Temporary Migration and the Size of the Government

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Abstract

The US is currently undertaking a comprehensive reform of its immigration policy and, most likely, the new system will be based on temporary work permits. The main unresolved issue is whether to offer a track to citizenship to future immigrants and to the large number of undocumented foreigners already in the country. This paper compares the dynamics of redistributive programs under two alternative scenarios. In the first, immigrants stay permanently in the country and gain the right to vote. In the second scenario, immigrants only receive temporary work permits, and hence only affect natives through their labor market outcomes. The main finding is that a shift toward a system based on temporary migration is likely to lead to a reduction in the size of redistributive programs. Specially, I build a dynamic political economy model where, in each period, voters choose an immigration policy and the size of an income redistribution program by majority vote. Over time, the income distribution varies because of intergenerational skill mobility and immigration. I first show that when immigrants gain the right to vote there exist equilibria where income redistribution is sustained indefinitely. In these equilibria, immigration policy is used strategically: the unskilled majority admits some of unskilled immigrants. Next I show that a shift toward temporary migration leads to abandoning redistributive programs. Finally, I argue that granting citizenship to the large number of undocumented workers currently in the US may significantly increase the current support for redistributive policies for a few decades but will not have permanent effects.

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1 Introduction

> "I think the president needs to remember that all of these illegal people are going to have kids who vote here one day," he said. "They think we don't matter, but those kids are not going to forget who helped their parents and who didn't."[1]

Since January 2004, the US has been engaged in a process of comprehensive reform of its immigration policy. At last, a proposal that had gathered enthusiastic social support was recently voted in the Senate. The proposal was built around two main pillars: regulation of future immigration by means of temporary work permits, and inclusion of a track to citizenship for the undocumented foreign workers already in the country (that satisfy certain requirements). In a context of massive street demonstrations, the bill was voted down (April 7, 2006), mainly reflecting that the positions of the two parties regarding citizenship remain far apart. While Democrats widely support including a track to citizenship, a large fraction of the Republican party opposes it.[2]

Why do the two parties have opposing views regarding the issue of citizenship? What are the consequences of offering immigrants a track to citizenship? This paper studies the dynamics of the size of government under two immigration scenarios. First, I assume that immigrants stay indefinitely in the country. Thus, immigration affects natives through two channels: its effect on current labor market outcomes and on future redistributive policies, once they gain the right to vote. In the second scenario, immigrants can only stay temporarily and cannot vote.

The main result is that a shift toward a system where future immigration is based on temporary work permits is likely to lead to a reduction in the size of redistributive programs. In addition, I show that granting citizenship to the large number of undocumented foreign workers currently in the US will significantly increase the current support for redistributive transfers for the next few decades but will not have permanent effects. To the extent that the Democratic party represents the interests of unskilled native voters, it is a bit paradoxical that it is vigorously supporting offering immigrants a track to citizenship while the Republican party is mostly in opposition. The findings here suggest an interpretation. Under permanent migration, the negative effect of unskilled immigration flows on the labor market outcomes of native unskilled voters is offset by the increased political support for redistribution, once the immigrants gain the right to vote. In contrast, under purely temporary migration, only the effect on labor market outcomes is present.

The paper presents a dynamic political economy model where, in each period, the size of a redistributive transfer and immigration policy are determined by majority vote. Over time, the skill distribution varies because of intergenerational skill mobility and immigration flows. A key aspect of the model is that voters take into account the effect of current immigration on future policies. I provide an analytical characterization of the dynamics of redistributive policies under the two immigration systems.

[1] Quotation of José F., an illegal immigrant who asked that his last name not be published, that appeared in the New York Times on May 16, 2006.

[2] Since then President Bush has shown strong support for the Senate's proposal. His statements are expect to be influential in the Senate's second attempt to pass the bill.

Before turning to voting equilibria it is instructive to examine the problem of a benevolent government that chooses redistribution and immigration policy. I show that the optimal policy consists in admitting as many skilled immigrants as available and to redistribute income vigorously, to reduce differences in marginal utilities of consumption between rich and poor workers.

Turning to the case where policies are determined by majority vote, I show that with permanent migration there exist equilibria where redistributive policies are sustained indefinitely. In this case, the pro-redistribution party uses immigration policy strategically and admits some unskilled immigrants, anticipating that they will vote in favor of redistribution once they gain the right to vote. The pro-redistribution party needs a constant inflow of unskilled immigrants to offset the upward trend in the fraction of skilled workers in the native population. This is reminiscent of the "voting for your enemy" behavior in the literature on dynamic club formation, as in Barbera, Maschler and Shalev (2001). Interestingly, the anti-redistribution party may also support admitting restricted amounts of unskilled immigrants.

The second main result is that a shift toward a temporary migration system, where immigrants never gain the right to vote, leads to abandoning redistributive policies under parameter values where this would not have been the case with permanent migration. Moreover, with temporary migration, the two parties have sharply opposing views over immigration policy: the pro-redistribution party only supports skilled immigration while the anti-redistribution party only supports unskilled immigration. This prediction should be of interest to the recent empirical literature on the determinants of individual attitudes toward immigration.[3]

In the last part of the paper I return to the current immigration policy debate in the US. I argue that the positions taken by the Democratic and Republican parties regarding the inclusion of a track to citizenship can be understood by each party's different view on the ideal size of redistributive transfers. Under the assumption that the Democratic party supports income redistribution and the Republican party opposes it, the model predicts that the pro-redistribution party will advocate for a system with a track to citizenship while the anti-redistribution party will be against it.

Secondly, I use a small extension of the model to evaluate the effect of granting citizenship to the 12 million undocumented workers already in the US on the skill distribution of US voters, with attention both to the magnitude and persistence of the impact. The results suggest that the effect is only temporary and washes away in two generations. However, the short-run effect is substantial, increasing the fraction of low-skill voters in 5 percentage points on impact.

The plan of the paper is the following. After a brief literature review, section 2 presents the model. As a benchmark case, section 3 studies optimal policy from the point of view of a benevolent government. Section 4 studies voting equilibria under permanent migration. Section 5 analyzes the simpler case of voting equilibria under temporary migration. Section 6 discusses the current debate in the US in the light of the model. Section 7 concludes. Figures and proofs can be found in the appendix.

[3] Some recent contributions, reviewed below, are Dustmann and Preston (2004) and Mayda and Facchini (2006).

1.1 Literature Review

There is a growing literature studying immigration policy from a political economy perspective. Benhabib (1996) is one of the pioneer contributions. He builds a (static) model where agents with heterogeneous capital holdings choose immigration policy by majority vote. In his model, there is an exogenous supply of potential migrants with different endowments of capital. In casting their votes, native workers take into account the effects of immigration on factor prices but ignore the effect on future policies. Benhabib (1996) argues that immigration policy is likely to display policy cycles, alternating long periods of tight restrictions with brief periods where large inflows of immigrants are admitted. Ortega (2005) provides an infinite-horizon extension of Benhabib (1996) and shows that stationary equilibria are also possible. He then argues that the main recent changes in US immigration policy are more consistent with the features of stationary equilibria, once educational trends are taken into account.

Dolmas and Huffman (2004) propose a 3-period model that incorporates endogenous redistribution in a setup inspired in Benhabib (1996). In the first period, a capital-heterogeneous native population votes over immigration policy. In the second period, the native population and the enfranchised immigrants vote over redistribution, which takes place in the last stage. In their model immigration affects factor prices and the size of redistributive policies. Their model allows for savings and international capital movements but assumes that potential immigrants are all identical. As a result, immigration policy is solely a decision over the size of immigration flows. The model is analyzed numerically and the results strongly depend on assumptions about initial conditions. The model I present here addresses the same question as Dolmas and Huffman (2004) using a very different framework, which emphasizes the link between the evolution of the skill distribution of voters over time and the steady-state size of redistributive transfers, and the size and skill composition of immigration flows. Moreover, I provide an analytical characterization of the results.

A number of papers have studied the effects of exogenously given immigration flows on the size of government. Razin, Sadka and Swagel (2002) study the effect of an exogenous inflow of immigrants on the level of income redistribution in a static voting model. Canova and Ravn (2000) is one of the few dynamic analyses of the effects of immigration on the future size of redistribution.[4] They provide a quantitative analysis of the dynamic effects of German unification in a model where redistributive transfers vary with immigration flows. In their model economy, agents can be skilled or unskilled. Apart from their skills, the other important difference is that only skilled workers are allowed to smooth consumption over time. Canova and Ravn (2000) emphasize the effects of immigration flows on capital accumulation through changes on taxes. In their model, the transfer policy is fixed and taxes are mechanically adjusted to balance the budget. The present analysis is highly complementary to theirs. I emphasize the effects of immigration on the size of transfers due to shifts in the political support for redistribution, once immigrants gain the right to vote. Another important difference between the two models is the role of family background in the determination of skills. Canova and Ravn (2000) assume that skills are independent of family background and argue that this does not matter much in their analysis. The model I present allows for skills to

[4] Storeslestten (2000) also attempts to quantify the effects of immigration on US public finances using a dynamic model but, in his analysis, government spending plans are kept fixed.

depend on family background. In fact, some results depend crucially on the assumption of high interegenerational persistence, which has strong empirical support.

