Migration and the Welfare State: Dynamic Political-Economy Theory

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Abstract

We model an overlapping-generations economy with two skill levels: skilled and unskilled. The welfare-state is modeled simply by a proportional tax on labor income to finance a demogrant in a balanced-budget manner. Therefore, some (the unskilled workers and old retirees) are net beneficiaries from the welfare state and others (the skilled workers) are net contributors to it. Migration policies are set to determine the total migration volume and its skill composition.We characterize subgame-perfect Markov political-economic equilibria consisting of the tax rate (which determines the demogrant), skill composition and the total number of migrants. We distinguish between two voting behaviors: sincere and strategic voting.

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1 Introduction

All over the world, the combination of declining population growth rates and rising life expectancy presents a major fiscal challenge to social security systems. From an economic perspective, a rise in the dependency ratio (i.e., the proportion of retirees per worker) increases the number of people drawing from the system; while it decreases the number of contributors. From a political perspective, the older is the decisive voter, the more relevant is the pension spending in the political agenda. One of the policy tools that are considered for mitigating these politico-economic forces which result in higher demand for, and lower supply of, social security benefits is migration policy.

The view that increased migration may come to the rescue of PAYG social security systems reflects the fact that the flow of migrants can alleviate the current demographic imbalance, by influencing the age structure of the host economy. A few empirical studies address this point by calibrating the equilibrium impact of a less restrictive policy towards migration according to U.S. data. Storesletten (2000) finds in a general equilibrium model that selective migration policies, involving increased inflow of working-age high and medium-skilled migrants, can remove the need for a future fiscal reform. By emphasizing the demographic side and abstracting from the migrants' factor prices effects, Lee and Miller (2000) conclude in a similar analysis that a higher number of migrants admitted into the economy can ease temporarily the projected fiscal burden of retiring baby boomers.

This paper combines two fields of the existing political economy literature, which have not been examined jointly, to our knowledge: the political economy of the PAYG social security systems (Cooley and Soares (1999), Bohn (2005), Boldrin and Rustichini (2000), Galasso (1999)) and the political economy of migration (Benhabib (1997)). There are also a few studies which deal with the effect of migrants on the PAYG social security system (Razin and Sadka (1999) and Scholten and Thum (1996)). This paper addresses the joint political economy decisions regarding both migration policy and social security policy in a dynamic set-up.

The paper develops a dynamic politico-economic model, in which both migration and taxes interact, focusing on inter- and intra-generational aspect of social security. The model is based on key demographic characteristics: that migrants are younger and have higher birth rates than the native born population. To isolate the inter-generational aspects, we abstract in this chapter from intra-generational income transfers considerations. .A standard dynamic equilibrium concept is employed in which migration policy and pay-as-you-go (PAYG) social security system are jointly determined through a majority voting process.

The paper is organized as follows. Section 1 discusses evidence for the fiscal burden of migration. Section 2 presents the analytical framework. Section 3 characterizes the political-economy equilibrium under sincere voting. Section 4 characterizes the political-economy equilibrium under strategic voting. Section 5 concludes.

2 Fiscal Aspects of Migration: Evidence

The European Union, both "old" (EU-15) and "new" (after the enlargement to EU-27), faces a severe aging problem. For instance the ratio of the elderly population (aged 60 years and over) to the working age population (aged 15-59 years) in the EU-15 is projected to at least double from about 20% in the year 2000 to over 40%, in the year 2050. Official retirement ages have failed to keep up with life expectancy, making pensions and health care provisions increasingly unaffordable."Many people in the rich-world OECD countries retire relatively early, which let them enjoy, on average, some 19 years in retirement before death." (The Economist, February 2nd, 2010). Years in retirement in Italy, Austria and France are 23, 24 and 25, respectively. The aging process shakes the financial soundness of the welfare state, especially its old-age security and medical health components, because there are fewer workers asked to support increasing numbers of retirees. As put metaphorically by the Economist (March 15th, 2003, 80):. . . "the fiscal burden on the diminishing number of worker-bees will rise as more people turn into pensioner drones." The Economist (24th August, 2002) also looks at some of the dimensions of the financial burden: "On some estimates, by 2050, government debt could be equivalent to almost 100 percent of national income in America, 150 percent in the EU as a whole [EU-15] and over 250 percent in Germany and France." Nevertheless, note that migration of young workers (as distinct from retirees), even when driven by the generosity of the welfare state, slows down the trend of increasing the dependency ratio. However, economic intuition suggests that even though unskilled migration improves the dependency ratio, it nevertheless burdens the welfare state. This is because low-skill migrants are typically net beneficiaries of the generosity of the welfare state. Indeed, in 1997 the U.S. National Research Council sponsored a study on the overall fiscal impact of immigration into the U.S.; see Edmonston and Smith (1997). The study looks comprehensibly at all layers of government (federal, state, and local), all programs (benefits), and all types of taxes. For each cohort, defined by age of arrival to the U.S., the benefits (cash or in kind) received by migrants over their own lifetimes and the lifetimes of their first-generation descendents were projected. These benefits include Medicare, Medicaid, Supplementary Security Income (SSI), Aid for Families with Dependent Children (AFDC), food stamps, Old Age, Survivors, and Disability Insurance (OASDI), etc. Similarly, taxes paid directly by migrants and the incidence on migrants of other taxes (such as corporate taxes) were also projected for the lifetimes of the migrants and their first-generation descendents. Accordingly, the net fiscal burden was projected and discounted to the present. In this way, the net fiscal burden for each age cohort of migrants was calculated in present value terms. Within each age cohort, these calculations were disaggregated according to three educational levels: Less than high school education, high school education, and more than high school education. The findings suggest that migrants with less than high school education are typically a net fiscal burden that can reach as high as approximately US-$100,000 in present value, when the migrants' age on arrival is between 20–30 years.

Following the recent enlargement of the European Union to 27 countries there were concerns that the EU-15 was likely to face a rise in welfare migration. Hans-Werner Sinn (Financial Times, July 12th 2004) made a somewhat alarming prediction:

> "There will be more migration in Europe, but it will be 'bad' migration as well as 'good'.'Good' migration is driven by wage and productivity difference. 'Bad' migration is driven by generosity of the welfare state."

Nevertheless, only three members of the EU-15 (the UK, Sweden and Ireland) allowed free access for residents of the accession countries to their national labor markets, in the year of the first enlargement, 2004. The other members of the EU-15 took advantage of the clause that allows for restricted labor markets for a transitional period of up to seven years. Focusing on the UK and the A8 countries[1], Dustmann at al (2009) bring evidence of no welfare migration. The average age of the A8 migrants during the period 2004[2]-2008 is 25.8 years, considerably lower than the native U.K. average age (38.7 years). The A8 migrants are also better educated than the natives. For instance, the percentage of those

[1] The A8 countries are the first eight accession countries (Czech Republic, Estonia, Hungary, Latvia, Lithuania, Slovenia and Poland.)

