MIGRATION AND THE WELFARE STATE: POLITICAL-ECONOMY POLICY FORMATION

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Preface

The Nobel laureate economist, Milton Friedman, had it right, that one can't have free immigration and a welfare state: "...It is one thing to have free immigration for jobs, it is another thing to have free immigration to welfare. And you cannot have both." (Friedman, YouTube). That is, a generous welfare state would be under constant attack by the many would-be immigrants who yearn for its many benefits. Under such a growing burden, sooner or later a political coalition would be formed which will either curtail the generosity of the state or restrict in-migration, or both. Open immigration can not coexist with a strong safety net.

On the other hand, a welfare state, especially an aging welfare state, may also welcome young and skilled migrants. Thus, the preferences of the native-born population towards migration depend on the skill composition and age distribution of the would-be immigrants; and migration policies may be tailored differently for various categories of potential migrants. Also, within the welfare state there is typically no consensus with respect to migration policies (as there is neither a consensus with respect to the generosity of the welfare state).

Over the last three decades, Europe's generous social benefits encourage a massive suyge of "welfare migration", especially low skilled labors. In the same period US has attracted a major portion of highly skilled migrants, boosting its innovative edge.

How the social-benefits-immigration conflicts are resolved in a political economic setup is the focus of this book. The book integrates elements from population, international, public and political economics into a unified static and dynamic framework. It is intended for graduate and advanced undergraduate students and scholars in the fields or demography and population; and international, public and political economics.

Several chapters of this book are based on previous work by the authors, and their co-authors. Chapter 2 is based on Cohen and Razin (2008). Chapter 3 is based on Cohen, Razin and Sadka (2009). Chapter 5 is based on Sand and Razin (2007), and Razin and Sand (2009). Chapter 7 is based on Razin, Sadka and Suwankiri (2009). Chapter 8 draws on Razin and Sadka (1999, 2004). Chapter 9 is based on Razin and Sadka (2010). We heartily thank Alon Cohen and Edith Sand for letting us incorporate joint work with them in this book. We wish also to thank Raz Lev and Ori Katz for competent research assistance. Nancy Chau, Frédéric Docquier, Kenneth Kimbrough, Guy Laroque, and Hans-Werner Sinn read earlier versions of the manuscript and made valuable comments and suggestions. we thank them all. Thanks are also due to anonymous reviewers for helpful comments and suggestions.

Chapter 1

Issues and Scope

1.1 Introduction

"Give me your tired, your poor,

Your huddled masses yearning to breathe free,

The wretched refuse of your teeming shore.

Send these, the homeless, tempest-tost to me,

I lift my lamp beside the golden door!"

Emma Lazarus, 1883

This wonderful sonnet captures the spirit of the free immigration era in the 19th century U.S.A. The welfare state idea, still in its embryonic state in Europe, had yet to be brought to the U.S. shores.

Free migration has been the subject of extensive theoretical investigation, dating back to Adam Smith (1776) who pointed out that curtailing free migration has a similar (and negative) effect to curtailing free flows of capital. In his words:

> "Whatever obstructs the free circulation of labour from one employment to another, obstruct that of a stock likewise; the quantity of stock which can be employed in any branch of business depending very much upon that of the labour which can be employed in it."

Nevertheless, whereas free capital mobility is widespread, free migration is very rare in practice.

About a century later, the Noble laureate, Milton Friedman, remarked that obviously one cannot have free immigration and a welfare state. That is, a welfare state with open borders might turn into a heaven for the poor and needy from all over the world, thereby draining its finances, and bringing it down. This observation underscores the motivation for this book.

As a backdrop, in 10 of the European Union's 27 member states deaths are expected to outnumber births in 2010. As of 2015 the EU as a whole is expected to experience negative natural population growth. The European Union has attracted 26 million migrants in the past two decades, But most of the European countries attempt to protect native-born labor by shutting out foreign workers, which results in massive inflow of illegal immigrants. That is, Europe generous social benefits encouraged a massive surge of "welfare migration". Consequently, Europe has ended up with 85 percent of all unskilled migrants to developed countries, but only 5 percent of the highly skilled migrants.

As a consequence, public opinion in the developed economies, with their fairly generous welfare system, favors putting, in some way or another, restrictions on migration.

This book attempts to explore how these restrictions are shaped in a political process. 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 restrictive policies. A welfare state, with an heterogeneous (by age, skill, etc.) population, typically does not 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 admitting unskilled migrants on such grounds. On the other hand, the same native born may favor unskilled migrants to the extent that a larger supply of unskilled workers boosts skilled-workers wages. The native born old may favor migration, even low-skilled, on the ground that it could help finance her old-age benefits. Chiswick and Hatton (2003) provide some figures describing the shift from uncontrolled migration in the pre-WWI to selective policies afterward. Despite the dramatic decline in the cost of relocation to the migrants, rates of migration went down. For instance, the annual immigration rate to the U.S.A. fell from 11.6 immigrants per thousand population in the first decade of the 20^{th}century to 0.4 per thousand population in the 1940s, rising to 4.0 per thousand population in the 1990s. The post WWII immigration rates are substantial bellow the pre-WWI rate.

Indeed, Canada decided to keep its borders open and even to speed up acceptance procedures for some highly skilled arrivals. While migrants have lost some ground recently, they're still twice as likely as native Canadians to hold doctorates or master's degrees. Sweden wasn't satisfied with merely implementing a new, skills-based immigration policy; it actually upgraded its integration efforts, including language and vocational training for existing immigrants, right in the middle of the financial crisis.

The variety of effects of migration 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.

The political economy set up features two aspects in policy formation: skilled (rich) vs. unskilled (poor), and young vs. old. Thus, the analysis consists of policies which resolve both the intra- and inter-generation conflicts.

1.2 Fiscal Aspects of Migration: Evidence

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

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

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

Indeed, only three members of the EU-15 (the UK, Sweden and Ireland) allowed free access for residents of the accession countries to their national labor markets, in the year of the first enlargement, 2004. The other members of the EU-15 took advantage of the clause that allows for restricted labor markets for a transitional period of up to seven years. Focusing on the UK and the A8 countries[1], Dustmann at al (2009) bring evidence of no welfare migration. The average age of the A8 migrants during the period 2004[2]-2008 is 25.8 years, considerably lower than the native U.K. average age (38.7 years). The A8 migrants are also better educated than the native-born. 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. A recent study by Barbone et al (2009), based on the 2006 European Union Survey of Income and Living conditions, finds that migrants from the accession countries constitute only 1-2 percent of the total population in the pre-enlargement EU countries (excluding Germany and Luxemburg); by comparison, about 6 percent of the population in the latter EU countries were born outside the enlarged EU. The small share of migrants from the accession countries is, of course, not surprising in view of the restrictions imposed on migration from the accession countries to the EU-15 before the enlargement and during the transition period after the enlargement. The study shows also that there is, as expected, a positive correlation between the net current taxes (that is, taxes paid less benefits received) of migrants from all source countries and their education level[3].

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

Hanmeueller and Hiscox (2010), using survey data in the US, find two critical economic concerns that apear to generate anti-immigrant sentiments among voters: concerns about labor-market competition, and concerns about the fiscal burden on public services. Not unexpectedly, employing opinion surveys, Hanson et al (2007) bring evidence that in the United States native residents of states which provide generous benefits to migrants also prefer to reduce the number of migrants. Furthermore, the opposition is stronger among higher income groups. Similarly, Hanson et al (2009), again employing opinion surveys, find for the United States that native-born residents of states with a high share of unskilled migrants, among the migrants population, prefer to restrict in migration; whereas native-born residents of states with a high share of skilled migrants among the migrant population are less likely to favor restricting migration[4]. Indeed, developed economies do attempt to sort out immigrants by skills (see, for instance, Bhagwati and Gordon (2009)). Australia and Canada employ a point system based on selected immigrants' characteristics. The U.S. employs explicit preference for professional, technical and kindred immigrants under the so-called third-preference quota. Jasso and Rosenzweig (2009) find that both the Australian and American selection mechanisms are effective in sorting out the skilled migrants, and produce essentially similar outcomes despite of their different legal characteristics.

While Europe ended up in the last two decades with 85 percent of all unskilled migrants to developed countries, US retain its innovative edge by attracting 55 percent of the world educated migrants.

1.3 Roadmap

We begin in part I with a static analytical framework, which is useful to be implemented on the available cross-country data that had very few time series observations. In such a framework the key aspect of the welfare state is the scope of its *intra*-generational redistribution, that is from the rich (skilled) to the poor (unskilled). Indeed, the skill composition of migration is the focus of this part of the book.

We begin in chapter 2 with the study of the effect of the generosity of the welfare state on the skill composition of migrants. This effect depends crucially on the policy regime, namely whether migration is free or restricted. Chapter 2 first builds a parsimonious (static) model to analytically study how different is the effect of the generosity of the welfare state on the skill composition of the immigrants across these policy regimes. In a free-migration regime, a typical welfare state with relatively abundant capital and high total factor productivity (implying relatively high wages for all skill levels) attracts unskilled and skilled migrants. Furthermore, the *generosity* of the welfare state attracts unskilled (poor) migrants, as they expect to gain more from the benefits of the welfare state than what they expect to pay in taxes for these benefits; that is, they are net beneficiaries of the generous welfare state. In contrast, potential skilled (rich) migrants are deterred by the generosity of the welfare state. Thus, the latter tilts the skill composition of the migrants towards the unskilled. In the restricted migration regime, these same considerations lead voters to open the door wide to skilled migration and slam the door shut on unskilled migration. Voters are motivated by two considerations: how migration affects their wages, and how it bears on the finances of the welfare state. Typically, unskilled migration depresses the unskilled wage and boosts up the skilled wage. The opposite occurs with skilled migration. The effect of migration on the finances of the welfare state is common to all voters of all skills, because skilled migrants are net contributors to the welfare state, whereas unskilled migrants are net beneficiaries. From a public finance point of view, native-born voters of all skills would therefore opt for the formers to come in and for the latter to stay out.

The EU-15 can serve as a laboratory for studying empirically the policy-regime differential effect of the generosity of the welfare sate on the skill composition of migration. Freedom of movement and the ability to reside and work anywhere within the EU are one of the fundamental rights to which member states of the EU are obligated towards each other. In contrast, labor mobility into the EU-15 member states, from non-EU-15 states, is still restricted to various degrees by national policies. Chapter 2 utilizes this difference in policy regimes across EU-15 and non-EU-15 states in order to test the predictions of the model about key differences between free and policy-restricted migration concerning the effect of the welfare state on the skill composition of immigrants.

The reader may note that the aforementioned empirical analysis may be plagued with an endogeneity problem associated with reverse causality: the skill composition of migration itself influences the voters' attitude towards the generosity of the welfare state. The reverse causality mechanism is analyzed in chapter 3, in which we ask how the skill composition of migration shapes voters decision concerning the generosity of the welfare state. Recalling that skilled migrants are typically net contributors for the welfare state, whereas unskilled migrants are net beneficiaries, voters in the host country are likely to boost its welfare system when absorbing high-skill migration, and curtail it when absorbing low-skill migration. This prediction is also confronted with evidence from European union countries. In doing so, we reckon with an endogeneity problem that arises because the skill composition is itself affected by the generosity of the welfare state; as is elucidated in chapter 2.

Chapter 4 integrates the two directions of causality discussed in the two preceding chapters into a joint politico-economic based determination of the generosity of the welfare state, the volume of migration, and its skill composition. This analysis is carried out for both policy regimes: free and restricted migration. We study analytically how productivity shocks in the host country and the skill composition of its native-born population affect its joint politico-economic determination of the generosity of the welfare system, the volume and the skill composition of migration. We also illustrate the joint determination of migration make up and the generosity of the welfare state with numerical simulations.

Part II delves into the theoretical analysis of similar issues in dynamic overlapping generations settings. In this framework there comes to life *inter-*

generational aspects of redistribution (that is, between the young and the old), in addition to the *intra*-generational features of redistribution (already dealt with in the preceding part). We begin in chapter 5 with an analysis of pure intergenerational distribution, abstracting from intra-generational aspects. In other words, the welfare state offers only old age social security and populations have homogenous skills. As we have already pointed out, the welfare state faces a serious financial problem that is growing in its severity due to the trend of a rising dependency ratio, which is in our setting, measured by the number of retirees per worker. In particular, this old-young dependency ratio declines in the developed (migration-absorbing) countries because of a higher longevity, declining fertility rates, etc.

Indeed, chapter 5 plausibly assumes that migrants have higher birth rates than the native-born. As we aim to highlight this demographic gap, we assume, in order to isolate the demographic-gap effect, that the birth rate 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. An overlapping generations model is employed and voting about current migration and social security policy is jointly conducted each period (where people live for two periods). As in the recent public economic literature, we employ a Markov 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. The state variables which drive the dynamics are one-period lagged demographic characteristics of the economy.

We study how a more generous old-age social security system affects the migration flows (in analogy to chapter 2); how the volume of migration affects the generosity of the old-age security system chosen by the native born (in analogy to chapter 3); and how the generosity of the old-age social security system and the migration flows are jointly determined by the native-born population (in analogy to chapter 4).

We next wish to analyze how the political process resolves both *inter*- and *intra*-generational conflicts. To help prepare the readers, chapter 6 provides the analytical tools that serve in the study conducted in chapter 7. The latter considers both *inter*- and *intra*- generational redistribution, that is, 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 conflict exists also between the skilled old and the unskilled old; and so on. Of particular interest is the characterization of the coalitions that are decisive in the politico-economic equilibria for different demographic and skill-distribution parameters.

Part III examines overall gains from (or the cost of) migration to the host country in view of the potential for fiscal burden from unskilled migration, and considers how the source country may respond to the outflow of labor.

Chapter 8 presents some estimates of the net fiscal burden of migration in the US and the EU. We examine whether the net fiscal burden imposed by migrants is a proper measure of the welfare cost of migration. It turns out that it might be a good measure in a static setup. But the fiscal burden may fail to capture the welfare benefit accorded by migration in a dynamic setup.

So far we focused mainly on the host country. The source country played a passive role. It merely serves as a reservoir of migrants for the host (destination) country. That is, it provided exogenously given, upward sloping, supply curves of unskilled and skilled would-be migrants to the host country.

Chapter 9 assigns an active role also for the source country. It models the source country in a stylistic way as an accession country of an economic union (i.e., the EU enlargement from 15 to 27 states) with its own welfare (tax-benefit) policy. Similarly, the host country is modeled stylistically as one of the welfare states of the core of an economic union (i.e., like the EU-15). Recall that there is a grace period between 2004 and 2014 where an EU-15 member state can nationally regulate the immigration flows from the accession countries. We let these two countries (different in terms of their productivity) engage in fiscal and migration competition. As the driving force behind migration is a productivity gap, we first analyze the implications of the productivity gap for the design of migration and tax policies.by using numerical simulations. Second, we examine how the migration and tax policies are shaped, how policies are affected by whether the skilled or the unskilled are in power, and the different effects on taxes between the controlled and free migration.regimes.

Part I

Migration and the Welfare State: Basic Theory and Cross-Country Evidence

Chapter 2

Key Implications of the Generosity of the Welfare State for the Skill Composition of Migration

2.1 Introduction

This chapter addresses the effect of the generosity of the welfare state on the skill composition of migrants. Free migration has been one of the important qualities of the integration of Europe into the European Union. Freedom of movement, and the ability to reside and work anywhere within the EU, are one of the fundamental rights to which member states of the EU are obligated towards each other.[5] In contrast, labor mobility into the EU members states from non EU states, is still restricted by national policies.

This difference in policy regimes across EU and non-EU states provides an opportunity to test theory predictions about key differences between free and policy-controlled migration. The differences in migration policies are also tightly linked to the generosity of the welfare state. For example, an impetus for relaxing migration restrictions by EU member states, towards non-EU states, is that birth rates dwindle and life expectancy goes on rising. Consequently, the EU native born population is both declining and ageing. A declining productive workforce needed to finance the increased economic burden of the costly welfare-state institutions, puts a downward pressure on output growth. One alternative is to adopt more liberal migration policies, especially towards skilled migrants, thereby solidifying the financial soundness of the welfare state. Unskilled migrants, in contrast, which are usually heavy users of the benefits provided by the welfare state, may put further strains on the dwindling welfare state. Therefore, voters in an ageing welfare state may opt for a migration policy which will be more liberal and also upgrade the skill composition of migration.[6][7]

We present a parsimonious model which predicts that the generosity of the welfare state serves as a magnet to unskilled migrants, but as a deterrent to skilled migrants. Also, voters in relatively more generous welfare states are more likely to opt for migration policies that are more laxed towards skilled migration and more tight towards unskilled migration. As a result, countries with more generous welfare systems are expected to have their skill composition of migrants biased towards unskilled migration, relative to countries with less generous welfare systems, if migration is free. The opposite is true when migration is controlled by national policies. That is, countries with more generous welfare systems are expected to have their skill composition of migrants biased towards skilled migration, if its voters can restrict migration relative to countries with less generous welfare systems.

In this chapter we also confront the predictions of our theory with empirical evidence. We consider the generosity of the welfare state as an exogenous variable and study the effect of this variable on the skill composition of immigration stocks in the cases of free and controlled migration. The EU provides a unique testing ground for the predictions of our parsimonious model, as there is more or less free migration among EU member states, whereas each EU member decides on whether, and to what extent, to restrict migration from the rest of the world.

