ECONSTOR
Make Your Publications Visible.

A Service of
ZBW
Leibniz-Informationszentrum Wirtschaft
Leibniz Information Centre for Economics

Winer, Stanley L.; Ferris, J Stephen

Working Paper

Searching for Keynes: An Essay on the Political Economy of Fiscal Policy, with Application to Canada, 1870-2000 - revised version

CESifo Working Paper, No. 1016

Provided in Cooperation with:
Ifo Institute – Leibniz Institute for Economic Research at the University of Munich

Suggested Citation: Winer, Stanley L.; Ferris, J Stephen (2003) : Searching for Keynes: An Essay on the Political Economy of Fiscal Policy, with Application to Canada, 1870-2000 - revised version, CESifo Working Paper, No. 1016, Center for Economic Studies and ifo Institute (CESifo), Munich

This Version is available at:
https://hdl.handle.net/10419/76651

Standard-Nutzungsbedingungen:

Die Dokumente auf EconStor dürfen zu eigenen wissenschaftlichen Zwecken und zum Privatgebrauch gespeichert und kopiert werden.

Sie dürfen die Dokumente nicht für öffentliche oder kommerzielle Zwecke vervielfältigen, öffentlich ausstellen, öffentlich zugänglich machen, vertreiben oder anderweitig nutzen.

Sofern die Verfasser die Dokumente unter Open-Content-Lizenzen (insbesondere CC-Lizenzen) zur Verfügung gestellt haben sollten, gelten abweichend von diesen Nutzungsbedingungen die in der dort genannten Lizenz gewährten Nutzungsrechte.

Terms of use:

Documents in EconStor may be saved and copied for your personal and scholarly purposes.

You are not to copy documents for public or commercial purposes, to exhibit the documents publicly, to make them publicly available on the internet, or to distribute or otherwise use the documents in public.

If the documents have been made available under an Open Content Licence (especially Creative Commons Licences), you may exercise further usage rights as specified in the indicated licence.

WWW.ECONSTOR.EU

Mitglied der Leibniz-Gemeinschaft

SEARCHING FOR KEYNES: AN ESSAY ON THE POLITICAL ECONOMY OF FISCAL POLICY, WITH APPLICATION TO CANADA, 1870-2000

J. STEPHEN FERRIS
STANLEY L. WINER

CESIFO WORKING PAPER NO. 1016
CATEGORY 2: PUBLIC CHOICE
AUGUST 2003- REVISED JUNE 2004

An electronic version of the paper may be downloaded
- *from the SSRN website: www.SSRN.com*
- *from the CESifo website: www.CESifo.de*

CESifo *Working Paper No. 1016*

SEARCHING FOR KEYNES: AN ESSAY ON THE POLITICAL ECONOMY OF FISCAL POLICY, WITH APPLICATION TO CANADA, 1870-2000

Abstract

Keynes' *General Theory* (1936) is arguably one of the most important books of the twentieth century. His ideas for stabilizing the aggregate economy have profoundly influenced economic theory as well as popular opinion about what governments can and should do with respect to the business cycle. On the other hand, whether Keynesian theory has substantially altered the course of public policy remains an open question. In this paper we identify the elements required for any investigation of the impact of Keynes' ideas on policy choices and then conduct our own 'search for Keynes', applying an intertemporal spatial voting framework to study the fiscal history of the Government of Canada from 1870 to 2000. The long time series allows the construction of a counterfactual – one of several essential elements - showing what governments would have planned to do 'after Keynes', if Keynes' ideas had not in fact been present. Our results suggest that textbook Keynesianism is identifiable in the Canadian data.

JEL Code: D72, D78, E12, E62, H30, H60.

Keywords: Keynesianism, spatial voting, permanent versus transitory policy, political equilibrium, liquidity constraints.

.

J. Stephen Ferris
School of Public Policy and Department of Economics
Carleton University
1125 Colonel By Drive
K1S 5B6 Ottawa, Ontario
Canada
stephen_ferris@carleton.ca

Stanley L. Winer
School of Public Policy and Department of Economics
Carleton University
1125 Colonel By Drive
K1S 5B6 Ottawa, Ontario
Canada
stan_winer@carleton.ca

We dedicate the paper to the memory of our colleague, W. Irwin Gillespie. This is a substantially revised version of a draft previously titled 'Searching for Keynes'. We are grateful for helpful comments from Dennis Mueller, Patrick O'Brien, Martin Paldam, SooBin Park, Georg Rich, Friedrich Schneider, Dan Usher, Klaus Stegman, Larry Kenny, Mark Rush and participants in seminars at the following locations: Carleton University, Duke University, the European Public Choice Society, Lisbon, the Hebrew University, the Institute of Advanced Studies, Vienna, Johannes Kepler University, Queen's University, the Universities of Dortmund, Florida, Konstanz, Southern California, Tennessee and Western Ontario, the International Institute of Public Finance, Moscow, and the Swiss National Bank. Research assistance was provided by Amanda Cahoon, Richard Levesque, Vincent Ngan, Zafrul Siddique, and Yu Zhang. Errors and omissions remain the responsibility of the authors.

Abstract

Keynes' *General Theory* (1936) is arguably one of the most important books of the twentieth century. His ideas for stabilizing the aggregate economy have profoundly influenced economic theory as well as popular opinion about what governments can and should do with respect to the business cycle. On the other hand, whether Keynesian theory has substantially altered the course of public policy remains an open question. In this paper we identify the elements required for any investigation of the impact of Keynes' ideas on policy choices and then conduct our own 'search for Keynes', applying an intertemporal spatial voting framework to study the fiscal history of the Government of Canada from 1870 to 2000. The long time series allows the construction of a counterfactual - one of several essential elements - showing what governments would have planned to do 'after Keynes', if Keynes' ideas had not in fact been present. Our results suggest that textbook Keynesianism is identifiable in the Canadian data.

JEL Codes: D72, D78, E12, E62, H30, H60.
Keywords: Keynesianism, spatial voting, permanent versus transitory policy, political equilibrium, liquidity constraints

This [revolutionary] extension of the role of the state was, implicitly, of a general and over-all nature, involving all departments of government; but in accordance with Keynesian economic theory, the greater part of this new responsibility came to focus on particular aspects of governmental operations--its fiscal and monetary policies; and what was called for in fiscal policy especially was an even more radical break with the traditions of the past.

H. Scott Gordon, 1965

1. Introduction

The idea that national governments can stabilize aggregate economic activity, introduced by John Maynard Keynes in his *General Theory of Employment, Interest and Money* (1936), is one of the most important innovations in economic policy thinking of the twentieth century. His ideas have profoundly influenced economic theory as well as popular opinion about what governments can and should do with respect to the business cycle. On the other hand, whether Keynes' arguments have actually changed the course of public policy remains an open question. In this paper we consider the elements that are required in order to address that question, and then conduct our own 'search for Keynes'. We narrow our investigation by focusing on fiscal policy which, as Scott Gordon notes, was the most radical element of the Keynesian prescription.[1]

Since we are concerned with the implications of Keynesianism for policy choices, a key requirement is a behavioral model of public policy. The framework that we develop is an intertemporal extension of a spatial voting model that to makes use of ideas from probabilistic voting theory (Coughlin, Mueller and Murrell 1990, Hinich and Munger 1994), modelling of the permanent or long run size of government (for example, Alt and Chrystal 1983), the macroeconomics of liquidity constraints (Campbell and Mankiw 1990, Holtz-Eakin, Rosen and Tilly 1994) and tax smoothing (Barro 1979, 1986). In this framework Keynesianism, if it exists, appears as a change in the process governing the ex ante transitory or shorter run components of equilibrium policy choices.

While the framework be adapted to study other competitive political systems, we look for evidence of *attempts* at Keynesian stabilization in the fiscal policy choices of the Government of

[1] The data used in this study are specified in a manner consistent with the relationship between the central government and the central bank. We leave the investigation of Keynesianism in monetary policy for future research.

Canada using data from 1870 to 2000.[2] The Canadian case is of particular interest for a number of reasons. The *White Paper on Employment and Income* in 1945 signalled the acceptance of Keynesian ideas in senior policy circles and R.B. Bryce, one of Keynes' early students, played an important role for many years in the Department of Finance.[3] The long time series is required in order to construct a counterfactual showing what governments would have planned to do if Keynesianism had not in fact been present.

In section two we identify the elements, including the counterfactual, that we think are essential to assess of the role of Keynesianism. A model of fiscal policy 'before' and 'after' Keynes that meets these requirements is developed in section three, and in section four a system of semi-reduced form estimating equations and a test for Keynes are derived. Following Bryce (1986), one might date the Keynesian period in Canada from 1939, but with the disruption of World War II we must effectively begin our search only after its end. Estimation of the model of non-interest federal spending, taxation, and the deficit net of interest paid to the private sector is presented in section five, and our test for the presence of Keynesianism is implemented. Brief conclusions complete the paper. Mathematical details are given in an Appendix and data sources are fully described in a companion working paper (Ferris and Winer 2003).

2. Essential Elements

A statement about the impact of Keynes on what governments planned to do implies that we think we know what would have happened 'after Keynes' had his ideas not influenced the course of public policy.[4] To answer this question we explicitly construct such a counterfactual - our first essential element - by estimating a model of policy based on the 1870 to 1938 time period before Keynesian ideas could come into effect. This model is then used to forecast into the period 'after

[2] The modern state in Canada begins in 1867.
[3] For histories of Keynesianism in Canada, see Gordon (1965), Campbell (1987, 1991), as well as Bryce (1986).
[4] Analogous arguments apply to the study of the study of the impact of any other idea on the course of public policy.

Keynes'. Our tests for the existence and strength of Keynesian stabilization policy are based on the study of how policy evolves 'after Keynes' *relative to* this counterfactual.

Explicit use of the counterfactual allows for the likelihood that, even 'before Keynes', policy choices are correlated with the cycle. Prior to Keynes, governments had to deal with voters who found themselves in economic distress and may well have responded in a manner that looks, but could not be, Keynesian. On balance, one suspects that 19th century governments behaved differently, perhaps more conservatively, with respect to the business cycle. (Estimation will shed light on this matter). But whatever the case, there is no reason why policy choices should be unaffected by shorter run developments 'before Keynes'. This fact must be taken into account in deciding whether or not there is a systematic change in the nature of policy choices 'after'.

Second, since Keynesian stabilization concerns the nature of a government's response to shorter run or transitory macro-economic events, it is necessary to distinguish between longer run or permanent policy actions, such as its response to an expected increase in permanent income, and its transitory or cyclical actions. Most studies of public policy do not distinguish between permanent and transitory elements in policy actions. (See, however, Alt and Chrystal 1983, Goff 1998, and Barro 1986). In the context of macroeconomic policy in Canada, Kneebone and McKenzie (1999) also recognize the need to remove the permanent part of the process governing policy choices and do so by using a Hodrick-Prescott trend. As Canova (1998) and others have emphasized, the choice of the long run model used to de-trend is crucial in macroeconomics and we should expect it to be important in the present context as well. In our case, we model long run policy choices explicitly.

Third, we are interested in *planned* policy actions and not in unintended outcomes. Traditionally, the study of Keynesian stabilization has distinguished discretionary (or structural) from automatic (or cyclical) aspects of fiscal policy. Discretionary changes are typically defined as those resulting from the adjustment of policy parameters like a tax rate, while automatic components are budgetary changes that result from fluctuations in activity for given policy parameters. The

discretionary component is often estimated by constructing a counterfactual showing what policy would have been this year had unemployment remained unchanged, using an autoregressive forecasting model that includes unemployment rates, with the difference between the hypothetical policy and last year's actual policy serving as the measure of discretionary change. This methodology may be useful for studying how actual budgets fluctuate with the cycle, but it does not yield a behavioral model of ex ante policy choices.

The discretionary versus automatic policy literature is immense. Work of this sort on Canada includes Will (1967), Gillespie (1979), Boothe and Davidson (1993), Wilson and Dungan (1993) and Boothe and Petchey (1995). These studies conclude generally that the discretionary component of policy is small compared to the total and often awkwardly timed from the perspective of Keynesian stabilization theory. (See, however, McKenzie and Kneebone 1999 who do find evidence of substantial discretionary changes in policy in the 1990's.) Thus, on our reading, this literature suggest that the evidence for the adoption of Keynesianism in Canada is not strong, unless one argues that Keynesian thinking led to an increased reliance on policies that act as automatic stabilizers, a conclusion that calls into question the initial distinction between automatic and discretionary policy.[5]

Fourth, the framework of analysis should incorporate a reason why Keynesian stabilization might be employed, so that the model of policy 'after Keynes' can be properly specified. For this reason, the model of the transitory components of policy must be formulated explicitly rather than modeled agnostically as general adjustment terms.[6] We interpret Keynesian stabilization as an attempt to capture the social benefits from internalizing the externalities inherent in an economy with liquidity constrained citizens, a seminal interpretation of Keynes' theory due to Leijonhufvud (1968). The model we develop therefore contains both liquidity-constrained and unconstrained citizens, and

---

[5] One should note that in a political economy setting, the distinction between discretionary and automatic policy is problematic. A political decision not to change a policy parameter in the face of expected changes in activity is just as active a policy as the opposite. See Ferris and Winer (2003) for an extensive critique of the automatic/ discretionary approach.