[2] More accurately, the said period extends from the second quarter of 2004 through the first quarter of 2009.

that left full-time education at the age of 21 years or later is 35.5 among the A8 migrants, compared to only 17.1 among the U.K. natives. Another indication that the migration is not predominantly driven by welfare motives is the higher employment rate of the A8 migrants (83.1%) relative to the U.K. natives (78.9%). Furthermore, for the same period, the contribution of the A8 migrants to government revenues far exceeded the government expenditures attributed to them. A recent study by Barbone et al (2009), based on the 2006 European Union Survey of Income and Living conditions, finds that migrants from the accession countries constitute only 1-2 percent of the total population in the pre-enlargement EU countries (excluding Germany and Luxemburg); by comparison about 6 percent of the population in the latter EU countries were born outside the enlarged EU. The small share of migrants from the accession countries is, of course, not surprising in view of the restrictions imposed on migration from the accession countries to the EU-15 before the enlargement and during the transition period after the enlargement. The study shows also that there is, as expected, a positive correlation between the net current taxes (that is, taxes paid less benefits received) of migrants from all source countries and their education level[3].

Indeed the general public perceives unskilled migrants as a drain on the public finance. In the U.K., the Daily Mirror (24 July, 2006) puts it bread and butter terms: "Economic migrants need schools for their children. They need housing .They need medical care. They can even lose their jobs."

Not unexpectedly, employing opinion surveys, Hanson et al (2007) bring evidence that in the United States native residents of states which provide generous benefits to migrants also prefer to reduce the number of migrants. Furthermore, the opposition is stronger among higher income groups. Similarly, Hanson et al (2009), again employing opinion surveys, find for the United States that native-born residents of states with a high share of unskilled migrants, among the migrants population, prefer to restrict in migration; whereas native-born residents of states with a high share of skilled migrants among the migrant population are less likely to favor restricting migration[4]. Indeed, developed economies do attempt to sort out immigrants by skills (see, for instance, Bhagwati and Gordon (2009)). Australia and Canada employ a point system based on selected immigrants' characteristics. The U.S. employs explicit preference for professional, technical and kindred immigrants under the so-called third-preference quota. Jasso and Rosenzweig (2009) find that both the Australian

[3] See also Boeri, Hanson, and McCormick (2002)
[4] See also Mayda (2006)

and American selection mechanisms are effective in sorting out the skilled migrants, and produce essentially similar outcomes despite of their different legal characteristics.

3 Analytical Framework

We employ a two-period, overlapping-generations model. The old cohort retires, while the young cohort works. There are two skill levels: skilled and unskilled. The welfare-state is modeled simply as in Part I of the book, by a proportional tax on labor income to finance a demogrant or public service in a balanced-budget manner.[5] Therefore, some (the unskilled workers and old retirees) are net beneficiaries from the welfare state and others (the skilled workers) are net contributors to it. Migration policies are set to determine the total migration volume and its skill composition. As in Chapter 5, we characterize subgame-perfect Markov politico-economic equilibria consisting of the tax rate (which determines the demogrant), skill composition and the the total number of migrants. We distinguish between two voting behaviors: sincere and strategic voting (see Appendix).

3.1 Preferences and Technology

The utility of each individual in period t, for young and old, is given, respectively, by

$$U^y(c_t^y, l_t^i, c_{t+1}^o) = c_t^y - \frac{\varepsilon (l_t^i)^{\frac{1+\varepsilon}{\varepsilon}}}{1+\varepsilon} + \beta c_{t+1}^o, \; i = s, u \tag{1}$$

$$U^o(c_t^o) = c_t^o. \tag{2}$$

where, as in Part I, s and u denote skilled and unskilled labor. Here, y and o denote to young and old, l^i is labor, ε is the elasticity of the labor supply, and $\beta \in (0, 1)$ is the discount factor.[6] Note that c_t^o is the consumption of an old individual at period t (who was born in period $t-1$). Agents in the economy maximize the above utility functions subject to their respective budget constraints. Given the linearity of U in c_t and c_{t+1}, a non-corner solution can be attained on only when $1 = \beta(1 + r)$, where r is the interest rate. We indeed assume that the interest rate r equal $\frac{1}{\beta} - 1$ and individuals have no incentive to either save or dissave. Fore simplicity, we set saving at zero.[7] This essentially reduces the two groups of old

[5] We draw heavily on Suwankiri (2009).
[6] This functional form of U^y is similar to the one used in Part I.
[7] In fact, any saving level is an optimal choice. Assuming no saving is for pure convenience. With saving, since old individuals do not work the last period of their life, they will consume savings plus any transfer.

retirees (skilled and unskilled) to just one because they have identical preference irrespective of their skill level. In addition to consumption, the young also decide on how much labor to supply. Individual's labor supply is given by

$$l_t^i = \left(A_t w^i (1-\tau)\right)^{\varepsilon}, \ i = s, u \tag{3}$$

where w^i is the wage rate of a worker of skill level $i = s, u$.

There is just one good, which is produced by using the two types of labor as perfect substitute.[8] The production function is given by

$$Y_t = w^s L_t^s + w^u L_t^u \tag{4}$$

where L_t^i is the aggregate labor supply of skill $i = s, u$. Labor markets are competitive, ensuring the wages going to the skilled and unskilled workers are indeed equal to their marginal products, w^s and w^u, respectively. We naturally assume that $w^s > w^u$.

As before, we denote the demogrant by b_t and the tax rate by τ_t. The agents in the economy take these policy variables as given when maximizing their utilities. Because the old generation has no income, its only source of income comes from the demogrant. The model yields the following indirect utility function (recall that saving is zero):

$$\begin{aligned} V^{y,i} &= \frac{\left((1-\tau_t) w^i\right)^{1+\varepsilon}}{1+\varepsilon} + b_t + \beta b_{t+1} \\ V^o &= b_t, \end{aligned}$$

for $i \in \{s, u\}$. For brevity, we will use V^i to denote $V^{y,i}$ because only the young workers need to be distinguished by their skill level.

In addition to the parameters of the welfare state (τ_t and, consequently, b_t), the political process also determines migration policy. This policy consists of two parts: one determining the volume of migration, and the other its skill composition. We denote by μ_t the ratio of allowed migrants to the native-born young population and denote by σ_t the fraction of skilled migrants in the the total number of migrant entering the country in period t.

Migrants are assumed to have identical preference to the native-born. As before, we assume all migrants come young and they are naturalized one period after their entrance.

Through both these channels, the old individuals benefit from migration. To keep the analysis short, we will just focus on the costs and benefits in terms of the welfare state.

[8] This simplification, nonetheless, allows us to focus solely on the linkages between the welfare state and migration, leaving aside any labor market consideration. In Appendix 7A.1, we consider the case where the two inputs are not perfect substitute.

Hence, they gain voting rights when they are old, as in the inter-generational model of chapter 5.

As in chapters 2 and 3, let s_t denote the fraction of native-born skilled workers in the labor force in period t (where $s_0 > 0$). The aggregate labor supply in the economy of each type of labor is given by

$$L_t^s = [s_t + \sigma_t \mu_t] N_t l_t^s \tag{5}$$

and

$$L_t^u = [1 - s_t + (1 - \sigma_t)\mu_t] N_t l_t^u, \tag{6}$$

where N_t is the number of native-born young individuals in period t.

