The welfare state, thresholds, and economic growth

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Abstract

Can a growing welfare state induce a regime switch in the growth rate of an economy? This paper constructs a dynamic political economy model of economic growth and the welfare state in which both variables are nonlinearly related and jointly endogenous. Using a Markov switching framework over the period 1950–2001, we find that the structural decline in growth rates that several welfare state economies experienced during 1970–1975 is preceded by movements to a high welfare state regime. This suggests that expanding welfare state regimes are associated with low economic growth regimes, while contracting welfare state regimes are associated with high growth regimes. However, we also find that the structural decline in growth rates leads to a downward structural break in the welfare state for many welfare state economies. This suggests that declining growth regimes are associated with contracting welfare state regimes, as lower growth forces politicians to cut the size of the welfare state. We also report strong evidence that both expansion and contractions in the welfare state affects growth nonlinearly. These results are able to characterize a predictable and general pattern of welfare state-growth evolution.

JEL classification: P16: Political economy of capitalism; E62: Fiscal policy; O40: Economic growth; C22: Time series models

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1. Introduction

In the late 1960s–mid 1970s, several of the world's industrialized economies experienced a reduction in their growth rates. For instance, in a symposium devoted to the issue of long run growth, Kahn (1992) notes that the potential rate of economic growth in industrialized countries is substantially lower than what it was in the 1960s. The structural break in growth is also confirmed by Shigehara (1992) who finds that nearly all the OECD economies experience a slowdown occurring between 1968 and 1975.

The most widely accepted cause of the growth slowdown in the US is a reduction in total factor productivity (Griliches, 1980; Nordhaus, 1982; Romer, 1987; Baumol, 1984), a phenomenon now referred to as the productivity puzzle. In the last decade, however, a growing literature has begun to focus on the growth implications of unproductive government spending, and whether such expenditures can induce structural breaks in growth (see Levine and Renelt, 1991; Easterly and Rebelo, 1993; Turnovsky and Fisher, 1995; Tanzi and Zee, 1997; Ghate and Zak, 2002; Romer, 2003). This literature, which has specific relevance to welfare state economies, posits two channels through which fiscal choices induce structural breaks in the growth rate of an economy. First, unproductive government expenditures (government consumption and transfers) hinder growth because such expenditures are a less-than-perfect substitute for private consumption in the aggregate (or possibly even a complement). This makes private savings decline, affecting investment and growth in the long run. A related channel adds a political economy explanation to declining investment and growth because of a rising welfare state. To wit, because politicians determine government expenditures, fiscal flows reflect political objectives (Ghate, 2003). Hence, political decisions have an important impact on the allocation of resources (Ghate and Zak, 2002; Romer, 2003). This suggests that some fiscal choices (e.g., higher transfer spending) could lead to a bloating of the welfare state because of populist pressure for redistributive spending. In the long run, growth is affected adversely because higher welfare state spending is financed by higher taxation which generates an economic inefficiency (Lindbeck et al., 1994; Organization for Economic Cooperation and Development, 1994a,b; Atkinson and Werner-Sinn, 1999; Ghate and Zak, 2002).

Barr (1992), Tanzi and Schuknecht (1997), and Hansson and Stuart (2003), document the expansion of the public sector created by higher expenditures on redistribution in public budgets in several countries. For instance, Barr (1992) shows that welfare spending constitutes a higher proportion of GDP in several countries since 1960, with spending doubling in Netherlands and Sweden, and nearly tripling in Switzerland. Accordingly, Tanzi and Schuknecht (1997, p. 399) write that "after World War II, and especially after 1960, subsidies and transfers, especially in cash, (has been) the driving force behind government growth." Finally, Hansson and Stuart (2003) also report a substantial bloating of the welfare state for several countries throughout the 1960s, 1970s, and upto the mid-1980s. However, Tanzi and Schuknecht (1997, p. 399) also note that the 1980s and 1990s saw "additional but small" increases in transfers and subsidies in several welfare state economies. Similarly, Hansson and Stuart (2003) document that 1992 serves as a 'peak year', indicating some sort of empirical limit to transfer and total spending across industrialized economies.

This paper utilizes the model of growth and the welfare state developed by Ghate and Zak (2002) as a point of departure, and estimates the main predictions of this model. Our analysis provides evidence attributing the structural decline in growth in 19 welfare state economies experienced during 1970–1975 to an upward structural shift in the size of their welfare states. Further, we also show that lower growth regimes induce a reduction in the welfare state. The 19 welfare state economies constitute the comparative welfare state dataset (CWS) compiled by Huber et al. (1997). Cumulatively, these economies constitute representatives from all of the welfare state models (Scandinavian, conservative-corporatist, and laissez-faire).[1]

Our main finding is that the structural breaks in the growth rate of several of the economies that we analyze can be attributed to a structural break in the trend growth of the welfare state variable. We also find that the incidence of structural breaks and thresholds in the size of welfare state closely match the reforms enacted by countries to curb the size of their welfare state. This suggests that a rise in the trend growth rate of the welfare state offers an alternative—though robust—explanation for the structural decline in growth performance of these economies. Indeed, our model is able to identify a predictable and general pattern of welfare state-growth evolution.

To test the mapping between structural breaks in the welfare state inducing structural breaks in growth, we employ a Markov switching model along the lines of Engle and Hamilton (1989) and Hamilton (1994). Our framework assumes the existence of two regimes with reference to growth and the welfare state: a high economic growth and low economic growth regime; and a high (expanding) welfare state and low (contracting) welfare state regime. We measure economic growth by real GDP growth. Our measure of the welfare state follows Ghate and Zak (2002): we define the size of the welfare state as the ratio of real transfer spending to real outlays on public investment. Defining the welfare state in this manner allows us to examine the size of the welfare state per 'dollar' of productive government spending. Hence, a growing welfare state can either be driven by one of two factors: an increase in real transfer spending relative to public investment, or a reduction in public investment relative to a given level of transfer spending.[2] We define a growth slowdown as a negative break in the trend function of the growth process.[3]

Our analysis leads to several interesting results. First, we find that the representative evolution of the welfare state across our cross-country sample over 1960–2001 follows a nonlinear (logistical) growth pattern. More specifically, we find that the welfare state initially grows at a slow rate, but slightly faster than the growth rate of output, but then

[1] See Arts and Gelissen (2002) for a discussion surrounding the appropriate welfare state typology. Because of the ambiguity surrounding this debate, our list is simply exhaustive, and does not compare the joint dynamics of welfare state evolution across welfare state type. We also include Japan and Ireland which do not fit into these traditional categories.

[2] Adding government consumption to transfer spending does not alter the empirical results of the model. Hence, we omit it from the analysis.

[3] Ben-David and Papell (1998) also attempt to characterize the breakpoints associated with growth rates for several OECD countries. However, the difference between Ben-David and Papell (1998) and our model is that while they assume a deterministic trend, we assume a stochastic trend.

grows rapidly following the first structural break. We refer to this stage as the *expansionary stage* of the welfare state. Over time however, the welfare state finally reverts back to a lower trend growth rate after a second structural break. We refer to this as the *contractionary stage* of the welfare state. Our analysis allows us to identify three characteristic periods of welfare state behavior: two regimes corresponding to slow economic growth and one corresponding to high economic growth. We then ask how expansions and contractions in the welfare state generate low and high growth regimes.

Second, the nonlinear and jointly endogenous relationship between economic growth and the welfare state identifies the intuition behind how the welfare state and growth are inter-related. The intuition runs as follows. Initially, a high pre-break growth rate induces the welfare state to rise at a slightly faster rate than the growth rate of output. This is because when politicians maximize votes, voter support to politicians depends not only on the transfers they receive, but also on the rate of output growth. As a consequence, in the expanding stage of the welfare state, transfer spending drives the growth of the welfare state. Over time, however, a threshold emerges wherein to maintain positive output growth, the government reduces transfer spending by cutting social welfare expenditure. More specifically, when growth falls, the welfare state also declines, although at a faster rate than the reduction in growth. This ultimately creates an upturn in growth. Accordingly, Tanzi and Schuknecht (1997) show that several industrialized countries that have undertaken reforms in the size of the public sector to increase economic growth (e.g., Finland, Sweden) have accomplished this through reductions in public subsidies and transfers.[4] This is supported by our own analysis. Thus, we find that regimes which generate low welfare state values also generate high growth values, while regimes that generate high welfare state values also generate low growth values. We find that the average transition period between both structural breaks across the 19 economies is approximately 15½ years.

Finally, our analysis indicates two separate waves of country-groupings with coinciding break timings in their growth rates. The first wave occurs over 1971–1972. The second wave occurs over 1974–1977. This supports evidence of the inter-relatedness of regime switches where structural breaks in the first wave economies affect the incidence of structural breaks in the second group of economies. In effect, the drag from welfare state spending in larger economies creates a negative wealth effect in the medium and long term. One possible channel through which these long term income losses affect the growth performance of other welfare state economies is by adversely affecting international trade (Mulas-Granados, 2003).

The paper is structured as follows. Section 2 outlines a variant of the dynamic model of growth and the welfare state outlined by Ghate and Zak (2002), and derives the testable implications of this model. Section 3 outlines a brief motivation for why we use a regime switching approach to test the model. Section 4 presents empirical evidence from the testable implications. Section 5 concludes.

[4] For instance, see Tanzi and Schuknecht (1997, Table 4).

2. The model

The model closely follows Ghate and Zak (2002).[5] Optimal policies are the solution to a representative politician's problem who enacts pro-growth policies and pro-redistributive policies. A politician's instantaneous felicity, W, is assumed to be a convex combination of the welfare of both policies. Hence, W, can be thought of an explicit support function. The parameter $\chi \in [0, 1]$ measures a politician's relative preference for pro-redistributive policies over pro-growth policies. When $\chi=0$, politician's derive utility from growth enhancing policies. When $\chi=1$, politician's derive utility from re-distributive policies. Hence, the politician's objective function is assumed to embody a trade-off between transfers and growth.