This paper is also related to a number of recent papers that study the size of government using dynamic political economy models. The early contributions of Krusell, Quadrini and Rios-Rull (1997) and Krusell and Rios-Rull (1999) try to account quantitatively for the evolution of the size of the US government. The model I present is more closely related to the recent work by Hassler et al (2002, 2005). These authors study the political sustainability of the welfare state using an overlapping-generations model (without altruism) that can be solved analytically. Another related, recent contribution to this literature is Doepke and Zilibotti (2005). They study the political support for introducing child-labor regulations in a dynamic political economy model with stochastic fertility and skills. In contrast to the previous papers, and to the analysis here, they assume that child-labor regulations are voted once and for all, as opposed to period-by-period.

The present paper also contributes to the small set of papers in this literature that can be studied analytically. In this respect, the most salient features of the model presented here are the following. Policies are chosen in each period by majority vote by infinitely-lived voters, the policy vector is multi-dimensional (the degree of redistribution and the relative size and average skills of immigration flows), the skill distribution varies over time, and the production function allows for an endogenous determination of the skill premium.

A number of papers have already studied the relation between immigration flows and the size of government but using only static frameworks where immigration flows are exogenously given. Roemer and Van der Straeten (2004) study the consequences of the rise in xenophobia (in Denmark) on the size of the welfare state. Razin, Sadka and Swagel (2002) extend the work of Metzler and Richard (1981) by including an exogenous flow of immigrants and study the connection between immigration and income redistribution in a static model.

Conceptually, this paper views immigration policy (when immigrants have access to citizenship) as a decision on admission to a political community. This relates the present work to the literature on dynamic club formation. Roberts (1998) and Barbera, Maschler and Shalev (2001) study dynamic games where current club members vote over new membership. In their analysis voters' preferences are exogenously defined over the composition of the club and substantial effort is required to prove existence of equilibrium. The model I analyze is much simpler in many respects and assumes that voters' preferences over immigration (new members) are derived solely from the effect of immigrants on wages and tax rates. Interestingly, Barbera, Maschler and Shalev (2001) find that some voters sometimes engage in a strategic use of admission policy, admitting individuals that reduce their current payoff anticipating that the new comers will provide support for desirable policies in the future. They refer to this behavior as "voting for your enemy". A similar feature will be present in the model I introduce in the next section.

Similar issues also arise in the literature on franchise extension. Important early contributions to this question are Acemoglu and Robinson (2000) and Lizzeri and Persico (2003). A recent contribution to this literature is closely related to the model here. Jack and Lagunoff (2005) present an infinite horizon, recursive model of franchise extension where policies are determined by majority vote. The policies they consider include the identity of next period's decisive voter and the degree of (intra-temporal) income redistribution. They study Markov perfect equilibria

and focus on equilibria with gradual franchise extension. While similar in some respects, there are several important differences between their model and the one I present here. In their model, the set of agents is fixed and economic mobility over time is not allowed. While more general in several other dimensions, their model is an endowment economy where general equilibrium effects are absent. Allowing for varying degrees of economic (educational) mobility turns out to play an important role in the analysis here.

The paper is also related to the empirical literature studying the determinants of individual attitudes toward immigration, and, in particular, to the papers focusing on welfare state considerations. Dustmann and Preston (2004) analyze UK data and Mayda and Facchini (2006) perform cross-country comparisons. The work of O'Rourke and Sinnott (2004), Hanson, Scheve, and Slaughter (2005), and Mayda (2005) focuses on differences in attitude toward immigration by educational attainment of the respondent.

2 Model

The environment here builds on Ortega (2005) but extends it along two important dimensions, by incorporating endogenous income redistribution and allowing for scarcity of potential immigrants.[5] In the economy, one consumption good is produced by a competitive firm using two complementary inputs: skilled and unskilled labor. Let $F(L_1, L_2)$ be the production function, a continuous, smooth and constant-returns-to-scale function satisfying the following standard properties: $F_i > 0$, $F_{ii} < 0$ for $i = 1, 2$ and $F_{12} > 0$. Observe that if we define $k = L_2/L_1$, the previous assumptions imply that $F_1(1, k)$ is a strictly increasing function of k and $F_2(1, k)$ is a strictly decreasing function of k. The respective derivatives (with respect to k) are $F_{12} > 0$ and $F_{22} < 0$. To save on notation I will use $F_i(k)$ to denote $F_i(1, k)$, for $i = 1, 2$.

The economy is populated by many agents with two possible skill levels. Unskilled agents will be denoted by $i = 1$ and skilled agents by $i = 2$. These workers can be either natives (born in the country) or immigrants (foreign-born). All agents evaluate consumption streams according to utility function

$$E_t \sum_{j=0}^{\infty} \beta^j u(c_{t+j}),$$

where u is an increasing, strictly concave, and continuous function. I will interpret these preferences in a dynastic sense. So c_t denotes the consumption of a worker at time t, c_{t+1} her only child's consumption and $\beta \in [0, 1)$ is the degree of altruism between parents and children. The expectation refers to uncertainty about the skill levels of the offspring. Each type-i agent is endowed with one unit of labor that is supplied inelastically. Bequests are not allowed.

In every period, the government redistributes income from the rich to the poor by means of a proportional income tax, paid by all workers, and a universal transfer. Taxes are non-distortionary

[5] Ortega (2005) studies an economy without redistribution where only immigration policy is endogenous. He also assumes an infinite supply of potential immigrants.

and $r_t \in [0,1]$ denotes the tax rate in period t. The government runs a balanced budget. Immigrants also pay taxes and receive transfers.

For most of the analysis, I assume that the children of immigrants are born with voting rights (*jus soli*), as is the case in the US and in many other countries. So in most of the paper the words citizen, voter and native-born worker will be synonymous.[6]

2.1 Exogenous policies

I assume that, given immigration and redistribution policies, prices and allocations follow a competitive equilibrium. Let $(N_1(t), N_2(t))$ and $(I_1(t), I_2(t))$ be, respectively, the skill distributions of native-born workers and immigrants arrived in period t. Period t's labor force is given by $L_i(t) = N_i(t) + I_i(t)$, $i = 1, 2$. As a result of constant returns to scale, wages in each period are solely a function of the *ratio* of skilled to unskilled workers in the labor force, that is $k_t = L_2(t)/L_1(t)$. Thus, individual consumption is given by

$$\begin{aligned} c_i(k_t, r_t) &= F_i(k_t) + r_t \left(f(k_t) - F_i(k_t) \right) \\ &= (1 - r_t) F_i(k_t) + r_t f(k_t), \text{ for } i = 1, 2, \end{aligned}$$

where $f(k_t) = \frac{F_1(k_t) + k_t F_2(k_t)}{1 + k_t}$ is the output per worker. It is easy to see that $f(k)$ is increasing as long as $F_1(k) < F_2(k)$. Below we shall introduce an assumption that will guarantee that skilled workers will always be richer than unskilled ones.

2.2 Intergenerational Mobility

Children's skills are determined stochastically but depend on parental skills. More specifically, I assume that intergenerational mobility in skills is governed by a two-state Markov chain with persistence. Letting p_i be the probability of being *skilled* given parental skill level i, I assume that $p_1 < 0.5 < p_2$. The skills of the children of immigrants are determined identically.[7] As a result, when we aggregate over all individuals,

$$\begin{pmatrix} N_1(t+1) \\ N_2(t+1) \end{pmatrix} = \begin{pmatrix} 1 - p_1 & 1 - p_2 \\ p_1 & p_2 \end{pmatrix} \begin{pmatrix} L_1(t) \\ L_2(t) \end{pmatrix},$$

where $L_i(t) = N_i(t) + I_i(t)$.[8] It will be useful to define the skilled to unskilled ratio among the natives in each period by

$$n_t = \frac{N_2(t)}{N_1(t)}.$$

[6] In some countries citizenship is only transmitted from parents to children (*jus sanguinis*). As we shall see later, this can be analyzed as a specific case of the general model.

[7] Educational attainment among the children of immigrants varies widely by ethnicity. Most studies for the US find that, controlling for parental education, Asian children have above-average attainment, while Hispanic children perform more poorly. However, on average, the attainment of the children of immigrants is similar to that of the children of natives. See, for instance, Hirschman (2001).

[8] In reality, skill accumulation is a conscious investment that is affected by a number of variables, including the market returns of education and parental education. The process specified here is analytically convenient and relatively general at the same time. In comparison, Canova and Ravn (2000) assume that family background does not matter: $p_1 = p_2$.