3.2 Dynamics

The dynamics of the economy are given by two dynamic equations: one governs the *aggregate* population, while the other governs the *skill* composition dynamics. Because skills are not endogenous within the model, we assume for simplicity that the offspring replicate exactly the skill level of their parents.[9] That is,

$$\begin{aligned} N_{t+1} &= [1 + n + (1 + m)\mu_t] N_t \qquad (7) \\ s_{t+1} N_{t+1} &= [(1 + n)s_t + (1 + m)\sigma_t \mu_t] N_t, \end{aligned}$$

where n and m are the population growth rates of the native-born population and the migrants, respectively. As in chapter 5, we plausibly assume that $n < m$, and we allow the population growth rates to be negative. Combining the two equations in (7) together, we get the dynamics of the labor supply of skilled native-born as follows:

$$s_{t+1} = \frac{(1 + n)s_t + (1 + m)\sigma_t \mu_t}{1 + n + (1 + m)\mu_t}. \tag{8}$$

Equation (8) implies that the fraction of the native-born skilled in the native-born labor force will be higher in period $t + 1$ than in period t if the proportion of skilled migrants in period t is higher than that of the native-born, that is, if $\sigma_t > s_t$. Naturally, when there is no migration the share of skilled workers out of (native-born) young population does not change over time, by assumption. When migration is allowed and its share of skilled labor

[9] Razin, Sadka, and Swagel (2002a, 2002b) and Casarico and Devillanova (2003) provide a synthesis with endogeneous skill analysis. The first work focuses on the shift in skill distribution of current population, while the latter studies skill-upgrading of future population.

is larger than that of the native-born, the share of skilled labor in the population will grow over time.

3.3 The Welfare-State System

As before, we model the welfare-state system as balanced period-by-period. In essence, it operates like a pay-as-you-go system. The proceeds from the labor tax of rate τ_t in period t serve entirely to finance the demogrant b_t in the same period. Therefore, the equation for the demogrant, b_t, is given by

$$b_t = \frac{\tau_t \left((s_t + \sigma_t \mu_t) w^s N_t l_t^s + (1 - s_t + (1 - \sigma_t)\mu_t) \, w^u N_t l_t^u \right)}{(1 + \mu_t) \, N_t + \left(1 + \mu_{t-1}\right) N_{t-1}}, \tag{9}$$

which upon some manipulation reduces to

$$b_t = \frac{\tau_t \left((s_t + \sigma_t \mu_t) w^s l_t^s + (1 - s_t + (1 - \sigma_t)\mu_t) \, w^u l_t^u \right)}{1 + \mu_t + \frac{1+\mu_{t-1}}{1+n+\mu_{t-1}(1+m)}}, \tag{10}$$

where the individual's labor supplies are given above in equation (3). It is straightforward to see that a larger σ_t increases the demogrant (recall that $w^s l_t^s > w^u l_t^u$). That is, a higher skill composition of migrants brings about higher tax revenues, and, consequently, enables more generous welfare state, other things being equal. Similarly, upon differentiation of b_t with respect to μ_t, we can conclude that a higher volume of migration enables a more generous welfare system if the share of the skilled among the migrants exceeds the share of the skilled among the native-born workers ($\sigma_t > s_t$).

3.4 Political Economy Equilibrium: Sincere Voting

In this section, we study the politico-economic equilibrium in the model. We imagine the economy with three candidates representing each group of voters. In the text, we discuss only the equilibrium with sincere voting.

We begin our analysis with "sincere voting", where individuals vote according to their *sincere* preference irrespective of what the final outcome of the political process will be. In this case, the outcome of the voting is determined by the largest voting group.[10] Therefore, it is important to see who forms the largest voting group in the economy and under what conditions. Note that there are only three voting groups: the skilled native-born young, the

[10] Evidently, this assumption amounts to majority voting when there are only two voting groups.

unskilled native-born young, and the old (recall that there is no saving, so that all the old care only about the size of the demogrant and thus have identical interest.

1. The group of skilled native-born workers is the largest group ("the skilled group") under two conditions. First, its size must dominates the unskilled young, and, second, it must also dominate the old cohort. Algebraically, these are

$$s_t > \frac{1}{2} \tag{11}$$

and

$$s_t > \frac{1 + \mu_{t-1}}{1 + n + \mu_{t-1}(1 + m)} \tag{12}$$

, respectively. It can be shown that, because $n < m \leq 1$, only the second of the two conditions is sufficient.

2. The group of unskilled native-born workers is the largest group ("the unskilled group") under two similar conditions; that are reduced to just one:

$$1 - s_t > \frac{1 + \mu_{t-1}}{1 + n + \mu_{t-1}(1 + m)}. \tag{13}$$

3. The group of old retirees is the largest group ("the old group"), when its size is larger than each one of the former groups, that is,

$$\frac{1 + \mu_{t-1}}{1 + n + \mu_{t-1}(1 + m)} \geq \max\{s_t, 1 - s_t\}. \tag{14}$$

3.5 Equilibrium

We first describe what are the variables relevant for each of the three types of voters when casting the vote in period t. First, s_t is the variable which describes the state of the economy. Also, each voter takes into account how her choice of the policy variables in period t will affect the chosen policy variables in period $t+1$ which depends on s_{t+1} (recall that the benefit she will get in period $t+1$, b_{t+1}, depends on τ_{t+1}, σ_{t+1}, and μ_{t+1}). Therefore each voter will cast her vote on the set of policy variables τ_t, σ_t, and μ_t which maximizes her utility given the values of s_t, taking also into account how this will affect s_{t+1}. Thus, there is a link between the policy chosen in period t to the one chosen in period $t+1$. The outcome of the voting is the triplet of the policy variables most preferred by the largest voting group.

The mechanism (policy rule or function) that characterizes the choice of the policy variables (τ_t, σ_t, and μ_t) is invariant over time. This mechanism relates the choice in any period to the choice of the preceding period (τ_{t-1}, σ_{t-1}, and μ_{t-1}). This choice depend also on the current state of the economy, s_t. Thus, we are looking for a triplet policy function $(\tau_t, \sigma_t, \mu_t) = \Phi(s_t, \tau_{t-1}, \sigma_{t-1}, \mu_{t-1})$, which is a solution to the following functional equation

$$\Phi(s_t, \tau_{t-1}, \sigma_{t-1}, \mu_{t-1}) = \underset{\tau_t, \sigma_t, \mu_t}{\arg\max} V^d \left\{s_t, \tau_t, \sigma_t, \mu_t, \Phi(s_{t+1}, \tau_t, \sigma_t, \mu_t)\right\} \tag{15}$$

$$\text{s.t. } s_{t+1} = \frac{(1+n)s_t + (1+m)\sigma_t \mu_t}{1+n+(1+m)\mu_t},$$

where V^d is defined in equations (7.5) and (7.11), and $d \in \{s, u, o\}$ is the identity of the largest voting group in the economy.

This equation states that the decisive (largest) group in period t chooses, given the state of the economy s_t, the most preferred policy variables τ_t, σ_t, and μ_t. In doing so, this group realizes that her utility is affected not only by these (current) variables, but also the policy variables of the next period $(\tau_{t+1}, \sigma_{t+1}, \mu_{t+1})$. This group further realizes that the future policy variables are affected by the current variables according to the policy function $\Phi(s_{t+1}, \tau_t, \sigma_t, \mu_t)$. Furthermore, this inter-temporal functional relationship between the policy variables in periods $t+1$ and t is the same as the one existed between period t and $t-1$. Put differently, what the decisive group in period t chooses is related to $s_t, \tau_{t-1}, \sigma_{t-1}$, and μ_{t-1} in exactly the same way (through $\Phi(\cdot)$) as what the decisive group in period $t+1$ is expected to be related to $s_{t+1}, \tau_t, \sigma_t$, and μ_t.

