The Fiscal Politics of Big Governments: Do Coalitions Matter?

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Abstract

This paper uses a closed voting rule to explain how gradual changes in the socio-economic structure of developed societies shift political coalitions and lead to rapid expansions of transfer programs. Equilibria in a lifecycle economy with three homogeneous groups of voters (retirees, skilled young workers, unskilled young workers) have three properties. One, if income inequality is sufficiently high, unskilled workers and retirees will form a dominant coalition which raises both intragenerational and intergenerational transfers. Two, when capital is abundant relative to labor, government transfers will be strictly intergenerational. Three, all transfers increase when the voting franchise is extended to less affluent individuals.

JEL Classification Number: E6, H1, H5.

1 Introduction

OECD countries have experienced a remarkable increase in the size of their governments since the 1930s. Most of this increase is coming from an expansion in government transfer programs.

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U.S. government outlays as a percentage of GDP went from about 10% in 1940 to 20% in 2001, peaking at about 25% in 1983. Government transfers defined as the sum of old-age and disability pensions, welfare, unemployment compensations, Medicare and Medicaid went from 1% to 11% of GDP over the same period, therefore accounting for the entire growth in government outlays. Government transfers more narrowly defined by excluding Medicare and Medicaid account for about 60% of the growth of government outlays.

Other industrialized economies have experienced even faster growth in government outlays and transfer programs. Total government outlays as a percentage of GDP have grown from 33% in 1970 to 45% in 2000 on average among OECD countries; about 50% of this growth stems from an increase in social benefits and transfers that exclude health care.

A closer look at the data reveals that most government transfer programs grew most rapidly in the period between 1970 until the mid 1980s. In the United States, for example, social security outlays doubled and income security outlays almost tripled during that period, to stabilize and then decrease after that. Other OECD economies, especially in Europe, experienced an even faster and more prolonged growth of their transfer programs.

We argue that a large increase in government transfers may be the result of the formation of a liberal coalition that favors such transfers. We develop a model where young unskilled workers and retirees form a dominant coalition that raises inter and intragenerational transfers.

Several factors favor the formation of a liberal coalition. The first is widening income inequality that brings the interests of inter and intragenerational transfer recipients together. After several decades of decline, income inequality started rising in the 1970s. Recent empirical works have attributed this widening in income inequality to a skill-biased technical change and increased trade with low-wage economies; the oil crises in 1973 and 1982 also contributed to this phenomenon.

A second factor is aging of the population. As retirees become a larger fraction of the electorate, political support for a more generous pay-as-you-go social security program builds up. In fact, all industrialized economies have experienced a steady increase in the share of the population aged 65 and above. In the United States, for example, this share has increased from 5% to 13% since 1929; for the OECD countries, this share has grown from 9% to 15% since 1950.

A third factor is that real interest rates have been low relative to the growth of real wages in mature economies. This further expanded the constituency in favor of a pay-as-you-go pension system. Intuitively, if capital is cheap and labor is expensive, individuals prefer old-age benefits to be a fraction of current labor earnings rather than the capitalization of their savings. In a dynamically inefficient economy, for example, individuals are better off with a pay-as-you-go rather than a fully funded old-age pension system. Real interest rates were low and even largely negative throughout the 1970s.

The rest of the paper is organized as follows. Section 2 reviews the literature; section 3 presents the model and sections 4 and 6 solve for the equilibrium. Section 7 illustrates our point with a numerical exercise and section 8 concludes.

2 Toward a Theory of Large Governments

A large body literature has addressed the issue of government growth in industrialized countries.[1] We briefly review some of this literature and how our work relates to it.

An informal but popular view is that large governments and deficits characterize democracies because politicians want to purchase votes or because they have a shorter horizon than voters or because they engage in pork-barrel spending. One issue that these views do not address is the timing of government growth. Why have governments grown so much in the 1970s and 1980s? Our paper provides an answer to this question.

The ratchet explanation states that large expansions of government are hard to reverse. The ratchet theory applies to some components of government spending better than others; for example, transfer programs have proven hard to reduce or eliminate, whereas military expenditures have fallen after each war to nearly pre-war levels. We rely on the ratchet theory for the existence of a status quo in transfer programs; our goal, however, is to explain what changes the status quo and in what direction.

Wagner's Law predicts that government involvement in fiscal matters increases as society develops. In other words, the income elasticity for publicly provided goods is larger than one in the short run and equal to one in the long run. Our work focuses on a complementary explanation of government size, namely on how income inequality and voting institutions affect government transfers.

Baumol [2] suggests that productivity in the service sector has grown slower than in the rest of the economy, so that higher wages in more efficient sectors have raised the wage bill for government services. We focus instead on government transfer programs, which are responsible, rather than public good provision, for nearly all government growth in the last decades.