We employ cross-sectional data from 14 EU countries and other 12 OECD countries in the year 2000.[8] We form source-host pairs of countries where only the EU countries (plus Norway and Switzerland) serve as host countries, whereas all the 26 countries in the sample serve as source countries. The identification strategy is a decomposition of the source-host pairs into two groups: a "free-migration" group (source-host pairs within the EU, plus Norway and Switzerland) and a "policy-controlled" group (source-host pairs where the host countries are the same as in the former group, and the source countries are from the remaining (non EU) countries). We assume, plausibly, that this free-restricted migration decomposition, which has its origin in the integration process in Europe that started in the 1950s, could not have as one of its determinants the eventual stock of the migrants in the EU states some 50 years later.

2.2 Parsimonious Model of Migration

Assume a Cobb-Douglas production function, with two labor inputs, skilled and unskilled[9]:

$$Y = AL_s^{\alpha} L_u^{1-\alpha}, \ 0 < \alpha < 1 \tag{2.1}$$

where, Y is the GDP, A denotes a Hicks-neutral productivity parameter, and L_i denotes the input of labor of skill level i, where $i = s, u$ for skilled and unskilled, respectively.

The competitive wages of skilled and unskilled labor are, respectively

$$w_s = \alpha Y / L_s \tag{2.2}$$

$$w_u = (1 - \alpha) Y / L_u.$$

Aggregate labor supply, for skilled and unskilled workers, respectively, is given by:

$$L_s = (S + \sigma\mu)\, l_s \tag{2.3}$$
$$L_u = (1 - S + (1 - \sigma)\, \mu)\, l_u.$$

There is a continuum of workers, where the number of native-born is normalized to 1; S denotes the share of native born skilled in the total native-born labor supply; σ denotes the share of skilled migrants in the total number of migrants; μ denotes the total number of migrants; and l_i is the labor supply of an individual with skill level $i \in \{s, u\}$

Total population (native born and migrants) is as follows

$$N = 1 + \mu. \tag{2.4}$$

We specify a simple welfare-state system which levies a proportional labor income tax at the rate τ, with the revenues redistributed equally to all residents (native born and migrants alike) as a demogrant, b, per capita. The demogrant captures not only a cash transfer but also outlays on public services such as education, health, and other provisions, that benefit all workers, regardless of their contribution to the finances of the system.

The government budget constraint is therefore

$$Nb = \tau Y. \tag{2.5}$$

The utility function for skill-type $i \in \{s, u\}$ is

$$u_i = c_i - \frac{\varepsilon}{1+\varepsilon} l_i^{\frac{1+\varepsilon}{\varepsilon}} \tag{2.6}$$

where c_i denotes consumption of an individual with skill level i, and $\varepsilon > 0$.

The budget constraint of an individual with skill level i is

$$c_i = b + (1-\tau)\, l_i w_i. \tag{2.7}$$

Individual utility-maximization yields the following the labor supply equation

$$l_i = \left((1-\tau)\, w_i\right)^{\varepsilon}. \tag{2.8}$$

It is then straightforward to calculate the equilibrium wages for the skilled and unskilled workers, which are given respectively by

$$\begin{aligned} w_s &= A\left(\alpha \delta^{\varepsilon} \theta^{1-\alpha}\right)^{\frac{1}{1+\varepsilon}} \\ w_u &= A\left((1-\alpha)\, \delta^{\varepsilon} \theta^{-\alpha}\right)^{\frac{1}{1+\varepsilon}} \end{aligned} \tag{2.9}$$

where $\delta \equiv \alpha^{\alpha} (1-\alpha)^{1-\alpha}$ and $\theta \equiv \frac{1-S+(1-\sigma)\mu}{S+\sigma\mu}$

In order to ensure that the skilled wage always exceeds the unskilled wage, $w_s > w_u$, we assume that

$$\frac{\alpha(1-S+(1-\sigma)\mu)}{(1-\alpha)(S+\sigma\mu)} > 1. \tag{2.10}$$

.We now use this model to to analyze the policy-controlled regime.

2.3 Policy-controlled Migration

Assume that the host country can receive as many migrants as it wishes of each one of the two skill types, so that the host-country migration policy is the sole determinant of migration flows[10]. The policy is determined by the median voter in the host country .We assume that the policy decisions on the tax rate, τ, and the total volume of migration, μ, are exogenous. We do this in order to focus the analysis on a single endogenous policy variable, which is the skill composition of migrants, σ. Note that once σ, μ, τ are determined, then the demogrant, b, is given by the government budget constraint; we thus denote the demogrant b as $b(\sigma;\tau)$; where the exogenous variable μ is suppressed here and elsewhere.

The indirect utility of an individual with skill level i is given by:

$$V_i\left(\sigma;\tau\right) = b\left(\sigma;\tau\right) + \frac{1}{1+\varepsilon}\left[(1-\tau)w_i\left(\sigma;\tau\right)\right]^{1+\varepsilon}. \tag{2.11}$$

Differentiating Equation (2.11) with respect to σ, employing the envelope theorem, yields

$$\frac{dV_i\left(\sigma;\tau\right)}{d\sigma} = \frac{db(\sigma;\tau)}{d\sigma} + (1-\tau)\, l_i\left(w_i\left(\sigma;\tau\right)\right)\frac{dw_i\left(\sigma;\tau\right)}{d\sigma}. \tag{2.12}$$

Thus, a change in the share of skilled migrants in the total number of migrants, σ, affects the utility level through two channels. First, an increase in σ raises average labor productivity and thereby tax revenues. This, in turn, raises the demogrant, b. Second, an increase in σ , which raises the supply of skilled labor relative to the supply of unskilled labor, depresses the skill-premium in the labor market.

We plausibly assume that only the native-born population is eligible to vote on the migration policy, as the would-be migrants are not yet a part of the host country. If the decisive voter is unskilled, both of the above effects increase her utility. Thus, an unskilled voter would like to set the skill-composition of migrants at the maximal limit, $\sigma = 1$. This means that the share of skilled migrants preferred by the decisive skilled voter is typically lower than that preferred by the decisive unskilled voter. We plausibly assume therefore that the decisive skilled voter would like to set σ below 1 (which is equivalent to assuming that the first-order condition is met before σ reaches 1).

Defining σ^i as the share of skilled immigrants most preferred by an individual with skill level $i = s, u$ in the host country, we get

$$\sigma^s < \sigma^u = 1.$$

Our goal is to find the effect of the change in the generosity of the welfare state on the migration policy concerning σ. The generosity of the welfare state, captured by the magnitude of the demogrant, b, depends positively on the tax rate, τ (we assume that economy is on the "correct side" of the Laffer curve). We thus look for the effect of τ on the change in the skill composition of the migrants, σ. We show in the appendix 2A.1 that

$$\frac{d\sigma^u}{d\tau} = 0; \frac{d\sigma^s}{d\tau} > 0. \tag{2.13}$$

This means that, if the decisive voter is an unskilled worker, an exogenous increase in the tax rate, τ, would leave the skill migration policy unchanged, because it is always set at the maximum possible limit. If, however, the decisive voter is a skilled worker, an exogenous increase in the tax rate, τ, will change the policy concerning the skill-composition of migrants in the direction towards a larger share of skilled migrants. The reason is that when the tax rate is higher, the redistribution burden upon a skilled decisive voter increases. Allowing an additional skilled migrants can ease this rise in the fiscal burden, dominating the adverse effect on the skilled wage[11].

2.3.1 Free Migration

We now assume that no restrictions are placed on migration by the policy-makers in the host country. The level of migration depends entirely on the choice of potential migrants. In choosing whether to migrate or not, a potential migrant of skill i compares his prospective utility, V_i, in the migration destination, to the reservation utility, denoted by $\overline{u}^i$ in the source country. For each skill level i, we assume that there is a continuum of would-be migrants, differing with respect to the reservation utility level in the source country. This heterogeneity of reservation utilities in the source country could stem from different traits of the potential migrants (e.g., family size, age, moving costs, forms of portable pensions, housing, cultural ties, etc.). Thus the host country faces an upward sloping supply curve, $S^i(V_i)$, of potential migrants from the source country for each skill level i.

Let m_s be the number of skilled migrants, and m_u the number of unskilled migrants. The proportion of skilled migrants, σ , is defined by

$$\sigma = \frac{\frac{m_s}{m_u}}{1+\frac{m_s}{m_u}}. \tag{2.14}$$

The indirect utility function in the host country no longer depends on the policy variable σ, but rather given by

$$V_i(\tau) = b(\tau) + \frac{1}{1+\varepsilon}\left((1-\tau)\,w_i\right)^{1+\varepsilon}. \tag{2.15}$$

The following equation determines, for each τ, the cut-off levels of the reservation utilities ($\overline{u}^s(\tau)$ and $\overline{u}^u(\tau)$, for a would-be migrant of skill $i = s, u$

$$V_i(\tau) = \overline{u}^i(\tau). \tag{2.16}$$

We can use this to find the supply curve of the potential migrants and hence the number of migrants for each skill level. By definition, the number of migrants of each skill level, $i = s, u$, is determined by the supply of migrants, that is

$$m_i(\tau) \equiv Q_i(\overline{u}^i(\tau)), \tag{2.17}$$

for $i = s, u$.

We now attempt to find the effect of an exogenous change in the generosity of the welfare state on the skill mixture of the migrants. We show in the appendix that:

$$\frac{d\sigma}{d\tau} < 0. \tag{2.18}$$

That is, the generosity of the welfare state attracts unskilled migrants and discourages skilled migrants.

The rationale for this result is as follows. An increase in τ raises the demogrant, b, but lowers the net wage, $(1-\tau)\,w_i$. For skilled migrants, the fall in net wage outweighs the increase in the demogrant. Thus, an increase in τ reduces the well-being of skilled workers. Consequently, an increase in τ reduces the cut-off reservation utility of skilled migrants, $\overline{u}^s(\tau)$. As a result, those skilled migrants with reservation utilities between the old one the new cutoff levels will choose not to migrate. The opposite holds true for unskilled migrants. Thus, an increase in the generosity of the welfare state under free migration deters skilled migrants and attracts unskilled ones, thereby tilting the skill composition of migration towards unskilled migrants.

2.4 Empirical Evidence on Welfare Migration

The existing literature addresses the issue of how the welfare-state generosity works as a magnet to migrants — the "welfare migration" phenomenon.[12]

Khoudouz-Castezas (2004), who studies emigration from the 19th century Europe, finds that the social insurance legislation, adopted by Bismarck in the 1880s, reduced the incentives of risk averse Germans to emigrate. He estimates that in the absence of social insurance, German emigration rate from 1886 to 1913 would have been more then doubled their actual level.

Southwick (1981) shows with U.S. data that high welfare-state benefit gap, between the origin and destination regions in the U.S., increases the share the welfare-state benefit recipients among the migrants. Gramlich and Laren (1984) analyze a sample from the 1980 U.S. Census data and find that the high-benefit regions will have more welfare-recipient migrants than the low-benefit regions. Using the same data, Blank (1988) employs a multinomial logit model to show that welfare benefits have a significant positive effect over the location choice of female-headed households. Similarly, Enchautegui (1997) finds a positive effect of welfare benefits over the migration decision of women with young children. Meyer (2000) employs a conditional logit model, as well as a comparison-group method, to analyze the 1980 and 1990 U.S. Census data and finds significant welfare induced migration, particularly for high school dropouts. Borjas (1999), who uses the same data set, finds that low skilled migrants are much more heavily clustered in high-benefit states, in comparison to other migrants or natives. Gelbach (2000) finds strong evidence of welfare migration in 1980, but less in 1990. McKinnish (2005, 2007) also finds evidence for welfare migration, especially for those who are located close to state borders (where migration costs are lower). Walker (1994) uses the 1990 U.S. Census data and finds strong evidence in support of welfare-induced migration. Levine and Zimmerman (1999) estimate a probit model using a dataset for the period 1979-1992 and find, on the contrary, that welfare benefits have little effect on the probability of female-headed households (the recipients of the benefits) to relocate.

Peridy (2006) studies migration rates in 18 OECD host countries from 67 source countries and finds that the host-source ratio of welfare-state benefits (as measured by total public spending) has a significant positive effect on migration. De Giorgi and Pellizzari (2006) conduct an empirical investigation of migration from outside the EU-15. Using a conditional logit approach, they find that welfare-state benefits attract migrants. When interacted with the education level, welfare benefits show also a positive effect on the probability of the lowest group of education to immigrate; whereas probabilities of the secondary and tertiary education groups are not significantly affected. Docquier at el. (2006) study the determinants of migration stocks in the OECD countries in the year 2000, with migrants from 184 countries, classified according to three education levels. They find that the social welfare programs encourage the migration of both skilled and unskilled workers. However, the unskilled are motivated by social expenditure much more than the skilled migrants. Thus they conclude that the skill composition of migrants is adversely affected by the welfare-state benefits, that is, welfare benefits encourage migration biased towards the unskilled.

Recall that our parsimonious model predicts a differential effect on migration and its skill composition, depending on whether migration is free or policy-controlled. Therefore, in order to obtain unbiased estimates of the generosity of the welfare state on migration (and on its skill composition), one must control for the migration regime (free versus controlled). This means that the studies of migration between states within the U.S. (such as Borjas (1999), for example), which are evidently confined to a single migration regime (namely, free migration), can produce a biased results. Other studies that employ samples confined to the policy-controlled migration regime, but at the same time employ a model of the migrants' choice, whether to migrate and to which country, are evidently inconsistent. In this case, the estimates convey little information on the migrants' choices (and hence on the welfare state as a magnet to unskilled migrants), but rather on the migration policy choices of the host country. Those studies that refer to both migration regimes without controlling for them are not easily interpretable because they convey a mixture of information on migration policies in the host countries, and on the individual migrant's migration choices in the source countries.

2.5 Empirical Analysis

2.5.1 Testable Hypotheses

There are two main predictions of our parsimonious model, which we would like to test. First, if migration is not restricted, the generosity of the welfare state has an adverse effect on the skill composition of migrants. A typical skilled migrant is more likely to move to a less generous welfare state with a lower tax rate rather than to a more generous country with a higher tax rate, other things being equal. Second, in the case that the skill composition of migration is policy-controlled, then the more generous is the welfare state, the more the skill composition of migrants is biased towards skilled migrants.

As explained before, both results hinge on the redistributive aspects of the welfare state. Under free migration, equilibrium migration reflects (among others) the choice of the migrants. Thus, a generous welfare state generating a fiscal burden on skilled migrants is a deterrent for skilled migration. In the policy-controlled migration regime, however, the interests of the native-born in the host country, as is reflected in the voting equilibrium, are at play. Fiscal burden associated with the generosity of the welfare state, which falls on the skilled native-born, induces this interest group to endorse higher rates of skilled migration. The unskilled native-born is in favor of maximum level of skilled migration, both for redistributive reasons and for labor complementarity reasons.

In sum, the testable hypotheses concerning the migration-regime differential effect of the generosity of the welfare state on the skill composition of the migrants can be stated as follows. Denote by $\sigma^F$and σ^R, respectively, the skill composition of migrants in the free-migration regime and the policy-controlled regime. First, an increase in the generosity of the welfare state (reflected in an exogenous increase in the tax rate, τ) adversely affects the skill composition of the migrants in the free-migration regime, that is $\frac{d\sigma^F}{d\tau} < 0$. Second, an increase in the generosity of the welfare state has a more pronounced effect on the share of skilled migrants when the migration-regime is policy-controlled, that is, $\frac{d\sigma^R}{d\tau} > 0$. Consequently, we expect $\frac{d(\sigma^R - \sigma^F)}{d\tau} > 0$.

2.5.2 Identification Strategy

To confront the predictions of our parsimonious model with cross-section data of source-host (developed) country pairs, we decompose the sample into two groups. The first group contains source-host pairs of countries which enable free mobility of labor among themselves. They also prohibit any kind of discrimination between native-born and migrants, regarding labor market accessibility and welfare-state benefits eligibility. These are 16 European countries, 14 of them are a part of the EU (Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Netherlands, Portugal, Spain, and U.K.), and Norway and Switzerland. For notational brevity, we will nonetheless refer to this group as the EU group. The data for this group, therefore, consist of bilateral migration stock for any pair of these countries. The second group includes source-host pairs of countries, within which the source country residents cannot necessarily move freely into any of the host countries. That is, the host countries control migration from the source countries. The host countries are the same 16 countries from the first group, and the source countries comprise of 10 developed non-European countries (U.S., Canada, Japan, Australia, New Zealand, Israel, Taiwan, Hong Kong, Korea and Singapore).

This decomposition is key to the identification strategy. It enables us to plausibly assume that migration is free among the 16 countries of the first group, and is *effectively* policy-controlled with respect to migrants from 10 source countries belonging to the second group. It is plausible to assume that the categorizing of both groups is exogenous to our dependent variable, the skill composition of immigrants. Thus, we can identify the differential effect of the generosity of the welfare state on the skill composition of immigrants across the two groups (the "free-migration" group and the "policy-restricted migration" group) in an unbiased way.

The reason that it is safe to assume that this decomposition is exogenous to the dependent variable, the skill composition of immigrants, is that the European integration is the result of long-term developments of multilateral treaties, whose content extends far beyond the issue of migration and their skill composition. The historical development of the "free-migration" group goes far back. The Treaty of Paris (1951) established the European Coal and Steel Community (ECSC) and was signed by France, West Germany, Italy, Belgium, Luxembourg and the Netherlands. The underlying idea was based on supra-nationalism, aiming to help the economy of Europe and to prevent future war by integrating its members together. This treaty, among other things, enabled the right to free movement for workers in these industries. Following that, the Treaty of Rome (1957) established the European Economic Community (EEC), signed by the same 6 countries. The main aim of the EEC was to "preserve peace and liberty and to lay the foundations of an ever closer union among the peoples of Europe." This treaty also provided for the free movement of all workers within the EEC.