Denoting the policy function, $\Phi(s_t, \tau_{t-1}, \sigma_{t-1}, \mu_{t-1})$, by $(\tau_t, \sigma_t, \mu_t)$, we can show that the outcomes of the policy rule are:

$$\tau_t = \begin{cases} 0 & \text{, if the skilled group is the largest} \\ \frac{1-\frac{1}{J}}{1+\varepsilon-\frac{1}{J}} & \text{, if the unskilled group is the largest} \\ \frac{1}{1+\varepsilon} & \text{, if the old group is the largest} \end{cases}$$

$$\sigma_t = \begin{cases} 1 & \text{, if either the skilled or unskilled group is the largest and } s_t < \frac{1}{1+n} \\ \widehat{\sigma} < \frac{1}{2} & \text{, if the skilled group is the largest and } s_t \geq \frac{1}{1+n} \\ 1 & \text{, if the old group is the largest.} \end{cases} \quad (16)$$

$$\mu_t = \begin{cases} \frac{1-(1+n)s_t}{m} & \text{, if the unskilled group is the largest and } \Psi > 0 \text{ or if the skilled group is the largest and } s_t < \frac{1}{1+n} \\ \widehat{\mu} < 1 & \text{, if the skilled group is the largest and } s_t \geq \frac{1}{1+n} \\ 1 & \text{, if the unskilled group is the largest and } \Psi \leq 0 \text{ or if the old group is the largest.} \end{cases}$$

where

$$J = \frac{(s_t + \sigma_t\mu_t)\left(\frac{w_t^s}{w_t^u}\right)^{1+\varepsilon} + 1 - s_t + (1-\sigma_t)\mu_t}{1 + \mu_t + \frac{1+\mu_{t-1}}{1+n+\mu_{t-1}(1+m)}} \quad (17)$$

$$\Psi = b_t^u + \beta b_{t+1}^o - \widehat{b}_t, \quad (18)$$

where we denote by $\widehat{b}_t$ the demogrant period t with $\mu_t = 1 = \sigma_t$, and b_t^u the demogrant in period t with $\sigma_t = 1$ and $\mu_t = \frac{1-(1+n)s_t}{m}$ (both demogrants are associated with the tax rate preferred by the unskilled group). Similarly, b_{t+1}^o is the demogrant in period $t+1$ associated with the set of policy variables preferred by the old group.

Notice that the case $s_t > \frac{1}{1+n}$ cannot happen if the unskilled group is the largest (because $n < 1$). In this case, the special migration policy variables preferred by the skilled group, $\widehat{\sigma}$, and $\widehat{\mu}$, are given implicitly from the maximization exercise

$$\langle \widehat{\sigma}, \widehat{\mu} \rangle = \arg\max_{\sigma_t, \mu_t} V_t^s = \frac{(A_t w_t^s)^{1+\varepsilon}}{1+\varepsilon} + \beta b_{t+1}^o \quad (19)$$
$$\text{s. t.} \qquad (1+n)s_t - 1 \leq \mu_t(1-(1+m)\sigma_t).$$

When the solution to the problem in (19) is interior, we can describe it by

$$\frac{\frac{\partial V^s}{\partial \sigma_t}}{\frac{\partial V^s}{\partial \mu_t}} = \frac{\widehat{\mu}(1+m)}{(1+m)\widehat{\sigma} - 1}. \quad (20)$$

There are also two possible corner solutions: $\langle \widehat{\sigma}, \widehat{\mu} \rangle = \langle 0, (1+n)s_t - 1 \rangle$ and $\langle \widehat{\sigma}, \widehat{\mu} \rangle = \left\langle \frac{2-(1+n)s_t}{1+m}, 1 \right\rangle$.

3.6 Interpretation: Migration and Tax Policies

The intuition for the aforementioned results is as follows. The skilled are the net contributor to the welfare state, while the other two groups are net beneficiaries. Preferences of the old retirees are simple. If the old cohort is the largest, it wants maximal social security benefits, which means taxing to the Laffer point $(\frac{1}{1+\varepsilon})$. They also allow the maximal number of skilled migrants in to the economy because of the tax contribution this generates to the welfare system.

It is interesting to note that, although the unskilled young are net beneficiaries in this welfare state, they are, nevertheless, still paying taxes. Hence the preferred tax policy of the unskilled voters is smaller than the Laffer point with a wedge $\frac{1}{J}$. (We will provide further discussions on this deviation factor below.) Clearly, the unskilled workers also prefer to let in more skilled immigrants due to their contribution to the welfare state. How many will they let in depends on the function Ψ, which weighs the future benefits against the cost at the present. Basically, if the unskilled workers are not forward-looking, it is in their best interest to let in as many skilled migrants as possible. However, this will lead to no redistribution in the next period because the skilled workers will be the largest. Hence, the function Ψ is the difference between the benefits they get by being, as they are, forward-looking and being myopic.

The skilled native-born prefer more skilled migrants for a different reason than the earlier two groups. They prefer to let in skilled migrants in this case because this will provide a higher number of skilled native workers in the *next* period. Thus, because the skilled are forward-looking, they too will prefer to have more skilled workers in their retirement period. However, they cannot let in too many of them because their high birth rate may render the skilled young in the next period as the largest group who will vote to abolish the welfare state altogether (similar to chapter 5).

A common feature among models with subgame-perfect Markov equilibrium is the idea that today's voters have the power to influence the identity of future policy makers. Such feature is also prominent in our analysis here (as well as in chapter 5). The migration policy of either young group reflects the fact that they may want to put themselves as the largest group in the next period. Thus, instead of letting in too many migrants, who will give birth to a large new skilled generation, they will want to let in as much as possible before the threshold is crossed. This threshold is $\frac{1-(1+n)s_t}{m}$. Letting $s_t = 1$ gets the result of the chapter. There are two differences between this threshold and the one in chapter 5. First, the equilibrium here has a bite even if the population growth rate is *positive*, which cannot be done when there are only young and old cohort, as in chapter 5, unless there is a negative population growth rate. Another fundamental is that, in order to have some transfer in the economy, the young decisive largest group has a choice of placing the next period's decisive power either in the hand of next period's unskilled or the old. So we need to verify an additional condition that it is better for this period's decisive young to choose the old generation next period, which is the case.