Recall that wages are just a function of k_t. It turns out that we can express the law of motion for skills as a function of solely k_t too:

$$n_{t+1} = M(k_t; p_1, p_2) = \frac{p_1 + p_2 k_t}{1 - p_1 + k_t(1 - p_2)},$$

which maps the skills of the labor force in a given period (the parents) to the skills of the native population in the next period (their children). To ease notation, I will denote $M(k_t; p_1, p_2)$ by Mk_t. As a function of k, M is increasing and strictly concave. We also note that $M(0) = \frac{p_1}{1-p_1}$, $M(\infty) = \frac{p_2}{1-p_2}$, and it has a unique fixed point at $\frac{p_1}{1-p_2}$.[9]

2.3 The supply of immigrants

At any point in time, the skill distribution of the native population is fully characterized by skilled-to-unskilled ratio n_t. We shall denote by $[\underline{n}, \overline{n}]$ the set of potential values for this variable, where $\underline{n} < 1 < \overline{n}$.[10] By choosing immigration policy appropriately, the country we are considering can vary its skilled-to-unskilled ratio, which affects wages and consumption. Naturally, the set of feasible ratios that the country can attain depends on the availability of immigrants of each skill type. A convenient way to model the supply of immigrants is the following. Given n_t, the set of feasible ratios after immigration, k_t, will be given by

$$k_t \in [a(n), b(n)],$$

where functions $a, b : [\underline{n}, \overline{n}] \to R^2_{++}$ are continuous, increasing, and satisfy

$$a(n) \leq n \leq b(n).$$

Thus, by admitting all available unskilled immigrants (and no skilled ones) current wages would be determined by ratio $k = a(n)$. Conversely, admitting only skilled immigrants would deliver a ratio $b(n)$. Obviously, any intermediate ratio can be attained by admitting appropriate numbers of immigrants of either type.[11] This flexible formulation allows us to study the case where only unskilled immigrants are available. In that case, the choice set would be given by $[a(n), n]$. We shall say that (current) immigration is unskilled when $n_t > k_t$, that is when the after-immigration skilled-to-unskilled ratio is lower than the ratio among natives only. Likewise, we shall say that immigration is skilled when $n_t < k_t$.

It will be useful to define the set of feasible policy pairs by

$$(k, r) \in \Gamma(n) = [a(n), b(n)] \times [0, 1].$$

The following assumption guarantees that skilled workers are always richer than unskilled ones. Let us assume that

$$F_2\left(b(\overline{n})\right) \geq F_1\left(b(\overline{n})\right).$$

[9] Its inverse function is given by $k_t = M^{-1}(n_{t+1}) = \frac{n_{t+1}(1-p_1)-p_1}{p_2 - n_{t+1}(1-p_2)}$.

[10] The set of relevant skilled-to-unskilled ratios depends on the parameters of the stochastic process governing the evolution of skills over time. The precise construction can be found in Appendix 1.

[11] In general, several vectors of immigrants (I_1, I_2) will deliver a given ratio k from a native population n.

3 Optimal policy

Prior to introducing political competition, it is helpful to study the case where policies are chosen by a benevolent government. This allows us to illustrate how beliefs about future policies are formed and to highlight the role of intergenerational mobility in determining policy outcomes.

More specifically, this section analyzes the policy choices of a government that cares about the dynastic utility of the residents in the country. For now, I also assume that immigrants remain in the country permanently. As a result, the skill distribution of the population changes both due to immigration and to educational mobility, which implies time-varying weights in the social welfare function. Thus it is natural to focus on optimal policies without commitment on the part of the government: the current government forecasts how the changes in the future composition of the population will affect future policies.

It is straightforward to show that if the government only cares about the current utility of its residents it is optimal to fully redistribute income, which equalizes marginal utilities of consumption, and to admit as many skilled immigrants as available, which maximizes output per worker. It turns out that this is the dynamic optimal policy as well.

Technically, the main difficulty is on modelling voters' beliefs about the future consequences of current policies. Following recent work in dynamic voting models, let beliefs about future policies be given by a *policy function*, that is, a pair of functions $(K, R) : [\underline{n}, \overline{n}] \to R^2_+$ that maps the skilled-to-unskilled ratio in each period to a policy pair. Given these beliefs about future policies, at each period the government chooses current policies to maximize the average (dynastic) welfare of its residents. Let n be the skilled-to-unskilled ratio among the native population. The set of feasible policies is then given by $\Gamma(n)$ and the dynastic utility of a worker of skill type i by $V_i(n)$, for $i = 1, 2$. We can now define an optimal policy more precisely.

Definition 1. *An optimal policy is a policy rule* $(K, R) : [\underline{n}, \overline{n}] \to R^2_+$ *and associated continuation values* $(V_1, V_2) : [\underline{n}, \overline{n}] \to R^2$ *such that*

i) Given policy rule (K, R)*, continuation values* (V_1, V_2) *satisfy*

$$V_1(n) = v_1(K(n), R(n)) + \beta \left[(1 - p_1)V_1(MK(n)) + p_1 V_2(MK(n))\right]$$
$$V_2(n) = v_2(K(n), R(n)) + \beta \left[(1 - p_2)V_1(MK(n)) + p_2 V_2(MK(n))\right]$$

for all $n \in [\underline{n}, \overline{n}]$*.*

ii) Given continuation values (V_1, V_2)*, policy rule* (K, R) *satisfies*

$$(K(n), R(n)) \in \arg \max_{(k,r)\in\Gamma(n)} \frac{(v_1(k, r) + \beta C_1(Mk)) + k\,(v_2(k, r) + \beta C_2(Mk))}{1 + k}$$

for all $n \in [\underline{n}, \overline{n}]$*, where* $C_i(n) = (1 - p_i)V_1(n) + p_i V_2(n)$ *is the expected utility of the child before the skill type has been determined.*

The first part of the definition simply states that voters' beliefs about the future are determined by the policy rule and by the probability distribution over the skills of the offspring. The second

part says that the policies chosen in each period maximize the average utility (in a dynastic sense) of the population in that period, including the recently arrived immigrants.

The following proposition describes the optimal policy.

Proposition 1. *The optimal policy rule is* $(K(n), R(n)) = (b(n), 1)$ *for all* $n \in [\underline{n}, \overline{n}]$ *with associated continuation values*

$$V_1(n) = V_2(n) = \sum_{t=0}^{\infty} \beta^t u\left(f\left(b(n_t)\right)\right) \text{ where } n_t = (M \circ b)^t (n).$$

Given this policy rule it is easy to show that the economy converges to a time-invariant skill distribution, which we define as a steady state. More specifically, we shall say that skilled ratio $n^* \in [\underline{n}, \overline{n}]$ is a steady state of policy rule (K, R) if $MK(n^*) = n^*$. Proposition 1 then implies the following result.

Corollary. *From any given initial* $n_0 \in [\underline{n}, \overline{n}]$, $\{n_t\}$ *converges to steady state* $n^*_{op} \in \left(\frac{p_1}{1-p_2}, \frac{p_2}{1-p_2}\right)$, *the solution of*

$$b(n^*_{op}) = M^{-1}(n^*_{op}).$$

Figure 1 in the appendix plots the optimal skilled-to-unskilled labor force ratio, given by function $K(n) = b(n)$. Function $k_t = M^{-1}(n_{t+1})$ maps current labor force skilled-to-unskilled ratios (which includes also recent immigrants) into skilled-to-unskilled ratios among native-born workers (voters) next period. Observe that steady state $n^*_{op} > p_1/(1-p_2)$.

Since this steady state was reached by allowing maximum skilled immigration in each period it will provide an upper bound for the set of steady states in the voting equilibrium. Note that, in principle, the steady state of the optimal policy might have a majority of skilled or unskilled workers. In order to allow for both cases to occur in the voting equilibrium I shall make the following assumption.

Assumption 1: $p_1 > 1 - p_2$.

Under this assumption, in the absence of immigration there would be a majority of skilled voters in the steady state.[12] As we shall see, in this case redistributive transfers would be eliminated forever. The main question in the next section is whether an unskilled majority will use immigration policy strategically in order to sustain redistribution.

[12] Appendix 2 provides some estimates of intergenerational persistence that suggest that the condition in assumption 1 is empirically plausible.

4 Political equilibrium with permanent migration

We now turn to an economy where policies are determined democratically by foresighted voters. We assume that immigrants and their offspring stay in the country permanently. On arrival immigrants can work but cannot vote. However, their children will be considered citizens with the right to vote. This creates a link between current immigration flows and future policies.

Even though a dynasty's skill type varies over time it is always the case that current skills determine voters' current views on redistribution. As the first result in this section shows, unskilled voters support redistribution while skilled voters are against it. For expositional purposes I shall refer to the set of currently unskilled voters as the pro-redistribution party and to the currently skilled voters as the anti-redistribution party. In steady state the relative size of each party will remain constant even though the exact composition will be changing over time.

Formally, the problem is a dynamic game with a state variable that summarizes the skill distribution of the electorate at each point in time. As common in the dynamic political economy literature, I restrict attention to stationary (Markov perfect) voting equilibria, where the state variable is the skilled-to-unskilled ratio in the native population. Voters' beliefs about future policies are given by a time-invariant (policy) function of the state variable. Taking the function as given, each voter is assumed to vote for her preferred policy pair. In each state, the policy proposed by the majority of voters is adopted. In the event of a tie, that is when there is an equal number of voters of each type, I assume that the party that decided policies in the last period can do so again. Formally, define state $n = 1^-$ as the tie where unskilled voters decide current policies. Likewise, let state $n = 1^+$ denote the tie where skilled voters decide current policies. State variable n_t determines which party is in the majority as well as the set of feasible policies.