[6] That is, the model must be more specific about the short run processes than, say, an error correction model that does not contain an explicit (separate) theory of short run changes other than adjustment to long run equilibrium.

is informed by Campbell and Mankiw (1990), and by Holtz-Eakin, Rosen and Tilly (1994) who first applied this work to the study of government[7]. Tax smoothing on behalf of both types of voters (as in Barro 1986) is then but one feature of a politically profitable fiscal platform. Consumption smoothing for liquidity-constrained voters and the trade-off between satisfying the political demands of liquidity-constrained voters and those not so constrained play important roles in motivating the choices made by governments in the model developed in section three.

Fifth, it is necessary to allow for structural changes in the public sector that may have nothing to do with Keynesianism, but which affect the responsiveness of the fiscal system to the cycle. In our case the rise of the income tax and the maturation of the welfare system since World War II has altered the responsiveness of budgets to the cycle and needs to be controlled for. Hence while we are critical of the automatic/discretionary decomposition, its good sense is its allowance for the (assumed) unrelated influence of the welfare state on the cyclicality of fiscal policies. In one particular version of our model, we control for the role of the welfare state by explicitly allowing for the gradual development of the welfare system over the post-war period.

Sixth and finally, we must construct the time series that represents the longer and shorter run economic developments (or expected shocks) to which the government planned to respond, and do so in a manner that allows historical work over the long period of time required for the construction of a counterfactual.

Our overall approach is summarized in Figure 1. Here we illustrate the model of planned policy 'before Keynes' (before 1938) and the forecast into the post World War Two period based on this model that constitutes the counterfactual. In each case policy consists of a long run, shown as constant for simplicity, and transitory action that varies with the cycle. The figure also illustrates the systematic part of policy 'after Keynes', and what we shall call *the policy differential* - the difference between an estimate of planned policy after Keynes and that of the counterfactual. In the case

[7] Holtz-Eakin et al do not use an explicit spatial voting framework.

illustrated, policy after Keynes is more countercyclical than in the counterfactual, indicating the presence of textbook Keynesian stabilization. Our tests for the existence of Keynesian policy involve the estimation of regressions to explain changes in these policy differentials.

[Figure 1 here]

3. Political Equilibrium

Since we are concerned with the nature of *public* policy, it is important to show that our estimating equations are consistent with collective choice. To do so we extend the spatial voting model to an intertemporal setting where some proportion of voters are liquidity constrained and where there is a distinction between longer run and shorter run components of ex ante policy choices. To develop this we consider in turn: policy platforms, government budget constraints and the private economy, voting behaviour, party objectives, and the political equilibrium.

3.1 Platforms, government budget constraints and the private economy

A policy platform $\{\mathbf{g}, \mathbf{t}, \mathbf{b}\} = \{g_t, \ldots g_{t+s}, \ldots g_\infty ; t_t, \ldots t_{t+s}, \ldots t_\infty ; b_t, \ldots b_{t+s}, \ldots b_\infty\}$ offered by either of two political parties is a set of fiscal policies for the current and all future periods that the party thinks voters will care about. 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 time horizon is infinite for convenience; the estimating equations allow us to remain agnostic about the politically relevant horizon. The common set of feasible platforms from which parties choose is assumed to be compact and convex. The flow government budget constraints applying to these policies are

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

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

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

where **x** is a vector of factors (discussed below) determining the longer run evolution of policy.

3.2 Voting behaviour

As already noted, there are two types of voters. *Type 1* voters are liquidity constrained while *type 2* chose only in relation to their permanent income. Within types, individuals are assumed to be homogeneous. Using E_tU_2 to represent the indirect expected utility of a type 2 voter who is *not* liquidity constrained,

$$E_tU_2 = \sum^{\infty} \beta^s E_t\mu[c^*_{t+s}(H(.)), \ell^*_{t+s}(H(.)); \{\mathbf{g}, \mathbf{t}, \mathbf{b}\}_{t+s}] ; \qquad s = 0,1,...\infty \qquad \textbf{(2)}$$

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

$$E_tU_1 = \sum^{\infty}\beta^s E_t\mu[c^*_{t+s}(H(.); \mathbf{y_t}), \ell^*_{t+s}(H(.); \mathbf{y_t}); \{\mathbf{g}, \mathbf{t}, \mathbf{b}\}_{t+s}], \qquad s = 0,1...\infty. \qquad \textbf{(3)}$$

E_tU_1 differs from E_tU_2 only because the liquidity constrained individual's evaluation of government depends upon the realization of a vector of stochastic current period variables $\mathbf{y_t}$. In this section, we define **y** as a deviation from long run that is *welfare improving* for liquidity constrained voters, such as an expected increase in current income above its long run level.

The individual voting decision 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 (assumed to be stochastic from the political parties' perspective).[8] 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, $V_j^{\mathbf{k}}$, is the sum of these parts: $V_j^{\mathbf{k}} = E_tU_j [\mathbf{g}(k), \mathbf{t}(k), \mathbf{b}(k)] + \xi_j^{\mathbf{k}} = E_tU_j(k) + \xi_j^{\mathbf{k}}$, where ξ_j^k describes the utility generated by the non-policy related characteristics of party k and its candidates.

With the political process consisting of an incumbent party (i) and an opposition (o), we may then define the non-policy *bias* of a representative voter of type j in favor of the opposition o as

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

$\varphi_j^{\mathbf{o}} = \xi_j^{\mathbf{o}} - \xi_j^{\mathbf{i}}$. By definition this non-policy bias is independent of policy choices.

The voting behaviour of individuals, from the perspective of the two parties, can now be described following Coughlin, Mueller and Murrell (1990). The probability that an individual of type j votes for the opposition rather than the incumbent is

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

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 from each party's perspective, the non-policy bias of a representative 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 a representative 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 party:

$$F_{jt}\ \{E_t U_j(o) - E_t U_j(i)\} = \alpha_j . \{ E_t U_j(o) - E_t U_j(i) - \varphi^j{}_{min} \}, \qquad \textbf{(4)}$$

where F_j is the cumulative distribution function of φ^j and where $\alpha_j = \partial F_{jt} / \partial E_t U_j(o) = 1/(\varphi^j_{max} - \varphi^j_{min})$ is the sensitivity of the voting probability to a change in welfare.

Assuming that $[E_t U_j(o) - E_t U_j(i)]$ 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.[9] This last assumption plus the probabilistic nature of voting makes the objective function of each party globally continuous in its policy instruments.

3.3 Party objectives and political equilibrium

Parties choose policies to maximize expected votes or, equivalently, their expected plurality.

---

[9] If this were not true, and the probability that some voters will support one of the parties falls to zero, a Nash equilibrium may not exist since the objective function of the parties, defined immediately below, may not be sufficiently concave for a Nash equilibrium to exist.

With N_{t1} type1voters and λ_t (= N_{t1}/N_t) equalling the fraction of the population that is liquidity constrained, the expected number of votes that the opposition party maximizes is

$$EV_t(o) = N_t\ \lambda_t\ F_{1t} + N_t\ (1-\lambda_t)\ F_{2t.} \qquad \textbf{(5)}$$

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 relevant 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). Here we note that concavity is equivalent to assuming that each party can design a vote-maximizing platform and assume that the concavity condition required for the existence of a Nash equilibrium is satisfied.

In an equilibrium, then, policy platforms converge so that the identity of the party in power is incidental to the determination of policy. Strict concavity of the expected vote functions and the fact that from (4), voting depends only on utility differences, means that no party gains a lasting advantage by adopting a platform that differs from that of its opposition (see Enelow and Hinich 1989 for proof). Since party platforms converge in equilibrium, we may drop the subscripts identifying the individual party and refer only to the governing party or government.

A convenient and well-known feature of Nash equilibrium in the probabilistic voting framework is that policy choices can be characterized as the maximum of a political support function that is a particular weighted sum of individual expected utilities (Coughlin and Nitzan 1981, Hettich and Winer1999).[10] Substituting from above into the expected vote function (5), this theorem indicates that the equilibrium policy platform can found as the solution to maximizing the weighted sum of the expected indirect utility of the two types of voters ($E_t\,\mu^j$, j=1,2), subject to constraints (1a) and (1b):

[10] This representation theorem is discussed further in Ferris and Winer (2003).

$$\underset{\{g_t,\ldots,g_{t+s},g_{t+s+1}\ldots,t_t,\ldots t_{t+s},t_{t+s+1}\ldots,b_t,..b_{t+s},\, b_{t+s+1},\ldots\}}{\text{Max}}\ \mathcal{L}_t = \theta_{1t}\cdot \sum^{\infty}\beta^s E_t\, \mu^1[g_{t+s}(H(.)),\, c^*_{t+s}(H(.)),\, \ell^*_{t+s}(H(.));\, y_{t+s}]$$

$$+\ \theta_{2\,t}\cdot \sum^{\infty} \beta^s E_t\, \mu^2[g_{t+s}(H(.)),\, c^*_{t+s}(H(.)),\, \ell^*_{t+s}(H(.))] \qquad \textbf{(6)}$$

$$+\ \sum^{\infty} \psi_{t+s}\{\prod^s R^s\}[t_{t+s} + (b_{t+s} - b_{t+s-1}) - r_{t+s}b_{t+s-1} - g_{t+s}\ ]\ ,$$

where the expectation E_t is conditional on the information available at time t-1 and the summation runs from s = 0 to s = +∞. $R^s = 1/(1+r_{t+s})$, where r is the interest rate, and the political influence weights $\theta_1 = N_t\lambda_t\alpha_1$ and $\theta_2 = N_t(1-\lambda_t)\alpha_2$ are the population weighted derivatives in (4) that reflect the political sensitivity of voters in each group.

The intuition is straightforward. Unless this weighted sum of utilities is optimized, the opposition party can find a platform that will improve its chances of electoral success by making someone better off. Political competition insures that in equilibrium, no such platform remains. However, this does not mean that all voters are treated equally. In moving towards the Pareto frontier, every party will trade support from less politically sensitive voters for the support of voters whose political weight θ_j is relatively high.[11]

The problem set up in (6) implies that in equilibrium, public policy will balance the shorter and longer run interests of liquidity and non-liquidity constrained voters. This is an intertemporal extension of pluralist politics to a framework suitable for an investigation of Keynesianism.

4. Derivation of Estimating Equations and Testing for Keynes

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 may refer to vectors of long-run factors and transitory developments respectively. Accordingly, from (6) the first order conditions of an internal optimum for g_{t+s}, t_{t+s} and b_{t+s} at time t+s are:

[11] The support function is not a special type of welfare function. Rather the weights θ on utilities are determined *within* the model by voting behaviour, and not on the basis of some exogenous social norm.

$$\partial\mathcal{L}_t/\partial g_{t+s} = \beta^s\{\theta_1 E_t[\mu^1_g(H(x_{t+s}),y_{t+s})] + \theta_2 E_t[\mu^2_g(H(x_{t+s}))]\} - \prod^s R^s \psi_{t+s} = 0, \quad \textbf{(7)}$$

$$\partial\mathcal{L}_t/\partial t_{t+s} = \beta^s\{\theta_1 E_t[\mu^1_t(H(x_{t+s}),y_{t+s})] + \theta_2 E_t[\mu^2_t(H(x_{t+s}))]\} + \prod^s R^s \psi_{t+s} = 0, \quad \textbf{(8)}$$

$$\partial\mathcal{L}_t/\partial b_{t+s} = \beta^s\{\theta_1 E_t[\mu^1_b(H(x_{t+s}),y_{t+s})] - \theta_2 E_t[\mu^2_b(H(x_{t+s}))]\} - \beta^{s+1}\{\theta_1 E_t[\mu^1_t(H(x_{t+s+1}),y_{t+s+1})]$$
$$+ \theta_2 E_t[\mu^2_t(H(x_{t+s+1}))]\} + \prod^s R^s[\psi_{t+s} - \psi_{t+s+1}] = 0. \quad \textbf{(9)}$$

Here we see that in equilibrium, expected vote maximizing behaviour means that planned government spending, taxes and borrowing will be adjusted until each becomes equally productive at winning votes on the margin. These first order conditions can be used to determine the planned changes in the levels of policy variables over time in a political equilibrium[12]. 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 changes 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:

$$\left[\frac{E_t[\lambda\alpha_1\mu^1_t(x_{t+s};\ y_{t+s}) + (1-\lambda)\alpha_2\mu^2_t((x_{t+s})]}{E_t[\lambda\alpha_1\mu^1_t(x_{t+s-1};y_{t+s-1})) + (1-\lambda)\alpha_2\mu^2_t(x_{t+s-1})]}\right] = \left[\frac{(1+\rho)\ \psi_{t+s}}{(1+r_{t+s})\ \psi_{t+s-1}}\right] \quad \textbf{(10)}$$

