for the growing influence of income taxation and the welfare system on the cyclicality of fiscal instruments, post — WWII factors left out of the model in Table 2 that may not correspond to Keynesianism. To do so, we employ the additional variable D(autoT) = [the lagged value of the four year moving average of the ratio of personal income tax revenue to total tax revenue] × [the contemporaneous change in real income per capita] and its lag in the regressions. By

[29] The debt policy differentials are stationary at 5% using a univariate ADF test with a constant and with a trend.

[30] On the nature of these budgets following the recession of 1990/91, see Ferris and Winer (2007).

[31] Note that by construction, our policy differentials capture all political responses to expected changes in aggregate activity, including those for motives that may have nothing to do with stabilization. For example, they do not explicitly allow for the growing importance of an income sensitive tax-transfer system that *may* be unrelated to Keynesian ideas. Here we allow for such possibilities.

[32] The unemployment rate could not be used earlier since it is available only from 1919. In assessing statistical significance in the regressions in Table 3, it should be noted that that Δy_u^e is not generated by a prior regression.

[33] Hansen (1992) stability tests on the OLS versions of the policy differential regressions indicate the instability of some coefficients. That instability largely disappears when shifts in constants and slopes in 1980 are allowed for. We also note that there is no evidence in Fig. 3 of differences in the policy differentials as between the fixed exchange rate (1950–62) and flexible rate (1963–1970) periods. Given the use of annual data here, we do not have enough degrees of freedom to reliably allow for coefficients to shift with the exchange regime. Adding a simple exchange rate dummy variable does not alter our conclusions.

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construction, this variable reflects directly the growing importance of cyclically sensitive taxation after WWII. In addition, it depends on total income rather than on a deviation from some trend, since taxes respond to the total change. *D*(autoT) is also highly correlated with structural change on the expenditure side (as represented, for example, by the moving average ratio of personal transfer payments to total government spending times the change in the unemployment rate). Hence *D*(autoT) can, and is used to reflect the sensitivity of the fiscal system to economic fluctuations on both sides of the budget.[34,35]

D(autoT) controls for the influence of changes in the cyclical sensitivity of the budget when the welfare system is *assumed* to be unrelated to Keynesianism. Since it could also be argued that Keynesian thinking made easier the adoption of cyclically sensitive fiscal institutions after 1945, we present the policy differential equations without *D* (autoT) in panel two of Table 3.[36] These equations allow a test for Keynes when the design of the welfare state is assumed to be fully part of the Keynesian revolution in policy. A reasonable guess is that evidence of Keynesianism lies somewhere between these two sets of results.

With this background, then, we turn to the estimation results using the policy differentials for the 1952–2000 period in Table 3.[37] Our discussion begins with consideration of the coefficients on Δy_u^e and its lags before considering the quantitative importance of Keynesian policy implied by the point estimates.

Panel one of Table 3 presents the policy differential regressions when the regressions control for the (assumed) separate role of the welfare state. Judging by the sum of significant coefficients on the current and lagged shocks Δy_u reported in the shaded column, we (still) find Keynesianism in all policy instruments over the sample period as a whole. Relative to the counterfactual, spending and the deficit rose and taxes fell when Δy_u^e was positive, that is, when unemployment was higher than expected. Panel one also shows that policy was less Keynesian *before* 1980, judging by the sum of coefficients for the two sub-periods considered. It is also interesting to note that there is a shift in the constant in 1980, indicating that afterwards there was on average less spending, less debt, and more taxation despite the existence of a stabilization regime that was more active than in the three preceding decades.[38] That stabilization was more pronounced after 1980 is not surprising since the worst recessions in Canada since the Great Depression occurred in this part of the sample.

Panel two of the table presents the results for the policy differential regressions when *D*(autoT) is dropped from the regressions so that the welfare state is viewed as now fully part of the Keynesian revolution. As one might expect, attempts at stabilization are now more strongly evident in the results. Judging again by the sum of coefficients on the transitory shocks, the magnitude of the countercyclical response of taxation exceeds by over 4 times that in panel one, and for the deficit are about 2 times as big per unit of shock. Comparison of panels one and two also confirms that D(autoT) does capture the effect of the rising cyclical sensitivity of the tax-transfer system on the policy differentials.