When $s_t \geq \frac{1}{1+n}$, we have a unique situation (which is only possible when $n > 0$). In this range of values, the number of skilled is growing too fast to be curbed by reducing migration volume alone. To ensure that the decisive power lands in the right hand (that is, the old), the skilled voters (who are the largest in this period) must make the unskilled cohort grow to weigh down the growth rate of the skilled workers. This is done by restricting both the skill composition as well as the size of total migration.[11]

The tax choice of the unskilled young deserves an independent discussion. In Razin, Sadka and Swagel (2002a, 2002b), it is maintained that the "fiscal leakage" to the native-born and to the migrants who are net beneficiaries may result in a lower tax rate chosen by the median voter. They assume that all migrants possess lower skill than the native-born. Because this increases the burden on the fiscal system, the median voter vote to reduce the size of the welfare state, instead of increasing it. To see such a resemblance the our result, we must first take the migration volume, μ_t, and the skill composition, σ_t, as given. Letting τ_t^u denote the tax rate preferred by the unskilled group, one can verify from equation (17) that $\frac{\partial \tau_t^u}{\partial \sigma_t} > 0$, and there exists $\overline{\sigma}$ such that, for any $\sigma_t < \overline{\sigma}$, we have $\frac{\partial \tau_t^u}{\partial \mu_t} < 0$. Conversely, for any $\sigma_t > \overline{\sigma}$, we would get an expansion of the welfare state, because $\frac{\partial \tau_t^u}{\partial \mu_t} > 0$.[12] The

[11]Empirically, with the population growth rate of the major host countries for migration like the U.S. and Europe going below 1%, it is unlikely that this case should ever be of much concern. Barro and Lee (2000) provides an approximation of the size of the skilled. While Barro and Lee statistics capture those 25 years and above, they also cite OECD statistics which capture age group between 25 and 64. The percentage of this group who received tertiary education or higher in developed countries falls in the range of 15% to 47%.

[12]Recall that the tax rate preferred by the unskilled young workers is less than the level that is preferred by the old retirees. The tax rate preferred by the old retirees, $\tau_t^o = \frac{1}{1+\varepsilon}$ is the Laffer point that attains the maximum welfare size, given immigration policies. Therefore the size of the welfare state is monotonic in the tax rate when $\tau \in [0, \frac{1}{1+\varepsilon}]$. Thus, our use of "shrink" and "expand" is justified.

inequalities tell us that higher number of skilled migrants will prompt a higher demand for intra-generational redistribution. The fiscal leakage channel shows that unskilled migration creates more fiscal burden, such that the decisive "unskilled" voters would rather have the welfare state shrink. In addition, an increase in inequality in the economy, reflected in the skill premium ratio $\frac{w_t^s}{w_t^u}$, leads to a larger welfare state demanded by the unskilled.

4 Strategic Voting Equilibrium

We now turn to strategic voting. Recall that we have only three groups: the skilled native-born, the unskilled native-born, and the old. Let the set of three candidates be $\{s, u, o\}$, denoting their identity. Then, as in Chapter 6, the decision to vote of any individual must be optimal under the correctly anticipated probability of winning and policy stance of each candidate. Because identical voters vote identically, we can focus on the decision of a representative voter from each group. Let $e_t^i \in \{s, u, o\}$ be the vote of individual of type $i \in \{s, u, o\}$ cast for a candidate. In the same spirit as in Chapter 6, voting decisions $\mathbf{e}_t^* = (e_t^{s*}, e_t^{u*}, e_t^{o*})$ form a *voting equilibrium* at time t if

$$e_t^{i*} = \arg\max \left\{ \sum_{j \in \{s,u,o\}} \mathcal{P}^j(e_t^i, \mathbf{e}_{-it}^*) V^i \left(\Phi_t^j, \Phi_{t+1}, \mathbf{e}_{t+1} \right) \mid e_t^i \in \{s, u, o\} \right\} \tag{21}$$

for $i \in \{s, u, o\}$, where $\mathcal{P}^j(e_t^i, \mathbf{e}_{-it}^*)$ denotes the probability that candidate $j \in \{s, u, o\}$ will win given the voting decisions, and $\mathbf{e}_{-it}^*$ is the optimal voting decision of other groups that is not i, and $\Phi_t^j = \left(\tau_t^j, \sigma_t^j, \mu_t^j\right)$ is the policy vector if candidate j wins. Thus we require that each vote cast by each group is a best-response to the votes by the other groups. In addition, the representative voter of each group must take into the account the *pivotal* power of their vote, because the entire group will also vote accordingly. The voting decision of the old voters is simple, because they have no concern for the future,

$$e_t^{o*} = \arg\max \left\{ \sum_{j \in \{s,u,o\}} \mathcal{P}^j(e_t^o, \mathbf{e}_{-ot}^*) V^i \left(\tau_t^j, \sigma_t^j, \mu_t^j \right) \mid e_{ot} \in \{s, u, o\} \right\}.$$

After the election, the votes are tallied by adding up the size of each group that have chosen to vote for the candidate. The candidate with the most votes wins the election and gets to implement his ideal set of policies.

Clearly, each individual prefers the ideal policies of their representative candidate. Strategic voting opens up the possibility of voting for someone else that is not the most preferred candidate in order to avoid the least favorable candidate. For the skilled young, they prefer the least amount of taxes and some migration for the future. Thus, they will prefer the policy choice of the unskilled over the old candidate. As for the old retirees, the higher the transfer benefits, the better. Clearly, the unskilled candidate promises some benefits whereas the skilled promises none, so they would choose the policies of the unskilled over the skilled.

As for the unskilled workers, both rankings are possible: either they prefer the policy choice of the skilled over the old, or vice versa. The parameters of the model will dictate the direction of their votes. The cut-off tax policy, $\widetilde{\tau}$, is the break-even point for the unskilled between getting taxed but receiving transfer (policies of the old candidate) or pay no tax at all (policies of the skilled candidate).Formally, this tax level, $\widetilde{\tau}$, is defined implicitly by the equation

$$\frac{(w^u)^{1+\varepsilon}}{1+\varepsilon} = \frac{((1-\widetilde{\tau})w^u)^{1+\varepsilon}}{1+\varepsilon} + \frac{\widetilde{\tau}(1-\widetilde{\tau})^{\varepsilon}\left((s_t+\sigma_t\mu_t)(w^s)^{1+\varepsilon} + (1-s_t+(1-\sigma_t)\mu_t)(w^u)^{1+\varepsilon}\right)}{1+\mu_t+\frac{1+\mu_{t-1}}{1+n+\mu_{t-1}(1+m)}}. \quad (22)$$

We know that such a tax policy exists, because, take next period's policy as given, the payoff in this period to the unskilled is maximized at its preferred policy and zero at $\tau = 1$. Therefore, at some $\widetilde{\tau}$, the equality will hold. This cut-off tax rate will play an important role for the unskilled young' voting decision.