To progress towards estimating equations, we add specificity to the indirect utility functions by assuming that individuals are distinguished only by the liquidity constraint: $\mu^1(x,y) = \mu^1(x) + \mu^1(y) = \mu^2(x) + \mu^1(y) = \mu^2(x,y)$. Then, as shown in the Appendix, after taking the logarithm of (10) we can rewrite the first order conditions for g as

$$\ln[\gamma E_t\mu^1_g(y_{t+s}) + E_t\mu^2_g(x_{t+s})] - \ln[\gamma E_t\mu^1_g(y_{t+s-1}) + E_t\mu^2_g(x_{t+s-1})]$$
$$= \rho - r^e_{t+s} + D[\ln\ \psi_{t+s}], \quad \textbf{(11)}$$

where we have used the approximation, $\ln(1+q) \approx q$ for $q = \{\rho, r\}$, $\mathbf{D}[\ln \psi_{t+s}] = \ln(\psi_{t+s}) - \ln(\psi_{t+s-1})$,

[12] Note from (9) that $\psi_{t+s+1} \neq \psi_{t+s}$. Even when $\partial(E_t\mu^2)/\partial b_t = 0$ for type 2 voters (who are indifferent to the level of debt), type 1 voters remain liquidity constrained with $\partial(E_t\mu^1)/\partial b_t \neq 0$. Government borrowing can then increase type 1 utilities by loosening individual budget constraints and thereby generate additional support. Such action is costly in terms of support from type 2 voters, however, so that the liquidity constraints will not be completely eliminated. One may also note that in a model of the sort used by Hall (1978), μ^1 is absent and $\psi_{t+s} = \psi_{t+s-1}$ since there are no impediments to shifting resources through time.

and where $\gamma = [N_t \lambda\alpha_1 /(N_t \lambda\alpha_1 + N_t (1-\lambda)\alpha_2]$, assumed constant, is the relative political weight of type 1, liquidity constrained voters in the political process.

Further progress can be made by linearizing (11) about its long run path $\hat{g} = g(x_{t+s}, x_{t+s-1}, y_{t+s}= 0, y_{t+s-1} = 0, ..)$ defined as government spending that would occur (given x) if all expected deviations from the long run path of the economy (the expected y's) were equal to zero. This is a natural choice as Keynesian stabilization emphasizes responses to expected shorter run or transitory economic developments. To more clearly distinguish between the role of liquidity constraints and longer run factors, the permanent component of g and the other policy variables will be defined to include the effects of wars.[13]

Because our results concern government plans, we now 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. Then, when the left side of (11) is linearized around $\hat{g}$ and the result is equated to the right side of (11) and rearranged, the following appealing estimating equations emerge (as shown in the Appendix):

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

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

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

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.[14] $\Delta(\Delta b_{t+s} - r_{t+s}\, b_{t+s-1})$ is the change in the real per capita deficit (net of interest paid to the private sector) and the ε's are error terms that reflect the mistakes made by governments in forecasting relevant information that in turn lead to deviations of

[13] Our long run components of policy thus differ from those of Barro (1986) where the permanent components are defined to exclude war.

[14] The transitory parts of the equations are more specific about adjustment around the long run path than is, for example, an error correction model. The specificity arises here because of the structure implied by the political tradeoffs between the interests of liquidity and nonliquidity constrained voters.

planned and actual changes in policy instruments. As an implication of the government budget constraint in (1a), $\beta_i = (\gamma_i - \tau_i)$ for all i. Finally $\varepsilon^g_{t+s} = (\Delta g_{t+s} - \Delta g^e_{t+s})$ is the difference between the actual and the predicted government spending (permanent plus transitory) and ε^t_{t+s} and ε^b_{t+s} are defined analogously. Hence the government budget restraint also implies that $\varepsilon^b_{t+s} = \varepsilon^g_{t+s} - \varepsilon^t_{t+s}$.

Note that the errors may be correlated over time if aggregate shocks are, but should be stationary since we are modelling an equilibrium system. The errors will also be uncorrelated with all explanatory variables if the forecasting of the government is rational in the sense that no information available at time t+s-1 could be used to improve forecasts of activity in the next period.

A detailed derivation of the estimating equations is provided in the Appendix. Here we explain the equations intuitively by first noting that the first differences in the variables appear because the linearization of (11) and its counterparts for taxation and the net deficit begins with the log of the ratio of first order conditions (i.e., the Euler Equation). The Δy^e_{t+s} terms in the transitory part in square brackets reflect directly the political concern with the interests of liquidity constrained voters, while the terms in Δx^e_{t+s} arise as a result of the trade-offs that must be made between the interests of these voters and those who are not liquidity constrained. The interest rate, relative to voters' common rate of time preference (present in the equations' constant terms), reflects the intertemporal nature of the optimizing decisions undertaken by the political parties.

The nature of the transitory components in equations (12)-(14) can be better understood by considering the reasons why Δg^e may differ from its long run value. This discussion also leads to predictions about the signs of the coefficients of the transitory part of the equations, which are derived formally in the Appendix (after further linearization):

- The first reason for Δg^e to depart from $\Delta \hat{g}$ is a pure liquidity effect. This appears as the third term in the square brackets in (12) and incorporates reactions to expected transitory changes. Because an expected increase in transitory income diminishes the scale of the liquidity constraint, it reduces support for government spending and results in a smaller change in g. Consequently, the coefficient γ_3 on Δy^e_{t+s} in (12) is expected to be negative. Correspondingly, we expect $\tau_3 > 0$, and hence $\beta_3 < 0$.

- The second reason arises because current spending will also adjust to changes in the permanent variables and this effect is the fourth term in square brackets. Because the government responds to the intertemporal wishes of voters, expected increases in x lead individuals to want additional consumption and to have it spread smoothly over time. Assuming reasonably that $(\partial y/\partial g_{t+s})^e > 0$, such actions reduce the magnitude of liquidity problems as a by-product and thus moderate the need for spending to deal with shorter run problems. The coefficient γ_4 on Δx^e_{t+s} in (12) should therefore be negative. For similar reasons we expect $\tau_4 > 0$ and $\beta_4 < 0$.

- The third reason for Δg^e to depart from $\Delta \hat{g}$ is when r_{t+s} changes relative to voters' rate of time preference, ρ. For example, if the interest rate falls relative to ρ, individuals prefer more of their consumption earlier. The resulting increase in government spending reduces the need for current spending to deal with liquidity problems. For this reason we expect the coefficient γ_2 on r_{t+s} in (12) to be positive, and, for similar reasons $\tau_2 < 0$ and $\beta_2 > 0$. Note, however, that the coefficient on the interest rate will also pick up the short run effects on the net deficit of changes in the cost of carrying existing debt, so we must remain agnostic about the sign of r_{t+s}.

4.1 *Testing for Keynes*

The model outlined above predicts political policy responses to the demands of liquidity and non-liquidity constrained voters. The question now arises: what exactly is Keynesianism in this framework and how would the strength of Keynesianism in public policy be assessed? Because competitive political parties will not undertake a new direction in policy unless that innovation has popular support, we must address the way in which individuals believe that Keynesian policy can improve their welfare.

One way that textbook Keynesian as illustrated in Figure 1 could arise is through the enhanced appreciation by individual voters of the role government can play as an agent for internalising the externalities inherent in liquidity constraints. In this sense Keynesianism follows Leijonhufvud's (1968) interpretation of Keynes. Greater recognition of both the feasibility and desirability of using government to increase expected utility when ye falls (i.e., when liquidity constraints become more binding) increases the political benefit of using fiscal policies and so leads government spending (taxes, and the deficit) to temporarily depart further from its equilibrium path. This interpretation implies that the coefficient on Δy^e_{t+s}, which directly reflects the political benefit of accommodating liquidity constrained voters, will increase in absolute value in the estimating equations 'after

Keynes'.[15] Thus with $\gamma_3 < 0$ in (12) and $\tau_3 > 0$ in (13), both the negative correlation between $(\Delta g_t - \Delta \hat{g}_t)$ and Δy^e_{t+s} and the positive correlation of $(\Delta t_t - \Delta \hat{t}_t)$ and Δy^e_{t+s} will be stronger. Correspondingly, the implied negative correlation for the deficit will also be larger.

A test for Keynesianism in the above sense can now be implemented as follows. Consider the differential policy process D_g defined as

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

where the counterfactual is a prediction of what ex ante transitory policy for the period after World War II would have been if the data generating process governing pre-Keynesian policy had continued to apply. (D_g is then the first difference of the policy differential shown in Figure 1). Similar policy differentials for taxation, D_t, and for the net deficit, $D_{\Delta b}$, can also be defined. Then if an increase in y^e loosens the liquidity constraint and so generates welfare for liquidity constrained voters, our model implies that D_g will be negatively correlated with Δy^e if textbook Keynesianism has been attempted. And such a countercyclical pattern for D_g would be revealed by a negative coefficient on Δy^e in a regression explaining D_g (outlined below). Exactly the opposite, or pro-cyclical pattern of D_t with respect to Δy^e, would be observed for taxes. Finally, because D_g moves counter-cyclically and D_t pro-cyclically, $D_{\Delta b}$ will move counter-cyclically like spending since $\Delta b - rb_{-1} = \Delta g - \Delta t$, $D_{\Delta b} = D_g - D_t$. We note for later use that y^e is sometimes measured as the deviation of the unemployment rate from its trend. In this case a positive expected deviation will tighten the liquidity constraint and reverse the predicted coefficient signs in the policy differential regressions.

Finally, notice that by construction, our policy differentials will capture all political responses

[15] The Appendix demonstrates (with some further linearization) that a rise in the expected marginal utility $E\mu^1_g$ from public spending will increase the absolute value of the coefficients on Δy^e_{t+s} in (12)-(14). A rise in the expected utility generated by government action, however, must be distinguished from an increase in the effectiveness of fiscal intervention, i.e., a rise in $\partial y/\partial g_{t+s}$. As shown in the Appendix, such a productivity shock *reduces* intervention. Because the channelling of resources to type 1 voters reduces the support from type 2 voters, the government can increase overall support by easing back on its intervention. In assessing this argument, it should be recalled that voters demand welfare, not intervention per se. Thus, by analogy, when the marginal cost of 'light' (or changes in welfare) falls because 'light bulbs' (fiscal interventions) now 'burn' twice as long, more hours of 'light' are demanded but fewer 'light bulbs' are used, assuming demand for 'light' is downward sloping. Finally, for completeness, we note that a change in the proportion λ of liquidity constrained voters yields ambiguous effects on fiscal policy.

to changes in aggregate activity for motives that may have nothing to do with stabilization. They do not explicitly allow for events like the growing importance of income taxation or the expansion of the welfare state following 1945 that *may* be unrelated to Keynesian ideas, and which may have affected the sensitivity of the fiscal system to transitory shocks. We allow for these possibilities explicitly in the empirical work, in a manner to be discussed below.

5. Estimation

Before implementing the model of planned fiscal policies and the associated test for Keynesianism, it is of interest to look at the history of the fiscal system that we are exploring.

[Figure 2 here]

At first glance, Figure 2 suggests that the volatility of the fiscal system of the Government of Canada was greater after World War II than before. But this may be an illusion as far as **g** and **t** are concerned. The coefficients of variation given in the table below the figure for the 1871-1913, interwar and 1950-2000 periods indicate that public spending and taxation are about as volatile after the second war as they were before the first.[16] On the other hand, the volatility of the net deficit is about 7 times larger after 1950 as before 1914. Since the volatility of real income per capita growth after 1950 is less than half of what it was prior to WW I, it is tempting to conclude on this evidence that Keynesianism via deficit financing played a role in stabilizing the real economy. Whether or not the methodology outlined above confirms that such stabilization was *attempted* remains to be seen.

5.1 Four steps

It is convenient to summarize the empirical implementation of our framework in four steps.

***Step One**: Specify a long run model of fiscal policy and construct estimates of both permanent income x^e and of the expected transitory shocks y^e.*

The two parts of step 1 are closely related and are completed together. To begin, the political

[16] It should keep 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 adjustment over the business cycle.

parties form their estimates of the longer run components of fiscal structure as well as of x^e and ye using the same information set in each case (although the weights placed on the members of this set may vary with the variable being forecast). A useful way to choose what should be included in the information set is by considering the determinants of the long run size of government and its financing, since the literature on this topic is well-established. The statistical properties of the variables identified can then be considered and a model of long run income estimated and then used to construct forecasts of expected transitory changes. It should again be noted that the latter are not surprises, but ex ante guesses at forthcoming shorter run developments.

The long run fiscal system is not estimated at this point. Rather we combine the estimation of the permanent and transitory elements of fiscal structure together in the next step. Before doing so, however, we will discuss the expected signs of the coefficients in a long run model of fiscal structure as this will be useful in assessing the results from the full model that are presented later.