In panel three the dependent variables used are just the estimated transitory components of short run fiscal policy based on data from the Keynesian era, while in panel four the estimated short run policy changes are based on data before 1939. Comparison of these regressions with those in panel one reveals how the use of the counterfactual affects our conclusions, and further illustrates the differences between policy choices before and

[34] Over 1950–2000, *D*(auto*T*) and its analogue for transfers to persons − *D*(auto*G*) = (the lagged four year moving average of the ratio of transfers to persons to non-interest spending) × (the contemporaneous change in the unemployment rate) have a correlation of −0.71. The correlation of *D* (auto*G*) with the measure of transitory activity Δy_{ut}^e is 0.88, while the correlation of *D*(auto*T*) with Δy_{ut}^e is lower at −0.61. Hence to reduce the problem of collinearity in the policy differential regressions, we used *D*(auto*T*) together with Δy_u^e.

[35] Unlike Δy_u^e , *D*(auto*T*) is not interacted with a shift in 1980 since by design it allows for changes in the structure of the fiscal system and adjusts in a manner proportional to the size of economic fluctuations. We note also that the work of Vermaeten, Gillespie and Vermaeten (1995) indicates that the tax-transfer system is approximately proportional to income over the post WWII period. So it is *not* appropriate to use a squared term as well as the level.

[36] Indeed, Granatstein in his Afterword to Bryce's book (2005, 330-1) on post-war Canadian policy argues forcefully that the family allowance program, the largest personal transfer program of its kind after the war, was explicitly intended to *stabilize* family incomes.

[37] We use two lags on Δy_u and one on *D*(auto*T*) in the policy differentials. Further lags lead to degrees of freedom problems. The current values of Δy_u and of *D*(auto*T*) are instrumented to allow for simultaneity with current fiscal policy and, to preserve the adding up of the policy differentials due to the government budget restraint, all variables are entered into each equation using the same instruments in each case. Conclusions are essentially the same if OLS is used instead.

[38] The late Richard Musgrave (2003, 47), citing Peggy Musgrave, suggests that stabilization policy after about 1970 was biased towards cutting taxes rather than increasing government size. Here we find evidence of a secular decline in government size after 1980. Judging by the sum of coefficients, we also see in panels 1 and 2 that a unit reduction in Δy_u^e results in a bigger cut in $(D_g - D_t)$ after 1980 than before.

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Table 3
Change in policy differentials D_g, D_t, $D_{\Delta b}$, 1952–2000 (system estimation)

(1) Assuming that Keynesianism and the rise of the welfare state are unrelated

	pre-1980			post-1980							
	Δy_u^e	$\Delta y_u^e - 1$	$\Delta y_u^e - 2$	Δy_u^e	$\Delta y_u^e - 1$	$\Delta y_u^e - 2$	Sum	D(autoT)	D(autoT)−1	Shift-1980	Statistics
D_g	0.62 (0.04)	−9.48 (−0.69)	24.89 (1.94*)	14.85 (0.589)	11.02 (0.50)	45.82 (3.52*)	87.72	−0.02 (−0.15)	−0.17 (−1.28)	−35.03 (−1.73**)	R^2=0.56 DW=2.00
D_t	−24.86 (−1.32)	30.50 (2.07*)	0.30 (0.02)	−74.56 (−2.74*)	35.31 (1.47)	−24.71 (−1.76**)	−27.52	0.34 (2.17*)	0.14 (0.97)	103.16 (4.73*)	R^2=0.78 DW=1.44
$D_{\Delta b}$	25.47 (0.98)	−39.47 (−1.98*)	24.59 (1.30)	89.40 (2.40*)	−24.30 (−0.74)	70.53 (3.66*)	146.20	−0.37 (−1.68**)	−0.31 (−1.57)	−138.19 (−4.62*)	R^2=0.79 DW=1.63

(2) Assuming that the welfare state is part of Keynesianism

	pre-1980			post-1980					
	Δy_u^e	$\Delta y_u^e - 1$	$\Delta y_u^e - 2$	Δy_u^e	$\Delta y_u^e - 1$	$\Delta y_u^e - 2$	Sum	Shift-1980	Statistics
D_g	3.31 (0.19)	−3.36 (−0.26)	24.42 (1.83*)	22.75 (1.57)	29.19 (2.05*)	48.23 (3.75*)	121.18	−41.59 (−2.07*)	R^2=0.52 DW=1.80
D_t	−43.26 (−1.91*)	27.23 (1.56)	0.98 (0.05)	−132.85 (−6.86*)	28.74 (1.51)	−37.78 (−2.19*)	−156.94	126.99 (4.72*)	R^2=0.64 DW=1.22
$D_{\Delta b}$	46.57 (1.50)	−30.59 (−1.28)	23.45 (0.96)	155.60 (5.88*)	0.45 (0.02)	86.02 (3.65*)	281.50	−168.58 (−4.58*)	R^2=0.66 DW=1.26