Following Barro (1990), we assume that pro-growth policies are driven by the level of public investment, λ, to maximize capital deepening (output growth). Public investment raises private productivity which in turn raises output and consumption (Aschauer, 1989; Rioja, 1999). We assume that the utility, $V(\cdot)$, that politicians derive from promoting pro-growth policies, depends on the rate of capital deepening, K_{t+1}/K_t, where K denotes the stock of private capital in the economy. Capital deepening is the proxy for growth in the economy.

The second aspect in the political decision problem is the value constituents place on receiving transfers, σ, from politicians, $V_\sigma(\sigma)$. The function $V_\sigma(\sigma)$ is continuous, strictly increasing, and concave. Politicians' preferences for transfers relative to capital growth are captured by the exogenous parameter χ, with politicians' value placed on transfers being $\chi V_\sigma(\sigma)$. Higher values of χ indicate a greater inclination by politicians to engage in re-distribution vis-a-vis productive public investment. When $\chi=0$, politicians derive no utility from promoting transfers. We let preferences over transfers be represented by a power function $V(\sigma_t)=(\epsilon_\sigma \sigma)^v$, with $v \in (0,1)$.[6] The restriction on parameter v generates diminishing marginal utility from transfer spending.[7]

We assume costs associated with bureaucratic waste in administering government investment projects and transfer programs, given by $\epsilon_\lambda \in (0,1)$ and $\epsilon_\sigma \in (0,1)$, respectively. When $\epsilon_\lambda=1(\epsilon_\sigma=1)$, public investment (transfer) programs are administered with no waste. When $\epsilon_\lambda<1(\epsilon_\sigma<1)$, a fraction of the funds raised for public investment and transfer programs is lost because of the waste or corruption associated with administering these programs. Hence, $\epsilon_\lambda \lambda$ and $\epsilon_\sigma \sigma$ can be interpreted as the *effective* level of public investment and transfers, respectively.

Politicians finance transfers and public investment by levying a proportional tax on output according to a simple balanced budget rule, $T_t=\tau Y$, where $\tau \in (0, 1)$ denotes the proportional tax rate on output, $Y=F(\cdot, \cdot)$ represents output produced using a neo-classical production function satisfying the standard conditions, and T_t denotes total tax revenues at

[5] However, we construct a minor variation to the model proposed by these authors. Here, politician utility is a convex combination of the utility that individual lobbies derive from the policies implemented for the groups. The specification follows Blomberg (1996).

[6] The parameter $\alpha \in (0,1)$ denotes the share of output paid to capital.

[7] Later, we will place a regularity condition on $v(v>1/2)$ so that the dynamics of the welfare state from the theoretical model mimic the cross-country evolution of the welfare state from our sample.

time t. In order to concretize the analysis, we use a Cobb-Douglas production function $F(K_t, \epsilon_\lambda \cdot \lambda_t)=K_t^\alpha[\epsilon_\lambda \lambda_t]^{1-\alpha}$, for $\alpha \in (0, 1)$. The parameter α denotes the share of output paid to capital.

Combining the above two objectives of politicians, the fiscal policy triple $\{T_t, \sigma_t, \lambda_t\}_{t=0}^{\infty}$ is found by solving

$$\text{Max}_{T,\lambda,\sigma} W = (1-\chi)\frac{K_{t+1}}{K_t} + \chi V(\sigma_t) \tag{1}$$

s.t.

$$C_t = F(K_t, (\epsilon_\lambda \lambda_t))(1-\tau) + \epsilon_\sigma \sigma_t - I_t \tag{2}$$

$$I_t = K_{t+1} - (1-\delta)K_t \tag{3}$$

$$T_t = \lambda_t + \sigma_t, \tag{4}$$

Eq. (2) is the economy's resource constraint equating consumption, C, to after tax output, $F(\cdot, \cdot)(1-\tau)$, investment, I, and effective transfers, $\epsilon_\sigma \sigma_t$. Eq. (3) is the stock accounting condition for the private capital stock, K, with $\delta \in [0, 1]$ the depreciation rate. Eq. (4) is the government budget constraint equating revenues, T_t, to expenditures on transfers and public investment, $\lambda_t + \sigma_t$, in each period.

It will be useful to define the level of transfers relative to government investment as,

$$\theta_t \equiv \frac{\sigma_t}{\lambda_t}. \tag{5}$$

This allows us to rewrite the government budget constraint, Eq. (4), as

$$T_t = (1+\theta_t)\lambda_t. \tag{6}$$

Note that θ proxies for the size of the welfare state in the economy: it denotes the ratio of real transfer spending to real outlays on public investment (Ghate and Zak, 2002). As noted before, proxying the welfare state in this manner allows us to examine the size of the welfare state per "dollar" of productive government spending.

Politicians maximize Eq. (1) with respect to λ_t and θ_t subject to the constraints Eqs. (2)–(4) utilizing Eqs. (5) and (6). The Lagrangean for the politician's problem is,

$$L = \frac{(1-\chi)}{K_t}\left\{K_t^\alpha (\epsilon_\lambda \lambda_t)^{1-\alpha} + (1-\delta)K_t - C_t - (1+\theta_t)\lambda_t + \epsilon_\sigma \theta_t \lambda_t\right\} + \chi \epsilon_\sigma^v \theta_t^v \lambda_t^v. \tag{7}$$

The first order conditions with respect to λ_t and θ_t are

$$\frac{(1-\chi)}{K_t}\left\{(1-\alpha)K_t^\alpha (\epsilon_\lambda \lambda_t)^{-\alpha}\epsilon_\lambda - (1+\theta_t) + \epsilon_\sigma \theta_t\right\} + \chi v \epsilon_\sigma^v \theta_t^v \lambda_t^{v-1} = 0, \tag{8}$$

and

$$\frac{(1-\chi)}{K_t}\left\{-\lambda_t + \epsilon_\sigma \lambda_t\right\} + \chi v \epsilon_\sigma^v \theta_t^{v-1} \lambda_t^v = 0, \tag{9}$$

respectively. Solving for θ_t in Eq. (9) implies

$$\theta_t^* = \left[\frac{v\chi\epsilon_\sigma^v}{(1-\chi)(1-\epsilon_\sigma)}\right]^{\frac{1}{1-v}} \frac{1}{\lambda_t} K_t^{\frac{1}{1-v}}. \tag{10}$$

Multiplying both sides of Eq. (10) by λ_t and noting the definition of θ_t implies,

$$\sigma_t^* = \left[\frac{v\chi\epsilon_\sigma^v}{(1-\chi)(1-\epsilon_\sigma)}\right]^{\frac{1}{1-v}} K_t^{\frac{1}{1-v}}. \tag{11}$$

Given Eq. (11), it is easy to see that,

$$\lambda_t^* = \left[(1-\alpha)\epsilon_\lambda^{1-\alpha}\right]^{\frac{1}{\alpha}} K_t, \tag{12}$$

which implies that,

$$T_t^* = \sigma_t^* + \lambda_t^*. \tag{13}$$

These optimality conditions reveal the trade-offs faced by policy-makers. Eq. (11) implies that politicians' optimal level of transfers grow faster than the capital stock since $v>0$. However, as politicians become less inclined to pursue redistributive policies, i.e., $\chi \to 0$, Eq. (11) shows that the politically optimal level of transfers approaches zero. Eq. (12) shows that government investment grows in proportion to the capital stock. When the capital stock is growing, government investment increases in lock-step, with the constant of proportionality reduced when the cost of administering this program rises.[8] Finally, Eq. (13) reveals that, due to transfers, taxes grow faster than the capital stock. This is because a rise in transfers is funded out of higher taxes.

Importantly, Eq. (10) governs the evolution of the welfare state. In a growing economy, transfers grow slightly faster than the capital stock but increase proportionately with rises in χ, the value given by policy setters to redistribution. However, since public investment increases lockstep with K, the dynamics of welfare state evolution is pinned down by the equation for transfers, Eq. (11). Hence, in a growing economy, θ also grows faster than output. This is because when politicians maximize votes, voter support to politicians depends not only on the transfers they receive, but also on the rate of output growth. As a consequence, in the expanding stage of the welfare state, transfer spending drives the growth of the welfare state. Over time, however, a threshold emerges wherein to maintain positive output growth, the government reduces transfer spending by cutting social welfare expenditure. Since χ enters into the equation for transfers, an exogenous shift in χ leads to an exogenous shift in the size of the welfare state. More specifically, let H denote high, and L denote low. This implies that a structural break in χ—say from χ_L to χ_H—induces a structural break in θ from Eq. (10) in period t.

To assess the impact of a rising welfare state on growth, following Solow (1956), we substitute out the above optimality conditions in the capital market equilibrium condition.

[8] Optimal government investment generally falls when the productivity of private capital, α, rises as politicians optimally reduce taxes to allocate more revenue to private capital.

The dynamical system that describes growth in this economy is given by[9]

$$K_{t+1} = s\left[GK_t - HK_t^{\frac{1}{1-\gamma}}\right] + (1-\delta)K_t, \tag{14}$$

where we denote after tax output by, $\bar{Y}_t = Y_t - T_t = \left[GK_t - HK_t^{\frac{1}{1-\gamma}}\right]$. Define $g_{t+1} = \frac{K_{t+1}}{K_t}$ to be the growth rate. Then,

$$g_{t+1} = (sG + 1 - \delta) - HK_t^{\frac{\gamma}{1-\gamma}}. \tag{15}$$

Together with Eq. (10), Eq. (15) determines the joint evolution of the welfare state and growth in the economy, respectively.