Perhaps the most prominent hypothesis associated with permanent government size is Wagner's Law: that increasing social complexity results in an income elasticity of government spending that is greater than one. Following Mueller (2003,509), we incorporate Wagner's Law by including both the forecasted change in real income per capita x^e and urbanization as determinants of government size and financing. Because urbanization itself 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 then expected in the long run part of the full model of government. We return to the role of income below.

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 less than a proportionate expansion in expenditure, suggesting a positive coefficient with elasticity less than one. On the tax side, however, publicness means that a larger population lowers the marginal tax price of both current and future taxation and may induce larger expenditure, so we cannot predict the sign.

The immigration to population ratio (IMMRATIO) is another demographic characteristic that may shape long run government size and financing in a country like Canada where immigration flows have been substantial, especially before the First World War. The sign here cannot be predicted for the same reasons as with POP.

Many studies of the long run size of government also find that the age structure, as measured by the proportion of the population that is old, has a positive effect on government size. Here we have available from 1870 only the proportion of the population that is less than 17 years old (%YOUNG) which is expected to behave 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 current taxation, though such self-interest will be tempered by concern with one's children. We expect %YOUNG to be associated with less spending and debt and with more taxation.

Another variable that has come into some 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 result in a larger size of government as a form of insurance (see Rodrik 1998). On the other hand, openness may enforce fiscal discipline in order to maintain international competitiveness (Borcherding, Ferris and Garzoni, 2003), leading perhaps to the opposite sign in the long run part of the 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 I (WWI), World War II (WWII) and the oil shock of the mid 1970's (OILPERM, = 1 from 1974 on). We also include dummies WWI-aftermath (= 1 for 1919-22) and WWII-aftermath (=1 for 1946-49) to allow for the rapid restoration of a peacetime economy.

Finally, in forecasting both the long run size of government and permanent income, Canadian politicians must take into account the longer run development of 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 permanent income than is current income.

The variables identified so far are listed in Table 1b, where the long run model for real income per capita is specified. We will use the same set of explanatory variables given in the table to model the permanent components of fiscal structure - that is, including USCON but excluding Canadian real income. It will become clear shortly why we find it useful to substitute Canadian income out of the model for long run fiscal structure using its reduced form forecasting equation.

The statistical properties of the logs of the variables we have identified are given in Table 1a.[17] In terms of their time series properties, almost all variables are integrated of order 1, becoming stationary only after first differencing. The exception is log (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 x 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 the equation. The cointegrating regression in levels is presented in Table 1b, for the entire time period 1871-2000.[18] As well, Table 1b presents the model estimated over the two individual subperiods - before and after WWII. This allows for a structural shift in the relationship (whose presence is confirmed by the reported F test). Tests of the equation residuals indicate stationarity in all three cases[19,20]. The unlogged, forecasted values from these regressions then form the basis for our estimates of x^e and y^e. An unconstrained distributed lag on the forecast (of real per capita income x) from the model in Table 1b, using a current value and two lags, is used to represent

[17] The log of the net deficit does not appear here because the net deficit is often negative.
[18] Table 1b also presents the equation for the whole period estimated via Saikkonen's (1991) method . However, the original cointegrating regressions in cols 2, 4 and 5 are used in subsequent steps as the basis for forecasts.
[19] Cointegration, as judged by stationarity of the residuals, is not inconsistent with the structural shift implied by the use of dummy variables if some of the right side variables also undergo the shifts needed to maintain cointegration.
[20] It appears that g and t can also be described as stationary in levels with a shift in the constant and slope. Following Perron (1997, 358, model 2) in using the minimization of the t-statistic for the test of the null that the coefficient on the lagged dependent variable is equal to one, the shift appears to occur sometime during WWII. This provides some ancillary support for estimating the model in two pieces.

expected long run income, x^e. A distributed lag on calculated transitory income $y = x - x^e$, again using the current and two lagged values, is used to model expected transitory developments y^e on which policy-makers act in formulating their stabilization and other policies. Similarly in what follows, r^e is proxied using a distributed lag on real interest rates r.

Step two*: Estimate the full model (12) - (14) as a system over two periods, one 'before Keynes' (1875-1938) and one 'after Keynes' (1950 - 2000). Use the results to estimate the ex ante transitory or shorter run components of fiscal structure.*

After the estimates of expected activity have been formed, the full model containing both permanent and transitory components can be estimated over the two periods, one 'before' and one 'after' Keynes. The transitory components can then be extracted. The estimated model of these components in the first (1875-1938) period is then used in the next step to construct the counterfactual. Our analytical framework indicates that these (Euler) equations should be in first difference form.

Perhaps because of the common pattern of growth throughout our long time period, the levels of the fiscal variables, g, t, $(\Delta b - r\, b_{-1})$, together with the explanatory variables identified in step one are integrated of order one, over the whole sample as well as for shorter sub samples (before and after WWII). The exceptions are POP and USCON which are I(2). Here then we utilize the fact that both the fiscal structure and our explanatory variables become stationary only in first differences to estimate the model of the permanent parts of fiscal structure in first difference form, with the *two* I(2) variables on the right side allowing the error term in the equations to remain stationary. This then fits nicely with our model of the transitory components, which is also specified in first difference form.

One approach to estimating equations (12) - (14) is to use the forecasts from a separately estimated long run model for fiscal structure (discussed above) to measure the permanent components of policy, and then estimate the transitory parts using the differences $[\Delta g_{t+s} - \Delta \hat{g}_{t+s}]$, $[\Delta t_{t+s} - \Delta \hat{t}_{t+s}]$, and $[\Delta(\Delta b_{t+s} - r_{t+s} b_{t+s-1}) - \Delta(\Delta \hat{b}_{t+s} - r_{t+s} \hat{b}_{t+s-1})]$. A better approach, in our view, is to estimate both long run and short run components together, allowing the two parts to interact and also

avoiding the use of generated regressors. 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 policy differentials D_g, D_t and $D_{\Delta b}$. To allow this 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. It was for this reason that we solved x^e out of the model of the long run components in step 1, as discussed earlier.[21, 22]

Table 2 presents three stage least squares estimates (3SLS) of the full model for 1875-1938 and 1950-2000.[23] Here contemporaneous values of the real interest rate r and of the change in transitory income Δy, are treated as endogenous, given our use of annual data, since they may depend to some extent on current policy choices, and the estimates of income used are those derived from estimation over the two periods given in Table 1b. Unconstrained distributed lags in the transitory parts allow for expectations formation by the government and for lags in policy implementation. We generally used the longest lag possible in each case, an approach that is tempered by degrees of freedom considerations.

Because the equations are the result of political optimizing by the same political party, they will all be symmetric on the right side. This structure is helpful. As long as the instruments used are the same across equations, the government budget restraints (1a) are automatically enforced and 3SLS is equivalent to equation-by-equation application of two-stage least squares.

[Table 2 here]

We consider the variables in the transitory part of the model first, beginning with the signs on

[21] In Ferris and Winer (2003) the first route was followed. There the forecast of the transitory part required that the long run effect of income be 'taken out' to get at the transitory part alone.

[22] Consideration of the role of the factors underlying the long run identified in step one is one useful check on the results of estimation. The sign restrictions for the (sum of) coefficients of Δy^e and Δx^e in (12)–(14) stated earlier provide a further way of assessing the results.

[23] Time periods differ from those in Table 1b due to the use of 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.

Δy^e and on Δx^e. These are as predicted for the 1950-2000 period, whether one considers significant coefficients or the sum of all coefficients. 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 the policy processes differ before and after the second war. It appears that governments before WWII did respond to expected short and longer run changes in aggregate activity, and did so pro-cyclically. Though if one judges by the absolute size of coefficients, the responsiveness was substantially less before1939 than after1950. An alternative interpretation of these results is that governments 'before Keynes' placed little weight on the interests of liquidity constrained voters while the coefficients on Δy^e and Δx^e pick up short and long run responses to changes in the demand for government spending and its financing, rather than short run trade-offs between the interests of the two voter types.

The estimated long run components of the equations are shaded grey in Table 2. Generally the model of the longer run components works well. Here we see that urbanization, proxied by AGRIC**,** has its predicted negative effect in the early period when urbanization was most pronounced and has no significant effect after. In contrast, Mueller (2003 chapter 21) reports limited success in the literature as a whole with such a variable. The proportion of young voters (%YOUNG) has its predicted negative sign in the second period, implying that spending and debt rise as the population ages, 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 sign for taxation in the later period is also positive, but it is 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.

The coefficients on POP suggest that evidence of 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. Moreover, coefficients on IMMRATIO are only negative (but insignificant) for debt in the second period, and are positive and significant for spending (in the early period) and for taxation (in both periods).

Finally, we note that the estimates indicate that after WWI, the post-war readjustment of spending and taxation was insufficient to offset wartime increases, implying the existence of a Peacock-Wiseman (1961) displacement effect after 1918. Dudley and Witt (2002) recently find a similar result concerning the First World War for a sample of western countries. We also see that the OPEC shock and its aftermath led to a contraction in the long run size of government.

Step three: *Use the transitory part of each estimated equation in Table 2 'before Keynes' to forecast into the period 'after' 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 'after Keynes' model of 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 Figure 3. Inspection of this interesting figure suggests the absence of trends and a shift about 1980 in the volatility of the differentials.[24] (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 be coincident with rapidly rising expenditure and debt and declining taxation relative to the counterfactual. We also see a similar but less pronounced pattern during the period of high unemployment (at least for the time) between 1957 and 1960.[25] On the other hand, in the four years following the OPEC oil embargo when unemployment rose continually, Dg was declining and D_t rising.

[Figure 3 here]

Step 4: *Regress* D_g*,,* D_t*, and* $D_{\Delta b}$ *on the transitory shocks to which the government may have responded in formulating stabilization policies, making due allowance for the possibly unrelated (to Keynesianism) rise of the welfare state after World War Two.*

---

[24] The policy differentials are stationary at least at 5% using a univariate ADF test with a constant and with a trend for the debt differential.

[25] It is interesting to note that in 1961 the Governor of the Bank of Canada resigned, in large measure because he did not agree with the government's avowed Keynesian policy stance. Scott Gordon, who is quoted in the Introduction, was instrumental in the academic movement to oust the Governor.

The final step formally tests for the presence of Keynesian elements in ex ante shorter run or transitory policy. Here we regress the calculated policy differentials on expected changes in transitory activity and variables that control for the greater cyclical sensitivity of the fiscal system due to the rise of the welfare state. Unconstrained lags in these variables allow for expectations formation and for decision and bureaucratic delays, leading to a sample that extends from 1952 to 2000. Preliminary exploration using sequential Chow tests on the ordinary least square versions of these equations, as well as the prior inspection of Figure 3, suggests allowing for shifts in the constant and in the slopes of the regressions.[26]

Given the importance attached to unemployment in public debate, we use unemployment rates to represent the expected transitory activity to which stabilization policy (if it exists) is tailored.[27] Specifically, we define Δy^e_u 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. Unlike transitory income, a positive value for Δy^e_u now represents a tightening of liquidity constraints. Thus a *(significantly) positive* sign on the sum of lags of Δy_u in the policy differential equation for spending implies that spending expands when the change in unemployment is expected to be 'high'. Together with a *negative* sign for taxation, and/or a *positive* sign in the deficit equation, this coefficient pattern would imply that planned transitory policy 'after Keynes' exhibits textbook Keynesian stabilization relative to the counterfactual.

To control for the growing influence of income taxation and the welfare system on the cyclicality of fiscal instruments, we employ an additional variable and its lag in the regressions: D(autoT) = [the lagged value of the four year moving average of the ratio of personal income tax

[26] It may also be noted that Hansen (1992) stability tests on the OLS versions of the policy differential regressions which exclude the shift in constant and slopes sometimes indicates instability of some coefficients. The instability largely disappears when the shifts in 1980 are incorporated.

[27] The unemployment rate cannot be used at prior stages since it is available only from 1919, while estimation begins with data for 1870. In assessing statistical significance in the regressions in Table 3, it should be noted that that Δy^e_u is not generated by a prior regression.

revenue to total tax revenue] *times* [the contemporaneous change in real income per capita]. By construction, this variable directly reflects the growing importance of the income tax after the war. In addition it is made to depend on total income rather than on a deviation from some trend, since taxes respond to the total change. D(autoT) is highly correlated with a second variable that we considered for structural change on the expenditure side - the moving average ratio of personal transfer payments to total government spending times the change in the unemployment rate. Hence D(autoT) can be used to reflect the sensitivity of fiscal policy to economic fluctuations on both sides of the budget.[28, 29]

It is important to note that D(autoT) is not a measure of the automatic part of fiscal policy in the traditional sense. It controls for the influence of the welfare system on cyclical sensitivity of the budget, when the welfare system is *assumed* to be unrelated to Keynesianism. What matters in the present context is whether or not the welfare state (or the income tax) evolved as part of a broader Keynesian enterprise of the sort discussed, for example, by Hall (1989). Since it can be argued that Keynesian thinking made it easier to adopt cyclically sensitive fiscal institutions after 1945, we also present the policy differential equations without D(autoT) in panel two of Table 3. These shorter equations then embody a test for Keynes when it is *assumed* that the design of the welfare state was fully part of Keynesianism. A reasonable guess is that the truth about Keynesianism lies somewhere in between the two sets of results.