(3) Without the counterfactual using only the estimated transitory component ‘after Keynes’

	pre-1980			post-1980							
	Δy_u^e	$\Delta y_u^e - 1$	$\Delta y_u^e - 2$	Δy_u^e	$\Delta y_u^e - 1$	$\Delta y_u^e - 2$	Sum	D(autoT)	D(autoT)−1	Shift-1980	Statistics
D_g	3.99 (0.29)	−10.87 (−1.01)	19.58 (1.93*)	13.87 (0.69)	3.19 (0.18)	37.81 (3.67*)	67.57	−0.04 (−0.34)	−0.10 (−0.94)	−18.84 (−1.18)	R^2=0.52 DW=2.41
D_t	−22.65 (−1.24)	29.60 (2.08*)	−0.77 (−.06)	−68.38 (−2.60*)	30.60 (1.32)	−25.18 (−1.86**)	−56.78	0.42 (2.71*)	0.09 (0.62)	97.90 (4.64*)	R^2=0.80 DW=1.44
$D_{\Delta b}$	26.64 (1.14)	−40.47 (−2.22*)	20.34 (1.19)	82.25 (2.45*)	−27.41 (−0.93)	62.99 (3.63*)	124.34	−0.45 (−2.32*)	−0.19 (−1.05)	−116.74 (−4.33*)	R^2=0.81 DW=1.68

(4) Without the counterfactual using only the estimated transitory component ‘before Keynes’

	pre-1980			post-1980							
	Δy_u^e	$\Delta y_u^e - 1$	$\Delta y_u^e - 2$	Δy_u^e	$\Delta y_u^e - 1$	$\Delta y_u^e - 2$	Sum	D(autoT)	D(autoT)−1	Shift-1980	Statistics
D_g	3.37 (0.61)	−1.38 (−0.32)	−5.31 (−1.31)	−1.00 (−0.12)	−7.82 (−1.13)	−8.01 (−1.94*)	10.64	−0.02 (−0.37)	0.72 (1.68**)	16.19 (2.53*)	R^2=0.55 DW=1.59
D_t	2.20 (1.23)	−0.90 (−0.64)	−1.06 (−0.81)	6.17 (2.39*)	−4.71 (−2.07*)	−0.47 (−0.35)	1.23	0.07 (4.79*)	−0.05 (−3.90*)	−5.26 (−2.54)	R^2=0.56 DW=2.08
$D_{\Delta b}$	1.17 (0.26)	−0.48 (−0.14)	−4.24 (−1.27)	−7.15 (−1.09)	−3.11 (−0.54)	−7.54 (−2.22*)	−21.35	−.09 (−2.34*)	0.13 (3.58*)	21.45 (−1.20)	R^2=0.67 DW=1.56

Notes: * (**) significant at 5% (10%). Endogenous variables: Δy_u^e and D(autoT). Instrumental variables: first lags of IPUS, RYPC, and y_u^e and first and second lags of URATE, all interacted with a dummy = 1 from 1980 on, = 0 otherwise. No. of observations = 49. Sum = sum of coefficients to the left in the row. Constant terms are not reported. R^2 is between observed and predicted. DW = Durbin–Watson. D_g (D_t, $D_{\Delta b}$) = estimated change in the transitory component of real non-interest spending per capita (real taxes per capita, real net deficit per capita) minus the forecast of the same variable ‘after Keynes’ based on our model of the transitory component ‘before Keynes’. Δy_u^e = first difference of (the current unemployment rate less the lagged value of the four year moving average of the unemployment rate). D(autoT) = (the lagged value of the four year moving average of the ratio of personal income tax revenue to total tax revenue) times (the contemporaneous change in real income per capita). Variable definitions: see Appendix.