2.1. Joint evolution between growth and the welfare state

To focus the analysis on the impact of θ_t on g_{t+1}, since the constant term H depends positively with $\frac{\chi}{1-\chi}$, from Eq. (15) it is easy to see that,

$$\frac{\partial g_{t+1}}{\partial \dfrac{\chi}{1-\chi}} < 0. \tag{16}$$

Eqs. (10), (15), and (16) permit us to see how a structural break from a rise in the welfare state creates a regime shift in growth.

Suppose χ rises from χ_L to χ_H. This implies that θ_t rises from a low welfare state regime to a high welfare state regime in period t. Further, θ increases slightly faster than capital since $v>0$. We refer to a rising θ relative to output as corresponding to an *expansionary stage* of the welfare state. From Eq. (15), however, a rise in χ reduces growth, g_{t+1}, in period $t+1$. Consequently, growth moves from a high growth regime, $g_{H,\,t+1}$, to a low growth regime, $g_{L,\,t+1}$, in period $t+1$.

The intuition is that a rise in χ, by raising σ_t, also requires an increase in taxes, T_t. This reduces disposable income and subsequently investment and capital accumulation. It is important to note however that a rise in θ in period t does not affect K in period t, but in period $t+1$. This is because Eq. (15) is inter-temporal. This implies that a structural increase in the size of the welfare state should *precede* the structural break in growth.[10]

Note that from Eq. (15), a reduction in growth leads to a lower capital stock in $t+1$. This reduces transfers, σ_{t+1}, in time $t+1$. However, since transfers fall slightly faster than output

[9] Here, $G = \alpha[\epsilon_\lambda(1-\alpha)]^{\frac{1-\alpha}{\alpha}} > 0$, and $H = \left[\frac{(\gamma\beta\epsilon_\sigma^{\gamma})}{[(1-\chi)(1-\epsilon_\sigma)]}\right]^{\frac{1}{1-\gamma}} > 0$. We also assume a regularity condition, $s\alpha[\epsilon_\lambda(1-\alpha)]^{\frac{1-\alpha}{\alpha}} - \delta > 0$, to ensure that the dynamics are not trivial. This restriction is likely to hold if δ is sufficiently small.

[10] To concentrate the analysis around movements in θ inducing movements in the growth rate, we ignore the possibility that the other constant parameters in the model can induce a structural break in growth. This is for three reasons. First, it is a well known fact that α, the share of income paid to capital, is constant. Second, the constant savings assumption has solid empirical support (Campbell and Mankiw, 1991; Blinder and Deaton, 1985). Finally, we assume that ϵ_λ and ϵ_σ are sufficiently small to not impact the aggregate dynamics of the economy.

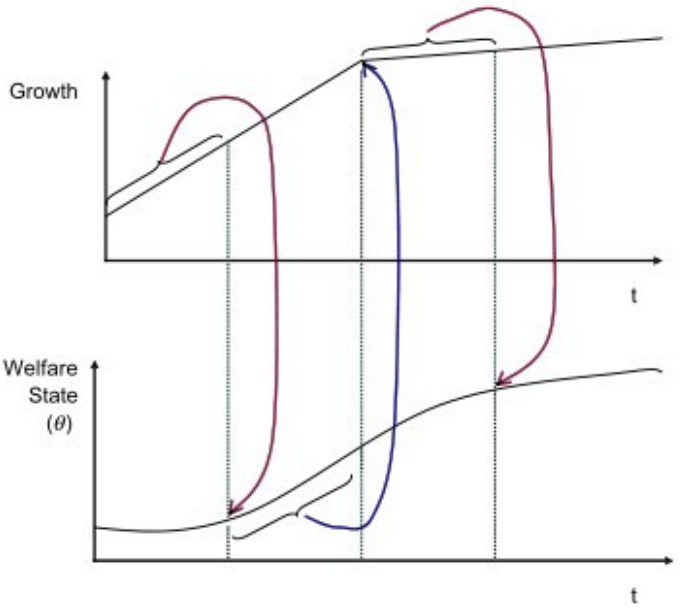

Fig. 1. Structural breaks in the welfare state (θ) and growth.

over time (even though public investment falls in proportion to output), this means θ also falls slightly faster than output over time. From the capital market clearing condition, this raises disposable income, and therefore growth in period $t+2$. We refer to a declining θ relative to output as corresponding to a *contractionary stage* of the welfare state. In other words, in the contractionary stages of the welfare state, a reduction in θ leads to higher growth over time.

Fig. 1 describes the dynamic impact of regime switches in the welfare state to regime switches in the growth rate given by Eqs. (15) and (10). Initially, a high growth regime funds a growing welfare state. This leads to a high growth-growing welfare state. However, since a rise in transfers requires taxes to rise from Eq. (13), the drag created by higher taxes on disposable income reduces capital accumulation and growth.[11] Hence, our theoretical analysis is consistent with macroeconomic performance of welfare state economies outlined in the introduction, i.e., in the long run, growth is affected adversely because higher welfare state spending is financed by higher taxation which generates an economic inefficiency (Lindbeck et al., 1994; Organization for Economic Cooperation and Development, 1994a,b; Atkinson and Werner-Sinn, 1999; Ghate and Zak, 2002). It is also important to note that when growth falls, the welfare state also declines, although at a faster rate than the reduction in growth. This ultimately creates an upturn in growth.

[11] The condition for balanced growth obtains by evaluating $\frac{dK_{t+1}}{dK_t} > 1$. When $\chi \neq 0$, $\chi \rightarrow 1$ implies that $T_t \rightarrow \infty$ from Eq. (13), or $\lim_{T_t \rightarrow \infty} \bar{Y} = 0$. In contrast, when $\chi = 0$, transfers are set to zero, which implies after tax output is linear in capital, i.e., $\bar{Y} = Y - T_t = \alpha\{(1-\alpha)\epsilon_L\}^{\frac{1-\alpha}{\alpha}} K_t$.

Finally, note from Eq. (14), as $\chi \rightarrow 1$ (or $H \rightarrow \infty$), a higher propensity for redistribution on the part of policy makers leads to output falling to zero in the long run. This is because a higher propensity to re-distribute increases the taxes required to fund transfers reducing after tax output. In contrast, when $\chi=0$ (or $H \rightarrow 0$), endogenous growth obtains and the economy grows on a balanced growth path. The after depreciation growth rate, or the *net* rate of growth is given by $sG-\delta$. Hence, the value of χ determines the aggregate dynamics of the economy.[12]

3. Empirical setup

3.1. Motivation for Markov switching approach

To test the model outlined in Section 2, we employ a Markov regime switching model along the lines of Engle and Hamilton (1989) and Hamilton (1994). Before outlining the testable hypothesis, however, we briefly detail the importance of using a Markov regime approach.

First, using a regime switching approach allows us to compute the mean values (of growth rates) in different regimes as well as the probabilities of moving from a high growth to low growth regime (or low welfare state to high welfare state regime). Also, to the best of our knowledge, using a regime switching approach to assess welfare state-economic growth dynamics is new in the literature. Hence, our model proposes a new modeling strategy for assessing the joint nonlinear impact of growth and welfare state evolution assuming that the timing of structural breaks are unknown.

Second, using a regime switching framework allows us to bypass the well-known problems associated with an ex-ante selection of the timing of structural change. This is because the date of the structural change is not defined under the null-hypothesis. This implies that the standard testing theory is not applicable (Hansen, 2001).

Third, an assessment of the impact of fiscal policy on economic growth based on linear regressions does not provide economically plausible and statistically significant results. This is because the relation between fiscal policy and growth may be nonlinear with the fiscal and growth variables jointly endogenous. While a solution to the joint endogeneity problem would be to use exogenous instrumental variables to proxy for various regressors, because of the multiplicity of possible regressors, the influence of one variable on growth does not necessarily imply that other variables do not affect growth (Easterly and Rebelo, 1993; Brons et al., 1999). Likewise, using simple linear regressions can lead to serious model mis-specification.[13] To see this graphically, a hypothetical structural break in growth induced by a rise in the welfare state is depicted in Fig. 2. Both variables, g (growth) and θ (measure of welfare state), are generated by two

[12] Matsuyama (1999) constructs a similar model in which factor accumulation and innovation capture different phases of a single growth experience.

[13] Having said this, using a-priori specified non-linear models does not fully solve the problem since the results are sensitive to the assumptions on model structure.

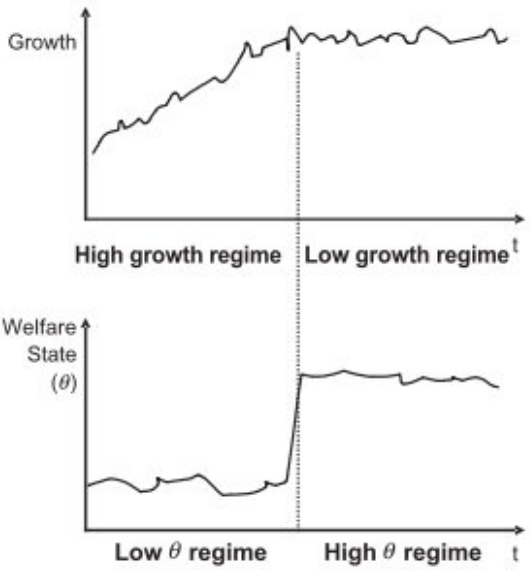

Fig. 2. Structural breaks and regime switches.

regimes. The causal link between g and θ exists *if the regimes that generate them overlap*.[14] However, any inference on the *direction of causation* is not restricted a-priori by a pre-specified linear or nonlinear function. This means that variable movements depend only on their regimes.

Fourth, a conceptual difficulty with using standard growth regressions is the multiplicity of explanations (Durlauf and Quah, 1998; Durlauf, 2000). This leads to a large set of potential explanatory variables.[15] This points to one of the advantages of using a regime switching model: we focus exclusively on the variables that drive the dynamics of the theoretical model.