We also estimate the policy differential equations using only the estimated ex ante transitory components of fiscal structure 'after Keynes', and then only with the 'before Keynes' components from Table 2 as the dependent variables. These regressions are presented in panels three and four of

---

[28] Over 1950-2000, D(autoT) and its analogue for transfers to persons - D(autoG) = (the lagged four year moving average of the ratio of transfers to persons to non-interest spending) **times** (the contemporaneous change in the unemployment rate) - has a correlation of -0.71. The correlation of D(autoG) with the measure of transitory activity Δy^e_{ut} is 0.88, while the correlation of D(autoT) with Δy^e_{ut} is -0.61. Hence to reduce the problem of collinearity in the policy differential regressions, we used D(autoT) together with Δy^e_u.

[29] Unlike Δy^e_u, D(autoT) is not interacted with a shift in 1980 since by design it allows for changes in the structure of the fiscal system over time and adjusts in a manner proportional to the size of economic fluctuations.

Table 3 respectively. Comparison of these regressions with those in panel one shows how the use of the counterfactual affects our conclusions, and illustrates the differences between the nature of ex ante policy before and after the second war.

Finally, we use two lags on Δy_u and one on D(autoT) in the policy differentials. Further lags lead to degrees of freedom problems. The current values of Δy_u and of D(autoT) are instrumented to allow for simultaneity with contemporaneous fiscal policies 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.

With this background, we turn to the results of the three-stage estimation of the policy differential equations (again equivalent to 2SLS in this symmetric case) over the 1952-2000 period. Our discussion of the results in Table 3 is based initially on consideration of the coefficients on Δy^e_u and its lags. We consider the quantitative importance or size of any Keynesian policy implied by the point estimates later.

[Table 3 here]

Panel one of Table 3 presents the policy differential regressions when the regressions control for the (assumed) unrelated role of the welfare state. Judging by the sum of significant coefficients on the current and lagged Δy_u reported in the shaded column, we find textbook Keynesianism in all policy instruments on average over the period after 1952 as a whole. On average, spending and the net deficit rose and taxes fell *relative to the counterfactual* when Δy^e_u was positive.

Panel one also shows that policy was less Keynesian in nature before1980, as taxation and the deficit, but not spending, are procyclical if we consider only significant coefficients in the early period. This aspect of the results in panel one are reminiscent of the Canadian automatic /discretionary literature referred to earlier in section two. One should recall here that evidence based

on pre-1980 data omits responses to the major recessions of the post-1945 period.[30]

Panel two of the table presents the policy differential regressions when D(autoT) is dropped from the regressions, so that the welfare state is now viewed as fully part of the Keynesian revolution. Here we see that attempts at stabilization are much more strongly evident in the data. Judging again by the sum of significant coefficients, the results in panel two exceed by a factor of three the results in panel one for the case of taxation (reflecting the income sensitivity of taxation), and by two times for the case of the deficit.[31]

Panel three of Table 3 presents results when the need for a counterfactual is ignored, and only the ex ante transitory components of policy 'after Keynes' are used as dependent variables. These results also look traditionally Keynesian, though less so than when the counterfactual is incorporated. For both spending and the deficit, the *difference* in results between panels one and three amounts to about 18-20 per cent of the amount in panel one, and about 7 percent for taxation. Finally, we note that the sums of significant coefficients in panel four suggest that if the 'before Keynes' regime was in place after 1952, policy would have been on balance mildly procyclical and thus would have been much more 'conservative' than ex ante policy actually was. This difference in the nature of fiscal policy before and after Keynes is a reflection of the statistically significant differences in regimes uncovered previously in Table 2.

5.3 *Significance versus importance and further sensitivity*

Statistical significance one thing and economic importance is another. It is possible that Keynesian stabilization was implemented but in magnitudes that were, for all practical purposes, irrelevant. In our results, however, the magnitudes involved appear to be substantive. To consider the matter, we use the policy differential regressions to calculate the effect on ex ante policy of a one

---

[30] Concerning panel one, it is interesting to note as well that the constant terms document a longer run shift in policy after 1980, involving less spending, less debt, and more taxation, on average, despite the pronounced role given to stabilization.

[31] Comparison of panels one and two confirms that D(autoT) in panel one does capture the effect of the cyclical sensitivity of taxes and transfers.

standard deviation change in the expected transitory part of unemployment. (This standard deviation is 1.52 percentage points, as shown in Table 4b.) The results of applying this change to the models in panels one and two of Table 3 are shown in the first two columns of Table 4a.

Using panel one, where the welfare state is assumed entirely unrelated to Keynesianism, a one standard deviation increase in Δy^e_u results in a change in the deficit of between $183 per capita and $222 per capita, depending on whether only significant coefficients or all coefficients are used. This is an amount that is about equal to one standard deviation in the estimated transitory part of income y (= actual income less estimated income x from Table 1b) over the 1952-2000 period recorded in Table 4b. The changes in g and t 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 even larger. In the case of the deficit, the change from $367 to $428 is about 1.75 to two 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 four major steps using estimates of permanent and transitory income based on the whole period from 1871 to 2000, instead of estimating separately over two samples, before and after WWII. This produces forecasts of income with a bigger variance, as shown in Table 4b, and is, in our view, a less desirable procedure 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 change in unemployment are given in Table 4a. Considering the results using all coefficients in column four, we see that the deficit changes by about 10% (90/887) of a standard deviation in the corresponding transitory income given in Table 4b. This rises to about 22% (198/887) when the welfare state is included as part of Keynesian policy. These results illustrate that it matters how one chooses to model both the long run evolution of the economy as well as the components of ex ante fiscal policy.

6. Conclusion

While the *General Theory* has undoubtedly influenced how economists, politicians and voters think about intervention, whether policy has actually changed in response to the introduction of Keynesian ideas is another matter. In this paper, we consider the procedures needed to search meaningfully for evidence of systematic attempts at Keynesian fiscal stabilization. In essence, the task requires, first, the construction of a counterfactual that illustrates what *planned* policy would have been 'after Keynes' had Keynesian stabilization not been attempted and, second, the separation of *ex ante* policy choices in political equilibrium into permanent and transitory components. Finally, all of this must be developed within a framework where there is a reason why Keynesian stabilization might generate political support from some voters. While the investigation requires a number of difficult conceptual choices at various points, the methodology we have developed for studying the evolution of the public finances over long periods of time leads to interesting insights into Canadian fiscal history, and could be applied to study the fiscal history of other countries as well.

Budgets in a democratic state are always the result of extensive political dealing. They embody implicit contracts that, because of negotiation costs, are costly to vary quickly through time. For such reasons, it would not be surprising to find that the degree of stabilization that actually occurs over the business cycle is small. In this regard, then, it is both interesting and significant that our analysis has found that, relative to a counterfactual and even assuming the welfare state is unrelated, Keynes' ideas can be judged to have had a substantial, systematic effect on shorter run fiscal policy choices, especially over the last two decades or so in Canada. Judging the extent to which these attempts at stabilization have been successful or are appropriate in the circumstances are other matters that remain outstanding problems for political economy. We hope that our analysis will be helpful in allowing further progress on these issues, as well as on others where a positive model of the public finances is required.

References

Alt, James E. and K. Alec Chrystal (1983). *Political Economics.* Berkeley: University of California Press.

Barro, Robert J. (1979). "On the Determination of the Public Debt." *Journal of Political Economy* 87 (5), 940-971.

Barro, Robert J. (1986). "U.S. Deficits since World War II". *Scandinavian Journal of Economics* 88 (1), 195 - 220.

Borcherding, Thomas E., J. Stephen Ferris and Andrea Garzoni (2004) "Changes in the Real Size of Government Since 1970", in Juergen Backhaus and Richard Wagner (eds.), *Kluwer Handbook in Public Finance* New York: Kluwer Academic Press. Forthcoming.

Boothe, Paul and M. Davidson (1993). "Fiscal Stabilization in a Federal State". University of Alberta Discussion Paper 93-12.

Boothe, Paul and Jeffrey Petchy (1996). "Assigning Responsibility for Regional Stabilization", in P. Boothe (ed). *Reforming Fiscal Federalism for Global Competition: A Canada-Australia Comparison*. University of Alberta: Western Studies in Economic Policy, 141-162.

Brenner, Reuven (1994): *Labyrinths of Prosperity: Economic Follies, Democratic Remedies.* Ann Arbor: University of Michigan Press.

Bryce, Robert B. (1986). *Maturing in Hard Times*. Kingston and Montreal: McGill-Queens University Press.

Buchanan, James M. and Richard E.Wagner (1977). *Democracy in Deficit: The Political Legacy of Lord Keynes*. New York: Academic Press.

Campbell, John and N. Gregory Mankiw (1990), "Permanent Income, Current Income, and Consumption". *Journal of Business and Economics Statistics*, 8(3), 265-79.

Campbell, Robert M. (1987). *Grand Illusions: The Politics of the Keynesian Experience in Canada, 1945-1975*. Peterborough: Broadview Press.

Campbell, Robert M. (1991). *The Full-Employment Objective in Canada, 1945-85*. Ottawa: Economic Council of Canada.

Canova, Fabio (1998). "Detrending and Business Cycle Facts". *Journal of Monetary Economics* 41, 475-512.

Coughlin, Peter J. and Shmuel Nitzan (1981), "Electoral Outcomes with Probabilistic Voting and Nash Social Welfare Maxima," *Journal of Public Economics,* 15 (1) February, 113-21.

Coughlin, Peter J., Dennis C. Mueller and Peter Murrell (1990). "A Model of Electoral Competition with Interest Groups". *Public Choice* 32, April, 307-311.

Cukierman, Alex and Allan H. Meltzer (1989). "A Political Theory of Government Debt and Deficits in a Neo-Ricardian Framework." *American Economic Review* 79(4): 713-32.

Department of Reconstruction (1945), *Employment and Income with Special Reference to the Initial Period of Reconstruction.* Ottawa: Queens Printer.

Dudley, Leonard and Ulrich Witt (2002). Yesterday's Games: Contingency Learning and the Growth of Public Spending, Unpublished, University of Montreal, 2002.

Enders, Walter (2004). Applied Time Series Econometrics, second edition. Wiley.

Enelow, James M. and Melvin J. Hinich (1989). "A General Probabilistic Spatial Theory of Elections." *Public Choice* 61(2): 101-13.

Eviews 4.1 *User's Guide*, Quantitative Micro Software, 2000.

Ferris, J. Stephen and Stanley L. Winer (2003). "Searching for Keynes: With Application to Canada, 1870-2000". Munich: CESifo Working Paper No. 1016, August.

Gillespie, W. Irwin (1979). " Post war Canadian Fiscal Policy Revisited, 1945-1975". *Canadian Tax Journal* 27(3): 265-276.

Gillespie, W. Irwin (1991). *Tax, Borrow and Spend: Financing Federal Spending in Canada, 1867 - 1990.* Ottawa: Carleton University Press.

Goff, Brian L. (1998). Persistence in Government Spending Fluctuations: New Evidence on the Displacement Effect." *Public Choice* 97, 141-157.

Goff, Brian L. and Robert D. Tollison (2002). "Explaining U.S. Federal Deficits: 1889-1998". *Economic Inquiry* 40(3), 457-469.

Gordon, H. Scott (1965), "A Twenty Year Perspective: Some Reflections on the Keynesian Revolution in Canada", in S. F. Kaliski (ed.), *Canadian Economic Policy Since the War.* Montreal: Canadian Trade Committee.

Hall, Robert E. (1978). "Stochastic Implications of the Life Cycle--Permanent Income Hypothesis: Theory and Evidence," *Journal of Political Economy,* 86, 971-87.

Hall, Peter A. (1989). *The Economic Power of Ideas: Keynesianism Across Nations.* Princeton University Press.

Hansen, Bruce E. (1992). "Testing for Parameter Instability in Linear Models," *Journal of Policy Modelling*, 14 (4), 517-533.

Hettich, Walter and Stanley L. Winer (1999). *Democratic Choice and Taxation: A Theoretical and Empirical Analysis*. New York: Cambridge University Press.

Hinich, Melvin J. And Michael C. Munger (1994). *Ideology and the Theory of Political Choice.* Ann Arbor: University of Michigan Press.

Holtz-Eakin, Douglas, Harvey Rosen and Schuyler Tilly (1994). "Intertemporal Analysis of State and Local Government Spending: Theory and Tests," *Journal of Urban Economics*, 35, 159-74.