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Table 4a
Some important sample statistics, 1952–2000

	Mean	Standard deviation
x estimated using two periods		
Estimated real GNP per capita (x^e)	15,068.0	4790.0
Estimated transitory income (y^e)	7.68	220.4
x estimated using entire sample		
Estimated real GNP per capita (x^e)	15,143.0	5073.1
Estimated transitory income (y^e)	−67.1	886.8
Estimated expected transitory unemployment (y_u^e)	0.24	1.52
Real non-interest public expenditure per capita (g)	2466.0	819.8
Real taxation per capita (t)	2422.8	816.2
Real net deficit per capita ($\Delta b - rb_{-1}$)	43.2	446.7

Notes: Figures in real dollars per capita. x^e = estimate of real long run income per capita. y^e = (actual real GNP per capita − x^e).

after the Keynesian era began. In panel three, we see that the results do not appear as Keynesian as when the counterfactual is incorporated. The *difference* in the sum of coefficients on the shocks between panels one and three is about 20% of the sum in panel one for spending, about 100% for taxation and about 15% for the deficit. These percentages are a measure of the mistake that would be made if a counterfactual that does not acknowledge the (pro-) cyclical sensitivity of budgets before Keynesianism became a serious factor in the policy process. Panel four confirms this conclusion, by indicating that if the 'before Keynesianism' regime was in place *after* 1952, policy would have been mildly pro-cyclical and thus much more conservative than (estimated) ex ante policy actually was.

5.1. Significance versus importance and further sensitivity analysis

Statistical significance is one thing and quantitative importance another. It is possible that Keynesian stabilization was implemented but in magnitudes that were, for all practical purposes, irrelevant. To consider this matter, we use the policy differential regressions to calculate the effect on short run ex ante policy actions of a one standard deviation change in the expected transitory change in the unemployment rate. In Table 4a this standard deviation in Δy_u is 1.52 percentage points over the sample period 1952–2000. The table also records that a standard deviation change in permanent real per capita income (x^e) over the same period was 220.4 dollars.

The results of applying the standard deviation shock to unemployment to the policy differential equations are shown in the first two columns of Table 4b. Using panel one of Table 3, where the welfare state is assumed entirely unrelated to Keynesianism, a one standard deviation increase in Δy_u^e results in a change in the deficit of between \$183 and \$222 per capita, depending on whether only significant coefficients or all coefficients are used. This is equal to about one standard deviation in the estimated transitory income over the 1952–2000 period. The changes in

Table 4b
Estimated changes in Keynesian policy following a standard shock (assuming a one standard deviation increase in expected transitory unemployment y_u^e)

	Using two periods (1871–1938 and 1947–2000) to estimate x^e		Using the entire sample (1871–2000) to estimate x^e	
	Real dollars per capita		Real dollars per capita	
	Sig. at 10%	All coefficients	Sig. at 10%	All coefficients
Welfare state unrelated to Keynesianism: panel 1, Table 3				
Change in non-interest spending	107.5	133.3	−43.3	−16.3
Change in taxation	−104.5	−88.5	−106.0	−106.5
Change in net deficit	183.1	221.5	−3.6	90.3
Welfare state part of Keynesianism: panel 2, Table 3				
Change in non-interest spending	154.8	188.8	34.1	102.7
Change in taxation	−325.1	−238.8	−90.5	−147.0
Change in net deficit	367.3	427.7	144.4	197.9

Notes: Sig. at 10%=>use of coefficients on Δy_u^e in Table 3 that are significant at 10% or better.

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spending and taxation are about half as big, but still substantial. Measures of the responsiveness of fiscal structure that fully include the welfare state as part of Keynesianism are correspondingly larger. In the case of the deficit, the changes are from \$367 to \$428, or about 1.75 to 2 times the standard deviation change in transitory income. Taxation responds by about three times as much (−\$239 versus −\$89) as when the welfare state is excluded in panel one.

Finally, as a check on our results, we redid all of the estimation using estimates of permanent and transitory income based on the whole period from 1871 to 2000, instead of those based on estimating separately over two samples, before and after WWII. This produces forecasts of income with a bigger variance, and is, in our view, less desirable given the possibility of structural change over the more than 130 years that we study. The resulting quantitative estimates of fiscal changes following a standard deviation unemployment shock are given in columns 3 and 4 of Table 4b. Using the results for all coefficients, we see that the deficit changes by about 10% (90/887) of a standard deviation in (the corresponding) transitory income given in Table 4a. This rises to about 22% (198/887) when the welfare state is included as part of Keynesian policy. These results illustrate the fact that in the present context, it matters how one chooses to model both the long run evolution of the economy as well as the long and shorter run components of ex ante fiscal policy.[39]

6. Conclusions

While the *General Theory* has undoubtedly influenced how economists think about macroeconomic intervention, whether policy actually changed as a result of the spread of Keynesian ideas is another matter. In this paper, we consider the elements that must be included in a careful search for evidence of changes in the nature of countercyclical fiscal policy, and look for such evidence using Canadian data from 1870. Because we are investigating the effects of ideas on the course of public affairs we must estimate, one way or another, what would have happened if these ideas had, in fact, no influence at all. This requires the construction of a counterfactual using long time series, illustrating what policy would have been like had Keynesian stabilization not been attempted.