In Meltzer and Richard [4] the constituency in favor of welfare transfers increases when income inequality worsens. As a result, more welfare transfers take place. We extend the work of Meltzer and Richard to a setting with both intragenerational, namely welfare, and intergenerational, namely social security, transfers; we also find that widening income inequality leads to the formation of a liberal coalition that results in more intra and intergenerational redistribution.

3 The model

To investigate how social and economic variables influence government outlays, we use a simple dynamical general equilibrium voting model with overlapping generations of heterogeneous voters, living over two periods. Start by considering the one-sector OLG growth model by Diamond [3]. The generation born at time t will be referred to as generation t; we assume that generation t is of size

$$N_t = (1+n)^t, \qquad t = 0, 1, \ldots. \tag{1}$$

If n is positive, population grows whereas if n is negative, population shrinks. There is a linear production technology:

$$F(K_t, L_t) = RK_t + L_t, \tag{2}$$

where K_t is the stock of capital and L_t is labor at time t; wage has been normalized to one, and $R \geq 0$ is the gross interest rate assuming that capital depreciates fully in each period. This production function is chosen for simplicity and without loss of generality: a linear production technology gives constant factor prices $(w, 1+r) = (1, R)$. There is no public debt or fiat money; stores of value are private loans and claims on physical capital.

When young, individuals work and consume; when old, they consume only. Individuals are heterogeneous in terms of their innate economic ability or skills in production: a fraction λ of young individuals have high ability, $1-\lambda$ have low ability. Hence, income inequality is a long-run phenomenon in our setting, unlike Stiglitz [5].[2] Individuals with high innate ability (skilled) produce y^h in one period, whereas individuals with low innate ability (unskilled) produce y^l in one period, with $y^h > y^l > 0$.

A generation t individual maximizes the following lifetime utility function when young

$$V_t^{i,t} = u(c_t^{i,t}) + \beta u(c_{t+1}^{i,t}), \qquad \beta > 0, \qquad i = h, l, \tag{3}$$

where c is private consumption and β is the subjective discount factor. The function $u : \mathrm{R}_+ \to \mathrm{R}$ is strictly increasing and strictly concave in its argument. When young, the individual cares about the present discounted value of her lifetime utility. The right-hand side of (3) is maximized, subject to budget constraints

$$y_t^i(1-\tau_t) + b_t = c_t^{i,t} + z_t^{i,t}, \qquad i = h, l, \tag{4}$$

$$c_{t+1}^{i,t} = z_t^{i,t} R + s_{t+1}, \tag{5}$$

where τ_t is a labor income tax, b_t is a welfare transfer from the government, z_t is private savings, and s_{t+1} is an old-age pension received from the government at $t+1$. Hence, a generation t-type i young individual pays net taxes $\tau_t y_t^i - b_t$ to the government. When old, a generation t individual cares only about current consumption and maximizes

$$V_{t+1}^{i,t} = u(c_{t+1}^{i,t}), \qquad i = h, l, \tag{6}$$

subject to the constraint (5). Her consumption when old therefore depends on private savings and government transfers. Over her lifetime, the generation t-type i's net tax payment to the government is $\tau_t y_t^i - b_t - s_{t+1}/R$.

We also assume that young individuals supply labor at t according to the inverse-L shaped schedule

$$L_t^i = \begin{cases} y_t^i & \text{if } \tau_t < \overline{\tau}, \quad i = h, l \\ 0 & \text{otherwise} \end{cases} \tag{7}$$

for some $\overline{\tau} \leq 1$. Since working entails some disutility, individuals supply one unit of labor only if their after-tax wage is above some minimum level.

For the purposes of this paper, the population can be divided into three groups labeled with an the index j defined as follows: $j = 0$ for the old group; $j = 1$ for the young with high productivity; $j = 2$ for the young with low productivity. The old population consists of both high- and low-productivity individuals: since individuals work only in their youth and are taxed on their labor income, this division can be ignored.

The government in this economy engages in intragenerational (welfare benefits) and intergenerational (old-age pension) transfers, which are financed by a tax on labor income. Government policy at t is a vector of three variables

$$\pi_{\mathrm{t}} = \left\{\tau_t, b_t, \frac{s_t}{1+n}\right\} \in [0, \overline{\tau}] \times R_+^2, \quad \overline{\tau} \leq 1, \tag{8}$$

where τ is the labor income tax, b is a lump sum welfare transfer to young individuals and s is a pension to old individuals. All fiscal variables are constrained to be positive and the labor income tax rate cannot exceed 1. The government balances the budget every period and allocates tax revenues according to the following constraint

$$\tau_t Y_t = b_t + \frac{s_t}{1+n}, \tag{9}$$

where aggregate income is $Y_t = \left[\lambda y_t^h + (1-\lambda) y_t^l\right] > 0$ if $\tau_t \leq \overline{\tau}$, and 0 otherwise.