Fifth, several cross-country empirical studies assume that the statistical model is invariant across investigated units (countries). This assumption—often referred to as parameter homogeneity—is usually a strong assumption to justify. For example, it is difficult to justify that a 1% change in school enrollment has the same effect on growth in two countries like the US and Botswana (Durlauf, 2000). Sorting countries into groups does not solve parameter heterogeneity as country-groupings are typically ad hoc with few alternative groupings.

We proceed by first analyzing all the variables of interest within the Hamilton framework. Inference on the behavior of each series is then used as a benchmark for analyzing the dynamics and causal links between the expenditure structure and growth.

[14] If the transition in θ is smooth and long lasting, regimes with high growth and low welfare states and low growth and high welfare states may not overlap. However, this does not mean that we cannot draw conclusions on the joint dynamics between growth and the welfare state.

[15] For instance, Durlauf (2000) and Durlauf and Quah (1998) report over 90 different variables as potential explanations for standard growth variation.

3.2. Testable implications

The model in Section 2, the joint evolution of the welfare state and growth given by Fig. 1, and Eqs. (10), (15), and (16) lead to the following testable implications.[16] The testable implications attempt to characterize the joint endogenity of welfare state and growth evolution.

- In the *expansionary stages of the welfare state*, $\uparrow$ growth$\rightarrow\uparrow\ \theta$. Hence, high growth regimes are associated with a high welfare state regime. However subsequently, expanding welfare state regimes are associated with low growth regimes: $\uparrow\ \theta\rightarrow\downarrow$ growth.
- In the *contractionary stages of the welfare state*, $\downarrow$ growth$\rightarrow\theta\downarrow$. Hence, lower growth regimes are associated with a low welfare state regime. However subsequently, contracting welfare state regimes are associated with high growth regimes:$\downarrow\ \theta\rightarrow\uparrow$ growth.
- A regime switch inducing structural break in θ precedes the structural break in the growth: i.e., an upward structural break in θ induces a structural break to a lower growth regime.
- A regime switch inducing structural break in growth precedes the structural break in the θ: i.e., a downward structural break in growth induces a downward structural break in θ.
- The joint evolution between growth and the welfare state is nonlinear.

3.3. Data description

We test the above using the CWS data-set compiled by Huber et al. (1997), as well as the IFS and OECD datasets.[17] The sample encompasses data for 19 welfare states economies. These are Australia (AUL), Austria (AU), Belgium (BEL), Canada (CAN), Denmark (DEN), Finland (FIN), France (FRA), Germany (GER), Ireland (IRE), Italy (ITA), Japan (JAP), Luxembourg (LUX), Netherlands (NET), New Zealand (NZL), Norway ((NOR), Sweden (SWE), Switzerland (SWZ), United Kingdom (UK) and United States (US).

Growth rates of RGDP are computed as differences in logs of GDP in constant prices. Further, our analysis of regime switches in RGDP starts from 1950. However, due to the lack of complete data on transfers and public investment over 1950–2000, the welfare state variable, θ, starts only from 1960. As the raw data contain business and political cycle factors irrelevant for long run output movements, a Hodrick-Prescott filter is run on both RGDP and θ.

[16] To ensure that the model matches the key features of the data, we assume that $v>1/2$.

[17] Annual data on RGDP are obtained from the IFS. Annual data on real outlays on public investments and real transfers come from the IFS , CWS, and OECD databases. The variable θ for DEN and LUX are defined as the ratio of total real transfers to gross domestic investment as there is insufficient data available on public investment.

4. Empirical results

4.1. Structural breaks in growth rates

As stated in the introduction and shown in Fig. 2, we first analyze all the variables of interest within the Markov regime framework. Inferences on the behavior of each series are then used as a benchmark for analyzing the dynamics and causal links between the welfare state and growth. To analyze structural breaks in the growth rates, we follow Hamilton (1994), as discussed in Appendix A. The RGDP growth series is decomposed into two stochastic trends corresponding to two regimes over 1950–2001: one that generates high growth and one that generates low growth rates. Table 1 summarizes the results for the investigated countries.

As Table 1 indicates, a majority of countries experience a growth slowdown in the mid 1970s, with average growth rates equal to 5.07% prior to the structural break, and 2.29% after the structural break. The *net* change in growth rates across all 19 economies is −2.78%. The highest pre-break growth rates are observed in Japan and Germany with growth rates of 9.33% and 7.09%, respectively. These countries also record the biggest (net) slowdown in the post-break period, −6.64% and −4.32%, respectively. Switzerland and Norway are the

Table 1
Identification of structural breaks in economic growth

Country	Pre-break growth rate (%)	Post-break growth rate (%)	Change: −slowdown, +upturn	Structural break
AU	5.4	2.34	−3.06	1977
AUL	5.32	2.81	−2.51	1975
BEL	4.33	2.04	−2.29	1975
CAN	5.18	2.38	−2.8	1977
DEN	4.3	1.89	−2.41	1975
FIN	5.25	2.74	−2.51	1975
FRA	5.25	2.03	−3.22	1977
GER	7.09	2.77	−4.32	1971
IRE	3.67	8.26	+4.59	1992
ITA	6.1	2.69	−3.41	1977
JAP	9.33	2.69	−6.64	1972
LUX	6.16	3.95	2.21	1985
NET	5.53	2.29	−3.24	1976
NOR	4.29	1.76	−2.53, +2.53	1980, 1994
NZL	3.81	1.79	−2.02, +2.02	1974, 1954
SWE	3.09	2.06	−1.03	1974
SWZ	5.21	1.56	−3.65	1972
UK	2.68	0.26	–	only first regime was recorded
US	4.02	2.37	−1.65	1972
Average	5.07[a]	2.29[a,b]	−2.78	

In IRE (1992), LUX (1985), and NOR (1994), the direction of growth change was opposite: the post-break growth rate was higher and the break occurred later.

[a] Excluding Luxembourg and Ireland.

[b] Including UK growth equal to 2.68%.

slowest growing economies after the break—growing at an average rate of 1.56% and 1.76%, respectively. Further, the direction of change in growth is opposite in Ireland and Luxembourg: for these economies, the average post-break rate exceeds the pre-break growth rate.[18] Evidence for Norway and New Zealand shows that these economies experience two breaks—one indicating a growth slowdown (Norway in 1980 and New Zealand in 1974) and the second an upturn in growth (Norway in 1994 and New Zealand 1954). Further, the identification of these breaks is consistent with the timing of several public sector reforms enacted by both countries. Finally, the model does not identify a break for United Kingdom (UK). This result is consistent with the findings of Ben-David and Papell (1998): i.e., the UK economy grew at an average of 2.68%—a growth rate substantially lower than the growth average for the high growth regime averages (5.07%), and closer to the average growth rates across the low growth regime (2.29%).

Table 1 also allows us to distinguish groups of countries with coinciding break timings. This identifies groups of economies whose growth rates are influenced by structural declines in the growth rates of groups of other economies. For instance, the first wave of countries that experience a downward regime switch in growth encompass Germany (1971), United States (1972), Japan (1972), and Switzerland (1972). The three big economies—US, Germany and Japan—could be regarded as engines of growth for other countries as growth in these economies affects the growth performance of other welfare state economies.[19] The second wave of regime switches occur over 1974–1977: Denmark, Finland, Sweden, Australia and New Zealand over 1974–1975; Belgium and Netherlands over 1975–1976; and Austria, France, Canada, and Italy, with growth breaks in 1977. In effect, the drag from welfare state spending in larger economies creates a negative wealth effect in the medium and long term. This appears to affect the growth performance of other welfare state countries.[20]

In summary, Table 1 indicates that the *early* 1970s *is an important turning point for many industrialized economies*. This constitutes our first finding. Hence, the implication of our results is that the average pre-break growth rates exceed the average post-break growth rates. The incidence of growth slow-downs for developed countries is also consistent with the many findings of post-war divergence in income levels across developed economies themselves. In the interest of economizing on space, we plot the evolution of RGDP rates in three "representative" economies as shown in Figs. 3, 5, and 7. These figures correspond to Finland, France, and Sweden, respectively.[21] These countries are representative because the RGDP series for several of the other countries analyzed using the Markov switching framework conforms to the pattern of thresholds in growth illustrated in these graphs.[22]

We now assess the welfare state series.

[18] As we will see later, Ireland's lower pre-break and higher post-break growth rate is only partially consistent with the theoretical model because of fiscal reforms enacted over the 1983–1994 period.

[19] The relatively early break for Switzerland could be explained by the fact that it is a small economy outside of the EU institutional apparatus.

[20] International trade is a possible channel through which long-term income losses in larger welfare state economies affects the growth performance of smaller welfare state economies (Mulas-Granados, 2003).

[21] The graphs for the remaining countries are available from the authors on request.

[22] See Appendix A for a formal treatment of the regime switching approach.