Since the focus is on stabilization policy in a democracy, a search for Keynesianism requires that ex ante policy choices be separated into permanent and transitory components within a framework where Keynesian stabilization could, at least potentially, generate substantial political support. Keynesianism is about policy over shorter horizons, and it simply would never persist in a competitive political system unless it was politically profitable. In other words, we have argued, an encompassing political economy framework is needed to interpret and disentangle the web of connections that link political decision-making in the short and longer runs.

In the course of constructing such a framework, we have shown how a dynamic spatial voting model can be explicitly solved, and its coefficients signed and estimated. While the investigation requires a number of difficult conceptual choices at various points, the methodological issues are of general interest, and the model we have developed can be applied to any democratic country where long time series are available. The results also shed substantial light on Canadian fiscal history including documenting statistically, and for the first time, the much greater conservatism in policy choices before World War Two, this in a country where Keynesianism clearly came to be part of officially accepted policy doctrine. In doing so, we have identified a quantitatively important Keynesian element in ex ante fiscal policy, especially *after* 1980.

Acknowledgements

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[39] On this point, see also Ferris et al. (2007).

Turin. The hospitality of the Center for Economic Studies, University of Munich and of the Department of Economics and the Center for the Study of Democracy at U.C. Irvine is also gratefully acknowledged.

Appendix

A.1. Variable names

AGRIC = proportion of the labor force in agriculture

Δb = real primary deficit per capita $= g - t$

$\Delta\hat{b}$ = long run or permanent real primary deficit per capita

D(autoT) = (the lagged value of the four year moving average of the ratio of personal income tax revenue to total tax revenue) times (the contemporaneous change in real income per capita)

g = real total government spending per capita − real net interest per capita paid to the private sector

$\hat{g}$ = long run or permanent size of real non-interest government expenditure per capita

IMMRATIO = immigrants as a fraction of total population

IPIUS = index of industrial production for the United States

OILPERM = dummy 1 for 1974 on, 0 otherwise

OPEN = (exports + imports)/GNP

%YOUNG = percentage of the population below 17

p = GNP deflator before 1927 and GDP deflator after (1986 = 100)

POP = Canadian population

RYPC = real income (GNP) per capita

r^e = expected real interest rate. (Represented by a distributed lag of: long term government bond rate − the actual rate of inflation (using p))

Shift-1980 = 1 for the years 1980–2000, 0 otherwise

t = real tax revenue per capita

$\hat{t}$ = long run or permanent real taxes per capita

URATE = unemployment rate

USCON = U.S. real consumption per capita

WW1 = dummy 1 for the years 1914–1918, 0 otherwise.

WWI aftermath = dummy1 for the years 1919–1921, 0 otherwise.

WW2 = dummy 1 for the years 1939–1945, 0 otherwise.

WWII aftermath = dummy 1 for the years 1946–1949, 0 otherwise.

x^e = expected long run real income per capita.

y^e = expected transitory income $=$ RYPC $- x^e$

Δy^e_u = change in the expected transitory component of unemployment. Measured as the change in the deviation of the unemployment rate from the lagged value of its four year moving average.

For extensive description of data sources, see "Variable Names and Data Sources for 'Searching for Keynesianism' at www.carleton.ca/~winers. or www.carleton.ca/~sferris. The fiscal data are based on Gillespie's (1991) reworking of the Public Accounts of Canada from 1867, as updated by the authors. Rich (1988) provided useful supplementary data.