The main problem with ranking the utility streams of the voters is due to the multiplicity of *future* equilibria once we extend our work to strategic voting. This makes it impossible for the voters to get a precise prediction of what will happen as a result of their action today. Even if we could pin down all the relative sizes of all possible payoffs in the next period, multiple voting equilibria do not allow a prediction of which equilibrium will be selected in the future. To deal with the problem, we restrict the voting equilibrium to satisfy the stationary Markov-perfect property, similarly to the policy choices in previous subsection. Now, we are ready to define the subgame-perfect Markov political equilibrium under strategic voting. We are looking for the a triplet policy function $(\tau_t, \sigma_t, \mu_t) = \Phi(s_t, \tau_{t-1}, \sigma_{t-1}, \mu_{t-1}, \mathbf{e}_t^*)$

with the voting vector $\mathbf{e}_t^*$ that solve the following two problems:

$$\Phi(s_t, \tau_{t-1}, \sigma_{t-1}, \mu_{t-1}, \mathbf{e}_t^*) = \underset{\tau_t, \sigma_t, \mu_t}{\arg\max} \quad V^d\left(s_t, , \tau_t, \sigma_t, \mu_t, \Phi(s_{t+1}, \tau_t, \sigma_t, \mu_t, \mathbf{e}_t^*)\right) \tag{23}$$
$$\text{s.t. } s_{t+1} = \frac{(1+n)s_t + (1+m)\sigma_t\mu_t}{1+n+\mu_t(1+m)},$$

where $d \in \{s, u, o\}$ is the identity of the the winning candidate, decided by the voting equilibrium $\mathbf{e}_t^*$ that satisfies the subgame-perfect Markov property and solves

$$\begin{aligned} e_t^{i*} &= \mathbf{e}^*\left(s_t, \tau_{t-1}, \sigma_{t-1}, \mu_{t-1}, \mathbf{e}_{t-1}^*\right) \\ &= \underset{e_t^i \in \{s,u,o\}}{\arg\max} \sum_{j \in \{s,u,o\}} \mathcal{P}^j(e_t^i, \mathbf{e}_{-it}^*) V^i\left(\Phi_t^j, \Phi(s_{t+1}, \tau_t, \sigma_t, \mu_t, \mathbf{e}_t^*), \mathbf{e}^*\left(s_{t+1}, \tau_t, \sigma_t, \mu_t, \mathbf{e}_t^*\right)\right) \end{aligned} \tag{24}$$

where $\mathcal{P}^j(e_t^i, \mathbf{e}_{-it}^*)$ denotes the winning probability of the representative candidate $j \in \{s, u, o\}$ given the voting decisions, and $\mathbf{e}_{-it}^*$ is the optimal voting decision of other groups that is not i, and $\Phi_t^j = \left\langle \tau_t^j, \sigma_t^j, \mu_t^j \right\rangle$ is the vector of preferred policy of candidate from group j.

The stationary Markov-perfect equilibrium defined above introduces another functional equation exercise. The first exercise is to find a policy profile that satisfies the usual Markov-perfect definition, as discussed in the case of sincere voting in the text. The second exercise restricts the voting decision to be cast on the belief that individuals in the same situation next period will vote in exactly the same way. With this property, the voters in this period know exactly how future generations will vote and can evaluate the stream of payoffs accordingly.

Lastly, the keep the analysis simple, we focus on voting equilibria that are consistent with policies derived in the text for the case of sincerely voting. This will be the case if the policies are always coupled with a voting equilibrium featuring the largest group always voting for its representative candidate. In particular, if the group forms the absolute majority, all votes cast from this group will go to its representative candidate. The economy can go through different equilibrium paths depending on n, m, and s_0, as follows:

1. If $n + m \leq 0$, the old group is always the absolute majority. Tax rate is at the Laffer point and the economy is fully open to skilled migration.
2. If $n + m > 0$, then the dynamics depend on the initial state of the economy, s_0. If $s_0 \geq \frac{1+\frac{n}{2}}{1+n}$, then the skilled workers are the majority (controlling 50% of the population), and zero tax rate with limited skilled migration will be observed. If $\frac{n}{2(1+n)} \geq s_0$, the unskilled workers are the majority, then there will be a positive tax rate (less than at

the Laffer point) and some skilled migration. If $n < 0$, then *initially* the old cohort is the majority; the tax rate will be at the Laffer point and the skilled migration will be maximal. Otherwise, the policies implemented are given in the equilibrium below.

The first equilibrium we look at is dubbed "Intermediate" because it captures the essence that the preferred policies of the unskilled workers are a compromise from the extremity of the other two groups. We can show that the following strategy profile forms a subgame-perfect Markov Equilibrium with strategic voting

$$e_t^{s*} = \begin{cases} s & \text{, if } s_t \geq \frac{1+\mu_{t-1}}{1+n+\mu_{t-1}(1+m)} \\ u & \text{, otherwise} \end{cases}$$
$$e_t^{u*} = u \tag{25}$$
$$e_t^{o*} = \begin{cases} o & \text{, if } \frac{1+\mu_{t-1}}{1+n+\mu_{t-1}(1+m)} \geq \max\{s_t, 1-s_t\} \\ u & \text{, otherwise} \end{cases}$$

and the policies implemented when no group is the absolute majority are

$$\Phi_t = \left(\tau_t = \frac{1-\frac{1}{J}}{1+\varepsilon-\frac{1}{J}}, \sigma_t = 1, \mu_t = \frac{2+n-2(1+n)s_t}{m} \right) \tag{26}$$

where $J = J(\mu_t, \sigma_t, s_t, \mu_{t-1})$ is as in equation (17).

The equilibrium features the unskilled voters always voting for their representative, whereas the other two groups vote for their respective candidate only if they are the largest group, or for the unskilled candidate otherwise. With these voting strategy, if no group captures 50% of the voting populations, the policy choice preferred by the unskilled candidate will prevail. One notable difference is the policy related to the immigration volume. In period $t+1$, as long as the skilled workers do not form 50% of the voting population, the policies preferred by the unskilled workers will be implemented. To make sure that this is the case, skilled migration is restricted to just the threshold that would have put the skilled voters as the absolute majority in period $t+1$. The volume of migration, $\mu_t^* = \frac{2+n-2(1+n)s_t}{m}$, reflects the fact that the threshold value for this variable has been pushed slightly farther. This level can be shown to be higher than the restricted volume in sincerely voting equilibrium.

In the preceding equilibrium, we let the preference of the skilled workers and the old retirees decide the fate of the policies. In the following analysis, the unskilled workers consider who they want to vote for. This will depend on how extractive the tax policy preferred by old is. We call the next equilibrium "Left-wing", because it features a welfare state of the size greater-than-or-equal to that of the intermediate policy equilibrium. This may arise when the tax rate preferred by the old voters is not excessively to redistributive. When $\frac{1}{1+\varepsilon} \leq \widetilde{\tau}$, we can show that we have an equilibrium of the following form

$$e_t^{s*} = \begin{cases} s & \text{, otherwise} \\ u & \text{, if } \frac{1+\mu_{t-1}}{1+n+\mu_{t-1}(1+m)} \geq s_t \geq \frac{1+\frac{n-m}{2}}{1+n} \end{cases}$$

$$e_t^{u*} = \begin{cases} u & \begin{cases} \text{, if } 1-s_t \geq \frac{1+\mu_{t-1}}{1+n+\mu_{t-1}(1+m)}, \text{ or} \\ \frac{1+\mu_{t-1}}{1+n+\mu_{t-1}(1+m)} \geq s_t \geq \frac{1+\frac{n-m}{2}}{1+n} \end{cases} \\ o & \text{, otherwise} \end{cases} \tag{27}$$

$$e_t^{o*} = o$$

and the policies implemented when no group is the absolute majority are

$$\Phi_t = \begin{cases} \left(\tau_t = \frac{1-\frac{1}{J}}{1+\varepsilon-\frac{1}{J}}, \sigma_t = 1, \mu_t = \frac{2+n-2(1+n)s_t}{m}\right) & \text{, if } \frac{1+\mu_{t-1}}{1+n+\mu_{t-1}(1+m)} \geq s_t \geq \frac{1+\frac{n-m}{2}}{1+n} \\ \left(\tau_t^* = \frac{1}{1+\varepsilon}, \sigma_t = 1, \mu_t = 1\right) & \text{, otherwise} \end{cases} \tag{28}$$

where $J = J(\mu_t, \sigma_t, s_t, \mu_{t-1})$ is as in equation (17) and $\widetilde{\tau}$ is given implicitly in equation (22).