4 The economic equilibrium

The first step in solving the model is to derive the economic equilibrium, taking fiscal policy as given. The economic equilibrium consists of the savings and labor supply decisions made by young individuals. Since this is a closed economy, savings equal capital that, together with labor supply, determines production and consumption.

The labor supply decision is described in (7).The savings decision of generation t is given by

$$z_t^i(\pi_{\mathrm{t}}, \pi_{\mathrm{t+1}}) = \arg\max u(c_t^{i,t}) + \beta u(c_{t+1}^{i,t}), \quad i = h, l, \tag{10}$$

subject to (4) and (5) and taking the fiscal policy sequence $\{\pi_{\mathrm{t}}\}$ as given. The first-order condition is

$$u'(c_t^{i,t}) = \beta R u'(c_{t+1}^{i,t}). \tag{11}$$

Consumption increases over an individual's lifetime if $\beta R > 1$ and decreases if $\beta R < 1$. Let k_t denote the capital-labor ratio at t. Capital accumulation for a given fiscal policy is described by

$$L_{t+1}(\pi_{\mathrm{t+1}})k_{t+1} = \left[\lambda z_t^h(\pi_{\mathrm{t}}, \pi_{\mathrm{t+1}}) + (1-\lambda) z_t^l(\pi_{\mathrm{t}}, \pi_{\mathrm{t+1}})\right] L_t(\pi_{\mathrm{t}}) \tag{12}$$

where $L_t(\pi_{\mathrm{t}}) = \lambda L_t^h(\pi_{\mathrm{t}}) + (1-\lambda)L_t^l(\pi_{\mathrm{t}})$ is the labor supplied by generation t. Given a feasible policy sequence $\{\pi_{\mathrm{t}}\}$ satisfying (9), any capital sequence $\{k_{t+1}\}$ satisfying (12) is an economic equilibrium. Notice that the economic equilibrium is uniquely defined in this economy. If $\tau_t > \overline{\tau}$, the economic equilibrium is trivial; labor supply and young individuals' income, savings and consumption are all zero, as are capital and production. If $\tau_t \leq \overline{\tau}$, then $L_t = N_t$ and (12) reduces to

$$(1+n)k_{t+1} = \lambda z_t^h(\pi_{\mathrm{t}}, \pi_{\mathrm{t+1}}) + (1-\lambda) z_t^l(\pi_{\mathrm{t}}, \pi_{\mathrm{t+1}}). \tag{13}$$

5 The political equilibrium in open-loop strategies

All individuals, young and old, vote in this economy and fiscal policy is decided by majority voting. Savings are a function of current and future fiscal policy variables, as they depend on current taxes and welfare transfers and on future pensions. We consider two classes of strategies: open-loop and closed-loop strategies.

With closed-loop strategies, individuals can condition their current actions to the history of past actions; with open-loop strategies, on the other hand, such conditioning does not take place and future fiscal policy variables are taken as given. We start by studying the Nash equilibrium in open-loop strategies; Section 6 will extended the analysis to subgame perfect equilibria in closed-loop strategies.

For simplicity, let y^h and y^l and therefore Y be time-invariant constants, and let the utility of group j at time t be $V^j(\pi_{\mathrm{t}}, \pi_{\mathrm{t+1}})$. The ideal fiscal policy for group j is the policy $\overline{\pi_{\mathrm{t}}}$ solving the following optimization problem

$$\overline{\pi_{\mathrm{t}}} = \arg\max V_t^j(\pi_{\mathrm{t}}, \pi_{\mathrm{t+1}}), \tag{14}$$

taking future fiscal policy as given, subject to (4), (5), (9), and where private savings are defined as in (10). Ideal policies (τ, b, s) in open-loop strategies are

$$\overline{\pi_{\mathrm{o}}^{\mathrm{j}}} = \begin{cases} (\overline{\tau}, 0, \overline{\tau}Y(1+n)) & j = 0 \\ (0,0,0) & j = 1 \\ (\overline{\tau}, \overline{\tau}Y, 0) & j = 2 \end{cases} \tag{15}$$

The ideal policy for the old is to levy the highest tax consistent with positive provision