The first enlargement was in 1973, with the accession of Denmark, Ireland and the United Kingdom. In 1981 Greece joined, and Spain and Portugal became members in 1986. Transitional periods of 6 years, postponing free labor mobility were introduced for these three countries. In 1990, after the fall of the Iron Curtain, the former East Germany became part of the EEC as part of a newly reunited Germany. The Maastricht Treaty came into force on 1 November 1993, introducing the European Union (EU), which absorbed the EEC as one of its three pillars, to be called as the European Community (EC). The agreements reiterated the free movement of persons (article 39). That is, citizens can move freely between member states to live, work, study or retire in another country. Such freedom of movement also entails the abolition of any discrimination based on national origin between workers of the member states as regards employment, remuneration and other conditions of work and employment. Austria, Sweden and Finland joined in 1995. These countries together form the EU-15 (or, the "old members states").[13]

The European Economic Area (EEA) came into being on January 1, 1994. The contracting parties to the EEA agreement are Iceland, Liechtenstein and Norway - and the EU Member States along with the European Community. Switzerland is not part of the EEA. However, Switzerland is linked to the European Union by bilateral agreements. The EEA as well as the Switzerland bilateral agreements with the EU are based on the same "four freedoms" as the European Community, which includes the free mobility of labor and equal treatment clauses.[14]

2.5.3 The Econometric Model

We specify the source-host pair migration stock by the following equation:

$$m^i_{s,h} = \beta^i_0 + \beta^i_1 R_{s,h} + \beta^i_2 B_h + \beta^i_3 R_{s,h} \cdot B_h + \beta^i_4 X_{s,h} + \beta^i_5 X_{s,h} \cdot R_{s,h} + u^i_{s,h}; \tag{2.19}$$

$$i \in \{s, u\}\,;\; u^i_{s,h} = \theta_{s,h} + \epsilon^i_{s,h}$$

$$R_{s,h} = \begin{cases} 0, & \text{if } s, h \text{ are in the } EU \\ 1, & \text{if } s \text{ is not in the } EU \text{ and } h \text{ is in the } EU \end{cases}$$

where $m^i_{s,h}$ denotes the ratio of the stock of migrants of skill level i, originated in source country s and residing in host country h, to the stock of all native workers of skill level i in the *source* country in the year 2000. $R_{s,h}$ is a dummy variable, which equals 0 if the source-host pair exercises free migration, and 1 otherwise. B_h denotes the average benefits per capita in the host country h, over the periods of 1974-1990. The remaining control variables are denoted by $X_{s,h}$, which include the ratio of the stock of unskilled migrants, from source country s in host country h, to the stock of all native unskilled migrants in the source country s in the year 1990; a similar ratio for skilled migrants; the proportion of unskilled native-born workers in the host country h in year 1990; and a similar proportion for the skilled.[15] We also have interaction terms of all variables with the dummy variable. The coefficients are depicted by the vectors β. The error term is denoted by $u^i_{s,h}$, which can be divided into two components: a skill-independent effect, $\theta_{s,h}$, and a skill-dependent term, $\epsilon^i_{s,h}$.

This simple model estimates the effects of the benefits per capita (and the other control variables) on the migration share, $m^i_{s,h}$, for each skill level $i = s, u$. Note that $\theta_{s,h}$ reflects some omitted variables which are skill-independent. In order to avoid the omitted-variable bias which is skill-independent, we define a skill-difference model (a version of difference-in-difference model), by subtracting the two equations in (2.19) and obtain

$$\triangle m_{s,h} = \triangle\beta_0+\triangle\beta_1 R_{s,h}+\triangle\beta_2 B_h+\triangle\beta_3 R_{s,h}\cdot B_h+\triangle\beta_4 X_{s,h}+\triangle\beta_5 X_{s,h} R_{s,h}+\epsilon_{s,h}, \quad (2.20)$$

where $\triangle$ is the skill-difference operator.

The dependent variable, $\triangle m_{s,h} = m^s_{s,h} - m^u_{s,h}$, can be considered as a measure for the skill composition of migrants. The model in equation (2.20) estimates relative effects of the regressors over $\triangle m_{s,h}$. A positive estimation of a certain coefficient indicates a positive effect on the skill composition measure of the migrants, and vice versa. Note that the effect of τ on σ^F is captured in the above equation by the coefficient $\Delta\beta_2$. Therefore, the null hypothesis, describing the effect of τ on σ^F, becomes

$$\triangle\beta_2 < 0. \tag{2.21}$$

Also, the effect of τ on σ^R is captured by the coefficient $\Delta\beta_2+\Delta\beta_3$. Therefore the null hypothesis, describing the the effect of τ on $\sigma^R - \sigma^F$, becomes

$$\triangle\beta_3 > 0. \tag{2.22}$$

An important statistical feature of the difference-in-difference model is that it eliminates the skill-independent error term, $\theta_{s,h}$. Any variable whose impact on migration is skill-invariant drops out. Additionally, by including past migration stocks in 1990 as a apart of $X_{s,h}$, we are able to account for other invariant effects.

A potential endogeneity problem may arise, in particular between the level of benefits in the host country, B_h , and the skill composition of the migrants, $\Delta m_{s,h}$, because skilled immigrants can influence the political economic equilibrium level of benefits.[16] One way to go around this problem is to take the average level of benefits over a long period before the year 2000, as we indeed do (using 1974-1990 data). Recall that we also control for the past migration stock rate (in 1990). Thus only migration between 1990-2000 is to be explained by the lagged benefit variable, which is completely predetermined.

In addition, we also run an IV estimation, using the legal origin in the host country (English, Scandinavian, or French-German) as an instrument. The legal origin, a century-old construct, was put in place without having the 2000 migration in mind. The legal origin is, however, closely linked to national attitudes towards the generosity of the welfare state, and its institutional setups. It is therefore likely to be strongly correlated with B_h, yet with little direct relationship to the skill composition of migrants in the year 2000, $\Delta m_{s,h}$. Note that we cannot use an IV estimation with usual instruments such as distance and common language. These variables would generate incongruent dimensions with other data, because the variables of interest is summed across *source* countries while the distance (or common language) are source-host variables. The IV estimation generates the fitted values of the migration variables, using the instrumental variables and the control variables in auxiliary regressions. After constructing the fitted value of our variables of interest, we use these new variables in the regressions.

2.5.4 Data Description

Migration data are taken from Docquier and Marfouk (2006). The dataset consists of bilateral stock of migrants, based on census and register data for the years 1990 and 2000. Migration stock variables are more suitable for testing the predictions of our model than flow variables because our model describes a long-run equilibrium of migration and voting decision.[17] Migrants are at working age (25+), defined as foreign-born, subdivided into three classes of education level: low-skilled (0-8 schooling years), medium-skilled (9-12 schooling years) and high-skilled (13+ schooling years). The countries in the dataset are all developed countries where the first schooling group (0-8 years) is extremely small. Therefore, we will refer to the second schooling group (9-12 years) as the unskilled group, and the third schooling group (13+ years) as the skilled group. Non-movers, that is, the stocks of the labor force for all the countries, especially the source countries, are also recorded.

Data for welfare-state benefits per capita are based on OECD's Analytical Database (averaged across 1974-1990). Social expenditures encompass all kinds of social public expenditures, in cash or in-kind, including, for instance, old-age transfers, incapacity related benefits, health care, unemployment benefits and other social expenditures. The data is PPP-converted to 1990 U.S. dollars. The other control variables of the main regression come from Razin, Sadka, and Swagel (2002a), which include dependency ratio, output, and voters of each skill level. The variables of our interest are the migration stock share for each education level $i = s, u$ in period t.

2.5.5 Findings

Table 2.1 presents the baseline estimation results. The dependent variable is the log difference between high and low skilled stocks of immigrants (as ratios of the native-born) in 2000. Columns 1 and 2 report OLS regression results; columns 3 and 4 report instrumental variable (IV) regression results. The difference between columns 1 and 3, on the one hand, and columns 2 and 4, on the other hand, is in the variables of the vector $X_{s,h}$. Columns 1 and 3 contain only the migration stock shares, skilled and unskilled, in the year 1990. Columns 2 and 4 include also the log-values of the skilled and unskilled native labor stocks ratio in the host country of the year 1990.

[insert table 2.1 here]

The first null hypothesis is that $\Delta\beta_2 < 0$. It captures the migrants' choice in the free-migration regime. Indeed, the coefficient is negative and significant in all four regressions. That is, the generosity of the welfare state adversely affects the skill composition of migrants in the free-migration regime. The magnitude of the coefficient is even higher in the IV regressions than in the OLS regressions. Whether we include the full set of control variables in $X_{s,h}$ in the regressions (columns 2 and 4) or not (columns 1 and 3) does not seem to have much of an effect on the magnitude of the coefficient[18].

The second null hypothesis is that $\Delta\beta_3 > 0$, reflecting the policy preference of the host country's voters in policy-controlled migration regimes. Indeed, the coefficient is positive and significant in all four regressions. That is, the effect of the generosity of the welfare state on the skill composition of migrants is more pronounced in the policy-controlled migration regime. The magnitude of the coefficient is even higher in the IV regressions than the OLS regressions. Again, whether we include the full set of control variables in $X_{s,h}$ in the regressions (columns 2 and 4) or not (columns 1 and 3) does not seem to have much of an effect on the magnitude of the coefficient.

Turning to the other control variables, $X_{s,h}$, the effect of low-(high-)skilled migration stock rate in 1990 on the skill composition of migration in 2000 is negative (positive) and significant across all four regressions in the free-migration regime. An interpretation of this result is that, in the free-migration regime there is an inertia over time for each skilled group of migrants: one unskilled migrants bring about further waves of unskilled migrants; and similarly, more skilled migrants bring about further waves of skilled migrants. We also find in the free-migration regime that the host-country share of skilled labor in 1990 has a significant negative effect on the skill composition of migrants in 2000. The interpretation of this result is that the high share of skilled labor in the host country depresses the wage of skilled labor and deters skilled migrants.

Note that the effect of any control variable on the dependent variable in the policy-controlled regime is given by the sum of the coefficient of the control variable and the coefficient of its interaction term. For instance, the effect of B_h on $m_{s,h}$ is given by $\Delta\beta_2+\Delta\beta_3$. In the policy-controlled migration regime, we find that past migration of the unskilled in 1990 increases the skill composition of migrants in 2000, whereas past skilled migration increases the skill composition of migrants in 2000, but less than that in the free-migration regime. An interpretation consistent with our model of this result is that having initially (in 1990) a large stock of unskilled migrants poses a fiscal pressure on the welfare state, and induces the decisive voter to opt for more skilled migrants in order to alleviate the burden. This explanation is supported in columns 2 and 4, where we account for the high-low skilled voters ratio in the host countries. One can see that as this ratio is higher, the skill composition of immigrants is lower. Clearly, this outcome is in line with our model, wherein $\sigma^s < \sigma^u$.

2.5.6 Robustness Tests

Our robustness test is divided into three parts. First, we replace the measure of our variable of interests. Instead of using the log-value of the average between 1974-1990, we use different periods (1980-1985, 1980-1990, 1980-1995, 1980-2000, 1980-2005). All estimations supports our hypothesis regarding the negative, market-based, supply-side effect. The positive, policy-based, demand-side effect is only weakly supported, as the results are not significant. We also replace the welfare-state benefits by the log-value of the old age pension payment, averaged between 1980-2000. Clearly, this is the largest component of social security. Based on the PAYG systems, it reflects redistribution of income which stands at the heart of our parsimonious model (whereas other components of welfare benefits may reflect additional considerations, like insurance and others). The results are perfectly in-line with our main findings. We also constructed a different index for the welfare generosity. We calculated the average tax proceeds per capita, excluding the portion for defense expenses.

The dependent variable in Table 2.2 is medium-skilled versus the low-skilled. The explanatory variables remain the same as in Table 2.1.

[insert table 2.2 here]

In Table 2.3 we add gravity-type explanatory variables, such as distance and common language.

[insert table 2.3 here]

In Table 2.4, we use subperiods, prior to 1990, to measure the period average for the benefits.

[insert table 2.4 here]

In Table 2.5 we shorten the period, prior to 1990, in measuring the period average of the benefits.

[insert table 2.5 here]

In table 2.6 we proxy the benefit variable by the index of non-defense spending.

[insert table 2.6 here]

In Table 2.7 we add the Gini Coefficient, as an explanatory variable.

[insert table 2.7 here]

All in all, Tables 2.2-2.7 support the findings in the baseline table (Table 2.1), that the free-migration coefficient of the benefit is negative (that is, a more generous welfare state attracts relatively more unskilled immigrants and relatively fewer skilled immigrants); and the coefficient measuring the effect of the difference between free and restricted migration is positive (that is, host countries that regulate migration opt for relatively more skilled immigrants).

Table 2.1

Dependent Variable: High-Low Difference in Migration Stock Shares at 2000

	OLS	OLS	IV	IV
benefits per capita (host country)	-0.139	-0.111	-0.199	-0.205
	(0.049)***	(0.054)**	(0.079)**	(0.086)**
benefits per capita (host country) X R	0.135	0.133	0.195	0.226
	(0.054)**	(0.061)**	(0.079)**	(0.088)**
migration stock share in 1990 -	-0.755	-0.757	-0.75	-0.75

Migration into 16 European countries, from 26 developed countries (inclusive of the 16 host countries, among which free migration is allowed); F (R) is a dummy variable for 16 (10) source countries whose emigration into the 16 host countries is (not) free; IV: legal originof the host country (English, Scandinavian, German-French) Robust Standard Errors in parentheses * significant at 10%, ** significant at 5%, *** significant at 1%

Table 2.2

Dependent Variable: Medium-Low Difference in Migration Stock Shares at 2000

	OLS	OLS	IV	IV
benefits per capita (host country)	- 0.215	- 0.126	- 0.173	- 0.152
	(0.082)***	(0.082)	(0.065)***	(0.068)**
benefits per capita (host country) X R	0.198	0.113	0.156	0.139
	(0.082)***	(0.083)	(0.065)***	(0.068)**
migration stock share in 1990 -	- 0.668	- 0.666	- 0.67	- 0.665

Migration into 16 European countries, from 26 developed countries (inclusive of the 16 host countries, among which free migration is allowed);

F (R) is a dummy variable for 16 (10) source countries whose emigration into the 16 host countries is (not) free;

IV: legal originof the host country (English, Scandinavian, German-French)

Robust Standard Errors in parentheses

* significant at 10%, ** significant at 5%, *** significant at 1%

Table 2.3

Dependent Variable: High-Low Difference in Migration Stock Shares at 2000

	OLS	OLS	IV	IV
benefits per capita (host country)	-0.138	-0.147	-0.279	-0.32
	(0.068)**	(0.070)**	(0.122)**	(0.133)**
benefits per capita (host country) X R	0.159	0.167	0.301	0.34
	(0.072)**	(0.074)**	(0.123)**	(0.134)**
				migration stock share in 1990 - low

Migration into 16 European countries, from 26 developed countries (inclusive of the 16 host countries, among which free migration is allowed);

F (R) is a dummy variable for 16 (10) source countries whose emigration into the 16 host countries is (not) free;

IV: legal originof the host country (English, Scandinavian, German-French)

Robust Standard Errors in parentheses

* significant at 10%, ** significant at 5%, *** significant at 1%

Table 2.4

Dependent variable: High - Low Difference in Migration Stock Shares at 2000

Average years for the benfits:	80-85	80-90	80-95	80-00	800-05
Benefits per capita (in logs) (host)	- 0.054	- 0.053	- 0.059	- 0.061	- 0.078
	(0.024)**	(0.023)**	(0.025)**	(0.026)**	(0.032)**
Benefits per capita (in logs) (host) X R	0.026	0.029	0.034	0.037	0.055
	(0.025)	(0.025)	(0.026)	(0.027)	(0.033)
Migration stock share in 1990	- 0.762	- 0.762	- 0.762	- 0.762	- 0.762

Migration into 16 European countries, from 26 developed countries (inclusive of the 16 host countries, among which free migration is allowed);

F (R) is a dummy variable for 16 (10) source countries whose emigration into the 16 host countries is (not) free;

Robust Standard Errors in parentheses

* significant at 10%, ** significant at 5%, *** significant at 1%

Table 2.5

Dependent variable: High - Low Difference in Migration Stock Shares at 2000

	OLS	OLS
Old age ben- e- fitx (in logs) 1980 - 2000 (host)	- 0.109	- 0.079
	(0.040)***	(0.030)***
Old age ben- e- fitx (in logs) 1980 - 2000	0.096	0.093

Migration into 16 European countries, from 26 developed countries (inclusive of the 16 host countries, among which free migration is allowed);

F (R) is a dummy variable for 16 (10) source countries whose emigration into the 16 host countries is (not) free;

Robust Standard Errors in parentheses

* significant at 10%, ** significant at 5%, *** significant at 1%

Table 2.6

Dependent variable: High - Low Difference in Migration Stock Shares at 2000

	OLS	OLS
Benefits in- dex (host)	- 0.127	- 0.083
	(0.049)**	(0.053)
Benefitx in- dex (host) X R	0.102	0.092
	(0.056)*	(0.065)
Migration stock share in 1990 - low skilled	- 0.759	- 0.762
	(0.098)***	(0.096)***

benefits index=log(real GDP per worker*(tax rate - defense expenses/GDP))

Migration into 16 European countries, from 26 developed countries (inclusive of the 16 host countries, among which free migration is allowed);

F (R) is a dummy variable for 16 (10) source countries whose emigration into the 16 host countries is (not) free;

Robust Standard Errors in parentheses

* significant at 10%, ** significant at 5%, *** significant at 1%

Table 2.7

Dependent variable: High - Low Difference in Migration Stock Shares at 2000

	OLS	OLS
Benefits per capita (in logs) 1974 - 1990 (host)	- 0.141	- 0.109
	(0.050)***	(0.064)*
Benefits per capita (in logs) 1974 - 1990 (host) X R	0.142	0.146

Migration into 16 European countries, from 26 developed countries (inclusive of the 16 host countries, among which free migration is allowed);

F (R) is a dummy variable for 16 (10) source countries whose emigration into the 16 host countries is (not) free;

Robust Standard Errors in parentheses

* significant at 10%, ** significant at 5%, *** significant at 1%

2.6 Conclusion

The chapter analyzes the effect of the generosity of the welfare state on the skill composition of migrants. We develop a parsimonious model in which the effect of an increase in the generosity of the welfare state (which implies tax burden) on the skill composition of migrants under free-migration is negative. The reason is that welfare-state benefits attract unskilled migrants because they contribute to tax revenues less than what they gain from benefits; and this generosity works to deter skilled immigrants, because they contribute in taxes more than they receive in benefits. In sharp contrast, the effect of an increase in the generosity (and taxes) of the welfare state on the skill composition of migrants is positive, if migration is controlled by policy. Being net contributors to the welfare state, skilled migrants can help finance a more generous welfare-state system; thus, they are preferred by the policy maker over unskilled migrants. This chapter brings the predictions of the model to cross-sectional data on source-host, OECD-EU country pairs in the year

2000. The identification strategy is to use the decomposition the source-host country pairs into two groups: one group, a "free-migration" group, consists of source-host country pairs within the EU; and another group, "policy-controlled migration" group, consists the pairs from non-EU countries into the EU. We find evidence in support of the predictions of the parsimonious model that the generosity of the welfare state adversely affects the skill-composition of migrants under free-migration; but it exerts a more positive effect under a policy-controlled migration regime relative to a free-migration regime.