Kenny, Lawrence, W. and Mark Toma (1998), "The Role of Tax Bases and Collections Costs in the Determination of Income Tax Rates, Seignorage and Inflation" *Public Choice,* 97.

Keynes, J. M. (1964). *The General Theory of Employment, Interest, and Money*. New York: Harcourt, Brace and Jovanovich (originally published in 1936).

Kneebone, Ronald and Ken McKenzie (1999). *Past (In) Discretions: Canadian Federal and Provincial Fiscal Policy*. Toronto: University of Toronto Press.

Leijonhufvud, Axel (1968). *On Keynesian Economics and the Economics of Keynes. A Study in Monetary Theory*. London: Oxford University Press.

Mueller, Dennis (2003). *Public Choice III*. Cambridge University Press.

Pagan, Adrian (1984)."Econometric Issues in the Analysis of Regressions with Generated Regressors" . *International Economic Review* 25(1), 221-247.

Peacock, Alan and Jack Wiseman (1961). *The Growth of Public Expenditure in the United Kingdom*. Princeton University Press.

Perron, Pierre (1997). "Further Evidence on Breaking Trend Functions in Macroeconomic Variables". *Journal of Econometrics*, 80 (2), 355-83.

Prachowny, Martin J. (2000). *The Kennedy-Johnson Tax Cut: A Revisionist History*. Cheltenham: Edward Elgar.

Rich, Georg (1988). *Cross of Gold: Money and the Canadian Business Cycle*, Ottawa: Carleton University Press.

Rodrik, Dani (1998). "Do More Open Economies Have Bigger Governments?" *Journal of Political Economy* 106(5), 997-1032.

Roemer, John (2001). *Political Competition.* Harvard University Press.

Saikkonen, Pentti (1991). "Asymptotically Efficient Estimation of Cointegration Regressions." *Econometric Theory* 7, 1-21.

Shazam *User's Reference Manual Version 9.0*. Northwest Econometrics, 2001.

Skidelsky, Robert (1995, 2000). *John Maynard Keynes Vol 2 - The Economist as Saviour, and John Maynard Keynes Vol 3 - Fighting for Britain, 1937-1946.* Macmillan.

M.C. Urquhart (1993) *Gross National Product, 1870-1926,* Kingston: McGill-Queen's University Press.

Will, Robert M. (1967). *Canadian Fiscal Policy 1945-63.* Studies of the Royal Commission on Taxation, No. 17. Ottawa: Queen's Printer.

Wilson, T. and P. Dungan (1993). *Fiscal Policy in Canada: An Appraisal*. Canadian Tax Foundation.

Figure 1

Planned Fiscal Policy 'Before' and 'After' Keynes

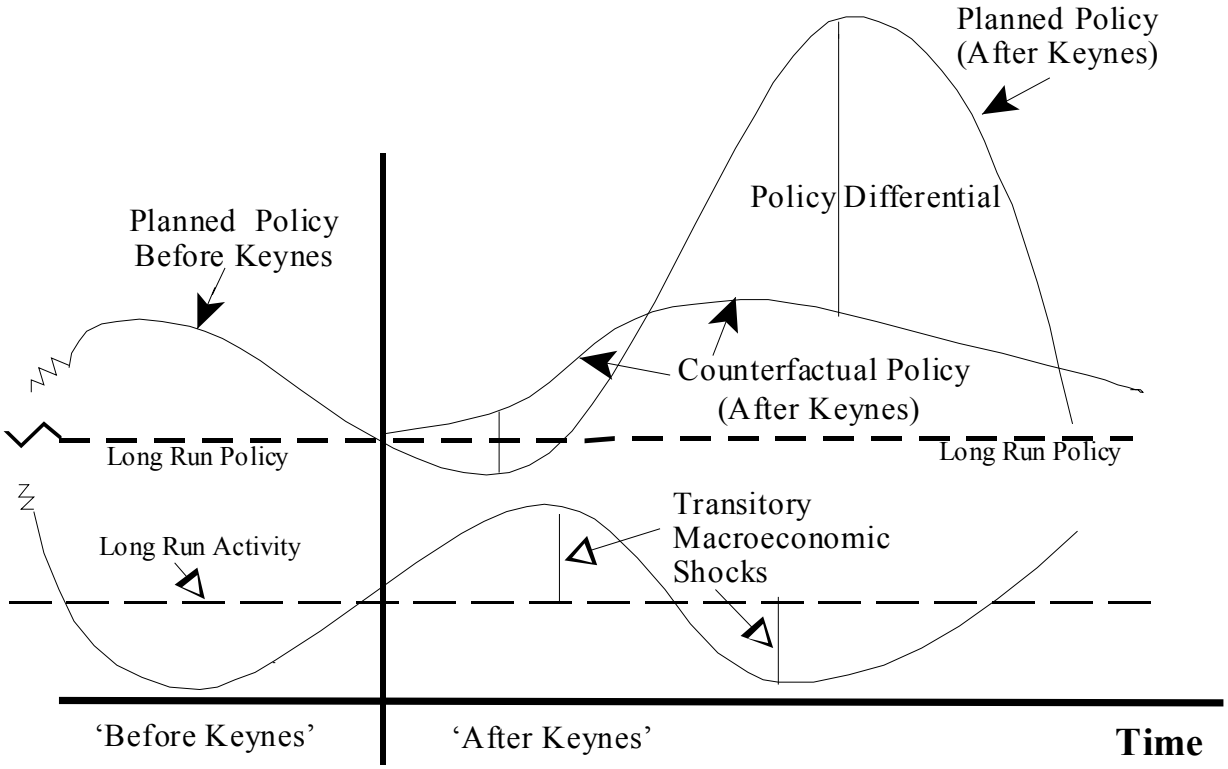
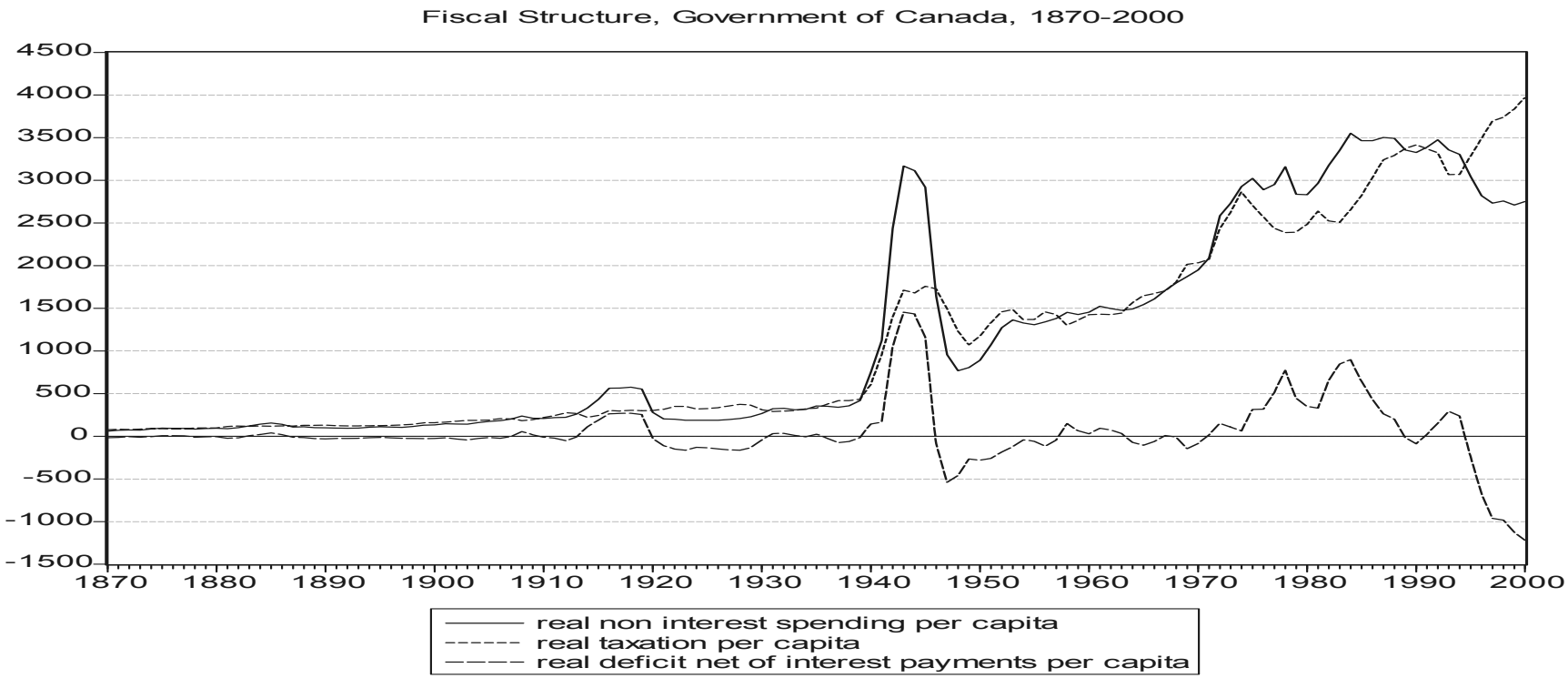


Figure 2



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. Figures may not add due to rounding.

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 -3.78*(6 lags)	-2.50	-4.96*
ADF (4 lags) 2nd dif								-7.00*	

Notes: * (**) = significant at 1% (10%) per cent 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.

Table 1b: Long Run Real Per Capita Income, Canada, Various Periods

(OLS Estimation. t-statistics in brackets)

Dependent variable: log (real income per cap)	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) 4.27 (2 lags)	-5.87 (1 lag) -5.38 (2 lags)	-4.00 (1 lag) -3.34 (2 lags)	-5.21 (1 lag) -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 (excluding dummies and logUSCON), 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 six explanatory variables is 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 Enders 2004, p 380).

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.

Table 2: Transitory and Permanent Components of Fiscal Structure: Government of Canada, 1875-1938 and 1950-2000

(3SLS Estimation)

Variables (expected signs)	Lag	Non-interest Expen. (Δg) 1875 -1938	Non-interest Expen. (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(IMRATIO)		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)
Obs **R^2** **DW** **ADF**		64 0.70 1.97 - 6.53*	51 0.40 2.03 -4.01*	**Obs** **R^2** **DW** **ADF**	64 0.70 1.93 -3.26*	51 0.48 1.61 -3.81*	**Obs** **R^2** **DW** **ADF**	64 0.65 1.97 -4.29*	51 0.53 2.16 -4.00*
ADF (1875-2000)		-8.97*			-7.08*			-7.66*	
P-value for shift		0.002			0.003			.00004	

Notes to Table 2: *(**) 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, y^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.

Figure 3
Change in Policy Differentials, 1950-2000
(3SLS Estimation)*

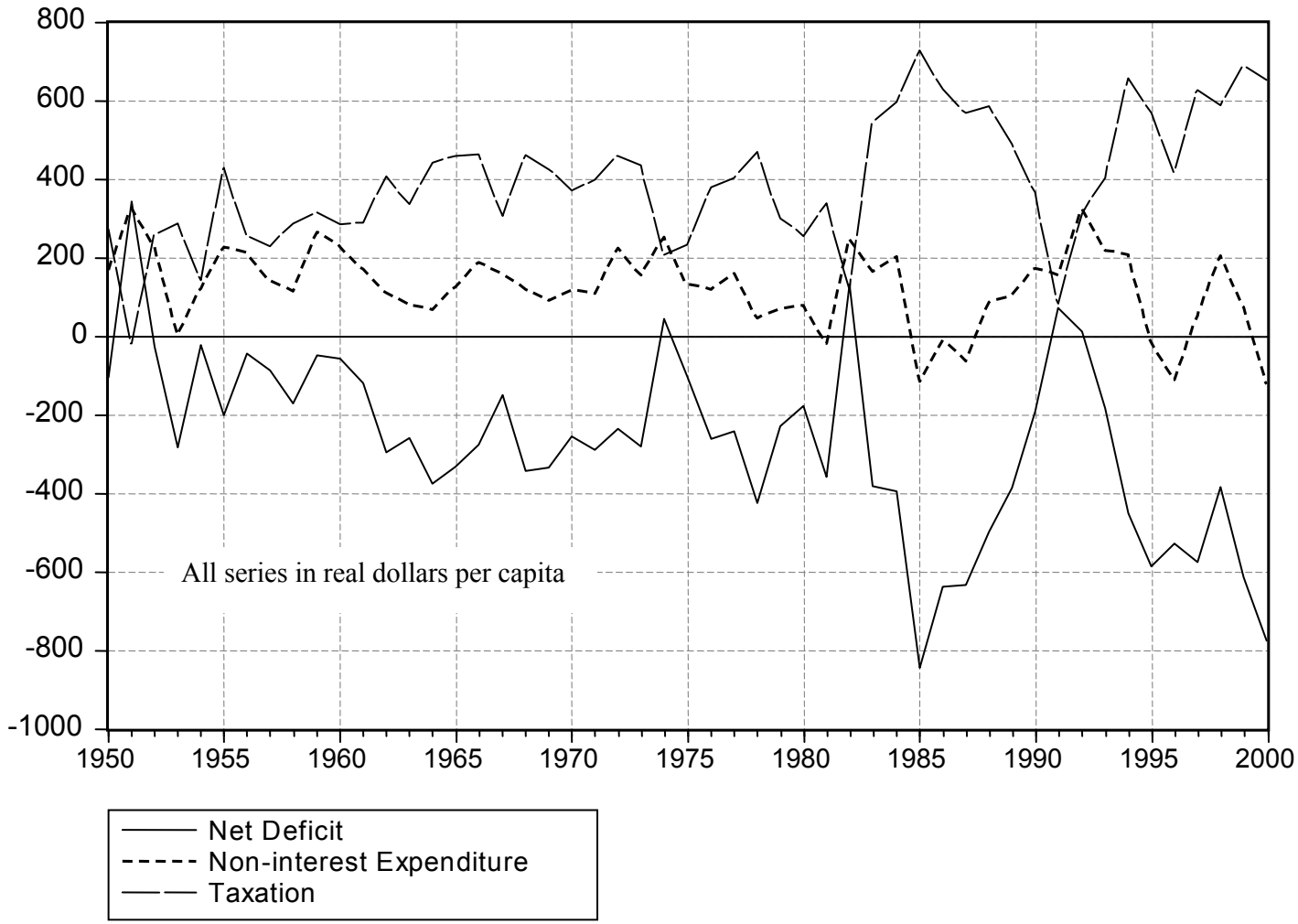


Table 3: Change in Policy Differentials Dg, Dt, DΔb, 1952-2000. (3SLS Estimation)