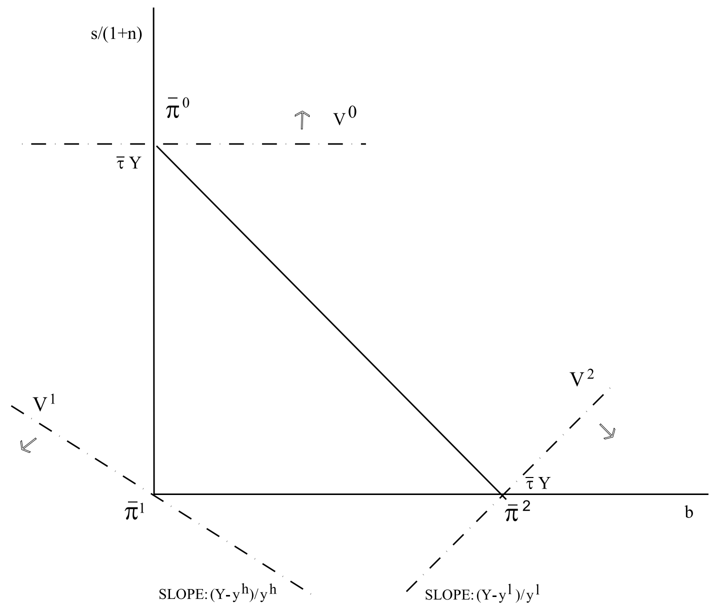

Figure 1: Ideal policies in open-loop strategies

of labor and allocate all revenues to old-age pensions. Intuitively, pensions are intergenerational transfers paid by the young that benefit the old, who want them to be as large as possible. Young individuals, on the other hand, do not want old-age pensions. Young individuals with low innate ability favor redistribution and want welfare transfers; hence, their ideal policy is to levy $\bar{\tau}$ and allocate all revenues to welfare transfers. Young individuals with high innate ability dislike redistribution and want no government transfers at all, as they are the net payers in the system; hence, their ideal policy is a zero tax rate and zero transfers.

Definition 1 *A group is dominant if it consists of at least half the voting population.*

Hence, a group is dominant if its size is at least $(2+n)/[2(1+n)]$.

Proposition 1 *If a group is dominant, the open-loop political equilibrium is the dominant group's ideal fiscal policy in open-loop strategies.*

The proof is simple: if a group is dominant, its ideal policy is a Condorcet winner. Figure 1 shows the ideal policy of the three groups in the $(b, s/(1+n))$ space. The straight line V^j is the indifference curve for group j and the arrow indicates which policy combinations would increase utility for this group.

Ideal policies cannot be a political equilibrium if no group is dominant. Intuitively, there is always a feasible fiscal policy that is strictly preferred to any of the three ideal fiscal policies by a majority of voters.

If there is no dominant group, the political equilibrium depends on the formal rules governing agenda formation and voting. Here, we model the legislative structure according to Baron and Ferejohn's [1] closed rule. There are three steps in the legislature; recognition, proposal and voting. At the beginning of each period, a recognition rule identifies an individual, i.e. a group, within the legislature; we assume that recognition is random. Once recognized, the individual makes a proposal that is voted against the status quo. If a majority of individuals vote in favor of the proposal, it is adopted; otherwise the status quo is implemented. The legislative process is repeated every period. Although rather stylized, this model reflects the endogenous nature of proposal making. The strongest assumption is that the status quo remains constant over time, which we interpret as the existence of an apolitical fiscal policy implemented if the legislature fails to reach a majority vote.

Let the status quo be denoted by $\pi = (\tau, b, s)$. We now characterize the political equilibrium for a generic status quo when no group is dominant. At the beginning of each period, group j's probability of being recognized, p^j, is equal to its relative size in the voting population; hence, old individuals will be recognized with probability $p^0 = 1/(2+n)$, young individuals with high ability will be recognized with probability $p^1 = \lambda(1+n)/(2+n)$ and young individuals with low ability will be recognized with probability $p^2 = (1-\lambda)(1+n)/(2+n)$.

Suppose group $j = 0$, the old, is recognized. The recognized old individual proposes the policy that maximizes her utility, under the constraint that a majority of individuals prefers it to the status quo. Let π be the status quo in Figure 2. The need for a majority prevents the old from choosing a policy too close to $\overline{\pi}_o^0$: her proposal must give another group at least as much utility as it would get in the status quo. This means that the old will either move along group 1's or group 2's indifference curve through the status quo, depending on which maximizes her utility. In Figure 2, the old individual prefers A to B and therefore coalesces with the high ability young individual.

Formally, the old proposes the policy solving the maximization problem (14) with $j = 0$, subject to

$$\frac{s_t - s}{1+n} \leq \frac{Y - y^h}{y^h}(b_t - b) \qquad \text{and} \qquad p^0 + p^1 \geq \frac{1}{2} \tag{16}$$

if she coalesces with the young with high ability, or to

$$\frac{s_t - s}{1+n} \leq \frac{Y - y^l}{y^l}(b_t - b) \qquad \text{and} \qquad p^0 + p^2 \geq \frac{1}{2} \tag{17}$$

if she coalesces with the young with low ability. (16) excludes all allocations above the indifference curve for group 1 through π and it requires the coalition with the young skilled