2.7 Appendix 2A.1

2.7.1 Proof of Equation (2.13)

We first show that $\frac{\partial b(\sigma;\tau)}{\partial\sigma} > 0$. Employing equation (2.15), we find that

$$\frac{\partial b(\sigma;\tau)}{\partial\sigma} = \frac{A\mu\tau\left(1-\tau\right)^{\varepsilon}}{1+\mu}\left\{\alpha w_s^{\varepsilon}\left[\frac{\left(1-\alpha\right)\theta^{\varepsilon}}{\alpha}\right]^{\frac{1-\alpha}{1+\varepsilon}}\left[1-\frac{\varepsilon\left(1-\alpha\right)\left(1+\mu\right)}{\left(1+\varepsilon\right)\left(1-S+\left(1-\sigma\right)\mu\right)}\right]\right. \tag{2.23}$$

$$\left.-\left(1-\alpha\right)w_u^{\varepsilon}\left[\frac{\left(1-\alpha\right)\theta^{\varepsilon}}{\alpha}\right]^{\frac{-\alpha}{1+\varepsilon}}\left[1-\frac{\varepsilon\alpha\left(1+\mu\right)}{\left(1+\varepsilon\right)\left(S+\sigma\mu\right)}\right]\right\} > 0.$$

To see this, observe that:

$$\begin{aligned}
\alpha w_s^{\varepsilon}\left[\frac{(1-\alpha)\theta^{\varepsilon}}{\alpha}\right]^{\frac{1-\alpha}{1+\varepsilon}} &> (1-\alpha) w_u^{\varepsilon}\left[\frac{(1-\alpha)\theta^{\varepsilon}}{\alpha}\right]^{\frac{-\alpha}{1+\varepsilon}} \\
\Leftrightarrow \alpha w_s^{\varepsilon}\left[\frac{(1-\alpha)\theta^{\varepsilon}}{\alpha}\right]^{\frac{1}{1+\varepsilon}} &> (1-\alpha) w_u^{\varepsilon} \\
\Leftrightarrow \frac{\alpha}{1-\alpha}\left(\frac{\alpha\theta}{1-\alpha}\right)^{\frac{\varepsilon}{1+\varepsilon}}\left[\frac{(1-\alpha)\theta^{\varepsilon}}{\alpha}\right]^{\frac{1}{1+\varepsilon}} &> 1 \\
\Leftrightarrow \left(\frac{\alpha\theta}{1-\alpha}\right)^{\frac{2\varepsilon}{1+\varepsilon}} &> 1 \\
\Leftrightarrow \frac{\alpha\theta}{1-\alpha} &> 1,
\end{aligned}$$

which is true by assumption, see equation (2.10). Also, observe that

$$\begin{aligned}
1-\frac{\varepsilon(1-\alpha)(1+\mu)}{(1+\varepsilon)(1-S+(1-\sigma)\mu)} &> 1-\frac{\varepsilon\alpha(1+\mu)}{(1+\varepsilon)(S+\sigma\mu)} \\
\Leftrightarrow \frac{\alpha}{(S+\sigma\mu)} &> \frac{(1-\alpha)}{(1-S+(1-\sigma)\mu)} \\
\Leftrightarrow \frac{\alpha\theta}{1-\alpha} &> 1,
\end{aligned}$$

which, again, is true by assumption; see equation (2.10). Hence, it follows indeed that $\frac{\partial b(\sigma;\tau)}{\partial\sigma} > 0$.

We next observe that

$$\begin{aligned}
\frac{\partial w_s(\sigma;\tau)}{\partial\sigma} &= -\frac{A\alpha\delta^{\varepsilon}(1-\alpha)\theta^{-\alpha}\mu(1+\mu)\left(\alpha\delta^{\varepsilon}\theta^{1-\alpha}\right)^{\frac{1}{1+\varepsilon}-1}}{(1+\varepsilon)(S+\sigma\mu)^2} < 0, \qquad (2.24) \\
\frac{\partial w_u(\sigma;\tau)}{\partial\sigma} &= \frac{A\alpha\delta^{\varepsilon}(1-\alpha)\theta^{-\alpha-1}\mu(1+\mu)\left((1-\alpha)\delta^{\varepsilon}\theta^{-\alpha}\right)^{\frac{1}{1+\varepsilon}-1}}{(1+\varepsilon)(S+\sigma\mu)^2} > 0,
\end{aligned}$$

which, indicates, as expected, that wages of each skill type fall with its proportions in the labor market.

It then follows from the equations in the text that $\frac{\partial V_u(\sigma;\tau)}{\partial \sigma} > 0$.Therefore, if the decisive voter is an unskilled individual, she opts for $\sigma^u = 1$, no matter what τ is, leading to our conclusion that $\frac{d\sigma^u}{d\tau} = 0$.When the decisive voter is a skilled individual, she will opt for a skill composition of migrants, σ^S, which is given by the first-order condition (2.12). Total differentiation of this

first-order condition yields

$$\frac{\partial^2 V_s(\sigma;\tau)}{\partial\sigma\partial\tau} + \frac{\partial^2 V_s(\sigma;\tau)}{\partial\sigma^2}\frac{\mathrm{d}\sigma^s}{\mathrm{d}\tau} = 0. \tag{2.25}$$

Given the second-order condition for maximization (that is, $\frac{\partial^2 V_s(\sigma;\tau)}{\partial\sigma} < 0$), it follows from the equation above that

$$sign\left(\frac{\mathrm{d}\sigma^s}{\mathrm{d}\tau}\right) = sign\left(\frac{\partial^2 V_s(\sigma;\tau)}{\partial\sigma\partial\tau}\right). \tag{2.26}$$

We can see that $\frac{\partial b}{\partial \sigma} = \gamma\tau(1-\tau)^\varepsilon$, where γ is positive and independent of τ. Hence, it follows from equation (2.12) that

$$\begin{aligned}\frac{\partial^2 V_i(\sigma;\tau)}{\partial\sigma\partial\tau} &= \frac{\partial}{\partial\tau}\left[\gamma\tau(1-\tau)^\varepsilon\right] + \frac{\partial}{\partial\tau}\left[(1-\tau)\,l_i(\sigma)\frac{\partial w_s(\sigma)}{\partial\sigma}\right] = \\ &= \gamma\left((1-\tau)^\varepsilon - \tau\varepsilon(1-\tau)^{\varepsilon-1}\right) - \frac{\partial w_s}{\partial\sigma}w_s^\varepsilon(1+\varepsilon)(1-\tau)^\varepsilon = \\ &= \left[\gamma\tau(1-\tau)^\varepsilon\right]\left(\frac{1}{\tau} - \frac{\varepsilon}{1-\tau}\right) + \left[(1-\tau)\,l_s\frac{\partial w_s}{\partial\sigma}\right]\left(\frac{1+\varepsilon}{\tau-1}\right).\end{aligned} \tag{2.27}$$

Note that

$$\begin{aligned} \frac{1}{\tau} - \frac{\varepsilon}{1-\tau} &> \frac{1+\varepsilon}{\tau-1} \\ \Leftrightarrow \frac{1}{\tau} - \frac{\varepsilon}{1-\tau} + \frac{1+\varepsilon}{1-\tau} &> 0 \\ \Leftrightarrow \frac{1}{\tau(1-\tau)} &> 0. \end{aligned}$$

Note also that $\gamma\tau(1-\tau)^{\varepsilon} + (1-\tau) l_s \frac{\partial w_s}{\partial \sigma} = 0$ at the level of σ chosen by the skilled workers (see equation (2.12)).

It then follows that $\frac{\partial^2 V_i^{|}(\sigma;\tau)}{\partial\sigma\partial\tau} > 0$. Hence $\frac{d\sigma^s}{d\tau} > 0$. This completes the proof of equation (2.13).

2.7.2 Proof of Equation (2.18)

Observe from the equations (2.16) and (2.17) that

$$\frac{\partial V_i(\sigma,\mu;\tau)}{\partial\tau} = \frac{\mathrm{d}\overline{u}^i(m_i)}{\mathrm{d}m_i}\frac{\mathrm{d}m_i}{\mathrm{d}\tau},\ i \in \{s,u\}. \tag{2.28}$$

As $\frac{d\overline{u}^i(m_i)}{dm_i} > 0$, we conclude that

$$sign\left(\frac{\mathrm{d}m_i}{\mathrm{d}\tau}\right) = sign\left(\frac{\partial V_i(\sigma,\mu;\tau)}{\partial\tau}\right). \tag{2.29}$$

Recall that

$$\frac{\partial V_i(\sigma;\tau)}{\partial \tau} = \frac{\partial b}{\partial \tau} - w_i\left(w_i(1-\tau)\right)^{\varepsilon} = \frac{Y}{N} - w_i l_i$$
$$= \frac{w_s l_s(S+m_s) + w_u l_u(1-S+m_u) - w_i l_i(1+m_s+m_u)}{N}. \tag{2.30}$$

Therefore, for the skilled migrants, it must be the case that

$$\begin{aligned}\frac{\partial V_s(\sigma,\mu;\tau)}{\partial \tau} &= \frac{(1-S+(1-\sigma)\mu)}{N}(w_u l_u - w_s l_s) \\ &= \frac{(1-S+m_u)(1-\tau)^{\varepsilon}}{N}\left(w_u^{1+\varepsilon} - w_s^{1+\varepsilon}\right) < 0,\end{aligned} \tag{2.31}$$

which implies that m_s is decreasing in τ. For unskilled migrants we have

$$\begin{aligned}\frac{\partial V_u(\sigma,\mu;\tau)}{\partial \tau} &= \frac{(s+\sigma\mu)}{N}(w_u l_u - w_s l_s) \\ &= \frac{(s+m_s)(1-\tau)^{\varepsilon}}{N}\left(w_s^{1+\varepsilon} - w_u^{1+\varepsilon}\right) > 0\end{aligned} \tag{2.32}$$

which proves that m_u is increasing in τ.

Lastly, recalling the definition of σ,

$$\sigma = \frac{m_s}{m_s+m_u},$$

it follows that

$$\frac{\mathrm{d}\sigma}{\mathrm{d}\tau} = \frac{\frac{\mathrm{d}m_s}{\mathrm{d}\tau}\left(m_s + m_u\right) - \frac{\mathrm{d}m_s}{\mathrm{d}\tau}m_s - \frac{\mathrm{d}m_u}{\mathrm{d}\tau}m_s}{\left(m_s + m_u\right)^2} = \quad (2.33)$$

$$= \frac{\frac{\mathrm{d}m_s}{\mathrm{d}\tau}m_u - \frac{\mathrm{d}m_u}{\mathrm{d}\tau}m_s}{\left(m_s + m_u\right)^2} < 0.$$

This completes the proof of equation (2.18).

Chapter 3

Implications of the Skill Composition of Migration for the Generosity of the Welfare State

3.1 Introduction

In the preceding chapter, the voters make decisions on migration policy. Specifically, they choose which skill-type of migrants to admit in the policy-controlled migration regime. That is, they choose the skill composition of migrants. We then ask how the generosity of the welfare state, taken as an exogenous variable, affects their decisions. In this chapter, we investigate, in essence, the inverse causality. Specifically, we let voters choose the generosity of the welfare state and investigate how the skill composition of migration affects their decisions, taking the migration flows as an exogenous variable .[19] Recall that migration has strong fiscal implications for the welfare state. It brings into the welfare state both net fiscal contributors (skilled migrants) and net fiscal consumers (unskilled migrants). As a result, migration can affect the appetite of the native-born towards redistribution.

3.2 Theory

We continue to employ the parsimonious model of the preceding chapter (see section 2.3). We consider the volume of migration (μ) and its skill composition (σ) as the exogenous variables, and we let the native-born voters choose the tax rate (τ); and, consequently, the generosity of the welfare state (b). We then ask how an exogenous change in the skill composition of the migrants (σ) affect the chosen parameters of the welfare state (τ and b).

For this purpose, we slightly change the utility specification concerning the treatment of b. We interpret it here as the level of spending per-capita on transfers and on all social services (such as on education, health care, etc.). Furthermore, we no longer assume that b is a perfect substitute to private consumption; we also assume that everyone opts for some positive level of b. That is, no one (skilled or unskilled) would like to get rid altogether of the welfare state. Specifically, we let the utility of an individual with skill type

$i = s, u$ be

$$u_i = c_i - \frac{\varepsilon}{1+\varepsilon} l_i^{\frac{1+\varepsilon}{\varepsilon}} + g(b), \tag{3.1}$$

where c_i denotes private consumption, $\varepsilon > 0$ is the elasticity of labor supply, and $g(b)$ denotes the utility generated by the per-capita public spending. We further assume that $g'(0) \to \infty$ (an Inada condition), so that all (skilled and unskilled) would like the government to levy some taxes in order to provide some positive level of b.

The budget constraint of an individual with skill level i is

$$c_i = (1 - \tau) w_i l_i. \tag{3.2}$$

Individual utility maximization yields the same labor supply equations as before:

$$l_i = ((1 - \tau) w_i)^{\varepsilon}. \tag{3.3}$$

The rest of the model is exactly as in chapter 2. Specifically, the production function, the marginal productivity conditions, the aggregate labor supplies, population size, and the government budget constraint are given by equations (2.1)-(2.5). As before, the equilibrium wages for the skilled and unskilled workers are given, respectively, by

$$
\begin{aligned}
w_s &= A\left(\alpha\delta^{\varepsilon}\theta^{1-\alpha}\right)^{\frac{1}{1+\varepsilon}} \\
w_u &= A\left((1-\alpha)\,\delta^{\varepsilon}\theta^{-\alpha}\right)^{\frac{1}{1+\varepsilon}} \\
&\text{where } \delta \equiv \alpha^{\alpha}\,(1-\alpha)^{1-\alpha} \\
&\text{and } \theta \equiv \frac{1-S+(1-\sigma)\,\mu}{S+\sigma\mu},
\end{aligned} \tag{3.4}
$$

In order to ensure that the skilled wage always exceeds the unskilled wage, that is $w_s > w_u$, we assume that

$$\frac{\alpha(1-S)}{(1-\alpha)(S+\mu)} > 1. \tag{3.5}$$

We now use this model to analyze the politico-economic choice of the welfare-state variables τ and b. This choice is done by majority voting. Given that there is essentially only one independent choice variable in this voting (because once one of the two variables - τ, b - is chosen, the other is determined by the budget constraint), it turns out that the outcome of the voting is determined by the choice of the median voter.

Note that the indirect utility of a native-born individual of skill level $i = s, u$ is by

$$V_i\,(\sigma;\tau) = g\,[b\,(\sigma;\tau)] + \frac{1}{1+\varepsilon}\,[(1-\tau)w_i\,(\sigma)]^{1+\varepsilon}\,, \tag{3.6}$$

where μ is suppressed from the expression. Note that w_i does not depend on τ due to the constant returns-to-scale feature of the production function and the independence of the ratio $\frac{l_s}{l_n}$ of τ; see equation (3.3).