In the previous section, we considered state space $[\underline{n}, \overline{n}]$. Some states in this set are relatively trivial, in the sense that regardless of the policies adopted in the current period, the dynamics of skill accumulation fully determine which party will be in power. In order to simplify exposition it is helpful to restrict the state space to

$$\Omega = \left[b^{-1}(\phi), a^{-1}(\phi)\right] \subset [\underline{n}, \overline{n}],$$

where ϕ is defined by $M\phi = 1$, the skilled-to-unskilled ratio of the current labor force that delivers a tie in next period's election.[13] Observe that for all states $n \in \Omega$ it is the case that $a(n) \leq \phi \leq b(n)$. In words, there exist feasible ratios k and k' that lead to a skilled majority in the next period when $k_t = k$ and to an unskilled majority when $k_t = k'$. Skilled-to-unskilled ratios $n < b^{-1}(\phi)$ or $n > a^{-1}(\phi)$ are fairly trivial since the next period majority is independent of the current immigration flow. For these states I shall assume that parties choose policies according to static considerations: unskilled majorities are assumed to choose $(K(n), R(n)) = (b(n), 1)$ and skilled majorities are assumed to choose $(a(n), 0)$, as dictated by static considerations.[14]

Let us now focus on policy determination in the non-trivial set of states, Ω. First, let us provide a formal definition of the voting equilibrium under permanent immigration.

[13] It is easy to show that $\phi = (1 - 2p_1) / (2p_2 - 1)$ and $\phi < 1$ when $p_1 > 1 - p_2$.

[14] This voting behavior is utility-maximizing when intergenerational persistence is high.

Definition 2. *A majority vote equilibrium with permanent migration is a policy rule* (K, R) *and a pair of value functions* (V_1, V_2) *such that:*

i) Given $(K, R) : \Omega \to R^2_+$*, continuation values are given by*

$$\begin{aligned} V_i(n) &= v_i\left(K(n), R(n)\right) + \beta[(1-p_i)V_1(MK(n)) + p_i V_2(MK(n))] \\ &= v_i\left(K(n), R(n)\right) + \beta C_i(MK(n)), \text{ for all } n \in \Omega \text{ and } i = 1, 2. \end{aligned}$$

ii) In all unskilled majority states, $n \leq 1^-$*,*

$$(K(n), R(n)) \in \arg \max_{(k,r)\in\Gamma(n)} v_1(k, r) + \beta C_1(Mk),$$

iii) and in all skilled majority states, $n \geq 1^+$*,*

$$(K(n), R(n)) \in \arg \max_{(k,r)\in\Gamma(n)} v_2(k, r) + \beta C_2(Mk),$$

where $\Gamma(n) = [a(n), b(n)] \times [0, 1]$*.*

The first point in the definition describes how voters' beliefs about the future are formed in a consistent manner. This is just like in the optimal policy problem of the previous section. The second point states that in states with an unskilled majority, $n \leq 1^-$, policies are chosen by the representative unskilled voter, who takes into account the consequences of current choices for the utility of her offspring. Analogously, the third point states that a foresighted representative skilled voter chooses policies in states with a skilled majority. Similar equilibrium concepts are employed in the recent literature on dynamic political economy. Krusell, Quadrini and Rios-Rull (1997) and Krusell and Rios-Rull (1999) provide numerical solutions for a richer environment using a similar equilibrium concept. More recently, Hassler et al (2002, 2005) and Jack and Lagunoff (2005) have studied similar concepts analytically.

As anticipated earlier, unskilled voters are pro-redistribution and skilled voters are against it.

Lemma 1. *In any majority vote equilibrium with permanent migration*

$$R(n) = \begin{cases} 1 \text{ if } n \leq 1^- \\ 0 \text{ if } n \geq 1^+ \end{cases}.$$

Recall that a policy rule (K, R) has a steady state n^* if $MK(n^*) = n^*$. Clearly, lemma 1 implies that there can be redistribution in steady state if and only if there is an unskilled majority, or $n^* \leq 1^-$. This is true regardless of whether immigration is temporary or permanent.

We also have the following observation.

Lemma 2. *Steady state* n^* *features unskilled immigration if* $n^* < \frac{p_1}{1-p_2}$*. Otherwise, immigration flows are skilled (or skill-neutral). Assumption 1 then implies that in unskilled majority steady states there will be unskilled immigration and redistribution.*

The reason why the pro-redistribution party admits unskilled immigrants in steady state is that skill accumulation implies that $n_{t+1} = Mn_t > n_t$. In order to offset it, unskilled immigrants are admitted. In contrast, for $n > p_1/(1-p_2)$, $n_{t+1} = Mn_t < n_t$ thus offsetting skill accumulation in this case requires skilled immigrants.

4.1 An equilibrium with long-run redistribution

The goal of this section is to illustrate that voting equilibria with long-run redistribution can exist with permanent immigration. We propose a simple policy rule supporting this outcome and discuss the conditions for its existence.[15]

Consider the following policy rule: $(K, R) : \Omega \to R^2$ such that

$$(K(n), R(n)) = \begin{cases} (\phi, 1) \text{ if } n \leq 1^- \\ (\phi, 0) \text{ if } n \geq 1^+ \end{cases} . \tag{1}$$

In unskilled majority states the policy rule specifies full redistribution and $k = \phi$, the skilled ratio that allows unskilled voters to retain the majority while delivering the highest feasible consumption. In skilled majority states, the rule specifies no redistribution and again $k = \phi$, which turns out to be the skilled ratio that generates the highest possible *skilled* consumption while maintaining a skilled majority. Note that there are two steady states: one with redistribution, $n^* = 1^-$, and one without, $n^* = 1^+$. Given an initial unskilled majority, income redistribution is maintained indefinitely.

The following result states that this policy can indeed be a majority vote equilibrium.

Proposition 2. *Assume $a(1) \leq \phi$ and suppose assumptions 2 and 3 below hold. If intergenerational persistence is high enough for both types of voters, policy rule (1) is a majority vote equilibrium with permanent migration. Starting $n_0 < 1$, redistribution is maintained forever and a steady state is reached where a restricted quantity of unskilled immigrants is admitted in each period.*

Figure 2 in the appendix illustrates the dynamics of this equilibrium. Observe that equilibrium function $k(n)$ is now a continuous function, constant over the interval of states $[b^{-1}(\phi), a^{-1}(\phi)]$. Observe that there are two steady states, which coincide with tie states $n = 1^-$ and $n = 1^+$.

The results rest on a number of assumptions. Assumption $a(1) \leq \phi$ ensures that enough unskilled immigrants are available to allow the pro-redistribution party to retain the majority in steady state.[16] Secondly, assumptions 2 and 3 below require some degree of altruism, β. In fact, when $\beta = 0$ both assumptions fail and when $\beta = 1$ both are satisfied.[17] More specifically, we assume:

[15] Tractability requires focusing on simple policy rules. For instance, Hassler et al (2002, 2005) study linear policy rules.

[16] We note that this assumption holds when intergenerational persistence is high for both types of workers. Observe that in this case ϕ is approximately 1 and $a(1) \leq 1$.

[17] A more concave utility function enlarges the set of parameters for which the two conditions hold.

Assumption 2: $u[f(1)] > (1-\beta)u[f(b(1))] + \beta u[F_1(1)]$.

Assumption 3: $u[F_2(1)] > (1-\beta)u[F_2(a(1))] + \beta u[f(1)]$.

Assumption 2 requires the utility of an unskilled worker from no redistribution to be low enough, compared to a constant consumption equal to output per worker (full redistribution). Note that unskilled voters face a trade-off. The immigration policy that gives them the highest consumption (output per worker) implies handing the majority to the anti-redistribution party. By admitting some unskilled immigrants, current consumption is lower than it could have been but the pro-redistribution party can retain control over future policies. Assumption 3 ensures that the one-period gain (for skilled voters) from admitting the largest feasible quantity of unskilled immigration is smaller than the accumulated loss, caused by the redistribution that would take place from that period onward.[18]

Proposition 2 has two important implications. First, observe that the pro-redistribution party uses immigration policy strategically. In order to sustain redistributive policies the unskilled majority admits foreign unskilled workers. This inflow of workers entails a sacrifice in terms of current consumption (utility) but, at the same time, it regenerates the political support for redistributive policies. This behavior is reminiscent of the so-called "voting for your enemy" effect in Barbera, Maschler and Shalev (2001) in the literature on dynamic club formation. The proposition provides a rationale for why left-wing parties often support less restrictive immigration policies than more conservative parties.

Secondly, we note that the equilibrium immigration policy entails both skill and quantity restrictions: only a restricted quantity of unskilled immigrants are admitted, with the exact quantity being a function of the parameters governing skill accumulation.[19]

4.2 Equilibria where redistribution is abandoned

Proposition 1 demonstrated that, with permanent migration, there exist equilibria where income redistribution is maintained indefinitely. The proposed equilibrium required that enough unskilled immigrants be available in order to offset domestic skill accumulation. The next result states that when this is not the case income redistribution cannot be sustained.

Proposition 3. *Assume $a(1) > \phi$. All majority vote equilibria with permanent migration converge to steady state $n_s^* > 1$, the solution to*

$$M^{-1}(n_s^*) = a(n_s^*),$$

where a skilled majority chooses no redistribution, $r^* = 0$, and admits as many unskilled immigrants as feasible.

[18] The condition holds when function $F_2(k)$ is relatively flat.

[19] As noted earlier, there are numerous inflows of immigration that map ratio n_t into k_t. A simple way to pin down the flow uniquely is to assume that there is a cost of issuing visas. In this case the chosen inflow of workers will be the one delivering the desired ratio at the lowest cost.