A.2. Linearization of first order conditions (7)–(9) and the interpretation of Keynesianism in the present framework

We proceed by taking Taylor series approximations of the left hand side of Eqs. (7–9) for the policy variables g, t and b. Here we show the detail for the case of government spending only and expand about the long run path of g, given the expected values of the permanent influences on government size, when the expected transitory deviations from the equilibrium path are equal to zero. That is, we linearize the first order equations around the long run expected paths for g, $\hat{g}_{t+s} = g(x^e_{t+s}, y^e_{t+s} = 0, \ldots)$ and $\hat{g}_{t+s-1} = g\ (x^e_{t+s-1}, y^e_{t+s-1} = 0, \ldots)$, defined by solving the Lagrangian (6) for policies of period $t+s-1$ and $t+s$ under the specified conditions. For this purpose we consider the left side of Eq. (10) to be a function of expected quantities x^e and y^e. Terminating the expansion after the set of second order terms, we find that the Taylor series expansion of the log of the left hand side of Eq. (10) becomes:

$$\approx \left[\begin{array}{l} \ln\left[\gamma E_t\mu^1_g(0) + E_t\mu^2_g(x_{t+s})\right] - \ln\left[\gamma E_t\mu^1_g(0) + E_t\mu^2_g(x_{t+s-1})\right] \\ + \left[\gamma E_t\mu^1_g(0) + E_t\mu^2_g(x_{t+s})\right]^{-1} \langle \left[\gamma E_t\mu^1_{gg}(0) + E_t\mu^2_{gg}(x_{t+s})\right] \left(g^e_{t+s} - \hat{g}_{t+s}\right) + \left[\gamma E_t\partial\mu^1_g/\partial y^e_{t+s}\right] \left(y^e_{t+s}\right)\rangle \\ - \left[\gamma E_t\mu^1_g(0) + E_t\mu^2_g(x_{t+s-1})\right]^{-1} \langle \left[\gamma E_t\mu^1_{gg}(0) + E_t\mu^2_{gg}(x_{t+s-1})\right] \left(g^e_{t+s-1} - \hat{g}_{t+s-1}\right) + \left[\gamma E_t\partial\mu^1_g/\partial y^e_{t+s-1}\right] \left(y^e_{t+s-1}\right)\rangle \end{array}\right] \tag{A1}$$

where we have simplified by assuming that the indirect utility function is separable in the policy instruments so that the cross partial terms are all zero.

To evaluate this expression, we assume that the expected marginal utility generated by a change in the policy variable is linearly related to the expected level of the state variables y^e_{t+s} and x^e_{t+s}, as in $E_t\mu^1_g = a + by^e_{t+s}$ and $E_t\mu^2_2 = c + dx^e_{t+s}$, where the scalars a and c are positive and both b and d are negative. (The analogous assumptions about the effects of taxes and debt are also made.) Additional government spending then generates positive utility along the equilibrium path, but produces less additional value for larger positive values of both transitory and permanent

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income. These are assumptions of convenience in the present discussion — the empirical work allows b and d to take either sign.

Because the difference in logarithms equals the rate of growth of the inside variables, the first term of the expansion in (A1) when evaluated at $\hat{g}_{t+s}$ and $\hat{g}_{t+s-1}$ becomes

$$\frac{\gamma b(a-a)+d\left(x^e_{t+s}-x^e_{t+s-1}\right)}{\gamma E_t\mu^1_g(0)+E_t\mu^2_g(x_{t+s-1})}=\frac{d\left(x^e_{t+s}-x^e_{t+s-1}\right)}{\gamma a+\left(c+dx^e_{t+s-1}\right)}. \tag{A2}$$

Repeating the use of linear marginal utility to evaluate the first order derivatives in Eq. (A1) and combining these with Eq. (A2), our linear approximation to (10) is[40]

$$\begin{aligned}&\frac{d\left(x^e_{t+s}-x^e_{t+s-1}\right)}{\gamma a+c+dx^e_{t+s-1}}+\frac{\gamma b\left(\partial y/\partial g^e_{t+s}\right)}{\gamma a+c+dx^e_{t+s}}\left(g^e_{t+s}-\hat{g}_{t+s-1}\right)-\frac{\gamma b\left(\partial y/\partial g^e_{t+s-1}\right)}{\gamma a+c+dx^e_{t+s-1}}\left(g^e_{t+s}-\hat{g}_{t+s-1}\right)\\&\quad+\frac{\gamma b}{\gamma a+c+dx^e_{t+s}}y^e_{t+s}-\frac{\gamma b}{\gamma a+c+dx^e_{t+s-1}}y^e_{t+s-1}=\rho-r_{t+s}+D\left[\ln\psi_{t+s}\right].\end{aligned} \tag{A3}$$