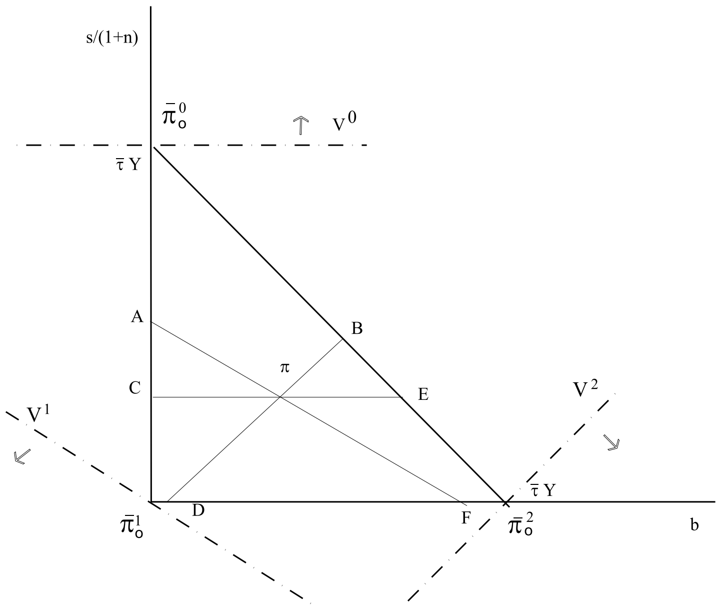

Figure 2: Proposals in open-loop strategies

to constitute a majority. Similarly, (17) excludes all allocations above the indifference curve for group 2 through π and requires the coalition with the young skilled to constitute a majority. The old needs only satisfy one set of constraints. The old proposes the policy that gives her higher utility; this is point A in Figure 2 if she coalesces with the young skilled or point B if she coalesces with the young unskilled.[3]

Consider the case where group 1, the young skilled, is recognized to make a policy proposal. Since we are considering a constant status quo and open-loop strategies, there is no link between the policy chosen today and tomorrow. The young skilled proposes the policy maximizing (14) for $j = 1$ subject to the additional constraints (17) and $n \geq 0$ if she coalesces with the young unskilled or

$$s_t \geq s \qquad \text{and} \qquad p^0 + p^1 \geq \frac{1}{2} \tag{18}$$

if she coalesces with the old. If the young skilled coalesces with the old, the proposed policy is point C in Figure 2. On the other hand, if the young skilled coalesces with the young unskilled, the proposed policy is point D in Figure 2. With open-loop strategies, old-age pensions are simply a loss for all young individuals. Hence, for high enough values of s in the status quo so that point D lies vertically above point π^1, the young skilled coalesces with the young unskilled and proposes $\bar{\pi}^1$. For low values of s in the status quo, namely for $s/(1+n) < b\lambda(y^h - y^l)/y^l$, the decision to propose C or D depends on the parameters of the model.

Finally, consider the case where a young unskilled is recognized to make a proposal. She solves the maximization problem in (14) subject to the additional constraint (16) and $n \geq 0$ or (18). If the young unskilled coalesces with the old, the proposed policy is point E in Figure 2; the proposed policy if she coalesces with the young skilled is point F in Figure 2. For high enough values of s in the status quo so that point F implies positive old-age pensions, the young unskilled coalesces with the young skilled and proposes $\bar{\pi}^2$. However, for relatively low values of $s/(1+n)$, the choice between a coalition with the old or the young skilled depends on the parameters of the model.

6 The political equilibrium in closed-loop strategies

This section studies closed-loop political equilibria. Typically, the closed-loop strategy space is much larger than the open-loop strategy space. We restrict our attention to stationary closed-loop strategies, which dictate that an agent acts in the same way in structurally equivalent subgames.[4] The subgames starting at the beginning of each period are structurally equivalent for the members of each group. However, for an individual born at time t, the subgame beginning at t and the subgame beginning at $t+1$ are *not* structurally equivalent, as she belongs to a group in period t but to another in period $t+1$. Therefore we consider group-specific stationary strategies.

With stationary closed-loop strategies, equilibria with constant intergenerational transfers may arise. If the real interest rate is low, young voters may prefer to pay for old-age benefits today provided the same amount will be given to them tomorrow. On the other hand, if the return to capital is high, private saving is a better technology for transferring resources to the future than a pay-as-you-go pension system.

We start by identifying each group's ideal policy in stationary closed-loop strategies. Since individuals are not altruistic and live for two periods, punishment lasts one period at most; we assume that a deviation in period t is punished by reverting to open-loop strategies in period $t+1$. Old individuals cannot be punished in case of a deviation; hence, they play open-loop strategies in a subgame perfect equilibrium. Young individuals, on the other hand, may be better off by playing a closed-loop strategy. A young individual in group j, $j=1,2$, at time t solves problem (14) subject to constraints (4), (5), (9) and

$$\pi_{\mathrm{t}} = \pi_{\mathrm{t+1}} = \overline{\pi_{\mathrm{c}}^{\mathrm{j}}}. \tag{19}$$