An individual of a skill type i opts for a tax rate (τ_i) which maximizes her utility. This tax rate is given implicitly by the first order condition

$$\frac{\partial V_i}{\partial \tau} = \hat{g}\left(\cdot\right)\frac{\partial b}{\partial \tau} - w_i\left[(1-\tau)w_i\right]^{\varepsilon} = 0 \tag{3.7}$$

for each $i = s, u$. Note also that the second-order condition is $\frac{\partial^2 V_i}{\partial \tau^2} \leq 0$. Because $w_s > w_u$, it follows from equation (3.7) that $\frac{\partial V_u}{\partial \tau} > 0$, when $\frac{\partial V_s}{\partial \tau} = 0$. Thus, as expected, an unskilled voter opts for a more generous welfare state (a higher tax rate, τ) than the skilled voter. This implies that the outcome of the voting is determined by the median voter, whether skilled or unskilled.

The effect of a change in the skill composition of migrants on the generosity of the welfare state most preferred by an individual of skill level $i = s, u$ is found upon total differentiation of equation (3.7) with respect to σ:

$$\frac{\partial^2 V_i}{\partial \sigma \partial \tau} + \frac{\partial^2 V_i}{\partial \tau^2}\frac{\mathrm{d}\tau}{\mathrm{d}\sigma} = 0. \tag{3.8}$$

Because of the second-order condition, $\frac{\partial^2 V_i}{\partial \tau^2} \leq 0$, it follows that

$$sign\left(\frac{\mathrm{d}\tau}{\mathrm{d}\sigma}\right) = sign\left(\frac{\partial^2 V_i}{\partial \sigma \partial \tau}\right) \tag{3.9}$$

for $i = s, u$. In the appendix, we show that $\frac{\partial^2 V_s}{\partial \sigma \partial \tau} > 0$ and $\frac{\partial^2 V_u}{\partial \sigma \partial \tau} > 0$.[20]

Therefore, we can conclude that

$$\frac{\mathrm{d}\tau}{\mathrm{d}\sigma} \geq 0 \text{ for both } i = s, u. \tag{3.10}$$

That is, the two types of voters (skilled and unskilled) opt for more generous welfare state, reflected in higher τ and b, when the skill composition of migration shifts more towards the skilled migrants (higher σ). Host countries with relatively more skilled migrants choose to have a more generous welfare system. This result follows because skilled migrants are net fiscal contributors, that is their tax payments exceed what the welfare state spend on them. The hypothesis derived in this section is confronted with data in the next section.

3.3 Empirical Evidence

This section provides empirical evidence in support of the hypothesis that a high proportion of skilled migrants has a positive effect on the welfare-state generosity of the host country, when this generosity is determined in majority voting (regardless of whether the median voter is skilled or unskilled).

3.3.1 Econometric Model

Assume that welfare-state per-capita spending in country i is determined according to the following equation:

$$b_i = \alpha_0 + \alpha_s m_{s,i} + \alpha_u m_{u,i} + X_i^b \beta + \epsilon_i^b, \qquad (3.11)$$

where b is the welfare-state per capita spending; m_s and m_u denote the stocks of skilled and unskilled migrants, respectively; X^b is a vector of other control variables; and ϵ^b is an error term. The respective coefficients of these variables are depicted by α_s, α_u, and β.

Note that there is an endogeneity problem concerning equation (3.11). It is difficult to identify the direction of causality between spending (b_i) and migrations of the two skill types. Indeed, the m's affect b as specified in this equation. But, on the other hand, the generosity of the welfare state also affects the level of migrations of the two types. Specifically, as demonstrated in Cohen and Razin (2008), the generosity of the welfare state has a negative effect on migration of skilled individuals (who are net fiscal contributors), but a positive effects on the migration of unskilled individuals (who are net fiscal beneficiaries), when migration is free. The opposite is true when the welfare state can control the volume and skill composition of migration, as between EU and non-EU countries!

We therefore introduce an instrumental variables for the two skill types of migrants. We assume that bilateral migration stocks for skill level $e = s, u$, between any source-host country pair (i, j) are determined in accordance with the following equation:

$$m_{e,i,j} = a_0 + a_1 Comlang_{i,j} + a_2 Dist_{i,j} + X^m_{i,j} b + \epsilon^m_{i,j}, \qquad (3.12)$$

where $e \in \{s, u\}$, $Comlang$ depicts a dummy variable, with the value 1 if the source and host countries share a common language, and 0 otherwise, $Dist$ captures the geographical distance between the source-host pair, $X^m_{i,j}$ is a vector of other control variables (note that it may be pairwise specific), and ϵ^m is an error term.

Our identification strategy is twofold. First, we choose the distance and common language variables as instruments in equation (3.12). We assume that these two variables are not correlated with the error term in equation (3.11). On the other hand, it is quite plausible and well-established that these variables affect migration as in all gravity equations. Second, we employ a sample of EU countries within which there is free migration, so that the OLS biases concerning the coefficients α_s and α_u in equation (3.11) are unambiguous: upward for the first and downward for the second.[21]

Estimating equation (3.12) yields the fitted values for the bilateral skill-dependent migration stocks. We sum these fitted value across source countries:

$$\widehat{m}_{e,i} = \sum_{j \neq i} \widehat{m}_{e,i,j} \qquad (3.13)$$

where the hat symbol denotes the fitted value estimation.

Therefore, our estimated equation is

$$b_i = \alpha_0 + \alpha_s \widehat{m}_{s,i} + \alpha_u \widehat{m}_{u,i} + X_i^b \beta + \epsilon_i^b. \tag{3.14}$$

3.3.2 Data

Our country sample includes 16 European countries: 14 EU members (Austria, Belgium, Denmark, France, Germany, Italy, the Netherlands, Sweden, Finland, Greece, Ireland, Portugal, Spain, and the U.K.), Norway and Switzerland. Naturally, there is free labor mobility among the EU countries and the two other non-EU countries enjoy bilateral agreements with the EU, practically ensuring free labor mobility.

The dependent variable, b, is social expenditures per capita, in cash or in kind, at constant (2000) prices, PPP converted into U.S. dollars, averaged between 2000 and 2005 (source: OECD.stat). The averaging is done in order to filter out business-cycle variations. Social expenditures encompass all kinds of social public expenditures, in cash or in kind, including, for instance, old age transfers, incapacity related benefits, health care, unemployment compensations and other social expenditures. The stocks of migrants in either country, originated in all of the remaining countries, by education attainment, is our variables of interest. Migrants are at working age (25 and over), defined as foreign born, subdivided into two classes of schooling years: low (0-12), and high (13 and over). We also use lagged stocks of migrant from 1990 (source: Docquier and Marfouk (2006)).

We control for the domestic labor force for each skill level in each country in 2000 (source: Docquier and Marfouk (2006)). This control variable is essential in light of the fact that we employ the number of migrants rather than the proportions of migrants as dependent variables. It also captures the relative power of the different interest groups as manifested in the politico-economic equilibrium, and the effect of migration on wages. Additionally, we include GDP per capita, PPP adjusted to USD in constant prices (2000), averaged between 2000 and 2004 (source: Penn World Tables 6.2). Normally, as a country's production is higher, its ability to dispense welfare-state benefits is higher. Given that the GDP per capita is potentially correlated with migration stocks, its inclusion is necessary. We also control for old age (65+) share in the population, averaged between 2000 and 2007 (source: U.S. Census Bureau, International). Pension benefits capture a vast portion of the welfare-state spending, thus, this variable should be highly positively correlated with the dependent variable, and therefore should be included as a control variable. Given the small number (16) of observations in the main equation (namely, equation (3.14)), we must focus on the two variables of interest ($\widehat{m}_{s,i}$ and $\widehat{m}_{u,i}$) and employ only the few most important exogenous control variables.

3.3.3 Results

The results of the regression are described in Table 3.1.

[insert table 3.1 here]

Consider first the first column. Migrants with high (low) education level have a negative (positive) effect on the welfare-state spending in the host countries. This result could be due to reverse causality (despite the lagging of migration stocks): higher spending reduces the skill composition of migration in free migration regimes as in chapter 2.

To remedy this potential reversal of causality, the second column employs the fitted migration stocks from the first stage regression. The result is exactly the opposite: high (low) skilled migrants have a positive (negative) effect on the level of welfare state spending. This is in line with the conclusions of our parsimonious model: the host country adopts a more generous welfare system, when high-skill migrants (who net fiscal contributors) enter the country. The opposite applies in the case of low-skill migration: the host country is reluctant to increase its welfare generosity, when such migrants who are net fiscal beneficiaries arrive.

Table 3.1	*OLS*	*2SLS*
High skilled migrants(1990, thousands)	−17.532	
	(8.348)*	
Low skilled migrants(1990, thousands)	1.866	
	(0.245)***	
Fitted − high skilled migration(1990, thousands)		49.423
		(14.206)***
Fitted − low skilled migration(1990, *thousands*)		−6.678
		(2.324)**
GDP per capita(2000 − 2004)	368.130	446.791
	(58.054)***	(100.640)***
Old age share(2000 − 2007)	521.675	776.090
	(137.087)***	(140.853)***
High − skilled domestic(2000, *thousands*)	0.045	−0.471
	(0.109)	(0.157)**
Low − skilled domestic(2000)	−0.053	0.047
	(0.015)***	(0.033)
Observations	16	16
R − squared	0.884	0.835

Robust standard errors in parentheses

* significant at 10%; ** significant at 5%; *** significant at 1%

3.4 Conclusion

Skilled migrants typically contribute to the welfare state more than they draw in benefits from it. The opposite holds for unskilled migrants. This suggests that a host country is likely to boost (correspondingly, curtail) its welfare system when absorbing high-skill (respectively, low-skill) migration. In this chapter, we examined this hypothesis. We first constructed a parsimonious politico-economic model. We showed that indeed, higher proportion of skilled migration for a given volume of migration encourages a host country to opt for a more generous welfare-state system. We the confronted this prediction with evidence from European countries. In doing so, we reckon with an endogeneity problem that arises because the skill composition of migration is itself affected by the generosity of the welfare state. We indeed found that the evidence supports the predictions of the theory. Furthermore, if one ignores this endogeneity problem (and employ OLS estimation), the estimates of the effects of skilled and unskilled migration on the generosity of the welfare state are severely biased, so much as to reverse the directions of these effects.

3.5 Appendix 3A: The Effect of the Skill Composition of the Migrants on the Generosity of the Welfare State

Differentiating equation (3.7) with respect to σ, we get:

$$\frac{\partial^2 V_i}{\partial\tau\partial\sigma} = g'' \frac{\partial b}{\partial\sigma}\frac{\partial b}{\partial\tau} + g' \frac{\partial^2 b}{\partial\tau\partial\sigma} - \frac{1}{1-\tau}\left[(1-\tau+\varepsilon)\left[(1-\tau)w_i\right]^{\varepsilon}\frac{\partial w_i}{\partial\sigma}\right]. \quad (3A.1)$$

In chapter 2, it is shown that, when g is linear (more precisely $g'' = 0$ and $g' = 1$), then the expression in equation (3A.1) is positive in the vicinity of $\frac{\partial V_i}{\partial\sigma} = 0$, that is, at the level of σ most preferred by an individual of skill level $i = s, u$. In fact, the reason why we made g nonlinear with $g' \rightarrow \infty$ as $b \rightarrow 0$ is to ensure that all skill types would prefer a positive level of government spending (an Inada condition). But it is quite plausible to make g approximately linear beyond a very small level of b and that b is perfectly substitutable to private consumption (that is, $g'' = 0$ and $g' = 1$). In this case, indeed $\frac{\partial^2 V_i}{\partial\tau\partial\sigma} > 0$.

Chapter 4

The Joint determination of the Generosity of the Welfare State and Migration

4.1 Introduction

In chapter 2, we investigated how the generosity of the welfare state affect the skill composition of migration. This was done first for the case of policy-controlled migration. That is, we studied how the generosity of the welfare state affects the politico-economic determination (through majority voting) of the welfare state. We then investigated how the generosity of the welfare state affects the skill composition of migration, when the latter is not chosen by the native-born in a politico-economic equilibrium but is rather determined by the migrants themselves as there is free migration. In chapter 3, we investigated essentially the reverse causality: that is, how the skill composition of migration affects the politico-economic determination of the generosity of the welfare state.

In this chapter, we relax all the exogeneity restrictions of the two preceding chapters. In particular, we investigate the joint politico-economic determination of the generosity of the welfare state, the volume of migration, and its skill composition. We do this for both the policy-controlled migration regime and the free-migration regime. That is, in the first regime, we let the native-born population choose in a politico-economic process the volume and skill composition of migration, in addition to the generosity of the welfare state; in the second regime - only the generosity of the welfare state is chosen by the naive-born population, as migration is free. The characterization of the politico-economic equilibrium is carried out through numerical simulations.

4.2 Analytical Framework

As before (see equation 2.1), we assume a CRS Cobb-Douglas production function with two labor inputs, skilled and unskilled (L_s and L_u, respectively) and a Hicks-neutral productivity parameter (A):

$$Y = AL_s^{\alpha} L_u^{1-\alpha},\ 0 < \alpha < 1, \tag{4.1}$$

where Y is GDP. The competitive wage rates are given by equation (2.2), and the aggregate labor supplies - by equation (2.3). Total population is given by equation (2.4). We continue to assume a quasi-linear direct utility function which is given by (see equation (3.1)):

$$u_i = c_i - \frac{\varepsilon}{1+\varepsilon} l_i^{\frac{1+\varepsilon}{\varepsilon}} + g(b), \ i = s, u. \tag{4.2}$$

Maximization of this utility function, subject to the budget constraint (3.2), yields the labor supply functions which are given by equation (2.8) The competitive equilibrium wage rates are then given as follows (see equation (2.9)):

$$\begin{gathered} w_s(\sigma, \mu; A, S) = A \left(\alpha \delta^{\varepsilon} \theta^{1-\alpha}\right)^{\frac{1}{1+\varepsilon}} \\ w_u(\sigma, \mu; A, S) = A \left((1-\alpha) \delta^{\varepsilon} \theta^{-\alpha}\right)^{\frac{1}{1+\varepsilon}}, \\ \text{where } \delta \equiv \alpha^{\alpha} (1-\alpha)^{1-\alpha} \\ \text{and } \theta \equiv \frac{1 - S + (1-\sigma)\mu}{S + \sigma\mu}. \end{gathered} \tag{4.3}$$

[We naturally continue to assume that equation (2.10) holds, so that $w_s > w_u$.]

Substituting l_i (and w_i) into the direct utility function yields the indirect utility function of an individual of skill level i ($i = s, u$) as follows (see equation (3.6)):

$$V_i\left(\tau,\sigma,\mu;A,S\right)=\frac{1}{1+\varepsilon}\left[(1-\tau)w_i\left(\tau,\sigma,\mu;A,S\right)\right]^{1+\varepsilon}+g\left[b\left(\tau,\sigma,\mu;A,S\right)\right], \tag{4.4}$$

where w_i is given by equation (4.3) and b is given by the government budget constraint (see equation (2.5)):

$$\begin{aligned} b &= \frac{\tau Y.}{N} \\ &= \frac{\tau\left(S+\sigma\mu\right)^{\alpha}\left(1-S+\left(1-\sigma\right)\mu\right)^{1-\alpha}(1-\tau)^{\varepsilon}}{1+\mu} \\ &\quad \cdot\left[w_s(\tau,\sigma,\mu;A,S)\right]^{\varepsilon\alpha}\left[w_u(\sigma,\mu;A,S)\right]^{\varepsilon(1-\alpha)} \\ &= \frac{\tau(1-\tau)^{\varepsilon}\alpha^{\varepsilon\alpha}\left(1-\alpha\right)^{\varepsilon(1-\alpha)}A^{1+\varepsilon}\left(S+\sigma\mu\right)^{\alpha}\left(1-S+\left(1-\sigma\right)\mu\right)^{1-\alpha}}{1+\mu} \end{aligned} \tag{4.5}$$

(Recall that the size of the native-born population N, is normalized to one.) Note from equation (4.5) that b is maximized when $\tau=\frac{1}{1+\varepsilon}$ (the Laffer point), so that it will never pay to anyone (skilled or unskilled) to set τ beyond this point.

4.3 Controlled Migration

We first consider the case where the volume of migration (μ) and its skill composition (σ) are controlled b the native-born population, in addition to the tax rate (τ). In this case, the most preferred policy triplet (τ,σ,μ) by individual i, denoted by $\left(\tau_i^c,\sigma_i^c,\mu_i^c\right)$, is the triplet which maximizes the indirect utility function of individual i. This triplet is characterized by the following three first-order conditions (specifying for simplicity that $g(b) = \ln(b)$):

$$\frac{\partial V_i}{\partial \tau} = -(1-\tau)^{\varepsilon} w_i^{1+\varepsilon} + \frac{1}{b}\frac{\partial b}{\partial \tau} = \begin{cases} 0 & \text{for } 0 < \tau < 1 \\ \leq 0 & \text{for } \tau = 0 \end{cases} \tag{4.6}$$

$$\frac{\partial V_i}{\partial \sigma} = [(1-\tau)w_i]^{\varepsilon}(1-\tau)\frac{\partial w_i}{\partial \sigma} + \frac{1}{b}\frac{\partial b}{\partial \sigma} = \begin{cases} 0 & \text{for } 0 < \sigma < 1 \\ \geq 0 & \sigma = 1 \\ \leq 0 & \sigma = 0 \end{cases} \tag{4.7}$$

$$\frac{\partial V_i}{\partial \mu} = [(1-\tau)w_i]^{\varepsilon}(1-\tau)\frac{\partial w_i}{\partial \mu} + \frac{1}{b}\frac{\partial b}{\partial \mu} = \begin{cases} 0 & \text{for } 0 < \mu < 1 \\ \geq 0 & \mu = 1 \\ \leq 0 & \mu = 0 \end{cases} . \tag{4.8}$$

When the skilled form the majority of the native-born population (namely, $S > \frac{1}{2}$), then their most-preferred triplet could constitute the politico-economic equilibrium. That is, the triplet $(\tau_i^c, \sigma_i^c, \mu_i^c)$ is the politico-economic equilibrium triplet and is given by equations (4.6)-(4.8) for $i = s$. Note that because we assumed that $g\prime \to \infty$ as $b \to 0$, it follows from equation (4.6) that τ_s^c will be positive. Naturally, τ will also be below the Laffer level $\frac{1}{1+\varepsilon}$. In the simulations, we choose parameter values that yield positive σ and μ.