It may be noted here that while similar variables have coefficients with the same general form across time in Eq. (A3), all coefficients are time dated and become equal only if the state variables are equal in adjacent periods. The same general form holds for t_{t+s}. We can rearrange Eq. (A3) to solve explicitly for g^e_{t+1} (and for t_{t+s}). Using X^e_{t+s} to represent the time dated term representing the weighted sum of the first derivatives, $X^e_{t+s}=\gamma a+c+dx^e_{t+s}>0$, we have

$$\begin{aligned}g^e_{t+s}-\hat{g}^{\,e}_{t+s}=&\frac{\left[\rho-r_{t+s}+D\ln\left(\psi_{t+s}\right)\right]}{(X^e_{t+s})^{-1}\gamma b(\partial y/\partial g_{t+s})^e}-\frac{1}{(\partial y/\partial g_{t+s})^e}\left[y^e_{t+s}-\frac{y^e_{t+s-1}}{X^e_{t+s-1}(X^e_{t+s})^{-1}}\right]\\&-\frac{d\left(x^e_{t+s}-x^e_{t+s-1}\right)}{\gamma b(\partial y/\partial g_{t+s})^eX^e_{t+s-1}(X^e_{t+s})^{-1}}+\left[\frac{\left(g^e_{t+s-1}-\hat{g}^e_{t+s-1}\right)}{X^e_{t+s-1}(X^e_{t+s})^{-1}}\right]\left[\frac{(\partial y/\partial g_{t+s-1})^e}{(\partial y/\partial g_{t+s})^e}\right].\end{aligned} \tag{A4}$$

To interpret this equation, note that since $X^e_{t+s}=\gamma a+c+dx^e_{t+s}$ and $X^e_{t+s-1}=\gamma a+c+dx^e_{t+s-1}$, then $X^e_{t+s-1}(X^e_{t+s})^{-1}\approx 1$. In addition, we assumed earlier that $\partial y/\partial g^e_{t+s-1}\approx\partial y/\partial g_{t+s}$. Using these approximations and rearranging, Eq. (A4) reduces to

$$\Delta g^e_{t+s}=\Delta\hat{g}^e_{t+s}+\frac{\left[\rho-r_{t+s}+D\ln\left(\psi_{t+s}\right)\right]}{(X^e_{t+s})\gamma b(\partial y/\partial g_{t+s})^e}-\frac{\left(y^e_{t+s}-y^e_{t+s-1}\right)}{(\partial y/\partial g_{t+s})^e}-\frac{d\left(x^e_{t+s}-x^e_{t+s-1}\right)}{\gamma b(\partial y/\partial g_{t+s})^e}. \tag{A5}$$

where Δg^e denotes that the equation is an approximation for the *planned* change in government spending, $\Delta g^e_{t+s}=(g^e_{t+s}-g^e_{t+s-1})$, $X^e_{t+s}=\gamma a+c+dx^e_{t+s}>0$, and where we have assumed that $X^e_{t+s-1}(X^e_{t+s})^{-1}=1$.

Eq. (A5) can be given one further useful simplification. Inspection of Eq. (9) indicates that $D\ln(\psi_{t+s})$ is a function of y_{t+s} through $E_t\mu^1_b$. Assuming that the relationship is linear allows us to write $D\ln(\psi_{t+s})=\varphi(y_{t+s}-y_{t+s-1})>0$ with $\varphi>0$. Hence Eq. (A5) becomes[41]

$$\Delta g^e_{t+s}=\Delta\hat{g}^e_{t+s}+\frac{(\rho-r^e_{t+s})}{Z_{t+s}}+\frac{\left(\phi-\left(x^e_{t+s}\right)^{-1}\gamma b\right)\left(y^e_{t+s}-y^e_{t+s-1}\right)}{Z_{t+s}}-\frac{d\left(x^e_{t+s}-x^e_{t+s-1}\right)}{\gamma b(\partial y/\partial g_{t+s})^e} \tag{A6}$$

where $Z_{t+s}=(X^e_{t+s})^{-1}\gamma b(\partial y/\partial g_{t+s})^e<0$. In interpreting the sign of Z_{t+s}, recall that y^e is defined so that positive values represent levels of aggregate output above their long run expected level. Thus if an increase in g^e increases y^e, $(\partial y/\partial g_{t+s})^e>0$. Our discussion below relies on this assumption (although the estimating equations allow for either sign). Since $X^e_{t+s}>0$ and $b<0$, $Z_{t+s}<0$. This implies that the coefficient on $(y^e_{t+s}-y^e_{t+s-1})$ is negative.[42]