Ideal subgame perfect policies are

$$\overline{\pi_{\mathrm{c}}^{0}} \quad = \quad (\overline{\tau}, 0, \overline{\tau} Y(1+n))$$

$$\overline{\pi_c^1} = \begin{cases} (\overline{\tau}, 0, \overline{\tau} Y(1+n)) & \text{if } R < R^h \equiv \frac{Y(1+n)}{y^h} \\ (0,0,0) & \text{otherwise} \end{cases} \tag{20}$$

$$\overline{\pi_c^2} = \begin{cases} (\overline{\tau}, 0, \overline{\tau} Y(1+n)) & \text{if } R < R^l \equiv \frac{Y(1+n)}{Y(1+n)-y^l n} \\ (\overline{\tau}, \overline{\tau} Y, 0) & \text{otherwise} \end{cases}$$

with $R^h < R^l$ if $\lambda < 1/(1+n)$. Figure 3 depicts ideal stationary closed-loop policies for the three groups. If the return to capital is low enough, the ideal policy for the three groups coincide with the provision of the largest feasible old-age pension and zero welfare transfers, which is the allocation at the upper corner of the triangle. If individuals are homogeneous so that $\lambda = 0$ or 1, then $R^h = R^l = 1+n$. In words, the economy must be dynamically inefficient in the standard sense for young individuals to be in favor of a pay-as-you-go social security program. If individuals are heterogeneous in terms of their labor income, youth's support for a pay-as-you-go pension system does not go hand in hand with dynamic inefficiency. More precisely, $R^h < 1+n$ and the economy must be more than dynamically inefficient for the young skilled to be in favor of intergenerational transfers, since they are the net payers in our fiscal system. For the young unskilled, $R^l \lesseqgtr 1+n$ if $n \gtreqless 0$: with low interest rates and negative growth, they may prefer inter to intragenerational transfers even though the economy is dynamically efficient because, together with the old, they are net recipients in the fiscal system.

The rate of return for a young person from a pay-as-you-go pension system increases with the growth rate of population, but falls with her taxable income. The intuition is

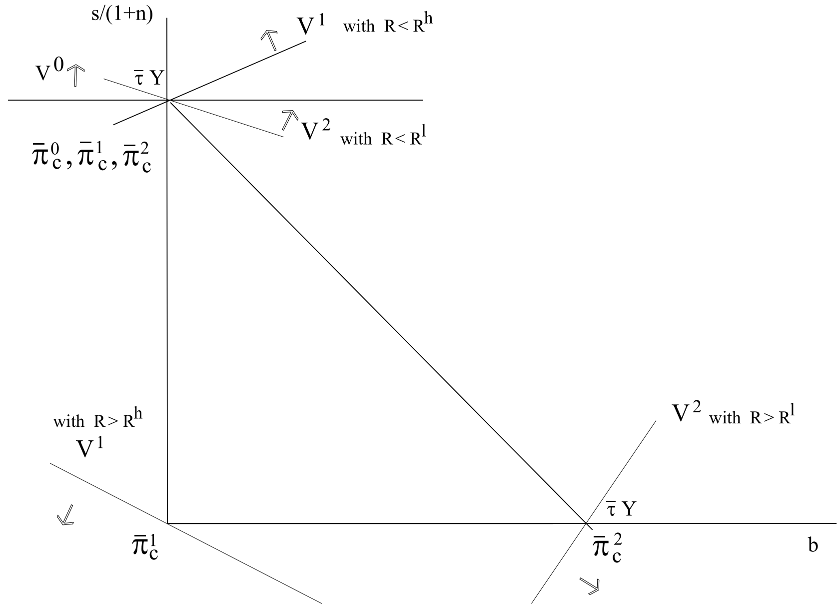

Figure 3: Ideal policies in closed-loop strategies

simple. The higher n, the more young individuals pay into the social security system and the more old individuals receive, everything else being equal. However, a pay-as-you-go social security system redistributes income from high to low labor income individuals so that the higher personal labor income, the lower the returns from the system.

Proposition 2 extends Proposition 1 to closed-loop strategies. Proposition 3 summarizes the results obtained above.

Proposition 2 *If a group is dominant, the closed-loop political equilibrium is the dominant group's ideal fiscal policy in closed-loop strategies.*

Proposition 3 *In a subgame perfect equilibrium, old individuals adopt open-loop strategies; young skilled individuals adopt closed-loop strategies and support a pay-as-you-go social security system if $R < R^h \equiv Y(1+n)/y^h$; young unskilled individuals adopt closed-loop strategies and support a pay-as-you-go social security system if $R < R^l \equiv$*

$Y(1+n)/[Y(1+n)-y^l n]$.

If no group is dominant, the political equilibrium depends on the voting rule. Let the legislative structure be the same as in Section 5: in each period, the recognized group makes a proposal that is voted by majority rule against the status quo, which is $\pi = (\tau, b, s)$, and tlet he probability that group j is recognized be p^j. To simplify the exposition, consumption is written as $c_t^{i,t}(\pi_{\rm t}, \pi_{\rm t+1})$ for the young and as $c_t^{i,t-1}(\pi_{\rm t})$ for the old.