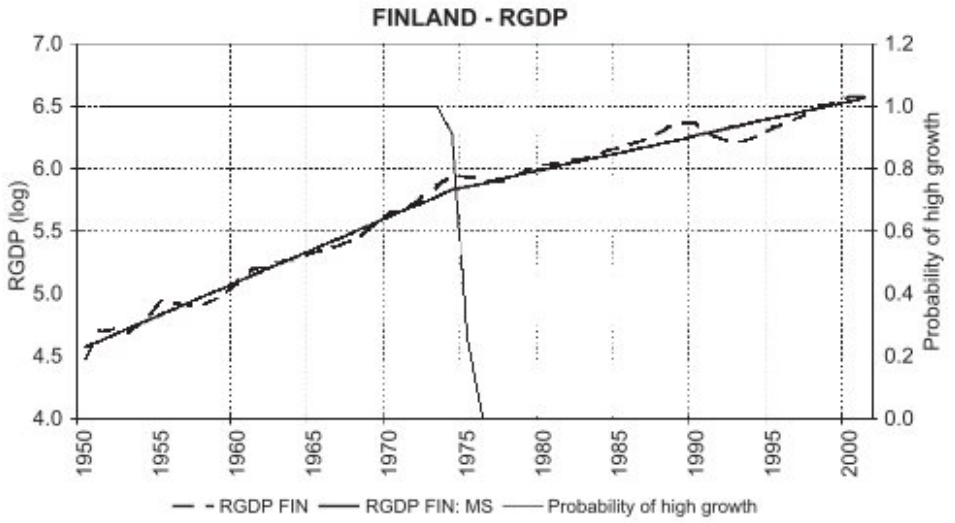

Fig. 3. RGDP (log) Finland (RGDP FIN) and RGDP (log) predicted by the Markov Switching Model (RGDP FIN: MS).

4.2. Structural breaks in the welfare state

Our analysis of the welfare state variable θ confirms the prediction from the theory that the welfare state evolves in a logistic pattern for most analyzed countries. This constitutes our second finding. Consistent with the previous section, we plot the evolution of the welfare state corresponding to the RGDP figures for Finland, France, and Sweden. These

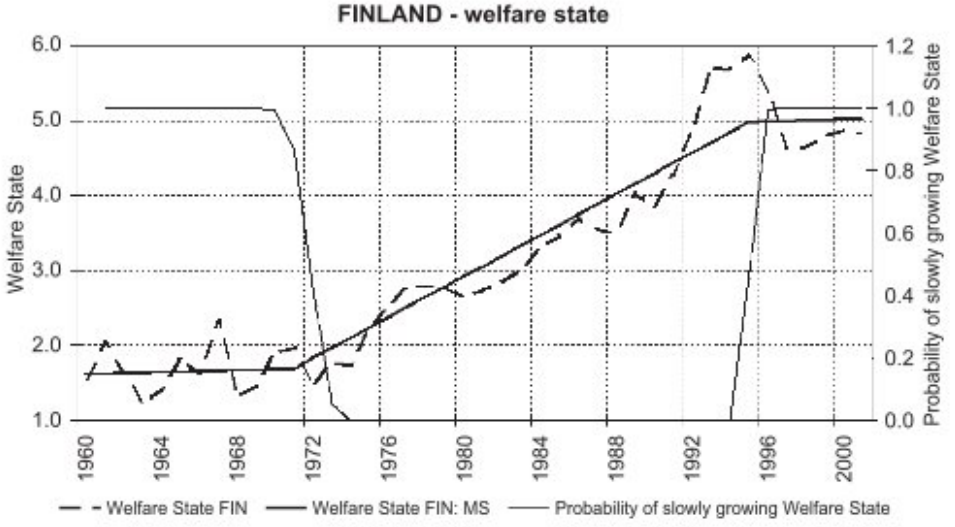

Fig. 4. Welfare State Finland (Welfare State FIN) and Welfare State predicted by the Markov Switching Model (Welfare State FIN: MS).

are given by Figs. 4, 6, and 8, respectively. As these figures show, applying the Hamilton model with two regimes—corresponding to slow and fast welfare state growth—enables identification of three characteristic periods of welfare state behavior. The first regime is a period in which the welfare state grows slowly when it is at a low level (period 1). The second regime is a period in which the welfare state grows rapidly in the transition period (period 2). The third regime is a period in which the welfare state grows slowly again although at a higher level than the size that the welfare state attained after the transition period (period 3). For instance, this can be seen in the case of Sweden in Fig. 8. The model identifies 1968 as the first regime switch to a high welfare state regime, and then the late 1980s–early 1990s as a reversion to a lower welfare state regime. As will be discussed later, as the welfare state falls in Sweden, (decreasing θ), there is a growing probability of higher growth, as can be seen for the years 1998–1999 in Fig. 7. This is consistent with the growth dynamics induced by a declining welfare state regime outlined in the last testable implication of the previous section: to wit, since the decline in the welfare state exceeds the reduction in growth, ultimately, there is an upturn in growth.

Table 2 confirms that most countries analyzed experienced two structural breaks in θ. We also find that the average transition period between both structural breaks across the sample lasts for 15.5 years. For instance, the process of welfare state growth begins earlier in Canada (1966) and Sweden (1968) than in the other countries. The UK and New Zealand exhibit the most stark increases in the welfare state: growing by 261% and 239%, respectively. Finally, there are four economies with three structural breaks in θ: Denmark,

Table 2
Identification of structural breaks in the welfare state

Country	% Change in welfare state[a]	Structural breaks 1, 2, (3)	Length of transition period[b]
AU	First Break Only	1993, –	–
AUL	152.4	1971, 1984	13
BEL	First Break Only	1977, –	–
CAN	161.3	1966, 1982	16
DEN	100	1972, 1983, (1989)	11.6
FIN	180.1	1972, 1996	24
FRA	71.5	1971, 1983	12
GER	80.7	1972, 1984, (1992)	12.8
IRE	First Break Only	1980, –	–
ITA	Opp. Direction of Breaks	1970, 1988, (1997)	–
JAP	131.3	1972, 1987, (1996)	15
LUX	Second Break Only	–, 1981	–
NET	218.7	1970, 1985	15
NOR	79.9	1970, 1986	16
NZL	239.0	1973, 1993	20
SWE	179.0	1968, 1986	18
SWZ	78.7	1969, 1984	15
UK	261.3	1971, 1985	14
US	Second Break only	–, 1980	–

[a] Beginning and end of transition period, HP values.
[b] In Years.

Table 3
Evidence for the model

Country	Welfare state structural break 1	Growth structural break	Welfare state structural break 2, (3)	Evidence for model
AU	1993	1977	–	No evidence
AUL	1971	1975	1984	Evidence
BEL	–	1975	1977	No evidence
CAN	1966	1977	1982	Evidence
DEN	1972	1975	1983	Evidence
FIN	1972	1975	1996	Evidence
FRA	1971	1977	1983	Evidence
GER	1972	1971	1984, (1992)	Evidence. 3 breaks.
IRE	1980	1992		No evidence
ITA	1970	1977	1988, (1997)	No evidence (opposite direction of breaks in θ)
JAP	1972	1972, 1993	1987, (1996)	Evidence. 3 breaks. Model recognizes the second break in growth in 1993. Cannot be directly attributed to θ.
LUX	1981	1985	–	Evidence (a decrease in θ growth leads to higher growth)
NET	1970	1976	1985	Evidence
NOR	1970	1980, 1994	1986	Evidence
NZL	1973	1974	1993	Evidence
SWE	1968	1974	1986	Evidence
SWZ	1969	1972	1984	Evidence
UK	1971	–	1985	–
US	–	1972	–	–

Germany, Japan and Italy. We later discuss why Germany and Japan should be regarded as special cases.[23]

4.3. Discussion of results

A detailed description of individual countries is presented in Table 3. For 12 countries—Australia, Canada, Denmark, Finland, France, Germany, Japan, Netherlands, Norway, New Zealand, Sweden and Switzerland—the empirical evidence surrounding θ confirms the co-evolution of growth and the welfare state described by Eqs. (10) and (15), as well as Fig. 1. Further, for Luxembourg, while the direction of structural breaks in growth and the welfare state are in the opposite direction, the joint dynamics are still consistent with the theory (a decrease in the welfare state variable, θ, leads to higher growth). Figs. 3–8 offer three sets of representative diagrams of growth starts and breaks for these 12 countries. In each, the first structural break in the welfare state variable, θ,

[23] The third structural break in θ in Denmark is caused by decreasing private investment (there is no disaggregated data on public investments available). For this reason, we discuss this among the countries with two structural breaks. The directions of structural breaks in θ in Italy are opposite from the other four economies.

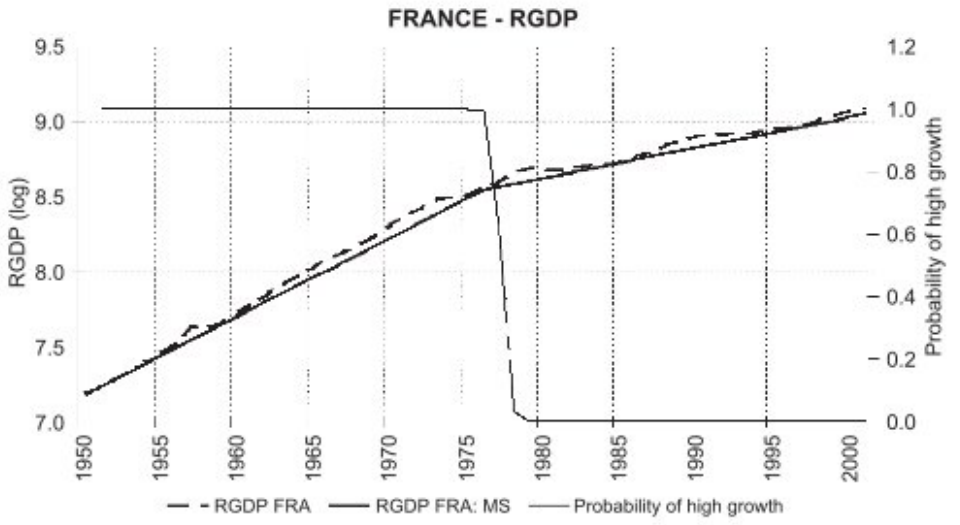

Fig. 5. RGDP (log) France (RGDP FRA) and RGDP (log) predicted by the Markov Switching Model (RGDP FRA: MS).

precedes the structural break in growth. In other words, for the economies listed above, the empirical evidence support the testable implications outlined in Section 3: i.e., that regimes that generate low θ values are associated with regimes that generate high growth rates, while regimes that generate high θ values also generate low growth regimes. This constitutes our third finding.