Figure 3 in the appendix provides a graphical representation. For states below $b^{-1}(\phi)$ and above $a^{-1}(\phi)$, the values for $K(n)$ are the trivial ones, which implies that there is a steady state with an anti-redistribution majority: $n_s^* > 1$. Note also that regardless of the values taken by $K(n)$ in the non-trivial states, no other steady states are possible. Hence, along any equilibrium path there will be a skilled majority after finitely many periods. From that point on, the anti-redistribution party will set the tax rate to zero.

5 Political equilibrium with temporary migration

Let us consider now an alternative immigration system. Suppose that immigrants (and their children) are forced to leave the country at the end of their working lives but before their children become citizens. This applies to temporary migration but also to permanent immigration in countries where citizenship is passed only by bloodline rather than birth place.[20] In each period, voters still decide on redistribution and immigration policy. However, they realize that immigrants will not become future voters. Clearly, voters' decision problems are now much simpler. The earlier trade-off between the labor market effects of immigration and its political consequences has now disappeared.

Let us now define an equilibrium with temporary migration.

Definition 3. *A majority vote equilibrium with temporary migration is a policy rule* (K, R) *and a pair of value functions* (V_1, V_2) *such that:*

i) Given $(K, R) : \Omega \to R_+^2$, *continuation values are given by*

$$\begin{aligned} V_i(n) &= v_i\left(K(n), R(n)\right) + \beta[(1-p_i)V_1(M(n)) + p_i V_2(M(n))] \\ &= v_i\left(K(n), R(n)\right) + \beta C_i(M(n)), \text{ for all } n \in \Omega \text{ and } i = 1, 2. \end{aligned}$$

ii) In all unskilled majority states, $n \leq 1^-$,

$$(K(n), R(n)) \in \arg \max_{(k,r)\in\Gamma(n)} v_1(k, r) + \beta C_1(M(n)),$$

iii) and in all skilled majority states, $n \geq 1^+$,

$$(K(n), R(n)) \in \arg \max_{(k,r)\in\Gamma(n)} v_2(k, r) + \beta C_2(M(n)),$$

where $\Gamma(n) = [a(n), b(n)] \times [0, 1]$.

The key observation is that under temporary migration the evolution of the skills of the electorate is independent from current policies. Specifically, next period's electorate is given by $n_{t+1} = Mn_t$, rather than Mk_t, which was the case under permanent migration and includes also the recently arrived immigrants. Hence, the inter-temporal trade-off disappears, greatly simplifying

[20] This principle of citizenship law is known as "jus sanguinis". Bertocchi and Strozzi (2004) document that an increasing number of countries is shifting away from it and embracing the "jus soli" principle.

voters' decision problems. In addition, the evolution of the skill distribution of the electorate is now completely determined by the intergenerational skill mobility process:

$$n_{t+1} = Mn_t = M^t n_0,$$

regardless of past immigration choices $\{k_t\}$. Consequently, a steady state distribution of voters under temporary migration is given by n^* such that $n^* = Mn^*$. It is easy to show that now there is a unique equilibrium.

Proposition 4. *Suppose that $n_{t+1} = Mn_t$, regardless of k_t. The unique equilibrium with temporary migration is given by*

$$(K(n), R(n)) = \begin{cases} (b(n), 1) \text{ if } n \leq 1^- \\ (a(n), 0) \text{ if } n \geq 1^+ \end{cases}, \tag{2}$$

which has a single steady state

$$n_a^* = \frac{p_1}{1 - p_2}.$$

We note that with temporary migration the sustainability of redistributive policies is fully determined by the (exogenous) process of intergenerational mobility. Under assumption 1, redistributive policies will eventually be abandoned and, in steady state, immigration flows will be unskilled, as in the above equilibria. But, in contrast to the equilibrium with redistribution no quantity restrictions are used; all available unskilled immigrants are being admitted.[21]

6 Comprehensive immigration reform in the US

The purpose of this section is twofold. First, I argue that the insights from the model help understand the ongoing policy debate in the US. Secondly, I provide an estimate of the effect of granting citizenship to the undocumented workers already in the US on the skill distribution of voters of the current and future generations.

6.1 Interpreting the current debate

The ongoing debate over how to conduct a comprehensive reform of immigration policy in the US has revealed a deep cleavage in the positions of the two major political parties. Most Democrats support the inclusion of a track to citizenship for future immigrants, as well as for undocumented workers already in the country that meet certain requirements. Instead a large fraction of Republicans advocate for granting future immigrants fixed-term work permits only, with no path to permanent residence or citizenship.[22]

[21] If assumption 1 does not hold and $p_1 < 1 - p_2$ then in steady state the pro-redistribution party will be decisive and income redistribution will be sustained indefinitely.

[22] Republicans are sharply divided over offering citizenship to the large mass of undocumented workers already in the US.

This paper provides an explanation for the opposing views of the two parties on the issue of citizenship. We have seen that under temporary migration, if assumption 1 holds, the only long-run equilibrium outcome entails the elimination of redistributive transfers (proposition 4). In contrast, under permanent migration there are equilibrium outcomes where redistribution is sustained indefinitely by using immigration policy strategically (proposition 2). Hence, a shift toward an immigration system based on purely temporary work permits is likely to lead to a progressive reduction in the political support for redistribution. If we accept that the Democratic party represents the interest of voters in favor of income redistribution, its endorsement of including a track to citizenship, together with the strong opposition of a large part of the Republican party, can be easily understood. This would also explain the recent shift in labor union's views over immigration, which have also shown strong support for allowing for access to citizenship.

A growing body of empirical work is studying the determinants of social attitudes toward immigration and how these attitudes are related to the interaction between immigration flows and changes on taxes and government spending.[23] An additional prediction of the analysis here is that a switch to an immigration system based on temporary migration will also lead to changes in social attitudes toward immigration. Under the existing immigration system in the US, native voters' views on desired immigration flows are the result of a trade-off between the current effects on the labor market and the effects on future policies, once immigrants gain the right to vote. However, under a system based on fixed-term work permits we should expect native voters' views to reflect to a larger extent the labor market impact of immigration.[24]

6.2 Illegal immigration and the skill distribution of natives

Let us now shift our focus from the effects of policies regarding future immigration flows to policies regarding the current stock of undocumented workers, which is arguably politicians' main concern in the current policy debate. According to some estimates, as many as 12 million foreign workers are now working illegally in the US. There is a large consensus that something needs to be done to provide incentives to these workers to apply for legal status. Senators McCain and Kennedy have produced a recent proposal that has gathered wide support consisting in offering a path to citizenship to those that have been in the US for some time and satisfy a number of additional requirements. What would be the effect of this measure on the US economy?

More specifically, I shall assume that future immigration flows will be purely temporary. In this case, the earlier findings imply that redistributive transfers will eventually be eliminated and the only open question is how long these transfers will last for. Granting citizenship to the foreign workers illegally in the country will affect the duration of redistribution to the extent that it changes the skill distribution of voters. Below, I calibrate the educational mobility process to the US economy and compare the evolution of the skill distribution of the electorate under two different scenarios.[25] In the first one, current illegal immigrants are granted citizenship (and choose to stay

[23] See Dustmann and Preston (2004), Mayda (2005), and Mayda and Facchini (2006). A typical question in the surveys analyzed in this literature is "Do you think that immigration flows should be reduced/stay the same/increase?".

[24] This prediction is consistent with several proposals suggesting not specifying any caps on the number of temporary work permits to be issued.

[25] The values of the process of intergenerational educational mobility determine the intensity of the "melting pot"

permanently). In the second scenario they only stay for a limited period of time (and then leave). To carry out a more meaningful quantitative analysis I consider three skill levels.[26]

6.2.1 Parameters

Using the 2004 US Current Population Survey we can summarize the population above the age of 25 by

$$(N_0, N_1, N_2) = (27744, 107382, 51749)$$

in thousands of people.[27] Let a skill distribution be given by $(n_0(t), n_1(t), n_2(t))$ where

$$n_i = \frac{N_i(t)}{N_0(t) + N_1(t) + N_2(t)}$$

for $i = 0, 1, 2$. Then the US skill distribution in 2004 can be described by

$$(n_0, n_1, n_2) = (0.15, 0.57, 0.28).$$

Let us now consider the generalized process for intergenerational educational mobility. As seen earlier, the prediction that redistribution is eventually abandoned depends on condition $p_2 \geq 1-p_1$, that is, on higher persistence "at the top" of the skill distribution. We now need to generalize this condition to the 3-state case. We shall say that an individual comes from a family of type $i \in \{0, 1, 2\}$ if *both* parents had educational attainment of type i.[28] Let p_{ij} denote the probability that an individual with family background $i \in \{0, 1, 2\}$ attains education $j \in \{0, 1, 2\}$.

I consider individuals in age group 25-45 in the PSID and classify them by their educational attainment and their family background. I then estimate p_{ij} by the fraction of individuals raised in a family of type j that attained education level i. The resulting process of intergenerational persistence is

$$\begin{pmatrix} N_0(t+1) \\ N_1(t+1) \\ N_2(t+1) \end{pmatrix} = \begin{pmatrix} .31 & .05 & .02 \\ .59 & .64 & .34 \\ .10 & .31 & .64 \end{pmatrix} \begin{pmatrix} (1+f_0)N_0(t) \\ (1+f_1)N_1(t) \\ (1+f_2)N_2(t) \end{pmatrix}$$

where f_i is the fertility rate for families of educational type $i = 0, 1, 2$. When a couple of type i has exactly two children then $f_i = 0$, meaning that each adult is just replaced by one child. An important caveat is that we should expect future educational choices to be affected by the returns to education in future periods, which would surely affect the transition probabilities in the matrix

in terms of educational attainment. The less important family background is, the faster the skills of the children of recent immigrants converge to the skills of the children of natives.