When the unskilled constitute the majority of the native-born population (namely, $S < \frac{1}{2}$), then their most-preferred policy triplet $(\tau_u^c, \sigma_u^c, \mu_u^c)$ is the politico-economic equilibrium policy triplet. Naturally, they will choose to admit only skilled migrants, that is $\sigma_u^c = 1$. This is because a larger proportion of skilled migrants raises both the wage of the unskilled, w_u, and the benefits[22]; see equations (4.3), (4.5), and (4.7). Once the unskilled set $\sigma_u^c = 1$, then raising the volume of migration also increases the unskilled wage and the benefit; see equations (4.8), (4.3), and (4.5). Therefore, the unskilled always set $\mu_u^c = 1$. Naturally, like the skilled, they choose the level of tax below the Laffer level. The simulations confirm also the intuition that the unskilled set a higher tax rate than the skilled (that is, $\tau_u^c > \tau_s^c$).

4.4 Free Migration

As in section 2.3.1, we now assume hat no restriction on migration (namely on σ and μ) can be imposed by the host country. However, the native-born population continues to determine in a politico-economic process the generosity of the welfare state. But now this has to reckon with the fact that the decision on the generosity of the welfare state (namely, the (τ, b) parameters) cannot be accompanied by any restrictions on migration (namely, the (σ, μ) parameters). The latter are determined by the migrants themselves.

As in section 2.3.2, the host country faces an upward sloping supply curve, $Q_i(V)$, of potential migrants for each skill level i. Specifically, $Q_i(V)$ is the number of migrants of skill level i who will migrate to the host country, if the level of utility that an individual of skill level i living in the host country enjoys is V. (Note that migrants and native-born of the same skill level enjoy the same level of utility.) Assuming that the reservation utility of potential migrants of skill level i is uniformly distributed over the interval $[f_i, h_i]$, then $Q_i(\cdot)$ is given by:

$$Q_i(V_i) = \begin{cases} 0 & \text{if } V_i < f_i \\ \frac{V_i - f_i}{h_i - f_i} & \text{if } f_i \leq V_i \leq h_i \\ 1 & \text{if } V_i > h_i, \end{cases} \tag{4.9}$$

where the number of potential migrants of each skill level is normalized to one. Naturally, we assume that $f_u < f_s$ and $h_u < h_s$, so that the reservation utility of the potential skilled migrants is on average higher than that of the potential unskilled migrants.

Thus, if the utility level enjoyed in the host country by individual of skill level i is V_i, then:

$$\mu = Q_u(V_u) + Q_s(V_s) \tag{4.10}$$

and

$$\sigma = \frac{Q_s(V_s)}{Q_u(V_u) + Q_s(V_s)}. \tag{4.11}$$

With free migration, the native-born population chooses by majority voting only the level of τ, as σ and μ are now determined by the free migration equations (4.10)-(4.11) (note that once τ is chosen, the benefit b is determined by the government budget constratint). Formally, if the skilled constitute the majority of the native-born population (namely, if $S > \frac{1}{2}$) then the politico-economic equilibrium level of the tax rate, denoted by τ_s^F, is a part of a solution to the following optimization problem:

$$\max_{\{\tau, V_s, V_u\}} V_s$$

subject to

$$\begin{aligned} V_s &= V_s(\tau, \sigma, \mu; A, S) \\ V_u &= V_u(\tau, \sigma, \mu; A, S) \\ b &= b(\tau, \sigma, \mu; A, S) \end{aligned}$$

where the functions $V_s(\cdot)$ and $V_u(\cdot)$ are defined by equation (4.4); the function $b(\cdot)$ is defined by equation (4.5); σ and μ are defined by equations (4.10) and (4.11), respectively; and the functions $Q_i(\cdot)$ are defined by equation (4.9).

Similarly, if the unskilled constitute the majority of the native-born population (namely, if $S < \frac{1}{2}$), then the politico-economic equilibrium tax rate, denoted by τ_s^F, is a part of a solution to a similar optimizing problem, except that V_u replaces V_s in the objective function.

4.5 Effects of Productivity and Skill Composition: Numerical Simulations

We seek to study the effect of changes in the productivity factor, A, and in the skill composition of the native-born population, S, on the politico-economic equilibrium policy. With controlled migration, this policy constitutes a triplet (τ, σ, μ), consisting of the generosity of the welfare state, τ (and b); the volume of migration, μ, and its skill composition, σ. With free migration, this policy consists of a single tool - the generosity of the welfare state, τ (and b). For this purpose, we resort to numerical simulations.

[insert figure 4.1 here]

[insert figure 4.2 here]

Consider first the case of policy-controlled migration. Figures 4.1 and 4.2 depict the effect of productivity on the policy triplet for the cases in which the majority of the native-born population is skilled and unskilled, respectively. In the first case, Figure 4.1 suggests that as productivity rises the skilled majority opts to raise the value of migration (μ), eventually to its highest allowable level, namely, one; and to decrease the share of skilled migrants in the total volume of migration, eventually to zero. This is because as productivity rises, the skilled wage rises and the depressing effect of skilled migration and the boosting up effect of unskilled migration becomes more pronounced. Given the diminishing marginal utility of b (recall that g is concave), a richer economy (that is, an economy with higher productivity) would opt to lower the tax rate. (Note also that a richer economy can finance the same level of b with a lower tax rate.)

Turning to the case in which the majority of native-born population is unskilled (namely, $S < \frac{1}{2}$), Figure 4.2 confirms indeed our general finding in section 4.3 that $\sigma_u^c = \mu_u^c = 1$. As for the tax rate, it falls when the economy becomes richer (more productive), as in the case where the majority of the native-born population is skilled, still allowing a higher level of b.

Figure 4.3 depicts the effect of the skill-composition of the native-born on the migration and welfare policies under controlled migration. Note that as S varies from 0 to 0.5, it is the unskilled who are the majority; and as S enters in the range between 0.5 and 1, it is the skilled who are the majority. This is why there are "jumps" in the graphs (namely, the policy variables) at $S = 0.5$. Starting with the range of S between 0 and 0.5 (where the unskilled are the majority), Figure 4.3 confirms the analytical result of section 4.3 that $\sigma_u^c = \mu_u^c = 1$. As S rises, the economy becomes more productive and the unskilled majority opts for a lower tax rate. Moving to the range of S between 0.5 and 1, note that as S rises the wage of the skilled majority declines (see equation (4.3)). To counter this, this majority lowers σ and w_s rises (see equation (4.3)). Note also that when σ is relatively low, then an increase in μ raises w_s. This explains the positive slope of the graph of μ in Figure 4.3. The skill composition of the native-born population does not seem to have much of an effect on tax rate, which remains fairly stable.

[insert figure 4.3 here]

Figures 4.4, 4.5 and 4.6 are analogous to figures 4.1, 4.2 and 4.3, respectively for the case of free migration. In all of these figures, the migration volume μ reaches naturally its highest allowable level, namely one. As productivity rises, the wages of both skilled and unskilled rises. Both types of individuals would like to immigrate to the welfare state. But because the total number of migrants reaches its highest allowable level and cannot rise any further, σ remains fairly stable, both when the skilled or the unskilled are the majority (figures 4.4 and 4.5 respectively). In both cases the tax rate diminishes slowly but still enabling to finance a higher b (because of higher productivity).

[insert figure 4.4 here]

[insert figure 4.5 here]

[insert figure 4.6 here]

Figure 4.6 suggests that as the share of the skilled in the native-born population rises the skill composition of the immigrants tilts towards the unskilled. This is because the higher portion of the skilled among the native-born population depresses the wage of the skilled and increases the wage of the unskilled. Turning to the tax-transfer policy, there are two conflicting effects as long as the unskilled form the majority (namely, $S < 0.5$). On the one hand, the latter who are net beneficiary of the welfare state would like to raise τ and b. But on the other hand, such a raise would bring in more unskilled migrants and fewer skilled migrants, thereby depressing the unskilled wage. As the share of the skilled rises (and with it rises also the unskilled wage) the depressing effect of the unskilled migration on the unskilled wage becomes more pronounced. For the parameter values employed in the simulations, this wage-depressing effect of unskilled migration dominates the desire to increase the generosity of the welfare state; and the unskilled majority opts for lowering τ (though b remains fairly stable, because the economy becomes more productive when S rises). When the skilled become a majority (namely, $S > 0.5$), they opt to attract more unskilled migrants who boost up the skilled wage, in order to counter the depressing effect of a higher S on skilled wage. The skilled majority votes for higher taxes and transfers.

Comparing the controlled-migration regime with the free migration, our simulations indicate a clear-cut pattern with respect to the skill-mix of migration. When the skilled are the majority they tend to restrict the migration of the competing skilled workers. Consequently, the share of skilled migrants in the migrants' population (namely σ) rises when migration controls are lifted. Analogously, when the unskilled are the majority, they opt to restrict the migration of competing unskilled workers. When migrants controls are lifted, more unskilled migrants come in (that is, σ falls). Also, as expected, the tax rate (τ) falls when migration controls are lifted. With free migration the native-born are expected to set high taxes, because the proceeds of these taxes serve to finance also benefits to uncontrolled number and quality of migrants[23].

figure captions:

Figure 4.1: Effects of Productivity under Controlled Migration: Skilled

are the majority.

Figure 4.2: Effects of Productivity under Controlled Migration: Unskilled are the majority.

Figure 4.3: Effects of the Skill-Composition of the Native-Born under Controlled Migration.

Figure 4.4: Effects of Productivity under Free Migration: Skilled are the majority.

Figure 4.5: Effects of Productivity under Free Migration: Unskilled are the majority.

Figure 4.6: Effects of the Skill-Composition of the Native-born under Free Migration.

4.6 Conclusion

We investigate in this chapter the joint politico-economic determination of the generosity of the welfare state, the volume of migration, and its skill composition. We consider two regimes. In one regime, the native-born control both the tax-benefit variables and the volume and skill composition of migrants. In the second regime, migration is free (both skill types of migrants are freely allowed in) and the native-born control only the tax-benefit variables.

We present simulation results. Of a particular interest is the comparison between the controlled and free migration regimes. When the skilled are the majority they tend to restrict the migration of the competing skilled workers. Consequently, the share of skilled migrants in the migrants' population (namely, σ) rises when migration controls are lifted. Analogously, when the unskilled are the majority, they opt to restrict the migration of competing unskilled workers. When migration controls are lifted more unskilled migrants come in (that is, σ falls). Also, as expected, the tax rate (τ) falls when migration controls are lifted. With free migration the native-born are reluctant to set high taxes, because the proceeds of these taxes serve to finance also benefits to uncontrolled number and quality of migrants (the "fiscal leakage" effect).

We by and large perceived the generosity of the welfare states by its fiscal parameters, such as taxes and benefits. However, a welfare state is typically characterized by other off-budget elements such as minimum wage, labor laws, etc.[24]. The effect of these labor market institutions on migration by skill are worthy of future research. Another topic worthy of future research is the empirical implications of our theoretical result that shows a sharp change in migration policies as the decisive voter changes from one skill type to another.

4.7 Appendix 4A: The Simulation Model

4.7.1 4A.1 The Free Migration Case

Consider the case where the skilled constitute the majority in the native-born population (namely, $S > \frac{1}{2}$). The utility function is of Cobb-Douglas from and the distribution function of reservation utilities is uniform.

The politico-economic equilibrium tax rate , τ_s^F, is obtained by solving the following maximization problem:

$$\max_{\{\tau,V_s,V_u,\mu,\sigma,b,Q_s,Q_u\}} \quad V_s$$

subject to

$$V_s = \frac{((1-\tau)A)^{1+\varepsilon}\alpha^{1+\varepsilon\alpha}(1-\alpha)^{\varepsilon(1-\alpha)}\left(\frac{1-S+(1-\sigma)\mu}{S+\sigma\mu}\right)^{1-\alpha}}{1+\varepsilon} + \ln(b) \quad (4.12)$$

$$V_u = \frac{((1-\tau)A)^{1+\varepsilon}\alpha^{\varepsilon\alpha}(1-\alpha)^{1+\varepsilon(1-\alpha)}\left(\frac{S+\sigma\mu}{1-S+(1-\sigma)\mu}\right)^{\alpha}}{1+\varepsilon} + \ln(b) \quad (4.13)$$

$$b = \frac{\tau(1-\tau)^{\varepsilon}\alpha^{\varepsilon\alpha}(1-\alpha)^{\varepsilon(1-\alpha)}A^{1+\varepsilon}(S+\sigma\mu)^{\alpha}(1-S+(1-\sigma)\mu)^{1-\alpha}}{1+\mu} \quad (4.14)$$

$$\mu = Q_s + Q_u \quad (4.15)$$

$$\sigma = \frac{Q_s}{Q_s+Q_u} \quad (4.16)$$

$$Q_u = \frac{V_u - a_u}{b_u - a_u} \quad (4.17)$$

$$Q_s = \frac{V_s - a_s}{b_s - a_s}, \quad (4.18)$$

where a_u, b_u, a_s, b_s are parameters. Note that the equations for Q_u and Q_s follow from the uniform distributions over $[a_u, b_u]$ and $[a_s, b_s]$, respectively.

We have 8 control variables and 7 constraints. In the case the unskilled constitute the majority, replace V_s by V_u in the objective function.

4.7.2 4A.2 The Controlled Migration Case

Consider the maximization problem of subsection 4A.1. The controlled migration case is the solution to a similar maximization problem, deleting constraints (4.15)-(4.18).

Part II

Migration and the Welfare State: Dynamic Politico-Economic Theory

Chapter 5

Migration and Inter-generational Distribution Policy

5.1 Introduction

So far, we dealt only with intra-generational issues associated with migration, and the analytic frameworks were static. We now turn to study inter-generational redistributions (from young to old, and vice versa). In doing so, we highlight the role of demography in shaping up migration and inter-generational distribution policies (such as social security).

Indeed, 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. An overlapping generations model is employed and voting about current migration and social security policy is jointly conducted each period (where people live for two periods). We employ a Markov 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 flowing period, and so on.

We study how a more generous old-age social security system affects the volume of migration (in analogy to chapter 2); how the volume of migration affects the old-age security system chosen by the native-born (in analogy to chapter 3); and how the generosity of the old age social security system and the volume of migration are jointly determined by the native-born population (in analogy to chapter 4)[25].

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

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

Our analysis of the dynamic interactions between the political and economic decisions is conducted in an analytical framework, developed by Krussel and Rios-Rull (1996) and Krusell, Quadrini, and Rios-Rull (1997). This chapter also follows Forni (2006), who provides a neat analysis of Markov sub-game perfect equilibrium of pay-as-you-go social security system in an overlapping generations model with capital accumulation[26].

5.2 Overlapping Generations Model with Repeated Voting

Consider an the economy which is populated by overlapping generations of identical individuals. Individuals live for two periods. When young, the representative individual works and makes labor-leisure and saving-consumption decisions. When old, the individual retires, and receives social security benefits and her actual savings. The tax-transfer system is "pay-as-you-go" (PAYG), where in every period the government levies a flat tax on the young's wage income, which fully finances the social security benefits paid to the old. Migrants enter the economy when young, and gain the right to vote only in the next period, when old. They are identical to the native-born except that they have a higher population growth rate. Migrants are fully integrated into the social security system upon arrival into the country. Offspring of migrants are like native-born in all respects, including having the same rate of population growth.

We assume that the utility of the representative young individual is quasi-linear within each period and logarithmic intertemporally, that is[27]:

$$U^y(c_t^y, c_t^o, l_t) = \log\left(c_t^y - \frac{\varepsilon}{1+\varepsilon} l_t^{\frac{1+\varepsilon}{\varepsilon}}\right) + \beta \log\left(c_{t+1}^o\right) \tag{5.1}$$

$$U^o(c_{t+1}^o) = c_t^o, \tag{5.2}$$

where U^y and U^o are the utility functions of young and old individuals, respectively, c_t^y is the consumption of the young in period t, c_t^o is the consumption of the old (born in period $t-1$) in period t, l_t is the labor supply of the young in period t, $\beta \in [0,1]$ is the discount factor, and $\varepsilon > 0$ is a parameter which equals the labor supply elasticity with respect to the wage rate.