[40] Here $\partial E_t\mu^1_g/\partial g_{t+s}=\gamma b(\partial y^e/\partial g)$ is assumed to be independent of the size of y^e; $\partial E_t\mu^2_g/\partial g_{t+s}=d(\partial x^e_{t+s}/\partial g_{t+s})=0$; $\partial E_t\mu^1_g/\partial y_{t+s}=\gamma b$; and $\partial E_t\mu^2_g/\partial y_{t+s}=0$.

[41] From Eq. (9), using $E\mu^2_b=0$, $D(\psi_{t+s+1})=[\theta_1\beta^s/\Pi^sR^s][E_t\mu^1_b(y_{t+s})-\beta E_t\mu^1_b(y_{t+s+1})]>0$ if and only if the liquidity constraint is expected to be increasingly binding. That is, as y_{t+s} increases relative to y_{t+s+1}, $E_t\mu_b{}^1(y_{t+s})$ *and* $D(\psi_{t+s+1})$ falls. The resulting positive relationship between Δy and $D(\psi)$ is represented by $D\ln(\psi_{t+s})=\varphi(y_{t+s}-y_{t+s-1})$ with $\varphi>0$.

[42] That is, with $\varphi>0$, $(X^e_{t+s})^{-1}\gamma b<0$ so that $[\varphi-(X^e_{t+s})^{-1}\gamma b]>0$.

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Finally, since $b<0$, $d<0$ and $\gamma>0$, the effect of an increase in $(x^e_{t+s}-x^e_{t+s-1})$ on the difference between the current and long run values of Δg is negative. Eq. (A6) and its counterparts for current taxation and deficit financing become the basis for estimating Eqs. (12–14). Note that while no constant term appears in Eq. (A6), one is added in the estimating equations by separating the first term on the right side of each equation $(\rho-r^e_{t+s})$ into a part that depends on ρ, assumed constant, and a part that depends on r^e_{t+s}. Allowing the constant term to vary freely provides further flexibility in the construction of a proxy for r^e, as well as for expectations of the y's and the x's.

A.2.1. The interpretation of Keynesianism in the present framework

In the above framework, Leijonhufvud's Keynesianism arises from a new understanding by voters that a coordinated reduction in the impact of liquidity constraints will allow constrained agents to realize more of their "notional" trading plans, thereby opening new opportunities for *both* liquidity and non-liquidity constrained individuals, so increasing expected individual welfare. Hence greater attempts at stabilization arise from individuals' enhanced appreciation of the role of government as an agent that is able to internalize externalities inherent in relaxing individual liquidity constraints through fiscal policies.

Greater recognition by a substantial part of the electorate of the desirability of using government impacts the model by increasing the indirect expected utility of government action $E\mu^1_g$. With $E\mu^1_g=a+by^e_t$ [where $a>0$ and $b<0$], a rise in the value to the electorate of using g in relation to the liquidity constraint will (through political competition) increase government spending beyond its previous departure from the equilibrium path in response to a given Δy^e_{t+s}. That is, a rise in the value in either a or b increases the absolute value of the coefficient on the third right-hand term in Eq. (A6). An analogous argument holds for Δt^e and for the change in the net deficit. This means that in the Keynesian era in public policy, both the negative correlation between ex ante short run policy $(\Delta g_t-\Delta\hat{g}_t)$ and Δy^e_{t+s} (where a positive change in y is a good event), and the positive correlation of $(\Delta t_t-\Delta\hat{t}_t)$ and Δy^e_{t+s}, will be stronger. The implied negative correlation for the deficit will also be larger.

It should be noted that a rise in the expected utility that will be generated by government actions is to be distinguished from an increase in the effectiveness of fiscal intervention on the economy, i.e., a rise in $\partial y/\partial g_{t+s}$. Using Eq. (A6) it can be seen that such a productivity change actually reduces government intervention. Given the political need to balance the interests of both types of voters, fewer resources on the margin are now devoted to dealing with liquidity constraints.

Finally, we note that a change in the proportion of liquidity constrained voters λ yields inconclusive effects on policy, and in any event is not needed to generate Keynesian stabilization in the present framework.

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