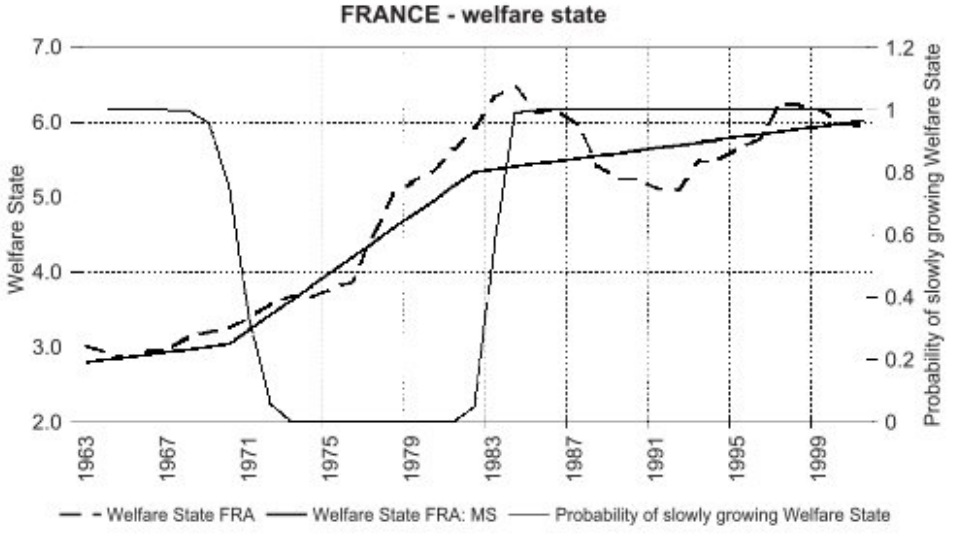

Fig. 6. Welfare State France (Welfare State FRA) and Welfare State predicted by the Markov Switching Model (Welfare State FRA: MS).

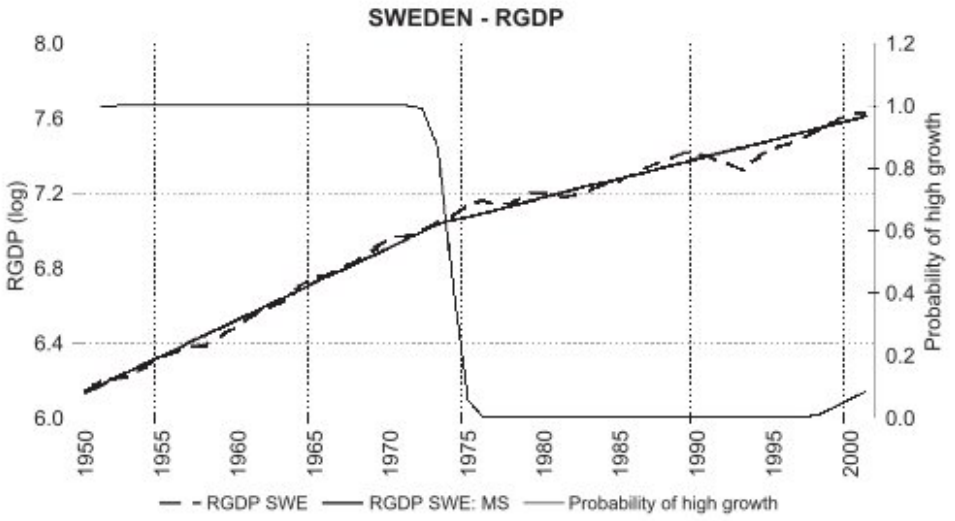

Fig. 7. RGDP (log) Sweden (RGDP SWE) and RGDP (log) predicted by the Markov Switching Model (RGDP SWE: MS).

We now look at certain countries in detail to verify whether the broader institutional reforms enacted by these countries predict the break points identified in the economic growth and welfare state series by the Markov switching framework above.[24]

4.3.1. Sweden and Finland

As can be seen for Finland and Sweden from (Figs. 3, 4, and 7 and 8), respectively, the joint dynamics of welfare state and growth thresholds are very similar. In particular, we consider the joint evolution between growth and the welfare state in Sweden to constitute strong evidence for the theoretical model. To wit, both Sweden and Finland faced high public debt, high unemployment, and low growth in the early 1990s. To tackle these, in addition to institutional reforms, both countries mainly targeted social security spending in their reform agenda (Organization for Economic Cooperation and Development, 1994a,b; Lindbeck et al., 1994). Among several reforms, Sweden reduced the replacement ratio for unemployment benefits, changed the indexation of pensions, and reduced child allowances and family support (Lindbeck et al., 1994). Finland raised the retirement age as part of its pension reform, reduced health insurance benefits, and curtailed producer subsidies and employment of local governments. The end effect was that both governments cut public spending by 4% of GDP between 1993 and 1995. For instance, as can be seen in Fig. 4—which depicts the incidence of structural breaks in the welfare state variable θ for Finland—the probability of moving to a contracting welfare state regime from an expanding welfare state regime rises in the 1994–1995 period. Similarly, for the case of

[24] The choice of country groupings is consistent with the emphasis given to certain countries in the welfare state reform literature. For instance, see Tanzi and Schuknecht (1997) and Mulas-Granados (2003).

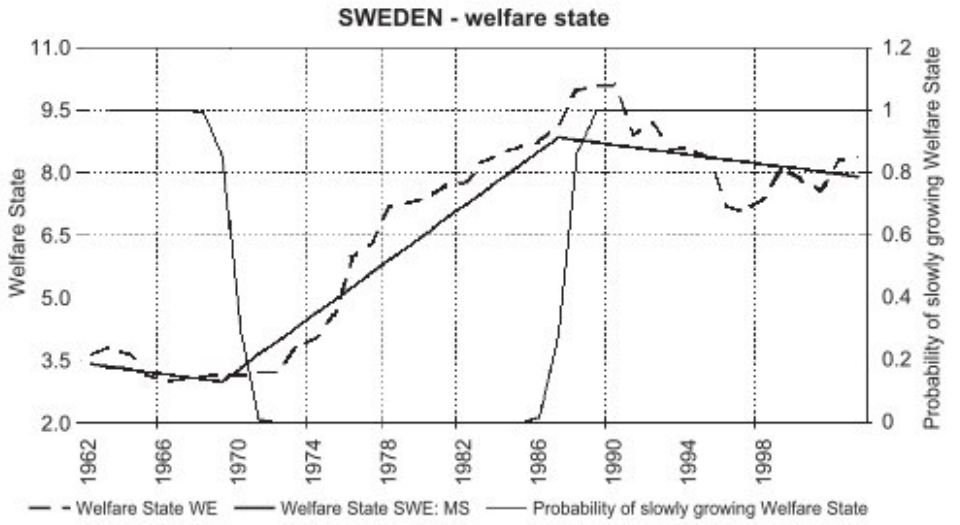

Fig. 8. Welfare State Sweden (Welfare State SWE) and Welfare State predicted by the Markov Switching Model (Welfare State SWE: MS).

Sweden in Fig. 8, the probability of moving to a contracting welfare state regime from an expanding welfare state regime rises in the late eighties and early nineties.[25] Accordingly, in the Swedish case, the probability of the high growth regime has been increasing since 1996, which is consistent with the theory: i.e., a result of the welfare reforms enacted in the late eighties and early 1990s which led to reductions in the size of the welfare state. While we do not discuss the case of France explicitly, similar patterns are discernible in the structural breaks governing France's growth rates. However, the difference between Finland on the one hand, and France and Sweden on the other hand, is the shorter transition period taken in France and Sweden taken to revert back to the low growth welfare state regime again (approximately 20 years in Finland vs. 10 years in France and 15 years in Sweden).

4.3.2. New Zealand

Our model also supports the joint dynamics of welfare state and growth thresholds in countries with two growth structural breaks, like New Zealand. Since 1994, New Zealand has adopted a Fiscal Responsibility Act that clearly defined the rules and objectives of fiscal policy. Further by 1994, public sector spending had declined by 10% of GDP compared to 1988. This reduction was almost exclusively achieved by cuts in transfers and subsidies (Tanzi and Schuknecht, 1997). These reforms are consistent with our findings for New Zealand in Table 2: our identification of a second structural break for θ in New Zealand is in 1993. In contrast, during the 1970s and 1980s, New Zealand was a highly

[25] Lindbeck et al. (1994, p. 98) document the enormous size in public spending in Sweden since 1950. To wit, public spending has grown from approximately 25% of GDP in the early 1950s to 70% in the early 1990s. Both transfer payments and public consumption have led this expansion. The number of public employees has increased from fewer than 500,000 in 1960 to about 1,600,000 in 1993.