[26] The theoretical analysis of the model with three skill levels is more complex since a median voter equilibrium may fail to exist.

[27] Group 0 includes individuals 25 years old and older that completed at most 11th grade. Group 1 includes high-school graduates and individuals with associate degrees. Group 2 contains individuals with bachelor's degrees or higher.

[28] This assumption is just made to reduce the number of family types to consider. To the extent that marital sorting in education levels is very prevalent in the US (see Mare (1991)), the results should be robust to the inclusion of a larger number of family types.

above.[29] Finally, we shall also take into account the differences in fertility rates across education groups. Currie and Moretti (2003) provide estimates of fertility rates by education level of the mother. Their data implies $(f_0, f_1, f_2) = (0.7, 0.25, 0)$.

6.2.2 Results

Let us now use the calibrated model to simulate the evolution over time of the skill distribution of the electorate when granting citizenship to the stock of currently undocumented foreign workers, and compare it to the alternative scenario where they are only granted temporary work permits. I assume that there are 12 million undocumented workers and that their educational attainment is the lowest (type 0).

Table 1 collects the results. As a benchmark, the first three columns describe the evolution of the skill distribution of the electorate under the assumption that current illegal immigrants are only granted temporary work permits (and then leave the country). Columns 4 through 6 describe the skill distribution under the alternative scenario of permanent residence (citizenship). The last two columns compare the two distributions.

Let us first describe the steady state skill distribution. Under our assumptions, the steady state distribution does not depend on whether the current stock of undocumented workers is allowed to stay in the country or not. Specifically, the steady state distribution is as follows: 6.4% high-school dropouts, 53.2% high-school graduates, and 40.4% college graduates (or above). Compared to the current distribution, the model predicts a substantial shift of mass from the bottom of the distribution to the top, suggesting a substantial reduction in the political support for redistributive policies in the near future.

Let us now compare the transition under the two policy scenarios. Columns 4-6 describe the evolution of the skill distribution of voters under the assumption of permanent residence. On impact the fraction of low-skill voters (type 0) would increase from the current 14.9% to 20%, while the fraction of high-skill voters (type 2) would fall 1.7 percentage points, from 27.7% to 26%. After one generation the difference in the fraction of low-skill voters in the two scenarios falls to 1.7 percentage points, while for the fraction of high-skill voters increases to 1.9 points. From the next generation on, the differences in the skill distributions in the two scenarios practically vanish. This results provide a quantification of the intensity of the "melting pot" effect in terms of educational attainment.

The results suggest that the effect of granting citizenship on the current political support for redistributive policies would increase for one or two generations only, before continuing the downward trend dictated by the educational mobility process. Given that recent electoral outcomes in the US have been decided by narrow margins, it is plausible to expect a significant effect on policy. Assuming the Democratic party is more pro-redistribution than the Republican party, these results provide an explanation for the Democratic support for granting citizenship to the 12 million foreign workers illegally in the US and the strong opposition to this by many in the Republican party.

[29] One interpretation for our taking these probabilities as constant is to assume that skill-biased technical progress continues taking place and that it offsets the reductions in skill premium arising from the increase in relatively abundance of qualified labor.

7 Final remarks

The US is not the only country currently discussing a comprehensive reform of its immigration policy. Other major European countries are doing so as well. The UK, for instance, has just adopted a new immigration system based on temporary work permits that includes a path to citizenship for high skilled immigrants only. Despite the policy relevance of the question few economic models are available to evaluate the impact over time of large changes in immigration policy.

This paper attempts to contribute with a first step in this direction by providing a simple model that considers the interplay of some important issues. In the model, immigration affects the consumption of native workers through its impact on labor market outcomes and on the size of transfers from the government. Finally, immigrants that stay permanently in the country affect future policies once they gain the right to vote. Further work is needed to make progress in the study of these issues in dynamic economies with endogenous public policies.

Beyond these issues, a deeper understanding of the effects of immigration on public policies requires further work along two lines. First, introducing an ideological component in voters' actions seems particularly relevant. It is well known that a large fraction of US immigrants have views on social issues that bring them closer to the Republican party, even when their views on purely economic issues differ substantially from those of the party. Secondly, some researchers have noted that the location choices of recent US immigrants are departing from those of previous immigration flows. In particular, there seems to be a shift toward states that did not attract immigrants in the past. A quantitative assessment of the effects of immigration on future policies requires taking these into account.

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Appendix 1: Definition of the state space

As noted earlier, extreme states $\underline{n}$ and $\overline{n}$ need to satisfy some conditions, which depend on the stochastic process for skill accumulation. Recall that p_i denotes the probability that a child of a type i worker becomes skilled. For reasons that will be clear when we introduce majority vote, define now ratio ϕ to be such that $M\phi = 1$. That is, when the current labor force (after immigration) is $k_t = \phi$, there is an equal number of voters of each type in the next period. It is easy to show that $\phi = (1 - 2p_1) / (2p_2 - 1)$ and $\phi < 1$ when $p_1 > 1 - p_2$. Suppose that (p_1, p_2) is an empirically plausible estimate of the mobility parameters. I shall assume that set $[\underline{n}, \overline{n}]$ satisfies

$$\begin{aligned} 0 &< \underline{n} \leq b^{-1}(\phi) < 1 \\ \overline{n} &= \frac{p_2}{1 - p_2} > 1. \end{aligned}$$

Moreover, I will assume that $a(n) \geq \phi$ for some $n \in [\underline{n}, \overline{n}]$.

Appendix 2: Intergenerational mobility in the US

This appendix provides a back-of-the-envelope estimate of the parameters governing intergenerational mobility in the model. I use individual survey data from the General Social Survey for the United States, which contains information about the educational attainment of parents and children for many individuals and many cohorts. Let us define an individual as being *skilled* if he or she had 14 years of education or more (some college) and let us say that an individual comes from a *skilled family* if his or her father was skilled. Ortega and Tanaka (2006) analyze changes in the effects of paternal and maternal education on educational attainment. I estimate p_i by calculating the fraction of skilled individuals that were born in a family of type $i = 1, 2$. I find that $\widehat{p}_1 = 0.33$ and $\widehat{p}_2 = 0.78$, with very small standard errors. When the estimation is restricted to the subsample of children with foreign-born parents the results are quite similar: $\widehat{p}_1 = 0.37$ and $\widehat{p}_2 = 0.83$. Note that these estimates satisfy that $p_1 > 1 - p_2$ and $p_1 < 0.5 < p_2$.

Appendix 3: Proofs

Proof proposition 1. Let us consider first the static optimal policy problem:

$$\max_{(k,r)\in\Gamma(n)} \frac{u(c_1)+ku(c_2)}{1+k}$$
$$\text{s.t. } \begin{cases} c_1=(1-r)F_1(k)+rf(k) \\ c_2=(1-r)F_2(k)+rf(k) \end{cases}.$$

The first-order condition with respect to the tax rate, for $r<1$, can be written as

$$(f(k)-F_1(k))\left(u'(c_1)-u'(c_2)\right)>0.$$

Hence, at the solution there is full redistribution: $R(n)=1$.[30] Using this fact, the first-order condition with respect to k simplifies to

$$u'(f(k))f'(k)>0,$$

implying that it is optimal to admit as many skilled immigrants as feasible: $K(n)=b(n)$.

Turning to the dynamic problem let us try the static solution as a guess: $R(n)=1$ and $K(n)=b(n)$. Given this policy rule, the associated continuation values are

$$V_1(n)=V_2(n)=V(n)$$

where

$$V(n)=u(f(b(n)))+\beta V(Mf(b(n)))$$

that can be expressed as

$$V(n)=\sum_{t=0}^{\infty}\beta^t u\left(f\left(b(n_t)\right)\right) \text{ where } n_t=(M\circ b)^t(n).$$

Observe that $V(n)$ is increasing over $[\underline{n},\overline{n}]$ since it is the composition of increasing functions. In particular, $f(k)$ is increasing because $F_2(k)>F_1(k)$ over all $k\in\Gamma(n)$, for all $n\in[\underline{n},\overline{n}]$.

With these continuation values, the social welfare function simplifies to

$$\begin{aligned} S(k_t,r_t) &= \frac{v_1(k_t,r_t)+k_tv_2(k_t,r_t)}{1+k_t}+\beta\left[(1-\pi(k_t))\,V_1(Mk_t)+\pi(k_t)V_2(Mk_t)\right] \\ &= \frac{v_1(k_t,r_t)+k_tv_2(k_t,r_t)}{1+k_t}+\beta V(Mk_t). \end{aligned}$$

Clearly, the solution to

$$\max_{\substack{a(n)\le k\le b(n)\\ 0\le r\le 1}} S(k,r)$$

entails $R(n)=1$ since redistribution does not affect next period's state. Now, the choice of k does have dynamic implications but note that given full redistribution,

$$S(k,1)=u[f(k)]+\beta V(Mk)$$

is the sum of two increasing functions. Therefore, $K(n)=b(n)$. ■

[30] Constant returns to scale implies that $f(k)-F_1(k)=k\left(F_2(k)-f(k)\right)$.