First, consider the case where a member of the old group is recognized; her proposed policy is exactly the same as in open-loop strategies.

Then, consider the case where a young skilled is recognized. Young skilled individuals propose the policy $\pi_{\rm c}^1 = (\tau_c^1, b_c^1, s_c^1) \in [0, \overline{\tau}] \times R_+^2$ solving the problem:

$$\pi_{\rm c}^1 = \arg\max \quad E_t V_t^{h,t} = u(c_t^{h,t}(\pi_{\rm c}^1, E_t \pi_{\rm t+1})) + \beta E_t u(c_{t+1}^{h,t}(\pi_{\rm t+1})) \tag{21}$$

subject to (19) and the government budget constraint (9), with

$$E_t \pi_{\rm t+1} = p^0 \pi_{\rm o}^0 + p^1 \pi_{\rm c}^1 + p^2 \pi_{\rm t+1}^2$$

and

$$E_t u(c_{t+1}^{h,t}(\pi_{\rm t+1})) = p^0 u(c_{t+1}^{h,t}(\pi_{\rm o}^0)) + p^1 u(c_{t+1}^{h,t}(\pi_{\rm c}^1)) + p^2 u(c_{t+1}^{h,t}(\pi_{\rm t+1}^2)),$$

where the policy proposed by group 2 at time $t+1$, $\pi_{\rm t+1}^2$, could be either in closed-loop or open-loop strategies. Young skilled individuals are rational and adopt closed-loop strategies if and only if they are better off doing so, namely if

$$E_t V_t^{h,t}(\pi_{\rm c}^1) \geq E_t V_t^{h,t}(\pi_{\rm o}^1). \tag{22}$$

Young unskilled individuals solve a similar problem.

The subgame perfect equilibrium when no group is dominant can be characterized as follows. If $R < \min\{R^h, R^l\}$, the policy $(\overline{\tau}, 0, \overline{\tau}Y(1+n))$ is optimal for every group; hence, it is proposed and adopted every period. If $R^h < R < R^l$, then the young skilled adopt open-loop strategies and $\pi_{\mathrm{c}}^1 = \pi_{\mathrm{o}}^1 = (0, 0, 0)$, whereas the young unskilled adopt closed-loop strategies and $\pi_{\mathrm{c}}^2 = (\overline{\tau}, 0, \overline{\tau}Y(1+n))$. If $R^l < R < R^h$, then the young unskilled adopt open-loop strategies and $\pi_{\mathrm{c}}^2 = \pi_{\mathrm{o}}^2 = (\bar{\tau}, \tau\bar{Y}, 0)$, whereas the young skilled adopt closed-loop strategies and $\pi_{\mathrm{c}}^1 = (\overline{\tau}, 0, \overline{\tau}Y(1+n))$. If $R > \max\{R^h, R^l\}$, both young groups adopt open-loop strategies, and the equilibrium is the one described in Section 5.

7 Can political coalitions explain the growth in government?

To illustrate our point, we simulate our model with parameter values matching the U.S. economy in 1967 and in 1996. Individuals maximize a CES period utility function of the following type:

$$u(c) = \frac{c^{1-\frac{1}{\sigma}}}{1-\frac{1}{\sigma}}. \tag{23}$$

Individuals live for 30 years; they are young for 15 years and old for 15 years. Table 1 presents the parameter values used for the 1967 simulation; all values are on an annual basis, except for the intertemporal elasticity of substitution σ. The values of y^h and y^l capture income distribution in 1967; in that year, households in the lower 60% of the income distribution had an average income of 18,000, measured in 1996 \$, whereas

Parameter	*Value*	*Parameter*	*Value*	*Parameter*	*Value*
R	1.02	λ	0.4	σ	2
β	0.96	n	0.01	y^h	57,000
y^l	18,000	$\overline{\tau}$	0.2	τ	0.18
b	3,815	s	2,670		

Table 1: Parameter values for 1967

Group recognized	*Proposed policy*			*Utility ratio*
	τ_o^j	b_o^j	$s_o^j/(1+n)$	*of group j*
$j=0$	0.125	0	3,866	1.0063
$j=1$	0.035	1,161	0	1.0621
$j=2$	0.2	6,720	0	1.065
$E\pi_o$	0.125	2,416	1,789	
$E\pi_o$ as % GDP		3.9	3	

Table 2: Equilibrium policies for 1967

households in the upper 40% of the income distribution had an average income of 57,000. R is the real interest rate on government bonds with 10 year maturity and n is the rate of growth of the civilian population in 1967.