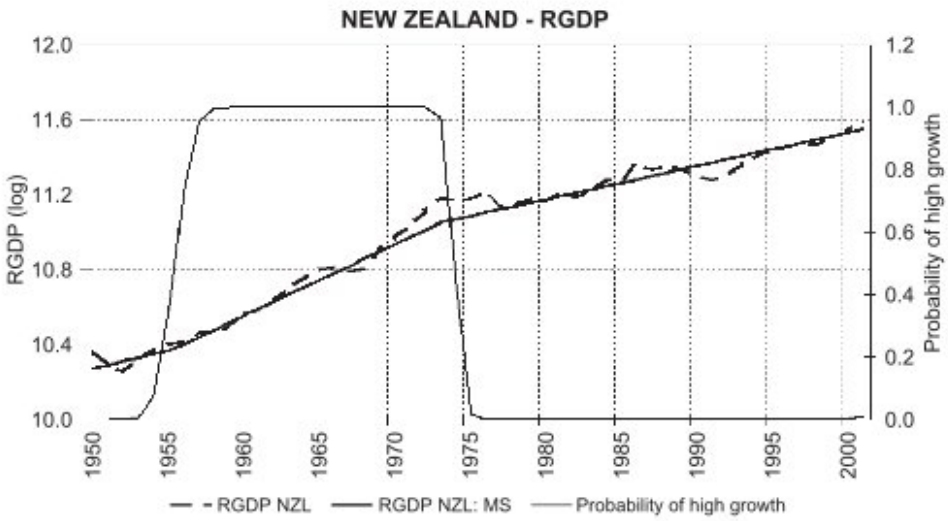

Fig. 9. RGDP (log) New Zealand (RGDP NZL) and RGDP (log) predicted by the Markov Switching Model (RGDP NZL: MS).

protectionist economy (Scott, 1996). From Table 2, this is consistent with the identification of an expanding welfare state regime in New Zealand in 1973. However, between 1984 and the mid-1990s, New Zealand's exhaustive reforms—which covered state enterprises, agriculture, the tax system, social policy reform, health, education, and pension benefits—created the conditions for higher economic growth in the mid 1990s (Figs. 9 and 10).[26]

4.3.3. Some other countries

The remaining countries in this group follow a similar pattern of breaks although with varying transition periods. These transition periods are outlined in Table 2. For instance, in the case of Australia, extensive government spending, lasting from the beginning of the 1970s, was curtailed in the mid 1980s, with a stabilization plan launched to correct for both internal and external balances. This consolidation mainly encompassed adjustments in the government wage bill and cuts in transfer programs.

In *Canada*, after a long period of public spending throughout the 1960s and 1970s, a fiscal stabilization program was enacted in the first half of the 1980s. The Canadian government cut the government wage bill, leaving social spending virtually unchanged. However, the expansion of the Canadian economy in 1982 triggered a re-orientation in the structure of Canadian public expenditures, making welfare state spending grow slower.

In *Denmark*, in 1982, a new right-wing government launched a fiscal stabilization program, with the adjustment equally divided between spending cuts and tax increases. On the spending side, the welfare cuts were broad ranging, but focused strongly on unemployment insurance and the pension system (Organization for Economic Cooperation and Development, 1994a,b). During 1983–1986, there were also reductions in redistrib-

[26] See Scott (1996) and Tanzi and Schuknecht (1997) for more details on the various reform elements in New Zealand.

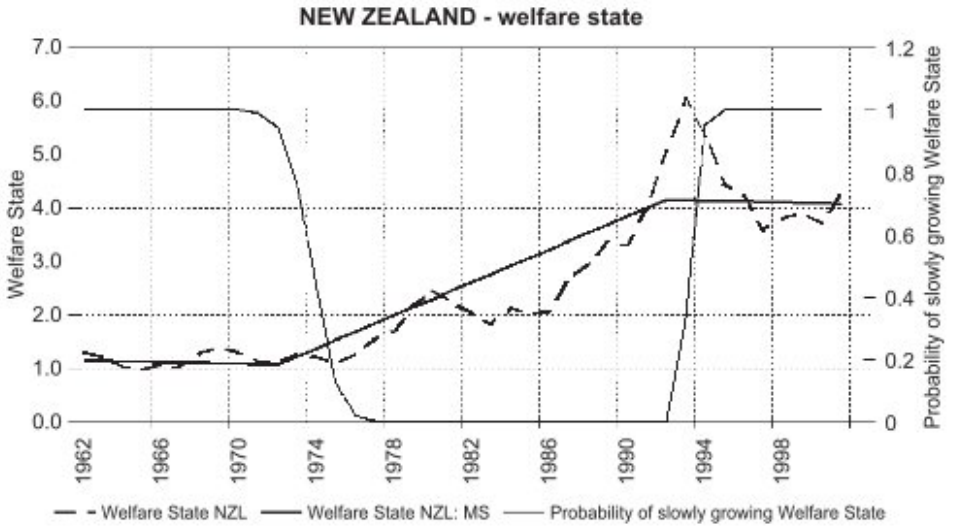

Fig. 10. Welfare State New Zealand (Welfare State NZL) and Welfare State predicted by the Markov Switching Model (Welfare State NZL: MS).

utive transfers to local governments. On the revenue side, the increases were on direct taxes for households and businesses, with modest increases in indirect taxes.

Finally, in the case of *Luxembourg*, the direction of θ and growth switches are opposite than in the rest of countries but still consistent with the theory—a decrease in welfare state growth leads to higher growth.

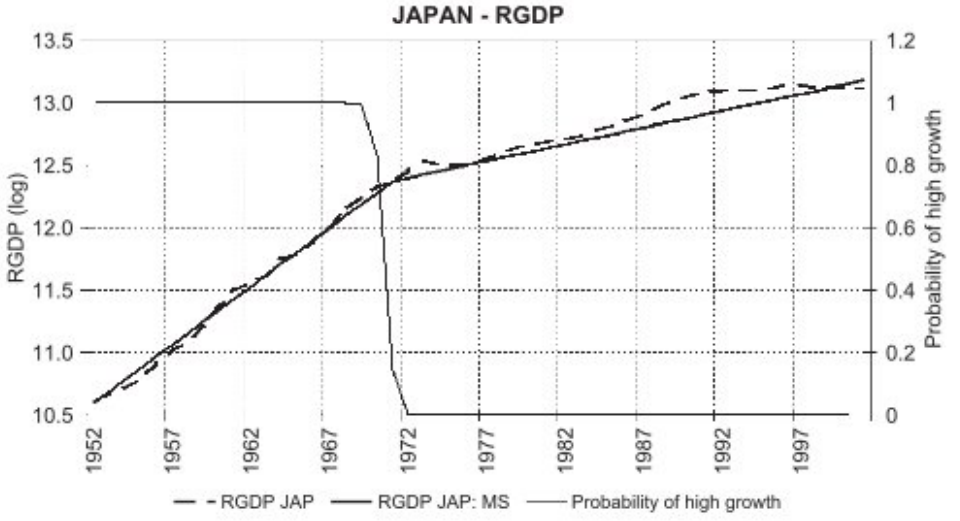

Fig. 11. RGDP (log) Japan (RGDP JAP) and RGDP (log) predicted by the Markov Switching Model (RGDP JAP: MS).

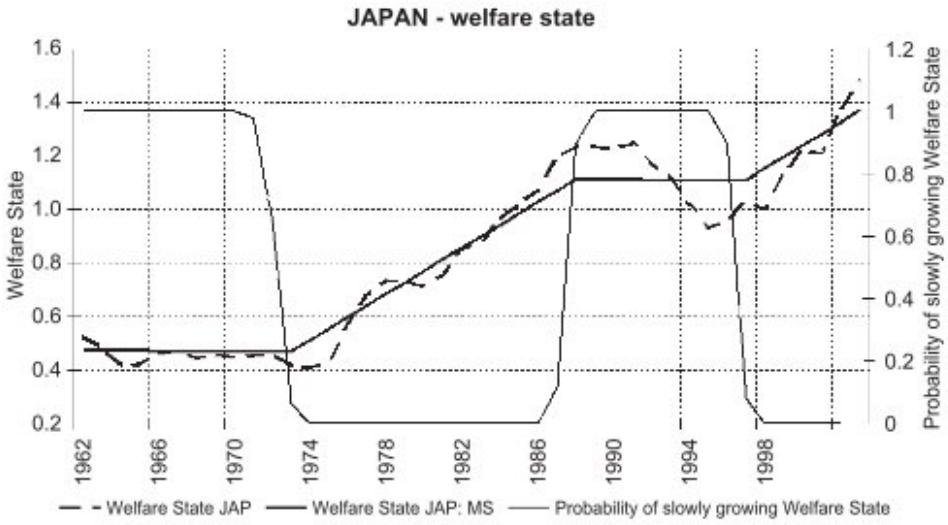

Fig. 12. Welfare State Japan (Welfare State JAP) and Welfare State predicted by the Markov Switching Model (Welfare State JAP: MS).

4.3.4. UK and USA

While the UK and USA do not directly support the model, the broad pattern of growth and welfare state evolution is consistent with the theoretical model. Hence, they deserve some elaboration. For the UK, the first structural break in θ in 1971 is not followed by a structural break in growth. One possible explanation for this is because transfer and subsidy spending as a percentage of GDP was already low in the UK compared to other countries such as Ireland, Finland, Belgium, and Sweden (Organization for Economic Cooperation and Development, 1994a,b; Ghate and Zak, 2002). Further, while the mid-1980 privatization reforms reduced public spending, public expenditure crept up again rapidly in the 1990s. To wit, public expenditure was only 2% below its previous peak in 1983 and subsidies and transfers were higher in 1994 before the Thatcher reforms. In contrast, for the US, we do not find evidence of a statistically significant rise in θ even though the model predicts a structural decline in growth starting in 1972. This is broadly consistent with the decline in growth and total factor productivity dated to 1971 in the US, with one possible factor being inadequate public investment in infrastructure (Aschauer, 1989).[27]

[27] As can be verified from Tables 1 and 2, for three countries—Austria, Belgium, and Ireland—we do not find evidence of a rise in θ preceding the structural break in growth. Even though Belgium achieved a substantial reduction in public expenditures between 1983 and 1994, the fiscal reform package after the early 1990s only led to marginal changes in fiscal expenditures (Organization for Economic Cooperation and Development, 1994a,b). This may explain why our analysis does not capture a second structural break for the welfare state variable θ. Likewise, Ireland's reform program between 1983 and 1994 was subsequently accompanied by a rebound in economic growth with reductions in subsidies and transfers taking on the bulk of Ireland's fiscal adjustment. Other reforms included a reduction in housing and producer subsidies, tightening of eligibility for social security benefits, and freezing the real value of social benefits. However, even though we do not find evidence for Ireland (due to the lack of an complete time series for Irish welfare state spending), the direction of the impact of Ireland's fiscal reforms on its post-break growth is consistent with the theoretical model, and predicted by Table 1.