Proof lemma 1. Let $n \leq 1^-$ and suppose that (k_1, r_1) is the utility-maximizing policy pair for an unskilled voter, with $r_1 < r_b$. Since the continuation value only depends on k_1, pair (k_1, r_b) is preferred over (k_1, r_1) if and only if $v_1(k_1, r_b) > v_1(k_1, r_1)$, that is

$$(1 - r_b)F_1(k_1) + r_b f(k_1) > (1 - r_1)F_1(k_1) + r_1 f(k_1).$$

But $F_2(k_1) > F_1(k_1)$ implies $f(k_1) > F_1(k_1)$. As a result, the inequality holds. Hence, in any equilibrium, $R(n) = r_b$ if $n \leq 1^-$. A symmetric argument proves that $R(n) = 0$ if $n \geq 1^+$. ■

Proof lemma 2. Define $k^a = p_1/(1 - p_2) > 1$ and let $n^* < k^a$ be a steady state, that is, $n^* = MK(n^*) < k^a$. Since M is an increasing function, $K(n^*) < M^{-1}(k^a) = k^a$, by definition of k^a. Recall now that $n < M(n)$ for $n < k^a$, which implies that $K(n^*) < MK(n^*) = n^*$. Rearranging, we obtain $\sigma^* = K(n^*) - n^* < 0$, that is immigration is unskilled. An analogous argument establishes that immigration is skilled in any steady state $n^* > k^a$. ■

Proof proposition 2. Let us start by partitioning the state space as follows. Define sets

$$\begin{aligned} U &= \{n \in \Omega : n \leq 1^-\} \\ S &= \{n \in \Omega : n \geq 1^+\}, \end{aligned}$$

respectively, the set of states with an unskilled majority and the set of states with a skilled majority. Observe that $a(1) \leq \phi$ implies that $1 \in \Omega$, that is, the state space includes states with a skilled majority and states with an unskilled majority.

Next, let us compute continuation values along the equilibrium path. Note that

$$V_i(U) = u\left(f\left(\phi\right)\right) + \beta\left[(1 - p_i)V_1(U) + p_i V_2(U)\right],$$

for $i = 1, 2$, which implies that

$$V_1(U) = V_2(U) = C_1(U) = C_2(U) = \frac{u\left(f\left(\phi\right)\right)}{1 - \beta}. \tag{3}$$

In addition,

$$V_i(S) = u\left(F_i\left(\phi\right)\right) + \beta\left[(1 - p_i)V_1(S) + p_i V_2(S)\right]$$

for $i = 1, 2$, which implies that

$$\begin{pmatrix} C_1(S) \\ C_2(S) \end{pmatrix} = \begin{pmatrix} 1 - p_1 & p_1 \\ 1 - p_2 & p_2 \end{pmatrix} \begin{pmatrix} u\left(F_1\left(\phi\right)\right) + \beta C_1(S) \\ u\left(F_2\left(\phi\right)\right) + \beta C_2(S) \end{pmatrix}.$$

This is a simple linear system with two unknowns. The solution is given by

$$\begin{aligned} \begin{pmatrix} C_1(S) \\ C_2(S) \end{pmatrix} &= \frac{1}{(1 - \beta)\left[1 - \beta(p_2 - p_1)\right]} \\ &\quad \begin{pmatrix} (1 - p_1) - \beta(p_2 - p_1) & p_1 \\ 1 - p_2 & p_2 - \beta(p_2 - p_1) \end{pmatrix} \begin{pmatrix} (1 - p_1)u\left(F_1\left(\phi\right)\right) + p_1 u\left(F_2\left(\phi\right)\right) \\ (1 - p_2)u\left(F_1\left(\phi\right)\right) + p_2 u\left(F_2\left(\phi\right)\right) \end{pmatrix}. \end{aligned}$$

Let us now analyze voters' best responses given these continuation values. Let us start with unskilled voters in unskilled-majority states. Set $n \in [a^{-1}(\phi), 1^-]$. Unskilled voters rank current policies according to

$$W_1(k,1) = u\left(f\left(k\right)\right) + \beta C_1(Mk),$$

where $k \in [a(n), b(n)]$ and I already used the fact that they will impose full redistribution. Now notice that among $k \leq \phi$, $C_1(Mk) = C_1(U)$ is constant and therefore ϕ dominates all other $k \leq \phi$. Similarly, $b(n)$ dominates $k \in (\phi, b(n)]$. Therefore, choosing ϕ will be optimal if and only if

$$u\left(f\left(b(n)\right)\right) - u\left(f\left(\phi\right)\right) \leq \beta\left[C_1(U) - C_1(S)\right],$$

which holds if and only if

$$u\left(f\left(b(1)\right)\right) - u\left(f\left(\phi\right)\right) - \beta\left[C_1(U) - C_1(S)\right] \leq 0. \tag{4}$$

Using the expressions for $C_i(U)$ and $C_i(S)$, it is immediate to verify that the left-hand side of (4) is a continuous function of (p_1, p_2). In addition, when $p_1 = 0$ and $p_2 = 1$, expression (4) simplifies to

$$u\left(f\left(b(1)\right)\right) - u\left(f\left(1\right)\right) \leq \frac{\beta}{1-\beta}\left(u\left(f\left(1\right)\right) - u\left(F_1\left(1\right)\right)\right),$$

which can be rearranged to

$$u\left(f\left(1\right)\right) \geq (1-\beta)u\left(f\left(b(1)\right)\right) + \beta u\left(F_1\left(1\right)\right).$$

When this condition holds with strict inequality (assumption 2), expression (4) will also hold for high enough intergenerational persistence, in the sense of p_1 close enough to 0 and p_2 close enough to 1.

We now turn to skilled voters' best responses. In states with a skilled majority, skilled voters rank current policies by means of

$$W_2(k,0) = u\left(F_2\left(k\right)\right) + \beta C_2(Mk),$$

where $k \in [a(n), b(n)]$ and I imposed zero redistribution. Now notice that among $k < \phi$, $C_2(Mk) = C_2(U)$ is constant and therefore $a(n)$ dominates all other values. Similarly, ϕ dominates $k \in [\phi, b(n)]$. Therefore, choosing ϕ will be optimal if and only if

$$u\left(F_2\left(a(n)\right)\right) - u\left(F_2\left(\phi\right)\right) \leq \beta\left[C_2(S) - C_2(U)\right],$$

which holds if and only if

$$u\left(F_2\left(a(1)\right)\right) - u\left(F_2\left(\phi\right)\right) - \beta\left[C_2(S) - C_2(U)\right] \leq 0. \tag{5}$$

It is straightforward to check that under full persistence, $(p_1, p_2) = (0, 1)$, condition (5) simplifies to

$$u\left(F_2\left(1\right)\right) \geq (1-\beta)u\left(F_2\left(a(1)\right)\right) + \beta u\left(f\left(1\right)\right).$$

When this condition holds with strict inequality,expression (5) will also hold for high enough intergenerational persistence, in the sense used above.

As a result, for high enough intergenerational persistence of both types of workers, the proposed rule will be an equilibrium policy rule when assumptions 2 and 3 hold. ■

Proof proposition 3. Let the initial condition be $n_0 < 1$. Note that when $a(1) > \phi$, the state variable along the equilibrium path becomes $n_T = MK(n_{T-1})$ for some $T > 0$, regardless

of the policy rule followed. Moreover, $a^{-1}(\phi) < 1$ implies that n_t will always be 'trivial' from that period onward. Thus, the policies adopted equilibrium for periods $t > T$ will be given by $(k_t, r_t) = (a(n_t), 0)$. It is easy to verify that in this case the system converges to a steady state given by the solution to $M^{-1}(n_s^*) = a(n_s^*)$. ■

Proof proposition 4. Let $n \in \Omega$ be the current state. Note that with temporary migration the voter's problem becomes

$$\max_{(k,r)\in\Gamma(n)} v_i(k, r) + \beta C_i(Mn),$$

which is a purely static problem. As a result, the unique equilibrium policy rule is given by each voter's favorite static policy pair. It is now trivial to show that this policy rule has a unique steady state with temporary migration, the solution to