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

	pre-1980			post-1980							
	Δy^e_u	Δy^e_u -1	Δy^e_u -2	Δy^e_u	Δy^e_u -1	Δy^e_u -2	**Sum-sig**	**D(autoT)**	**D(autoT)-1**	**Shift-1980**	**Statistics**
Dg	0.62 (0.04)	-9.48 (-0.69)	24.89 (1.94*)	14.85 (0.589	11.02 (0.50)	45.82 (3.52)	70.71	-0.02 (-0.15)	-0.17 (-1.28)	-35.03 (-1.73**)	$R^2 = 0.56$ DW = 2.00
Dt	-24.86 (-1.32)	30.50 (2.07*)	0.30 (0.02)	-74.56 (-2.74*)	35.31 (1.47)	-24.71 (-1.76**)	-68.77	0.34 (2.17*)	0.14 (0.97)	103.16 (4.73*)	$R^2 = 0.78$ DW = 1.44
DΔb	25.47 (0.98)	-39.47 (-1.98*)	24.59 (1.30)	89.40 (2.40*)	-24.30 (-0.74)	70.53 (3.66*)	120.46	-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^e_u	Δy^e_u -1	Δy^e_u -2	Δy^e_u	Δy^e_u -1	Δy^e_u -2	**Sum-sig**	**Shift-1980**	**Statistics**
Dg	3.31 (0.19)	-3.36 (-0.26)	24.42 (1.83*)	22.75 (1.57)	29.19 (2.05*)	48.23 (3.75*)	101.84	-41.59 (-2.07*)	$R^2 = 0.52$ DW = 1.80
Dt	-43.26 (-1.91*)	27.23 (1.56)	0.98 (0.05)	-132.85 (-6.86*)	28.74 (1.51)	-37.78 (-2.19*)	-213.89	126.99 (4.72*)	$R^2 = 0.64$ DW = 1.22
DΔb	46.57 (1.50)	-30.59 (-1.28)	23.45 (0.96)	155.60 (5.88*)	0.45 (0.02)	86.02 (3.65*)	241.62	-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^e_u	Δy^e_u -1	Δy^e_u -2	Δy^e_u	Δy^e_u -1	Δy^e_u -2	**Sum-sig**	**D(autoT)**	**D(autoT)-1**	**Shift-1980**	**Statistics**
Dg	3.99 (0.29)	-10.87 (-1.01)	19.58 (1.93*)	13.87 (0.69)	3.19 (0.18)	37.81 (3.67*)	57.39	-0.04 (-0.34)	-0.10 (-0.94)	-18.84 (-1.18)	$R^2 = 0.52$ DW = 2.41
Dt	-22.65 (-1.24)	29.60 (2.08*)	-0.77 (-.06)	-68.38 (-2.60*)	30.60 (1.32)	-25.18 (-1.86**)	-63.96	0.42 (2.71*)	0.09 (0.62)	97.90 (4.64*)	$R^2 = 0.80$ DW = 1.44
DΔb	26.64 (1.14)	-40.47 (-2.22*)	20.34 (1.19)	82.25 (2.45*)	-27.41 (-0.93)	62.99 (3.63*)	104.77	-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^e_u	Δy^e_u -1	Δy^e_u -2	Δy^e_u	Δy^e_u -1	Δy^e_u -2	**Sum-sig**	**D(autoT)**	**D(autoT)-1**	**Shift-1980**	**Statistics**
Dg	3.37 (0.61)	-1.38 (-0.32)	-5.31 (-1.31)	- 1.00 (-0.12)	-7.82 (-1.13)	-8.01 (-1.94*)	-8.01	-0.02 (-0.37)	0.72 (1.68**)	16.19 (2.53*)	$R^2 = 0.55$ DW = 1.59
Dt	2.20 (1.23)	-0.90 (-0.64)	-1.06 (-0.81)	6.17 (2.39*)	-4.71 (-2.07*)	-0.47 (-0.35)	1.46	0.07 (4.79*)	-0.05 (-3.90*)	-5.26 (-2.54)	$R^2 = 0.56$ DW = 2.08
DΔb	1.17 (0.26)	-0.48 (-0.14)	-4.24 (-1.27)	-7.15 (-1.09)	-3.11 (-0.54)	-7.54 (-2.22*)	-7.54	-.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^e_u and D(autoT). **Instrumental variables**: first lags of IPUS, RYPC, and y^e_u and first and second lags of URATE, all interacted with a dummy =1 from 1980 on, = 0 otherwise. No. of observations = 49. **Sum-sig** = sum of coefficients significant at least at 10%. Constant terms are not reported. $\mathbf{R^2}$ is between observed and predicted. **DW** = Durbin-Watson. **Dg (Dt, DΔb)** = 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'. $\mathbf{\Delta y^e_u}$ = first difference of (the current unemployment rate **less** the lagged value of the four year moving average of the unemployment rate). **D(autoT)** = first difference of (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.

Table 4a

Estimated Changes in Keynesian Policy Following a Standard Shock
(Assuming a one standard deviation increase in expected transitory unemployment y^e_u)

	Using two periods (1871-1938 and 1947-2000) to estimate x		**Using the entire sample (1871-2000) to estimate x**	
	real dollars per capita		**real dollars per capita**	
Welfare state unrelated to Keynesianism: panel 1, Table 3	sig. at 10%	all coeffs	sig. at 10%	all coeffs
change in noninterest 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 noninterest 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: x = estimate of long run income (as in Table 1b), a distributed lag on which is used to estimate expected long run income x^e; sig. at 10% = use of coefficients on Δy^e_u in Table 3 that are significant at 10% or better.

Table 4b
Some Important Sample Statistics, 1952-2000

	Mean	**Standard deviation**
x estimated using two periods:		
estimated real gnp per capita (x)	15068.0	4790.0
estimated transitory income (y)	7.68	**220.4**
x estimated using entire sample:		
estimated real gnp per capita (x)	15143.0	5073.1
estimated transitory income (y)	-67.1	**886.8**
estimated expected transitory unemployment (y^e_u)	0.24	**1.52**
real noninterest public expen. 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: See notes to Table 4a. All figures in real dollars per capita. y = (actual real GNP per capita - x), a distributed lag on which is used to estimate expected transitory income y^e.

Appendix

1. Variable Names

AGRIC = proportion of the labor force in agriculture

Δb = real primary deficit per capita = g + real net interest per capita paid to the private sector - t

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

D(autoT) = first difference of (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 government spending per capita

$\hat{g}$ = long run or permanent size of real 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 = long term government bond rate - the actual rate of inflation (using P)
$\mathbf{r^e}$ = expected real interest rate (based on a distributed lag on r)

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

t = real tax revenue per capita

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

URATE = the 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 = estimate of long run real income per capita
$\mathbf{x^e}$ = expected long run real income per capita (based on a distributed lag on x)

y = calculated transitory income = RYPC–**x**
$\mathbf{y^e}$ = expected transitory income (based on a distributed lag on y)

$\Delta \mathbf{y^e_u}$ = change in the expected transitory or shorter run component of unemployment

For data sources, see J. Stephen Ferris and Stanley L. Winer (2003). "Searching for Keynes: With Application to Canada, 1870-2000". Munich: CESifo Working Paper No. 1016, August. Sources are also available from the authors on request. The fiscal data are based on Gillespie's (1991) reworking of the Public Accounts of Canada from 1867, updated by the authors..

The following material is available in Ferris and Winer (2003) and is provided here for the benefit of referees.

2. Linearization of First Order Conditions (7) - (9)

We proceed by taking Taylor series approximations of the left hand side of equations (23) for the policy variables g and t. 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, $\hat{g}_{t+s} = g(x^e_{t+s}, y^e_{t+s}= 0, ...)$ and $\hat{g}_{t+s-1} = g(x^e_{t+s-1}, y^e_{t+s-1}= 0, ...)$, defined by solving the Lagrangian (15) for policies of period t+s-1 and t+s under the specified conditions. For this purpose we consider the left side of (24) 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 left hand side of (11) becomes:

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

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 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

$$\frac{\gamma\, b\,(a-a) \;+\; d\,(x^e_{t+s}-x^e_{t+s-1})}{\gamma\, E_t\,\mu^1_g(0) + \;E_t\,\mu^2_g(x_{t+s-1})} \;=\; \frac{d\,(x^e_{t+s}-x^e_{t+s-1})}{\gamma\, a+(c+d\,x^e_{t+s-1})}. \qquad \textbf{(A2)}$$

Repeating the use of linear marginal utility to evaluate the first order derivatives in (A1) from (24) and combining these with (A2), our linear approximation to (25) becomes[32]

$$\begin{aligned}\frac{d\,(x^e_{t+s}-x^e_{t+s-1})}{\gamma\, a+c+d\,x^e_{t+s-1}} \;+\; \frac{\gamma\, b\,(\partial y/\partial g^e_{t+s})}{\gamma\, a+c+d\,x^e_{t+s}}(g^e_{t+s}-\hat{g}_{t+s}) - \frac{\gamma\, b\,(\partial y/\partial g^e_{t+s-1})}{\gamma\, a+c+d\,x^e_{t+s-1}}(g^e_{t+s-1}-\hat{g}_{t+s-1})\\ +\frac{\gamma b}{\gamma a+c+d\,x^e_{t+s}}\;y^e_{t+s} \;-\; \frac{\gamma b}{\gamma a+c+d x^e_{t+s-1}}\;y^e_{t+s-1} \;=\; \rho - r_{t+s} + D[\ln\psi_{t+s}]\;.\end{aligned} \qquad \textbf{(A3)}$$

It may be noted here that while similar variables have coefficients with the same general form across time in (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 (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

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

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, (A4) reduces to

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

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 $X^e_{t+s-1}(X^e_{t+s})^{-1} \cong 1$.
Finally, (A5) can be given one further useful simplification. Inspection of (9) indicates that $\mathbf{D}\ln(\psi_{t+s})$ is a function of y_{t+s} through $E_t\mu^1_b$. Assuming that the relationship is linear allows us to write $\mathbf{D}\ln(\psi_{t+s}) = \varphi\,(y_{t+s} - y_{t+s-1}) > 0$ with $\varphi > 0$. Hence (A5) becomes[33]

---

[32] Here ∂Etμ1g /∂gt+s= γb(∂ye/∂g) is assumed to be independent of the size of ye; ∂Etμ2g /∂gt+s = d(∂xet+s/∂gt+s) = 0; ∂Etμ1g/∂yt+s = γb; and ∂Etμ2g/∂yt+s= 0.

[33] From (9), using $E\mu^2_b = 0$, $\mathbf{D}(\psi_{t+s+1}) = [\theta_1\beta^s / \prod^s R^s]\,[E_t\mu^1_b(y_{t+s}) - \beta\, E_t\mu^1_b(y_{t+s+1})] > 0$ 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}, $E_t\mu^1_b(y_{t+s})$ and $\mathbf{D}(\psi_{t+s+1})$ falls. The resulting positive relationship between Δy and $\mathbf{D}(\psi)$ is represented by $\mathbf{D}\ln(\psi_{t+s}) = \varphi\,(y_{t+s} - y_{t+s-1})$ with $\varphi > 0$.