The transfer payment to the old at period t, b_t, is financed by collecting a flat income tax rate, $\tau_t \in [0,1]$, from the young individual's wage income at the same period, $w_t l_t$, where w_t denotes the wage rate in period t. The interest rate and savings of the young at period t are given by r and s_t respectively. The budget constraints of the young in period t are given by:

$$s_t + c_t^y = (1-\tau_t)w_t \tag{5.3}$$

$$c_{t+1}^o = (1+r)s_t + b_t. \tag{5.4}$$

In order to simplify the analysis we assume that factor prices are exogenously fixed, which can arise as an equilibrium outcome through international capital mobility and constant returns to scale production technology. The production function which is thus effectively linear in labor, N_t, and capital, K_t is given by

$$Y_t = wL_t + (1+r)K_t, \tag{5.5}$$

where Y_t is gross output. The wage rate, w, and the gross rental price of capital, $1+r$, are determined by the marginal productivity conditions for factor prices and are already substituted into the production function. Capital is assumed to fully depreciate at the end of the production process.

A worker can be either native-born or migrant, perfectly substitutable with each other, and with equal productivity. The migration quotas is expressed as a certain percentage of the number of young individuals in the native-born population, $\gamma \in [0,1]$[28]. Labor supply is therefore

$$N_t = L_t l_t (1 + \gamma_t), \tag{5.6}$$

where L_t is the number of young individuals in the native-born population (old people do not work).

We assume that the native-born population has a lower population growth rate, $n \in [-1,1]$, than that of the migrant population, $m \in [-1,1]$, that is, $n < m$. The number of young native-born individuals in period t is thus

$$L_t = L_{t-1}(1+n) + \gamma_{t-1} L_{t-1}(1+m). \tag{5.7}$$

In addition, migrants are also assumed to contribute to, or benefit from, the social security system in the same way as the native-born. We assume that the social security system is of the PAYG type, so that benefits are equal to contributions, period-by-period:

$$b_{t+1} L_t (1+\gamma_t) = \tau_{t+1} w l_{t+1} L_{t+1}(1+\gamma_{t+1}). \tag{5.8}$$

Re-arranging yields:

$$b_{t+1} = \frac{\tau_{t+1} w l_{t+1}[(1+n) + \gamma_t(1+m)](1+\gamma_{t+1})}{(1+\gamma_t)}. \tag{5.9}$$

The saving-consumption and labor-leisure decision of young individuals are made by maximizing their utility while taking the policy choices as given. This gives rise to the following saving and labor supply equations:

$$s_t = \frac{1}{1+\beta}\left(\beta\frac{1}{1+\varepsilon}wl_t(1-\tau_t) - \frac{b_{t+1}}{1+r}\right) \tag{5.10}$$

$$l_t = w(1-\tau_t)^{\varepsilon}. \tag{5.11}$$

Substituting for s_t and l_t in equations (5.10) and (5.11) respectively, into equation (5.1), the indirect utility function of a young individual can be written as:

$$V^y(\tau_t, b_{t+1}) = \frac{1+\beta}{1+\varepsilon}\log\left[(w(1-\tau_t))^{1+\varepsilon} + \frac{b_{t+1}}{1+r}\right]. \tag{5.12}$$

Substituting for b_t in equations (5.9) into equation (5.12), yields the indirect utility functions of an old individual:

$$V^o(s_{t-1}, \tau_t, \gamma_{t-1}, \gamma_t) = \frac{\tau_t w\left(w(1-\tau_t)\right)^{\varepsilon}[(1+n)+\gamma_{t-1}(1+m)](1+\gamma_t)}{(1+\gamma_{t-1})} + s_{t-1}(1+r). \tag{5.13}$$

As is evident from the last equation, the old individual in period t prefers that the migration quota, γ_t, be as large as possible, because a larger migration quota would raise the total amount of tax collected, and thus the social security benefits received. The old preferable tax rate is the "Laffer point" tax rate, where the tax revenues, and therefore the social security benefits, are maximized. It is straightforward to verify that the tax rate at that point is equal to $\frac{1}{1+\varepsilon}$.

The young individual prefers naturally that the current tax rate be as low as possible, namely zero. Concerning migration quotas, the young preferences are ambiguous. Larger quota increases the number of young in the next period more than it increases the number of the old in the next period, due to the assumption that migrants have a higher birth rate than that of the native-born ($m > n$). This leads to two conflicting effects on next period's benefits (b_{t+1}): On the one hand, a larger quota increases the number of next period old recipients of social security but the total sum of next period social security benefits increases even more, thereby leading to higher next period social security benefits per old individual. On the other hand, because migrants gain the right to vote in the second period of their life, when old, the quota influences the identity of next period decisive voter. By voting for a low enough level of migration quota (below a certain a threshold level), the current young voter generates a majority of old voters in the next period which maintain the political interest in her favor when old. These two conflicting effects of migration quota lead the current young voter to favor the largest possible quota (due to its positive effect on next period's benefits), but which still does not destroy the majority of the old in the next period.

5.3 A Political-Economic Equilibrium: Definition

We employ a subgame-perfect Markov equilibrium of perfect foresight as our equilibrium concept (see Krusell and Rios-Rull (1996)). Note that in each period t, the state of the economy is summarized by one state variable, γ_{t-1}. Given this state variables, we define a pair of policy rules (concerning the tax rate and the migration quota) which depend on the state variable. The policy variables in period t, which are the tax rate, τ_t, and the migration quotas, γ_t, (denoted as the policy outcome) have to maximize the decisive voter's indirect utility function, V^i, while taking into account that next period politico-economic policy rules depend on the current state variable, that is, the current migration quota, and the saving decision in period t. Current and future politico-economic policy rules, as a function of the state variable must be identical. Thus, the subgame-perfect Markov equilibrium notion states that the expected politico-economic policy function, which depends on the current state variables, must be self-fulfilling. Formally:

Definition 1 *.A Markov perfect political equilibrium is defined as a pair of policy decision rules,* $\Pi = (T, G)$*, and private decision rule,* S*, where* T

is the tax policy rule, $\tau_t = T(\gamma_{t-1})$*, and* G *is the migration policy rule,* $\gamma_t = G(\gamma_{t-1})$*, and* $S : [0,\infty) -> [0,\infty)$*, is the saving decision rule,* $s_t = S(\pi_t, \pi_{t+1})$*, such that the following functional equations hold:*

1. $\widehat{\Pi}(\gamma_{t-1}) = \arg\max_{\pi_t} V^i(\gamma_{t-1}, \pi_t, \pi_{t+1})$*, subject to* $\pi_{t+1} = \Pi(\gamma_t)$*.*

2. $S(\pi_t, \pi_{t+1}) = \frac{1}{1+\beta}\left(\frac{\beta}{1+\varepsilon} w l_t (1-\tau_t) - \frac{b_{t+1}}{1+r}\right)$*, with* $\pi_{t+1} = \Pi(\gamma_t)$*.*

3. The fixed-point condition requires that if next period policy outcome is derived by the pair of policy decision rules – Π*, the maximization of the indirect utility of the current decisive voter subject to the law of motion of the capital stock, will reproduce the same law of motion,* $\widehat{\Pi}(\gamma_{t-1}) = \Pi(\gamma_{t-1})$*, as in 1.*

5.4 Characterization of the Equilibrium

Because migrants gain the right to vote only in the second period of their life, the next period ratio of old to young voters who are allowed to vote, denoted by u_{t+1}, is given by:

$$u_{t+1} = \frac{(1+\gamma_t)}{(1+n) + \gamma_t(1+m)}. \tag{5.14}$$

Assuming that in case of a tie the old will be the decisive, the condition, $u_{t+1} < 1$, ensures a majority of young individuals in the next period, while the condition, $u_{t+1} \geq 1$, ensures a majority of old individuals. We thus employ u_t as a state variable in period t (instead of γ_{t-1}), because this variable determines the next period decisive voter. We now derive the equilibrium policy rule.

If the old-young ratio is smaller than one ($u_t < 1$), the decisive voter in the current period is a young voter. She naturally favors a zero tax rate, but has two conflicting considerations regarding the desired migration quota. On the one hand, if she chooses the maximum allowed quota ($\gamma_t = 1$), there will be more working people in period $t+1$, and therefore, the tax revenue, which will be collected from a larger work force and would serve to support retirement benefits, will increase. The young decisive voter in period t, who will be old in period $t+1$, would benefit from the more generous social security benefits. On the other hand, because the migration policy is extremely liberal, the decisive voter in period $t+1$ will be a young voter. This voter will want to see the tax rate in period $t+1$ reduced to zero; hence no social security benefits will be offered whatsoever in period $t+1$. There is a threshold level of the migration quotas, $\gamma_t = -\frac{n}{m}$, which is exactly the level of the migration that would equate the number of old and the number of young in period $t+1$. Thus, by choosing the migration quota at this level, the decisive voter in period t would finely balance the two conflicting effects on period $t+1$ social security benefits, so as to maximize these benefits. Observe that the young voter's preferred migration quota is chosen *strategically* to ensure that the identity of the decisive voter in the next period is old.

If the old-young ratio is higher or equal to one ($u_t \geq 1$), the decisive voter in the current period is an old voter. She will naturally vote for the most liberal migration policy possible, because only the current social security benefits matter to her. The migration quota is therefore equal to its maximum level (i.e., one); see Figure 5.1. The tax rate is set at the "Laffer point", that is, at $\frac{1}{1+\varepsilon}$, because in this way the current social security benefits are maximized.

The subgame-perfect Markov political equilibrium and its possible equilibrium paths, which depend on the birth rates of the native-born and migrant populations and the saving of the young of the preceding period, can be formalized as follows. There are three possible equilibrium paths, depending on the population growth rates of the native-born and immigrant population, as follows: (1) The first case of interest is when $n > 0$ (the native-born young form the majority). There is no taxation/social security benefits. There are two other cases in which $n < 0$ (and the old native-born form the majority) that are unrealistic and we discuss them only briefly in order to understand the logics of the model. (2) If $m + n < 0$, migration quota is set at its maximum, and there is a positive level of taxation/social security benefits (the "Laffer point" tax rate). (3) If $n < 0$ and $m + n > 0$, there is a "demographic switching" equilibrium path, where some positive level of migration always prevails while there is a cycling taxation/social security policy; in periods where the decisive voter is old, the economy is fully opened to migration and there is a positive level of taxation (the "Laffer point" tax rate); whereas in periods where the current decisive voter is young, there is no taxation/social security benefits and a more restrictive policy towards migration ($\gamma = -\frac{n}{m}$). The formal proof can be found in Sand and Razin (2007).

[insert figure 5.1 here]

[insert figure 5.2 here]

The first equilibrium path is the one where the population growth rates of the native-born and the migrant are both positive, that is, n, $m > 0$. In this case, the level of social security benefit is zero. This is due to the fact that for every level of migration, the number of next period young voters exceeds the number of next period old voters. Therefore, the decisive voter in the current and all the following periods is a young voter, and her preferences are for zero labor tax. The young voter is indifferent concerning the level of migration, because it has no influence on her current income, nor on the next period decisive voter's identity. The resulting equilibrium path is one in which there is a majority of young voters, and the social security system is dismantled, for ever.

The second equilibrium path occurs when the sum of the population growth rates of the native-born and migrant is negative, $m + n < 0$. In this case, the number of next period old voters always exceeds the number of next period young voters. Thus, along this equilibrium path, a majority of old will always prevail, which validates a permanent existence for the social security system and a maximum flow of migrants. The tax rate is set at the "Laffer" level.

The third equilibrium path is obtained when the native-born and migrant's population growth rates are such that $n < 0$, and $m + n > 0$. This equilibrium path is characterized by a cycling taxation/social security policy over two consecutive periods. Some positive level of migration always prevails. This is due to a "demographic switching" strategy of the current and next period young voters. The reason is that when there is a majority of old, their preferable immigration quota is at the maximum and the tax rate is at the "Laffer point". Because $m + n > 0$ and the old decisive voter allows as much as possible immigrants, the number of next-period young voters exceed the number of next-period old voters. Thus, in the next period the decisive voter must be the young. This voter opts for a zero tax rate, and does vote strategically on migration levels. This means setting migration at the threshold level , $\gamma_t = -n/m$. The identity of the next-period decisive voter will change from young to old (a possibility of such demographic changes exists because the native-born birth rate is negative). This creates a cycling taxation/social security policy, with a certain level of migration, depending on the identity of the decisive voter. The equilibrium paths depend on the native-born and migrant's birth rate.

figure captions:

Figure 5.1 - Migration Policy Rule

Figure 5.2 - Tax Policy Rule

5.5 The Extended Analytical Framework with Capital Accumulation

We now drop the assumption that factor prices are fixed (through, say, the small open economy assumption); instead they are determined by the capital-labor ratio which is in turn determined by savings (capital accumulation) and labor decisions. We continue to employ the basic features of the model used so far.

The economy is populated by overlapping generations of representative individuals, who live for two periods. The tax-transfer system is a "pay-as-you-go", where in every period the government levies a flat tax on the wage income of the young generation and pays social security benefits paid to the old generation. The representative individual makes labor-leisure and saving-consumption decisions, and pays social security taxes in the first period of her life. The individual retires in the second period. The retired individual receives interest income from private savings (made in the first period, when she was young), and social security benefits. Migrants enter the economy when young, and gain the right to vote only in the next period, when old. They have the same preferences as those of the native-born, except for having a higher birth rate. We assume that $n > 0$ is the native-born birth rate, and $m(> n)$ is the birth rate of migrants. On arrival, migrants are fully integrated into the social security system. That is, they pay the social security tax when young, and receive the social security benefits when old. Offspring of immigrants are like native-born in all respects (in particular, they have the same birth rate as the offspring of the native-born). As is standard in such Diamond-type overlapping generations model, the aggregate savings of the current young population generates next period aggregate capital. The latter is used as a factor of production, along with the labor input in the next period. The production function exhibits constant returns to scale. Both the wage rate and the rate of interest are endogenously determined along the equilibrium path.

The utility of the representative young individual is assumed logarithmic,

$$\begin{aligned} U^y(\tau_t, s_t, b_{t+1}) &= Log(wl_t(1-\tau_t) - s_t - \frac{l_t^{1+\varepsilon}}{1+\varepsilon}) + \\ &\quad \beta Log(b_{t+1} + (1+r)s_t), \end{aligned} \tag{5.15}$$

and the utility function of the representative old individual is given by:

$$U^o(s_{t-1}, b_t) = b_t + (1+r)s_{t-1}, \tag{5.16}$$

where τ_t is the tax rate in period t, s_t is the individual saving in period t, b_{t+1} is the social security benefit in period t+1, l_t is the individual labor supply in period t, w_t is the wage rate in period t, and r_t is the interest rate in period t.

The production function is of a Cobb-Douglas form, which is assumed to use both labor and capital as its factors of production:

$$Y_t = N_t^{1-a} K_t^{\alpha}, \tag{5.17}$$

where K_t is the aggregate amount of capital, $N_t = (1+\gamma_t)l_t$ is the aggregate labor supply (native-born and migrants) in period t, and γ_t is the ratio of migrants to the young native-born population in period t.

The wage rate and interest rate are determined competitively by the marginal productivity conditions (for simplicity, capital is assumed to depreciate completely at the end of the period):

$$w_t = (1-a)(1+\gamma_t)^{-a} l_t^{-a} k_t^{\alpha} \tag{5.18}$$

$$r_t = \alpha(1+\gamma_t)^{1-a} l_t^{1-a} k_t^{\alpha-1} - 1, \tag{5.19}$$

where k_t is capital per (native-born) worker. The balanced government budget constraint is derived as in the preceding section:

$$b_{t+1} = \frac{\tau_{t+1} w_{t+1} l_{t+1}[(1+n) + \gamma_t(1+m)](1+\gamma_{t+1})}{(1+\gamma_t)} \tag{5.20}$$

The saving-consumption decisions of young individuals are made by maximizing their utility, taking the prices policy variables as given, and the labour-leisure decision is given as in the previous section:

$$s_t = \frac{1}{1+\beta}\left(\beta \frac{\varepsilon}{1+\varepsilon} w_t l_t (1-\tau_t) - \frac{b_{t+1}}{1+r_{t+1}}\right), \tag{5.21}$$

$$l_t^{\varepsilon} = w_t(1-\tau_t). \tag{5.22}$$

The market clearing condition requires that domestic savings constitutes domestic investment:

$$s_t = k_{t+1}\left(\frac{1+n+\gamma_t(1+m)}{(1+\gamma_t)}\right) \tag{5.23}$$

Solving equations (5.20) and (5.21) for b_{t+1} and substituting b_{t+1} in equation (5.15) , we can write the indirect utility function of the young as follows.

$$\begin{aligned} V^y(w_t,\tau_t,r_{t+1},\tau_{t+1}) &= Log\left(\tfrac{1}{1+\beta}\tfrac{\varepsilon}{1+\varepsilon}w_t l_t(1-\tau_t)(1+\beta f(\tau_{t+1}))\right) \\ +\beta Log&\left(\tfrac{\beta}{1+\beta}\tfrac{\varepsilon}{1+\varepsilon}w_t l_t(1-\tau_t)(1+\beta f(\tau_{t+1}))(1+r_{t+1})\right), \end{aligned} \tag{5.24a}$$

where $f(\tau_{t+1}) = \frac{\frac{1-\alpha}{\alpha}\frac{1}{1+\beta}\tau_{t+1}}{1+\frac{1-\alpha}{\alpha}\frac{1}{1+\beta}\tau_{t+1}}$,

such that,

$$k_{t+1} = \frac{\beta}{1+\beta}\frac{\varepsilon}{1+\varepsilon}\frac{(1+\gamma_t)w_t l_t(1-\tau_t)(1-f(\tau_{t+1}))}{1+n+\gamma_t(1+m)} \tag{5.25}$$

$$l_t^{\varepsilon} = w_t(1-\tau_t) \tag{5.26}$$

$$l_{t+1}^{\varepsilon} = w_{t+1}(1-\tau_{t+1}). \tag{5.27}$$

Now, substituting b_t from equation (5.20) and k_t from equation (5.23), and using equation (5.16), the indirect utility function of the old is:

$$V^o(\gamma_{t-1}, k_t, w_t, r_t, \tau_t) = \frac{\tau_t w_t l_t[(1+n)+\gamma_{t-1}(1+m)](1+\gamma_t)}{(1+\gamma_{t-1})} + (1+r_t)k_t\left(\frac{1+n+\gamma_{t-1}(1+m)}{(1+\gamma_{t-1})}\right), \tag{5.28}$$

such that,

$$l_t^{\varepsilon} = w_t(1-\tau_t). \tag{5.29}$$

As expected, the old individual favors a maximizing-revenue level of the social security tax rate (the "Laffer Point"), $\tau^* = \frac{\varepsilon}{1+\varepsilon}$, and the largest immigration quota,$\gamma = 1$.