The results of the simulation are reported in table 2. Since the real interest rate is higher than both R^l and R^h, neither young group adopts closed-loop strategies. The first column in Table 2 indicates the recognized group; columns two to four report the proposed fiscal policy; columns five shows the ratio of period utility for the proposing group under the proposed policy and the status quo. The last two rows reports average fiscal policy, calculated as $E_t\pi_{t+1} = \sum_{j=0}^{2} p_j \pi_t^j$, and average fiscal policy as a percentage of output.

In this simulation, the equilibrium policies in terms of figure 2 are A, D and F: when recognized, the old coalesce with the young skilled; when recognized, the young skilled coalesce with the young unskilled; when recognized, the young unskilled coalesce with the young skilled. No coalition chooses the maximum level of redistribution and taxation. Total expected transfers are 6.9% of GDP, which is just a bit larger than the 5% of the data; the average tax rate on labor income is 12.5% in our simulation, while it was 18% in the actual data.

We simulate the model for 1996 with the parameter values specified in table 3. The real interest rate is higher and income distribution is more unequal than in 1967. More precisely, income measured in 1996 $ is $20,000 for the young unskilled and $80,000 for the young skilled; these are, respectively, the average income for individuals in the lower 60% and the top 40% of the actual U.S. income distribution in 1996. These figures imply that income grew by 40% for the young skilled but only by 11% for the young unskilled between 1967 and 1996. For comparative purposes, we keep the status quo unchanged.

The outcome of the simulation is presented in table 4. Once again, the young groups do not adopt closed-loop strategies in equilibrium, so that all proposed policies are in open-loop strategies. Points B, D and F in figure 2 are the equilibrium policies: when recognized, the old coalesce with the young unskilled; when recognized, the young skilled coalesce with the young unskilled; when recognized, the young unskilled coalesce with the young skilled. There is an important change from the earlier simulation: the old coalesced with the young skilled in 1967, but coalesce with the young unskilled in 1996. Thus, increased income inequality leads to the formation of a liberal coalition between the old and the young unskilled that raises taxation and redistribution. In terms of figure 2, the policy proposed by the old switches from point A to point B. As a result, total

Parameter	*Value*	*Parameter*	*Value*	*Parameter*	*Value*
R	1.038	λ	0.4	σ	2
β	0.96	n	0.009	y^h	80,000
y^l	20,000	$\overline{\tau}$	0.3	τ	0.16
b	3,815	s	2,670		

Table 3: Parameter values for 1996

Group recognized	*Proposed policy*			*Utility ratio*
	τ_o^j	b_o^j	s_o^j	*of group j*
$j = 0$	0.3	7,904	6,058	1.011
$j = 1$	0.048	2,093	0	1.056
$j = 2$	0.23	10,082	0	1.132
$E\pi_o$	0.22	7,361	2,826	
$E\pi_o$ as % GDP		9.2	3.5	

Table 4: Equilibrium policies in open-loop strategies for 1996

expected government transfers increase from 6.9% for the 1967 simulation to 12.7% of GDP for the 1996 simulation; the actual data are 5% and 8.5%, respectively. The average tax rate on labor income is 22% in our simulation, against a 20% in the actual data.

If inequality had increased more than assumed in our 1996 simulation, the welfare state would have also increased further. More precisely, if y^h=$ 90,000 rather than $80,000 in 1996, the proposed equilibrium policies in our simulation would have been B, D and E. In other words, a complete liberal coalition would emerge, with the young unskilled coalescing with the old when either group is recognized. Under this scenario, total government transfers reach 14% of GDP.

8 Conclusions

This paper emphasizes that changes in the size of the welfare state can be explained by shifts in voting coalitions brought by changes in the economic and social structure of society. Widening income inequality, a raising share of retirees in the voting population and low real rate of returns contribute to the formation of a coalition among the groups that favor inter and intragenerational redistribution. We believe that these forces, among others, were at work during the rapid expansion of the welfare state in the 1970s and 1980s.

Even though our model is simple, we believe it outlines a mechanism that remains valid in a richer setting. This would include models with a more realistic production function and legislative structure.

Finally, it would be interesting to extend this model to allow for budget deficits. In an overlapping-generation model like ours, the retirees favor both more generous pay-as-you-go pension benefits and budget deficits, as both imply a transfer resources from the future to the present. The formation of a liberal coalition between the young unskilled workers and the retirees may have contributed to the budget deficits experienced by industrialized economies concurrently with the expansion of the welfare state.

Notes

[1]For a review of such theories, see Tullock [6].

[2]Stiglitz [5] assumes homogenous economic ability and shows that wealth and income

become asymptotically evenly distributed in a neoclassical growth model.

[3]The formal expressions for these policies are available upon request.

[4]Two structurally equivalent subgames satisfy the following conditions: (1) the structure of the subgames at the initial node are identical; (2) the sets of players to be recognized at the next recognition node are the same; (3) the strategy sets of agents are identical.

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