When the tax rate preferred by the old voters is not excessively redistributive in the eyes of the unskilled, we could have an equilibrium where the unskilled voters strategically vote for the old candidate to avoid the policies preferred by the skilled voters. This will be an equilibrium when the size of the skilled is not "too large." Recall that, voting to implement the policies selected by the old candidate leads to opening the economy fully to the skilled immigrants. If the size of the skilled group is currently too large, there is a risk of making the skilled voters the absolute majority in the next period and will result in no welfare state in the retirement of this period's workers. The cutoff level before this happens is given by $\frac{1+\frac{n-m}{2}}{1+n}$. Therefore, voting for the old will only be compatible with the interest of the unskilled voters when the tax rate is not excessively high and when the size of the skilled is not too large.

We turn our attention to the next equilibrium. When $\frac{1}{1+\varepsilon} > \widetilde{\tau}$, we can show that there is an equilibrium with the following functions:

$$e_t^{s*} = \begin{cases} s & \text{, otherwise} \\ u & \text{, if } 1 - s_t \geq \frac{1+\mu_{t-1}}{1+n+\mu_{t-1}(1+m)} \end{cases}$$
$$e_t^{u*} = \begin{cases} u & \text{, otherwise} \\ s & \text{, if } \frac{1+\mu_{t-1}}{1+n+\mu_{t-1}(1+m)} \geq \max\{s_t, 1 - s_t\}. \end{cases} \quad (29)$$
$$e_t^{o*} = \begin{cases} o & \text{, otherwise} \\ u & \text{, if } s_t \geq \frac{1+\mu_{t-1}}{1+n+\mu_{t-1}(1+m)} \end{cases}$$

and the policies implemented when no group is the absolute majority are

$$\Phi_t = \begin{cases} \left(\tau_t = 0, \sigma_t = 1, \mu_t = \frac{2+n-2(1+n)s_t}{m}\right) & \text{, if } \frac{1+\mu_{t-1}}{1+n+\mu_{t-1}(1+m)} \geq \max\{s_t, 1 - s_t\} \\ \left(\tau_t = \frac{1-\frac{1}{J}}{1+\varepsilon-\frac{1}{J}}, \sigma_t = 1, \mu_t = \frac{2+n-2(1+n)s_t}{m}\right) & \text{, otherwise} \end{cases} \quad (30)$$

where $J = J(\mu_t, \sigma_t, s_t, \mu_{t-1})$ is as in equation (17) and $\widetilde{\tau}$ is given in equation (22).

When the Laffer point is higher than $\widetilde{\tau}$, the tax rate is read as excessive. In this case, the unskilled voters will instead choose to vote for the skilled over the old candidate. The resulting equilibrium as the size of the welfare state less-than-or-equal to that in the intermediate policy equilibrium, hence we refer to it as "Right-wing." When the tax preferred by the old is excessive from the perspective of the unskilled, the political process could implement the policies preferred by the skilled in order to avoid the worst possible outcome. This happens when the old voters constitute the largest group, and the unskilled voters vote strategically for the skilled candidate. In other cases, however, the policies preferred by the unskilled will be implemented, irrespective of the identity of the largest group in the economy.

For our results with multidimensional policies, it is important to note here that the ranking of candidates by individual voters allows us to escape the well-known agenda-setting cycle (the "Condorcet paradox"). Such a cycle, which arises when any candidate could be defeated in a pairwise majority voting competition, leads to massive indeterminacy and non-existence of a political equilibrium. The agenda-setting cycle will have a bite if the rankings of the candidates for all groups are unique: no group occupies the same ranked position more than once. However, this does not arise here, because, in all equilibria, some political groups have a *common* enemy. That is, because they will never vote for the least-preferred candidate (the "common" enemy), the voting cycle breaks down to determinate policies above, albeit their multiplicity. This occurs when voters agree on who is the least-preferred candidate and act together to block her from winning the election. The literature typically avoids the Condorcet paradox by restricting political preferences with some ad hoc assumptions. For our case, the preferences induced from economic assumption lead to the escape of the Condorcet paradox. For discussions on agenda-setting cycle, see Drazen (2000, page 71-72), and Persson and Tabellini (2000, page 29-31).

5 Conclusion

In this paper we built a dynamic politico-economic model featuring three groups of voters: skilled workers, unskilled workers, and retirees. The model features both *inter-* and *intra-*generational redistribution, resembling a welfare state. The skilled workers are net contributors to the welfare state whereas the unskilled workers and old retirees are net beneficiaries. When the skilled cohort grows rapidly, it may be necessary to bring in unskilled migrants to counter balance the expanding size of the skilled group.

The native-born young, whether skilled or unskilled, benefit from letting in migrants of all types, because their high birth rates can help increase the tax base in the next period. In this respect, skilled migrants help the welfare state more than unskilled migrants, to the extent that the offspring resemble their parents with respect to skill. On the other hand, more migrants in the present will strengthen the political power of the young in the next period who, relatively to the old, are less keen on the generosity of the welfare state. In this respect, unskilled migrants pose less of a threat to the generosity of the welfare state then skilled migrants.

6 Appendix: Elements of Strategic Voting with Multiple Groups

The initial motivation for our politico-economic setup is the class of models with citizen-candidate structure. Before the introduction of the citizen-candidate structure, earlier models in the fields of public choice and political economics utilize heavily the Downsian candidate setup that leads to the result of platform convergence of the candidates (Downs (1957)). The model assumes purely office-motivated candidates competing for a single office post. The competition to win the election will drive the policy platforms of all the candidates to the bliss point of the median voters, trying to attract as many votes as possible.[13] Thus the campaign among the candidates boils down to pursuing what drives the preference of the median voter and what may shift the distribution of voters. Moreover, the complete convergence in platforms does not seem to be observed in practice in most elections. Furthermore, candidates must arise from the citizen body and citizens are presumed to have some preferences for the policy chosen, regardless of the number of voters. Hence, assuming that candidates are only office-motivated misses out key policy determinants of voting models. The citizen-candidate model stands on the other end of the spectrum. First studied by Osborne and Slivinski (1996) and Besley and Coate (1997), the citizen-candidate model seeks to endogenize the candidates' selection from within the body of the citizens, and how the policy is ultimately determined.

However, due to the richness of strategic choices in the model, the citizen-candidate model is not easily applicable for applied research. In particular, the model suffers from massive multiplicity of equilibria, even in a static setting. For those seeking a dynamic politico-economic framework, the citizen-candidate proves formidable. In a subsequent work, Besley and Coate (1998) have extended the static model to a two-period setting. Anything beyond two-period must face exponentiated complexity. All in all, the citizen-candidate model is appropriate for an analysis focussing on a small-scale election, and possibly static. Therefore, it remains just a motivation for our exposition in this chapter, as we have adapted the model into an easily applicable version.

