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THE WELFARE STATE AND THE SKILL MIX OF MIGRATION: DYNAMIC POLICY FORMATION

Assaf Razin
Efraim Sadka
Benjarong Suwankiri

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ABSTRACT

The paper develops 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 skill 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.

Assaf Razin
Department of Economics
Cornell University
Uris 422
Ithaca, NY 14853
and NBER
ar256@cornell.edu

Benjarong Suwankiri
Department of Economics
Cornell University
Ithaca, NY
14853
bs246@cornell.edu

Efraim Sadka
Tel Aviv University
Eitan Berglas School of Economics
P.O.B. 39040
Ramat Aviv, Tel Aviv, 69978, ISRAEL
sadka@post.tau.ac.il

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Assaf Razin,
Cornell University and Tel Aviv University
Efraim Sadka,
Tel Aviv University
and
Ben Suwankiri
TMB Bank Plc. Thailand

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Abstract

Tthe native-born young, whether skilled or unskilled, benefit from letting in migrants of all skill 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.

1

The comprehensive welfare state is characterized by both inter generational redistribution (such as old-age social security) and intra-generational redistribution (such as income maintenance programs)[1].This paper delves into the theoretical analysis of the links between the generosity of the welfare state and migration in a political-economy dynamic setting. The framework brings to life *inter*-generational aspects of redistribution (that is, between the young and the old), in addition to the *intra*-generational features redistribution. An overlapping generations model is employed

[1]Some features of the welfare state, such as national health insurance, involve both inter- and intra- generational redistribution.

and voting about current migration and social security policy is jointly conducted each period (where people live for two periods). We plausibly assume that migrants have higher birth rates than the native-born. As we aim to highlight this demographic difference, we assume that this is the only feature by which migrants differ from the native-born. The latter jointly determine in a political process the migration policy (that is, the number of migrants allowed in) and the size of a pay-as-you-go (PAYG) old-age social security. We employ a forward looking equilibrium concept which means that each young voter takes into account the effect of her vote on the evolution of the economy in the next period, which, in turn, affects the voting outcome in the next period, especially with respect to the social security benefit that she receives in the next period when she grows old; voting in the next period is in turn influenced by the outcome of this voting on the voting outcome in the following period, and so on.

We study how a more generous old-age social security system affects the volume of migration ; how the volume of migration affects the generosity of the old-age security system chosen by the native born; and how the generosity of the old-age social security system and the volume of migration are jointly determined by the native-born population .

The voting is conducted with respect to concurrent decisions on redistribution between the old and the young, and between the rich (skilled) and the poor (unskilled). In this setup there arise many more than two voting groups. The skilled young does no longer share necessarily the same interests as the unskilled young. Similarly, a distribution draws between the skilled old and the unskilled old; and so on. We study the joint determination of the generosity of the welfare state and the volume and skill composition of migration. Of particular interest is the characterization of the coalitions that are decisive in the political-economic equilibria for different demographic and skill-distribution parameters.

2 Background

Milton Friedman, reminded us that one cannot obviously have free immigration and a welfare state. That is, a welfare state with open borders might turn into a heaven for the poor and the needy from all over the world, thereby draining its finances, and bringing it down.

Indeed, public opinion in the developed economies, with a fairly generous welfare system, favors putting in some way or another restrictions on migration. A skilled and young migrant may help the finances of the welfare state; whereas an unskilled and old migrant may inflict a burden on the welfare state. Of a particular interest is therefore the skill and

age composition of these restrictions. A welfare state with a heterogeneous (by age, skill, etc) population does not evidently have a commonly accepted attitude towards migration.

For instance, a skilled (rich) and young native-born who expects to bear more than an average share of the cost of providing the benefits of the welfare state is likely to oppose on this ground admitting unskilled migrants. On the other hand, this same native-born may favor unskilled migrants to the extent that it boosts up her wage. A native born old may favor migration, even low-skilled, on the ground that it could help finance her old-age benefits.

This variety of effects necessitates the use of a general equilibrium framework in order to study how migration policies affect the native-born voters. Furthermore, there are conflicting interests among the native-born voters concerning these policies. This book develops a framework to study how these many conflicts are resolved in a politico-economic setup.