$$n_{t+1} = Mn_t,$$

that is,

$$n_a^* = \frac{p_1}{1 - p_2}.$$

■

Appendix 4: Figures and Tables

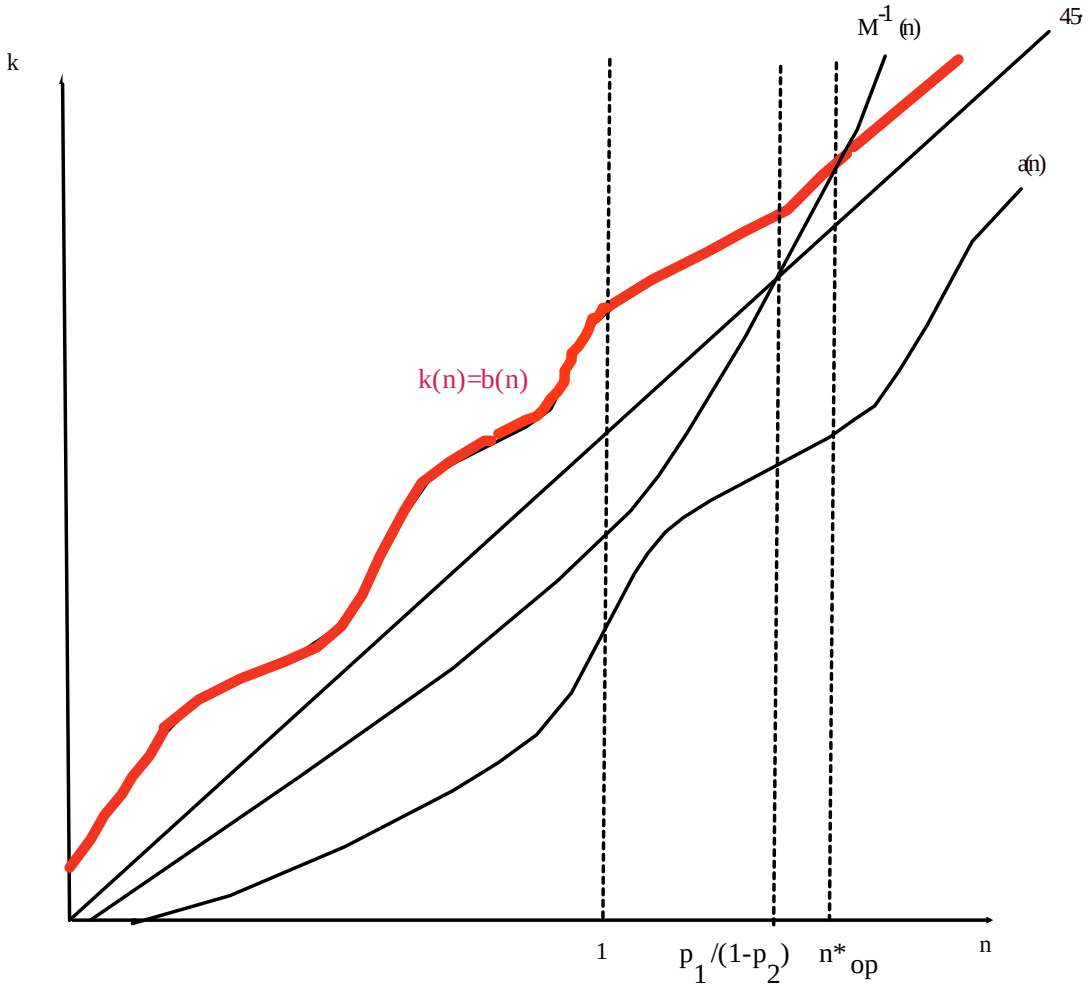

Figure 1: Optimal policy

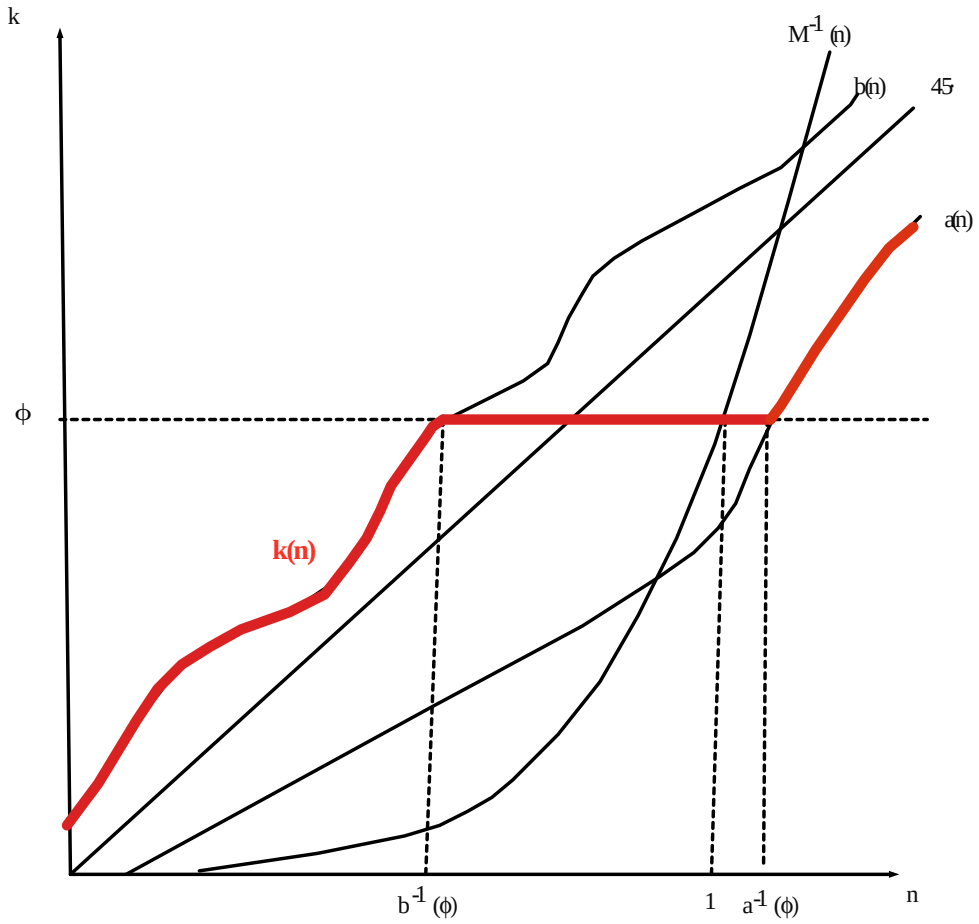

Figure 2: Voting equilibrium with permanent migration. Long-run redistribution

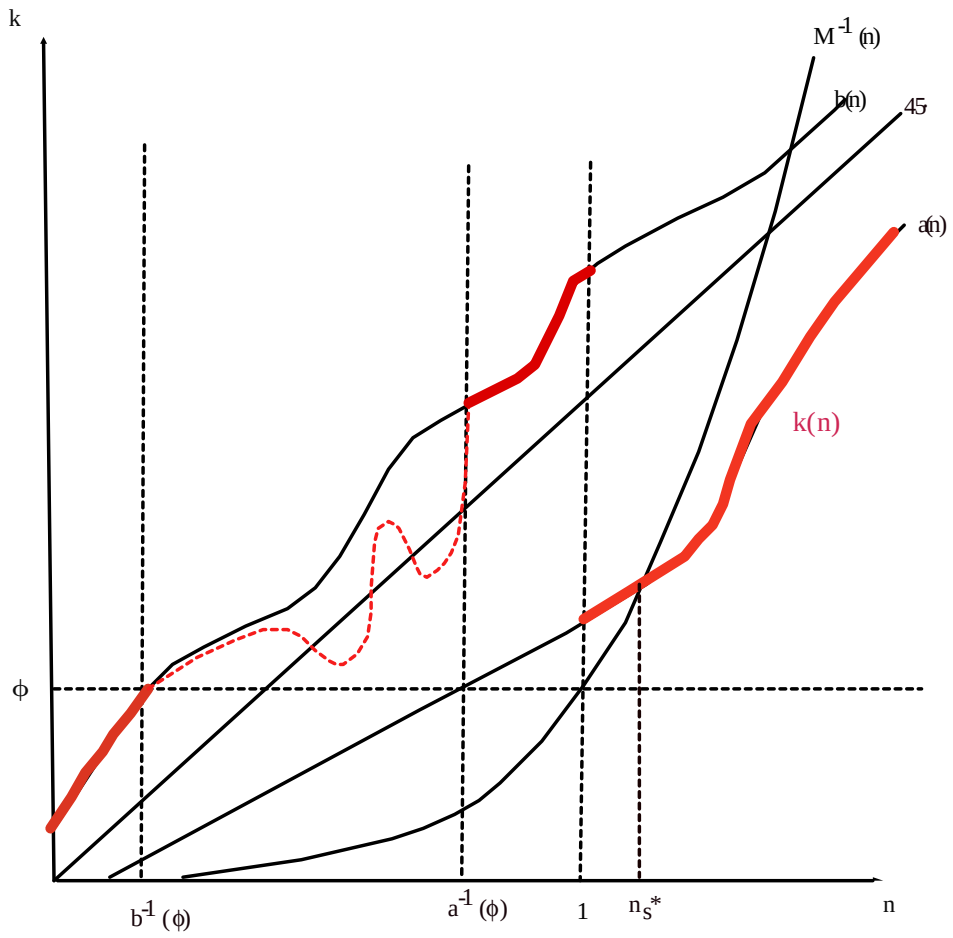

Figure 3: Voting equilibrium with permanent migration. No redistribution in the long run

Table 1: Simulation US skill distribution of voters

	No Citizenship			Citizenship			Difference	
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
period	n0	n1	n2	n0	n1	n2	[4] - [1]	[6] - [3]
0	0.1485	0.5746	0.2769	0.1998	0.5399	0.2602	0.0514	-0.0167
1	0.0959	0.5633	0.3408	0.1132	0.5654	0.3214	0.0172	-0.0194
2	0.0766	0.5486	0.3747	0.0831	0.5531	0.3638	0.0064	-0.0109
3	0.069	0.5401	0.3909	0.0716	0.5429	0.3856	0.0026	-0.0053
inf.	0.0636	0.5325	0.4039	0.0636	0.5325	0.4039	0	0