6.1 Many candidates

Consider an economy with a continuum of citizens, normalizing the population size to a unit. The citizens are divided into N groups, indexed by $i \in \{1, 2, \ldots, N\}$, and each has a mass of $\omega_i \geq 0$, where $\sum_{i=1}^{N} \omega_i = 1$. We imagine N to be relatively small. This means that, with a large population, people with similar interests often get grouped together. This setup abstracts from the possibility that one individual may belong to more than one group, sharing many interests.[14]

To highlight the mechanics of the model, suppose that the voters must collectively choose a one-dimensional policy (that is, $p \in P = \mathbb{R}$).[15] We assume that any two citizens belonging

[13] The politico-economic models we employed in the preceding chapters were in this spirit too.

[14] This shortfall, nonetheless, is common even in literature concerning itself primarily with interest groups' influence.

[15]

to the same group will have identical preference over the policy. The representative citizen from group i has a preference defined over the policy space, represented by the utility function $v^i(p)$. These preferences are "singled-peaked" and we let p_i^* denotes group i's preferred policy.

We assume that there are N candidates running for office representing directly the interest of the group they belong to. We denote with $j \in \{1, \ldots, N\}$ the identity of the candidates. This is fully known to all voters. Only one candidate is present from each group. We assume that, if the candidate representing group j wins the election, the implemented policy will be p_j^*. Under plurality rule, candidates who receive the most votes win.

Each citizen has a single vote that can be cast for a candidate. In particular, because voters from the same group have identical preference, they will vote identically.[16]

Let $e^i \in \{1, \ldots, N\}$ denote the vote casted by voters of group i. How each chooses to vote depends on her preference and what we allow them to consider while voting. We consider two canonical voting behaviors: *sincere* and *strategic*.

6.2 Sincere Voting

Voting sincerely is the simpler of the two. Under sincere voting behavior, voters will vote for candidates $j \in \{1, \ldots, N\}$ whose policy platform maximizes their utility, that is

$$\widetilde{e}^{i*} = \arg\max \left\{ v^i \left(p_j^* \right) \mid e^i \in \{1, \ldots, N\} \right\}.$$

We can denote the voting vector as $\widetilde{\mathbf{e}}^* = \left(\widetilde{e}^{1*}, \ldots, \widetilde{e}^{N*} \right)$. Under this voting behavior, voters belonging to group i will vote for candidate representing their group. That is $\widetilde{e}^{i*} = i$. The winner of the election will be decided purely by the size of the groups. Under plurality rule, the winning candidate will come from the group with the largest size, as reflected by ω_i. In the special case with two groups ($N = 2$), then the winning candidate will be represent the median voter of the economy. However, as N gets larger, it is no longer the case that the winning candidate will represent the preference of the median voter. When there are more fractions in the economy, and no collusion is allowed (that is, assuming everyone votes sincerely), the preference of the largest group in the economy will dictate the implemented policy.

Besley and Coate (1997) studies a more general environment with possible multi-dimensional policy space.

[16] We allow no abstentions within the model. Abstention can be built directly into voting choices. Depending on the context, however, it may appear unrealistic because, if one voter from a group abstains, all members of the same group must accordingly abstain.

6.3 Strategic Voting

Strategic voting relaxes the assumption of sincere voting. People are no longer required to vote for the candidate they like most, but rather they take into account the probability of that candidate winning the election. A voter is said to be voting *strategically* if she votes for the candidate with a policy platform that maximizes her.expected utility, where the expectation is taken over all the candidates and their probability of winning the election. Moreover, the votes must be consistent with the induced probability of winning of each candidate. Formally, voting decisions $\mathbf{e}^* = (e^{1*}, \ldots, e^{N*})$ form a *voting equilibrium*[17] if

$$e^{i*} = \arg\max \left\{ \sum_{j=1}^{N} \mathcal{P}^j(e^i, \mathbf{e}^*_{-i}) v^i \left(p^*_j\right) \mid e^i \in \{1, \ldots, N\} \right\}$$

for $i \in \{1, \ldots, N\}$, where $\mathcal{P}^j(e^i, \mathbf{e}^*_{-i})$ denotes the probability that candidate $j \in \{1, \ldots, N\}$ will win given the voting decisions, and $\mathbf{e}^*_{-i}$ is the optimal voting decisions of other groups that is not i. Thus we also require that each vote cast by each group is a best-response to the votes by the other groups. In addition, this also means that the representative voter of each group must take into the account the *pivotal* power of her vote, because the entire group will also vote accordingly. After the election, the votes are tallied by adding up the size of each group that have chosen to vote for the candidate. The candidate with the most votes wins the election and gets to implement her ideal set of policies. The winning probability quantity, $\mathcal{P}^j(e^i, \mathbf{e}^*_{-i})$, must be determined endogenously from the voting vector and the groups' weight. Lastly, we define a *political equilibrium* to consists of two vectors, $\mathbf{e}^*$ and $\mathbf{p}^*$, where the latter is the vector listing the policies preferred by every candidate.

It is important to contrast the strategic voting scenario with the sincere counterpart. We do this by a couple of examples, which will also demonstrate how the probability a candidate would win is determined, $\mathcal{P}^j(\mathbf{e}^*)$. Under sincere voting, voters assume that the policy of their most-preferred candidate will be implemented with probability one, while under strategic voting, the probability depends on how other groups vote. A special case arises when a certain group form more than 50% of the population. In this case, the winning candidate, who will also represent the preference of the median, will belong to this group, irrespective of the voting profiles of the other groups. Therefore, the probability that its candidate will win is 1. One can easily construct other examples with different conclusions.

[17] *The original definition of this voting equilibrium is due to Besley and Coate (1997).*

For example, let $N = 3$, and $\omega_i = \frac{1}{4}, \frac{1}{3}, \frac{5}{12}$ for $i = 1, 2, 3$ respectively. No one group consists of more than 50% of the population; group 3 is the largest. However, if group 1 and 2 both dislike the policy preferred by group 3, they could collude to surpass 50% and win the election. The implemented policies will be decided by the voting equilibrium. If collusion means voters from group 1 and group 2 both vote from group 2's candidate, the ideal policy of group 2 will be implemented in equilibrium. The probability of winning for candidates representing group 1 and 2 are $\mathcal{P}^1(\mathbf{e}^*) = 0$ and $\mathcal{P}^2(\mathbf{e}^*) = 1$. Likewise, group 1 and 2 could both vote for group 1's representative candidate, hence resulting in policy preferred by group 1 in equilibrium. In this case, the probability of winning for candidates representing group 1 and 2 are reversed $\mathcal{P}^1(\mathbf{e}^*) = 1$ and $\mathcal{P}^2(\mathbf{e}^*) = 0$. By either collusions, the preferred policy of the largest group, group 3, will be blocked in equilibrium. These two voting equilibrium will generate $\mathcal{P}^3(\mathbf{e}^*) = 0$.

Note that a rule for a tie breaker should be defined. That is, if two candidates receive the same amount of votes, how will this be resolved. Besley and Coate (1997) proposes equal probability across all leading candidates. Alternatively, one can also assign some other arbitrary rules, such as the candidate belonging the larger group always win or the candidate with a smaller group index wins. Whichever rule one chooses, it should complement the analysis underlying the usage of the model.

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