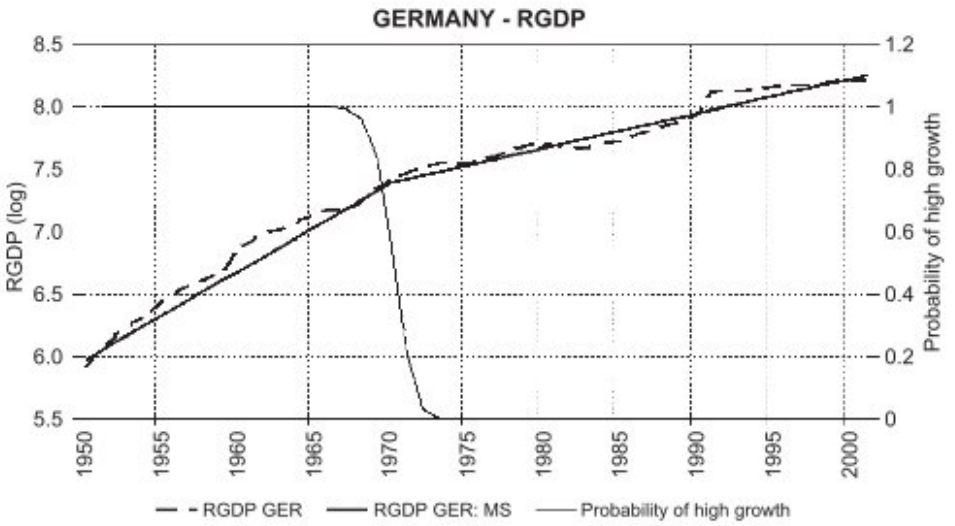

Fig. 13. RGDP (log) Germany (RGDP GER) and RGDP (log) predicted by the Markov Switching Model (RGDP GER: MS).

Thus, our results closely match the country-specific anecdotal experience with institutional reform, its bearing on structural changes in the size of the welfare state, and the impact of such reforms on the growth experience of our sample economies.

4.4. Three structural breaks in the welfare state: further evidence

For three countries—Germany, Japan, and Italy—the welfare state series exhibits three structural breaks. The joint dynamics of welfare state evolution and growth is also consistent with the theoretical model. From these countries, we focus on the cases of Germany and Japan, as they deserve some elaboration. Figs. 11–14, relating to Japan and Germany, respectively, summarize the dynamics of growth and the welfare state.

4.4.1. Japan

Fig. 11 shows that the forecasted probability of staying in a high growth regime declines around 1972, even though growth remains impressive until 1993. However, the time trend of θ identifies three distinct periods of welfare state growth: 1974–1986, 1987–1996, and 1997 onwards. In the 1974–1988 period, the forecasted probability of staying in the low growth welfare state regime drops to zero. Further, this probability increases (approximates 1) only around 1988, when there is a structural break in the trend growth rate of the welfare state. The forecasted probability of staying in a low welfare state regime however drops again to zero around 1998, as θ begins to rise.[28] What drives the increase in θ in Japan after 1995 however are reductions in real outlays in public investment (Land, Infrastructure, and

[28] Until 1993, Japan RGDP growth has been 0.79%. This is the number we obtain from running the Hamilton model on growth rates for the sample after the first break.

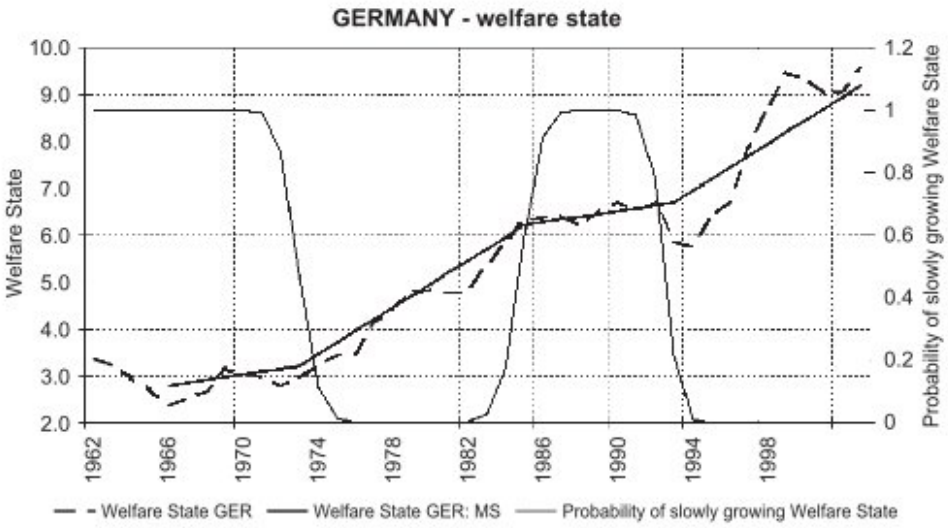

Fig. 14. Welfare State Germany (Welfare State GER) and Welfare State predicted by the Markov Switching Model (Welfare State GER: MS).

Transportation Ministry Report, 2000). This provides one possibility for the structural rise in θ in Japan: a concerted drive to reduce outlays on public investments in the late 1990s.

4.4.2. Germany

We consider Germany to be an interesting case. Germany, like Japan, also exhibits three structural breaks in θ. The model however identifies only one structural break in the growth rate (in 1971). As Fig. 14 shows, the forecasted probability of staying in a low welfare state regime drops to zero in the 1975–1977 period, rises back to 1 during the 1983–1993 period and then drops down to zero again in the post 1993 period. Accordingly, Germany shifted to a generous system of retirement subsidies in 1972 (first break—see Table 2), which were reduced in 1982, with the impact on its welfare state emerging in 1984 (second break). However, the rise in social spending in unified Germany got a boost once West Germany's social security became fully extended to East Germany in the early nineties (third break). Thus, the structural increase in θ since 1993 possibly reflects the increase in transfers to East Germany related to unification and the inability of Germany to undertake adequate labor market reforms. It remains to be seen whether the structural rise in θ will dampen the economic growth in Germany in the future.[29]

5. Conclusion

This paper undertakes an empirical test of the model of economic growth and the welfare state developed by Ghate and Zak (2002). By using a Hamilton regime switching model on

[29] The model did not identify a growth break so far. Although in 2001, Germany enacted a pension reform plan (known as the 'Riester' reform).

an exhaustive list of welfare state economies, our main finding is that structural breaks in the growth rate of several welfare state economies can be attributed to a structural break in the trend growth of the welfare state variable. We identify the general intuition behind the co-evolution between growth and the welfare state is as follows: initially, a high pre-break growth rate induces the welfare state to rise. Over time, a growing welfare state leads to a decline in growth. In the long run, lower growth dampens the growth of the welfare state. This is because higher taxes are required to fund a growing welfare state leading to lower growth in the long run. In other words, regimes that generate low welfare state values also generate high growth values, while regimes that generate high welfare state values also generate low growth values. We find that the early 1970s is an important turning point for many welfare state economies. We also find that the average transition period across the 19 economies between both structural breaks is approximately 15½ years. We also find that in several economies, as predicted by the model, the structural break in the time trend of welfare state growth precedes the structural break in growth rates. However, reductions in economic growth are associated with lower values of the welfare state as lower growth forces politicians to cut transfers and taxes. The dynamic feedback process between growth and the welfare state illustrates the joint endogeneity and nonlinearity of both variables, and a predictable pattern of growth-welfare state evolution.

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Appendix A.

This discussion follows Hamilton (1994). Consider the stochastic process,

$$\tilde{y}_t = n_t + \tilde{z}_t, \tag{17}$$

where $\tilde{y}_t$ is the dependent variable, n_t is a Markov trend following

$$n_t = \mu(s_t) + n_{t-1} = \alpha_0 + \alpha_1 s_t + n_{t-1}, \tag{18}$$

$s_t \in \{0, 1\}$ denotes a regime variable with transition probability matrix

$$P = \begin{pmatrix} q & 1-q \\ 1-p & p \end{pmatrix}, \tag{19}$$

and $\tilde{z}_t$ is a random component. Each observation of the dependent variables is drawn from one of two distributions: the first m_1 observations are generated by regime 0, the next m_2

from regime 1, and so on. It is important to note that each m_i, $\forall i \in 1,2...M$ (where M is denotes the total number of switching points) is unknown. We assume that $\tilde{z}_t$ follows an ARIMA(r,1,0) process where,

$$\tilde{z}_t - \tilde{z}_{t-1} = \varphi_1(\tilde{z}_{t-1} - \tilde{z}_{t-2}) + \varphi_2(\tilde{z}_{t-2} - \tilde{z}_{t-3}) + \ldots + \varphi_r(\tilde{z}_{t-r} - \tilde{z}_{t-r-1}) + \epsilon_t, \tag{20}$$

with $E(\epsilon_t)=0$, $\mathrm{Var}(\epsilon_t)=\sigma^2$, and $\mathrm{Cov}(\epsilon_t, \epsilon_{t+k})=0$. Taking first differences of Eq. (17) and substituting $y_t=\tilde{y}_t-\tilde{y}_{t-1}$ and $z_t=\tilde{z}_t-\tilde{z}_{t-1}$ implies

$$y_t = \alpha_0 + \alpha_1 s_t + z_t. \tag{21}$$

Since y_t is observable, our objective is to estimate the transition probabilities across states, the parameters α_0 and α_1 (denoting the mean level of y_t in both regimes), and the variances of their random components.

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