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

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.[34]

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. Equation (A6) and its counterparts for current taxation and deficit financing become the basis for estimating equations (12)-(14). Note that while no constant term appears in (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.

Summary of Definitions and Assumptions Used in the Derivation of Equations

$\lambda = N_1/N > 0$	$\partial(\theta_2 E_t\mu^2)/\partial b_t = 0$
$\gamma = N_1\alpha_1 / (N_1\alpha_1 + N\alpha_2) < 1$	$\partial y/\partial g_{t+s-1} = \partial y/\partial g_{t+s} > 0$
$\alpha_h = \partial F_{h\,t}/\partial(E_t(U^h(k)) = 1/(\varphi_{max} - \varphi_{min})$	$\partial y/\partial t_{t+s-1} = \partial y/\partial t_{t+s} < 0$
$\theta_1 = N_t\,\lambda\,\alpha_1,\ \theta_2 = N_t(1-\lambda)\,\alpha_2$	$(\partial^2 y/\partial t_{t+s}{}^2) < 0$
$\mu^1(x, y) = \mu^1(x) + \mu^1(y) = \mu^2(x) + \mu^1(y)$.	$X^e_{+s} = \gamma\cdot a + c + d\cdot x^e_{+s} > 0$
$\partial(\theta_2 E_t\mu^2)/\partial b_t = 0$	$X^e_{t+s-1} = \gamma\cdot a + c + d\cdot x^e_{t+s-1} > 0$
$E_t\mu^1_g = a + b\cdot y^e_{t+s} > 0;\ a > 0, b < 0$	$X^e_{t+s-1}(X^e_{t+s})^{-1} \approx 1$
$E_t\mu^2_g = c + d\cdot x^e_{+s} > 0;\ c > 0, d < 0$	$Z_{t+s} = (X^e_{t+s})^{-1}\ \gamma\cdot b\cdot (\partial y/\partial g_{t+s})^e < 0$
$E\mu^1_t = e + f\cdot y^e_{t+s} < 0;\ e < 0, f > 0$	$W_{t+s} = (V^e_{t+s})^{-1}\ \gamma\cdot f\cdot(\partial y/\partial t_{t+s})^e > 0$
$E\mu^2_t = h + k\cdot x^e_{+s} < 0;\ h < 0, k > 0$	$V^e_{t+s} = \gamma\cdot e + h + k\cdot x^e_{t+s} < 0$
$\partial(\theta_1 E_t\mu^1)/\partial b_t \neq 0$	

3. On the interpretation of Keynes

Textbook Keynesian in the above framework would arise from a new understanding by voters that a co-ordinated reduction in the impact of liquidity constraints would allow constrained agents to realize more of their "notional" trading plans, thereby opening new market opportunities for both liquidity and non-liquidity constrained individuals, and increasing individual expected welfare. In other words, greater attempts at stabilization could arise through individuals' enhanced appreciation of the potential role of government as an agent that is able to internalize externalities inherent in relaxing individual liquidity constraints through fiscal and other policies. Keynesianism in this sense follows Leijonhufvud's (1968) seminal interpretation of Keynes.

Greater recognition by the community of the desirability of using government in this way increases the expected utility generated by government action and, hence, the expected political benefit of using fiscal policy to depart from the desired equilibrium path. Specifically, with $E\mu^1_g = a + b\,y^e_t$ [with $a > 0$ and $b < 0$], a rise in the value to the community of using g in relation to the liquidity constraint will increase the reason for actual government spending to depart from its equilibrium path in response to a given Δy^e_{t+s}. A rise in the value of either a or b then increases the absolute value of the coefficient on the third right-hand term in equation (A6). An analogous argument holds for Δt^e and for the change in the net deficit.
This means that 'after Keynes', both the negative correlation between the $(\Delta g_t - \Delta\hat{g}_t)$ 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. Thus the implied negative correlation for the deficit will also be larger.

It should be noted that a rise in the expected utility that would 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 (A6) it can be seen that such a productivity change actually reduces government intervention. On the margin, no more resources will be devoted to dealing with liquidity constraints than are necessary. The intuition for this result is explained in the main text.

Finally, we note that a change in the proportion of liquidity constrained voters λ yields inconclusive effects on policy, and so does not clearly lead to Keynesian stabilization in the present framework.

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

CESifo Working Paper Series

(for full list see www.cesifo.de)

---

950 Thomas Eichner and Rüdiger Pethig, A Microfoundation of Predator-Prey Dynamics, May 2003

951 Burkhard Heer and Bernd Süssmuth, Cold Progression and its Effects on Income Distribution, May 2003

952 Yu-Fu Chen and Michael Funke, Labour Demand in Germany: An Assessment of Non-Wage Labour Costs, May 2003

953 Hans Gersbach and Hans Haller, Competitive Markets, Collective Decisions and Group Formation, May 2003

954 Armin Falk, Urs Fischbacher, and Simon Gächter, Living in Two Neighborhoods – Social Interactions in the LAB, May 2003

955 Margarita Katsimi, Training, Job Security and Incentive Wages, May 2003

956 Clemens Fuest, Bernd Huber, and Jack Mintz, Capital Mobility and Tax Competition: A Survey, May 2003

957 Edward Castronova, The Price of 'Man' and 'Woman': A Hedonic Pricing Model of Avatar Attributes in a Synthetic World, June 2003

958 Laura Bottazzi and Marco Da Rin, Financing Entrepreneurial Firms in Europe: Facts, Issues, and Research Agenda, June 2003

959 Bruno S. Frey and Matthias Benz, Being Independent is a Great Thing: Subjective Evaluations of Self-Employment and Hierarchy, June 2003

960 Aaron Tornell and Frank Westermann, Credit Market Imperfections in Middle Income Countries, June 2003

961 Hans-Werner Sinn and Wolfgang Ochel, Social Union, Convergence and Migration, June 2003

962 Michael P. Devereux, Measuring Taxes on Income from Capital, June 2003

963 Jakob de Haan, Jan-Egbert Sturm and Bjørn Volkerink, How to Measure the Tax Burden on Labour at the Macro-Level?, June 2003

964 Harry Grubert, The Tax Burden on Cross-Border Investment: Company Strategies and Country Responses, June 2003

965 Kirk A. Collins and James B. Davies, Measuring Effective Tax Rates on Human Capital: Methodology and an Application to Canada, June 2003

966 W. Steven Clark, Using Micro-Data to Assess Average Tax Rates, June 2003

967 Christopher Heady, The 'Taxing Wages' Approach to Measuring the Tax Burden on Labour, June 2003

968 Michael P. Devereux and Alexander Klemm, Measuring Taxes on Income from Capital: Evidence from the UK, June 2003

969 Bernhard Eckwert and Itzhak Zilcha, The Effect of Better Information on Income Inequality, June 2003

970 Hartmut Egger and Josef Falkinger, The Role of Public Infrastructure for Firm Location and International Outsourcing, June 2003

971 Dag Morten Dalen and Trond E. Olsen, Regulatory Competition and Multi-national Banking, June 2003

972 Matthias Wrede, Tax Deductibility of Commuting Expenses and Residential Land Use with more than one Center, June 2003

973 Alessandro Cigno and Annalisa Luporini, Scholarships or Student Loans? Subsidizing Higher Education in the Presence of Moral Hazard, June 2003

974 Chang Woon Nam, Andrea Gebauer and Rüdiger Parsche, Is the Completion of EU Single Market Hindered by VAT Evasion?, June 2003

975 Michael Braulke and Giacomo Corneo, Capital Taxation May Survive in Open Economies, July 2003

976 Assar Lindbeck, An Essay on Welfare State Dynamics, July 2003

977 Henrik Jordahl and Luca Micheletto, Optimal Utilitarian Taxation and Horizontal Equity, July 2003

978 Martin D. D. Evans and Richard K. Lyons, Are Different-Currency Assets Imperfect Substitutes?, July 2003

979 Thorsten Bayindir-Upmann and Frank Stähler, Market Entry Regulation and International Competition, July 2003

980 Vivek Ghosal, Firm and Establishment Volatility: The Role of Sunk Costs, Profit Uncertainty and Technological Change, July 2003

981 Christopher A. Pissarides, Unemployment in Britain: A European Success Story, July 2003

982 Wolfgang Buchholz, Richard Cornes, and Wolfgang Peters, On the Frequency of Interior Cournot-Nash Equilibria in a Public Good Economy, July 2003

983 Syed M. Ahsan and Panagiotis Tsigaris, Choice of Tax Base Revisited: Cash Flow vs. Prepayment Approaches to Consumption Taxation, July 2003

984 Campbell Leith and Jim Malley, A Sectoral Analysis of Price-Setting Behavior in US Manufacturing Industries, July 2003

985 Hyun Park and Apostolis Philippopoulos, Choosing Club Membership under Tax Competition and Free Riding, July 2003

986 Federico Etro, Globalization and Political Geography, July 2003

987 Dan Ariely, Axel Ockenfels and Alvin E. Roth, An Experimental Analysis of Ending Rules in Internet Auctions, July 2003

988 Paola Conconi and Carlo Perroni, Self-Enforcing International Agreements and Domestic Policy Credibility, July 2003

989 Charles B. Blankart and Christian Kirchner, The Deadlock of the EU Budget: An Economic Analysis of Ways In and Ways Out, July 2003

990 M. Hasham Pesaran and Allan Timmermann, Small Sample Properties of Forecasts from Autoregressive Models under Structural Breaks, July 2003

991 Hyun Park, Apostolis Philippopoulos and Vangelis Vassilatos, On the Optimal Size of Public Sector under Rent-Seeking competition from State Coffers, July 2003

992 Axel Ockenfels and Alvin E. Roth, Late and Multiple Bidding in Second Price Internet Auctions: Theory and Evidence Concerning Different Rules for Ending an Auction, July 2003

993 Pierre Salmon, The Assignment of Powers in an Open-ended European Union, July 2003

994 Louis N. Christofides and Chen Peng, Contract Duration and Indexation in a Period of Real and Nominal Uncertainty, July 2003

995 M. Hashem Pesaran, Til Schuermann, Björn-Jakob Treutler, and Scott M. Weiner, Macroeconomic Dynamics and Credit Risk: A Global Perspective, July 2003

996 Massimo Bordignon and Sandro Brusco, On Enhanced Cooperation, July 2003

997 David F. Bradford, Addressing the Transfer-Pricing Problem in an Origin-Basis X Tax, July 2003

998 Daniel Gros, Who Needs Foreign Banks?, July 2003

999 Wolfram Merzyn and Heinrich W. Ursprung, Voter Support for Privatizing Education: Evidence on Self-Interest and Ideology, July 2003

1000 Jo Thori Lind, Fractionalization and the Size of Government, July 2003

1001 Daniel Friedman and Donald Wittman, Litigation with Symmetric Bargaining and Two-Sided Incomplete Information, July 2003

1002 Matthew Clarke and Sardar M. N. Islam, Health Adjusted GDP (HAGDP) Measures of the Relationship Between Economic Growth, Health Outcomes and Social Welfare, July 2003

1003 Volker Grossmann, Contest for Attention in a Quality-Ladder Model of Endogenous Growth, August 2003

1004 Marcel Gérard and Joan Martens Weiner, Cross-Border Loss Offset and Formulary Apportionment: How do they affect multijurisdictional firm investment spending and interjurisdictional tax competition ?, August 2003

1005 Burkhard Heer, Nonsuperneutrality of Money in the Sidrauski Model with Heterogeous Agents, August 2003

1006 V. Anton Muscatelli, Piergiovanna Natale, and Patrizio Tirelli, A Simple and Flexible Alternative to the Stability and Growth Pact Deficit Ceilings. Is it at hand?, August 2003

1007 Reto Foellmi and Josef Zweimüller, Inequality and Economic Growth: European Versus U.S. Experiences, August 2003

1008 James S. Costain and Michael Reiter, Business Cycles, Unemployment Insurance, and the Calibration of Matching Models, August 2003

1009 Marco Runkel, Optimal Contest Design when the Designer's Payoff Depends on Competitive Balance, August 2003

1010 Donald O. Parsons, Torben Tranaes and Helene Bie Lilleør, Voluntary Public Unemployment Insurance, August 2003

1011 Rüdiger Pethig and Andreas Wagener, Profit Tax Competition and Formula Apportionment, August 2003

1012 Johan Willner, Privatisation and Public Ownership in Finland, August 2003

1013 Seppo Kari and Jouko Ylä-Liedenpohja, Taxation and Valuation of International Real Investments, August 2003

1014 James Heckman, Rosa Matzkin and Lars Nesheim, Simulation and Estimation of Hedonic Models, August 2003

1015 Biswa N. Bhattacharyay, Towards a Macro-Prudential Leading Indicators Framework for Monitoring Financial Vulnerability, August 2003

1016 J. Stephen Ferris and Stanley L. Winer, Searching for Keynes: An Essay on the Political Economy of Fiscal Policy, With Application to Canada, 1870-2000, August 2003