3 Fiscal Aspects of Migration: Evidence

In 1997 the U.S. National Research Council sponsored a study on the overall fiscal impact of immigration into the U.S.; see Smith and Edmonston (1997). The study looks carefully 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.

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[2], Dustmann at al (2009) bring evidence of no welfare migration. The average age of the A8 migrants during the period 2004[3]-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 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[4]. 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.

Hanson et al (2007) employing opinion surveys, find for the United States that natives of states which provide generous benefits to migrants prefer to reduce the number of migrants. This 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 migrants' population are less likely to favor restricting migration. Indeed,

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

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

[4] This finding does not yet indicate whether or not the A8 migrants impose a net fiscal burden, because the latter takes in to account the present value of all taxes paid by and revenues received by migrants through their life time.

developed economies do attempt to sort out immigrants by skill (see, for instance, Bhagwati and Hanson (2009)). Australia and Canada employ a point system based on selected immigrants' characteristics. Recently 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 and American selection mechanisms are effective in sorting out the skilled migrants and produce essentially similar outcomes despite of their different legal characteristics. A welfare state is typically engaged in both *inter-* and *intra*generational redistribution. Therefore, in this chapter, we also introduce an elaborate and explicit feature of intra-generational redistribution, and analyze the interactions between inter and intragenerational conflicts. As was already pointed out, not only the native-born contribute to, and benefit from, the welfare state, migrants also contribute and benefit as well. Keeping this in mind, the political process selects both the size of redistribution as well as he migration policy. Therefore, the native-born voters must take into consideration the costs and benefits of migrants when casting their votes. Because of this interesting linkage between these two policy dimensions, we study in this chapter the joint determination of redistribution and migration policies.[5] In particular, the redistribution policy must have in mind both *inter* and *intra*generational aspects, resembling a full-fledged welfare-state system.

4 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 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 politico-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 . When participating in political decisions, as we indeed have, sincere voting is too simplistic. We therefore study also the case of strategic voting among the native-born in order to enable the formation of strategic political coalitions.

Consider an economy consisting of overlapping generations. Each

[5] Earlier studies include Dolmas and Huffman (2004) and Ortega (2005).

individual lives for two periods, working in the first period when young, and retiring in the second period when old. The population is divided into two groups according to their exogenously given skills: skilled (s) and unskilled (u).

4.1 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 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

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

[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. 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.

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. 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

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

and

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

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

4.2 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 endogeneous within the model, we assume for simplicity that the offspring replicate exactly the skill level

of their parents.[9] That is,

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

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

4.3 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

[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.

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 ($\sigma_t > s_t$).

5 Political Economy Equilibrium: Sincere Voting

In this section, we study the political-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. In the next section we consider the equilibrium with strategic voting.

We focus on "sincere voting," where individuals vote according to their *sincere* preference irrespective of what the final outcome of the political process will be; see chapter 6. 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 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:

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

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

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,

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

5.1 Equilibrium Characteristics

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

$$\begin{aligned} \Phi(s_t, \tau_{t-1}, \sigma_{t-1}, \mu_{t-1}) = \underset{\tau_t, \sigma_t, \mu_t}{\arg\max} & V^d\left\{s_t, \tau_t, \sigma_t, \mu_t, \Phi(s_{t+1}, \tau_t, \sigma_t, \mu_t)\right\} \\ \text{s.t. } & s_{t+1} = \frac{(1+n)s_t + (1+m)\sigma_t\mu_t}{1+n+(1+m)\mu_t}, \end{aligned} \tag{15}$$

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

intertemporal 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:

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

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

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

where

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

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

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

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

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

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

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

5.2 Migration and Tax Policies: Interpretation

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 policymakers. 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 $\frac{1-(1+n)s_t}{m}$. This strategic motive on migration quota is previously fleshed out in chapter 5. 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

[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%.

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 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.

6 Strategic-Voting Equilibrium

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,

[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.

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

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

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

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

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

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

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:

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

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

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

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 pair-wise 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.[13]

7 Conclusion

The paper develops 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.

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