5.5.1 Politico-Economic Equilibrium

The Markov sub-game perfect equilibrium is defined as follows.

Definition 2 *A Markov subgame perfect political equilibrium is a vector of policy decision rules,* $\Pi = (T, G)$*, and private decision rule,* S*, where* $T : [0,1] \longrightarrow [0,1]$*, is the tax policy rule,* $\tau_t = T(k_t)$*, and* $G : [0,1] \longrightarrow [0,1]$*, is the immigration policy rule,* $\gamma_t = G(k_t)$*, and* $S(k_t)$ *is the saving decision rule so that* $k_{t+1} = S(\pi_t, k_t)$*, such that the following functional equations hold:*

(1) $\widehat{\Pi}(k_t) = \arg\max_{\pi_t} V^i(\gamma_{t-1}, \pi_t, \pi_{t+1})$

subject to $\pi_{t+1} = \Pi(\gamma_t, S(\pi_t, k_t))$.

(2) $S(k_t) = \frac{\beta}{1+\beta}\frac{\varepsilon}{1+\varepsilon}\frac{(1+\gamma_t)w_t l_t(1-\tau_t)(1-f(\tau_{t+1}))}{1+n+\gamma_t(1+m)}$,

with $\tau_{t+1} = T(S(k_t))$.

(3) A fixed-point condition requiring that given the next period policy outcome (the vector of policy decision rules- $\Pi(k_{t+1})$*, the maximization of the indirect utility of the current decisive voter, subject to the law of motion of the capital stock, will reproduce the same law of motion,* $\widehat{\Pi}(k_t) = \Pi(k_t)$*, (as in condition (1)).*

This means that in equilibrium, policy variables have to maximize the decisive voter's indirect utility function, while taking into account the law of motion of capital, and the expectations that the next period decision rules depend on next-period capital per (native-born) worker, which is equal to the savings in period t.

5.5.2 Policy Rules With Social Security

With social security we can show that the equilibrium tax and migration policy rules are:

$$T(k_t) = \begin{cases} \tau(k_t) & if \quad k_t \in [k(\overline{\tau}), k(0)] \\ 0 & otherwise \end{cases} \tag{5.30}$$

$$G(k_t) = \begin{cases} 1 & if \quad k_t \in [k(\overline{\tau}), k(0)] \\ \gamma^* & otherwise \end{cases} \tag{5.31}$$

$$S(\tau_t,\gamma_t,k_t,\tau_{t+1}) = \begin{cases} S(\tau(k_t),1,k_t,\tau(k_{t+1})) & if \quad k_t\in[k(\overline{\tau}),k(0)] \\ S(0,\gamma^*,k_t,0) & otherwise \end{cases}, \tag{5.32}$$

where

$$\gamma^* = \frac{\beta(1-\alpha)\varepsilon(m-n)-\alpha(1+\varepsilon)(1+n)(1+\frac{\beta\alpha(1+\varepsilon)}{\alpha+\varepsilon})}{\alpha(1+\varepsilon)(1+m)(1+\frac{\beta\alpha(1+\varepsilon)}{\alpha+\varepsilon})},$$

$$S(\tau_t,\gamma_t,k_t,\tau_{t+1}) = \frac{\beta}{1+\beta}\frac{\varepsilon}{1+\varepsilon}\frac{1+\gamma_t}{1+n+(1+m)\gamma_t}\frac{(1-\alpha)(1+\gamma_t)^{-\alpha}(k_t)^{\alpha}(1-\tau_t)^{\frac{1+\varepsilon}{\varepsilon+\alpha}}}{1+\frac{(1-\alpha)(1-\tau_{t+1})}{\alpha+\varepsilon}},$$

and

$$k(\tau) = ((1+\frac{(1-\alpha)}{\alpha}\tau)^{1+\beta}(1-\tau)^{\frac{\beta(1-\alpha)}{\alpha+\varepsilon}}\frac{1}{c})^{-(1+\frac{(1+\varepsilon)\alpha\beta}{\varepsilon+\alpha})}$$, for $\tau=\overline{\tau}$ and $\tau=0$,

where c is a constant of integration

In the appendix we derive the expressions for γ^*, $k(\overline{\tau})$, and c. .

First, we explain that the equilibrium tax function $\tau(k)$ is decreasing in k, in the range $k\in[k(\overline{\tau}),k(0)]$. When the next-period tax rate rises, there are two conflicting forces at work on tax revenues. The increase in rates , for a given tax, increases revenues. On the one hand, an increase in period t+1 tax rate, for a given tax base, raises period t+1 tax revenues, and thereby social security benefits. But the tax increase reduces the labor supply and diminishes the tax base. If the tax rate is below the Laffer point, which is always desirable by the voter, the tax revenue must increase with the rise in the tax rate. If the tax revenue, and thereby also the social security benefits, rise in period t+1, the incentive to save in period t diminishes, as required by the Euler fist-order condition. Because aggregate savings in period t are equal to the aggregate capital stock in period t+1, the rise in period t+1 tax rate diminishes the aggregate capital stock in period t+1. Hence, the tax function $\tau(k)$ is decreasing in k, in the range $k \in [k(\overline{\tau}), k(0)]$. At the threshold point $\overline{\tau}$, the value of $\tau(k)$ is driven to zero.

Turning to the equilibrium migration quota, consider the expression for γ^*.The positive term in the numerator on the right-hand side captures the beneficial effect of having larger labor force with the immigrants' offspring which boosts up the return to savings of the current young. The negative term in the numerator the expression for γ^* captures the wage depressing effect of immigrants, which is harmful to the young decisive voter. Consider as a benchmark the case $m = n$. In this case the beneficial effect of migration, from the perspective of the decisive voter, which arises from the increase in the period t+1 share of the young working force in the total population, vanishes completely. The wage depression effect dominates, and the migration quota is set equal to zero. If, however, m>n, a beneficial economic effect to bring in migrants does exist. For a sufficiently large gap between m and n, the young decisive voter in period t, anticipating an increase in social security benefits in period t+1, will admit immigrants. In this case $\gamma^* > 0$.

Observe also that there is a positive effect of the aging of the native-born on the migration quota, captured by a reduction in n.

5.5.3 Policy Rules With No Social Security

In order to emphasize the role of the social security system in the model, we now consider a similar model, but without any transfer payments from the young to the old.

The equilibrium migration policy rule, and the saving rate are:

$$G(k_t) = \gamma^* \tag{5.33}$$

$$S(\gamma^*) = \frac{\beta}{1+\beta}\frac{\varepsilon}{1+\varepsilon}\frac{1+\gamma^*}{1+n+(1+m)\gamma^*}\,\frac{(1-\alpha)(1+\gamma^*)^{-\alpha}(k_t)^{\alpha}}{1+\frac{(1-\alpha)}{\alpha+\varepsilon}} \quad . \tag{5.34}$$

We can now compare migration policies with and without a social security system. Inspecting the equilibrium migration policies with, and without social security, we can verify that in the former migration policies are either the same, or more liberal, than in the latter regime, depending on the range in which the equilibrium levels of the capital per worker are. The conclusion is that the social security system effectively creates an incentive, through a political-economy mechanism, for a country to bring in migrants.

5.6 Conclusion

In the benchmark setup, with which we start at the beginning of this chapter, a perishable consumption good is produced using only labor as input; transfers from young to old (paid by flat tax rate on labor income) are an important supplement for private savings guaranteeing old-age consumption. Each generational cohort lives for two periods, supplying labor elastically when young, and deriving utility from consumption in both periods of life.

If there were not to be migration, it is a standard outcome in this framework that if the population growth rate is positive, the young always outnumber the old. Therefore, a pay-as-you-go social security system cannot be sustained under majority voting. If, however, population growth is negative, so that the old outnumber the young, then the pay-as-you-go system can be sustained with a constant tax rate that maximizes the social security benefits (the preferred point of old cohort at each period). Now, introduce migration into the standard framework. Migrants arrive young but cannot vote until they are old. Their children, who are identical to the young native-born, can vote when young. Moreover, migrants (though not their offspring) have a birth rate that is larger than the native-born rate. Migration policy is described by an endogenously determined quota variable. The central tension faced by today's young in thinking about migration policy is that both the ratio of young to old in the next period, and the ratio of taxpayers to old dependents in the next period increase when the present period migration quota rises. A higher value of the latter this period will raise the number of young taxpayers per old dependent next period, but will also increase the voting power of the young next period, perhaps putting them in the majority. If the native-born and the migrants' population growth rates are positive (while by assumption the latter rate exceeds the former), then young voters always outnumber old voters and the pay-as-you-go social security system will not be sustainable as a Markov equilibrium. So migration is of no help in this case. On the other hand, if the native-born population growth rate is negative, then the social security system is sustainable in the absence of migration. In this case, the quest is not whether migration helps sustain social security, but whether it threatens its sustainability. Assuming that the population growth rate of the native-born is negative, the sort of equilibrium that arises depends on the sum of native-born and migrants' population growth rates. If this sum is negative, admitting no migrants today guarantees an old majority tomorrow. Even if the current young chooses the maximum allowable migration so as to maximize next period's benefits, there will still be a majority of the old in the next period. Both the current old and the current young agree on letting in the maximal number of migrants, and except perhaps for the initial period, the majority of voters will always be old. Therefore, the tax rate is set at the "Laffer" rate. Migration does not yet add (nor subtract) much to the survival of the social security system in this case.

But when the sum of the native-born and the migrants population growth rates is positive and the native-born population growth rate is negative, migration adds an interesting twist. In essence, it poses a threat to social security that in the absence of migration will be assured. In this case, the numbers of old and young next period are equal and by assumption, ties are decided in favor of the old. Then current young's desire for higher migration, to maximize their old-age benefits is constrained by their desire to maintain an old majority next period. If the young are currently in the majority, they set the current tax rate equal to zero (implying no benefits for the current old), and set migration quota at an intermediate level that barely preserves the old majority in the next period. In the next period, the old median voter sets the tax rate at the "Laffer" rate and the migration quota at the maximum level. The latter guarantees that the young will be in majority in subsequent period; and the cycle repeats itself.

Sand and Razin (2008) extends this model to include capital accumulation and endogenous factor prices. The extended model has an additional collection of equilibria. As in Forni (2005), in the case of a positive native-born population growth rate, when the young are always in the majority, a pay-as-you-go social security system is sustained by a tax rate on labor income which varies with the level of the capital stock. Specifically, the tax rate on labor income is decreasing in the capital stock. In the case in which the population growth rates of the native-born and the migrants' are positive ($n, m > 0$), the number of next-period young voters exceeds the number of next-period old voters, which means that the decisive voter is always young. Still, if the capital per the native-born workforce is in some range, then the optimal strategy of the young is always to vote for a positive tax rate, and maximum migration quota, thus sustaining both migration and the social security system. The size of the social security system depends on the capital per native-born worker, and on the exogenously given ceiling on migration quota. Thus the polico-economic sustainable migration boosts up the tax base for financing the social security.

Drawing on Sand and Razin (2008) and Razin and Sand (2009), we also examine a politico- economic, inter-generational, mechanism through which the social security system affects voter attitudes in favor of more liberal immigration regime. We show that the pay-as-you-go social security system, which in recent time suffers from demographic imbalances, can benefit from immigrants with birth rates that exceed the native-born birth rates. Thus, a social security system provides effectively an incentive, through the political economy mechanism, to liberalize migration policy. We examine a politico-economic, inter-generational, mechanism through which the social security system affects voter attitudes in favor of more liberal immigration regime. We demonstrate that the Markov equilibrium with social security consists of more liberal migration policies than the corresponding Markov equilibrium with no social security.

We note that the typical condition under which a social security system improves on competitive allocations in overlapping generation models is when the population growth rate is higher than the interest rate. So, given some interest rate, a high population growth rate is associated with an inefficient competitive equilibrium, and efficiency can be restored with the introduction of a PAYG social security system.[29] In our model, social security can only be voted on when the population growth rate is small This means that social security is more likely to be voted on when the equilibrium is already dynamically efficient, and to be voted out when it would be most desirable on efficiency grounds to have social security.

The main prediction of the model is that countries with a more comprehensive (Beveridgian-type) social security system, will be more liberal in their migration policies.

Related empirical work (e.g., Cohen and Razin (2009)) demonstrates that there exists a statistically significant positive effect of the generosity of the welfare state on the skill composition of migration. Skilled migrants, who provides fiscal benefits, are more desirable than unskilled migrants, who constitute a fiscal burden for the welfare state[30].

5.7 Appendix

In this appendix we formally derive key properties of equilibrium policy rules. Because n>0, the majority resides with the young voters. Thus, the policy decisions concerning the tax rate and migration quotas maximize the young's indirect utility function. (We follow the proof of Forni (2004) to derive the tax policy decision rule.) The policy decision rules are derived by using, as a constraint, the first-order derivative with respect to the policy variables of the logarithm of the capital accumulation equation. The policy decision rules are:

$$\left(1 + \frac{1-\alpha}{\alpha}\tau_t(k_t)\right)^{1+\beta} (1 - \tau_t(k_t))^{\frac{\beta(1-\alpha)}{\varepsilon+\alpha}} = k_t^{-x} c \qquad (5.35)$$

$$\gamma_t = 1, \tag{5.36}$$

where $x = 1 + \frac{(1+\varepsilon)\alpha\beta}{\varepsilon+\alpha}$,and c is a positive constant of integration. The policy decision rule of the immigration quotas is at its maximal value, and the policy decision rule of the tax rate is implicitly given in equation (5.35). Define the following function: $k(\tau) = \left((1 + \frac{1-\alpha}{\alpha}\tau)^{1+\beta}(1-\tau)^{\frac{\beta(1-\alpha)}{\alpha+\varepsilon}}\frac{1}{c}\right)^{-\frac{1}{x}}$. Thus we can rewrite the policy decision rule of the tax rate as: $k(\tau_t) = k_t$. The function $k(\tau)$ is decreasing in τ, for $\tau \in [0, \overline{\tau}]$, where $\overline{\tau} = \frac{\varepsilon(1+\beta)+\alpha}{\varepsilon(1+\beta)+\alpha+\beta}$, and increasing in τ, for $\tau \in [\overline{\tau}, 1]$. Thus, according to equation (5.35), for every value of capital per (native-born) worker, k_t, there are two solutions for $\tau(k_t)$ in the range $[0, 1)$. The solution which satisfies the equilibrium conditions, which is denoted by $\tau(k_t)$, is decreasing in k_t for $k_t \in [k(\overline{\tau}), k(0)]$.

The solution for the policy variables given in equations (5.35) and (5.36), will be proved to satisfy the first-order conditions of the problem. The young voter's indirect utility function under the assumption that next-period decisive voter is young, which sets next period policy decision rules for the tax rate and immigration quotas to be $\tau_{t+1} = \tau(k_{t+1})$,and $\gamma_{t+1} = 1$ respectively, can be written in its Lagrangian form as follows:

$$L(k_t) = A + (1+\beta)Log\left((1-\alpha)k_t^{\alpha}(1+\gamma_t)^{-\alpha}(1-\tau_t)\right)^{\frac{1+\varepsilon}{\varepsilon+\alpha}} +$$
$$(1+\beta)Log[(1+\beta f(\tau(k_{t+1})) + \beta Log\alpha\left((1-\alpha)k_{t+1}^{-\varepsilon}2^{\varepsilon}\left(1-\tau\left(k_{t+1}\right)\right)\right)^{\frac{1-\alpha}{\varepsilon+\alpha}}$$
$$-\lambda_1(k_{t+1} - \tfrac{\beta}{1+\beta}\tfrac{\varepsilon}{1+\varepsilon}\tfrac{(1+\gamma_t)\left((1-\alpha)k_t^{\alpha}(1+\gamma_t)^{-\alpha}(1-\tau_t)\right)^{\frac{1+\varepsilon}{\varepsilon+\alpha}}(1-f(\tau(k_{t+1}))}{1+n+\gamma_t(1+m)})$$
$$-\lambda_2(\tau_t-1) - \lambda_3(-\tau_t) - \lambda_4(\gamma_t-1) - \lambda_5(\gamma_t). \tag{5.37}$$

The Kuhn-Tucker conditions are:

$$\frac{\partial L}{\partial \tau_t} = 0 = -\frac{1+\varepsilon}{\varepsilon+\alpha}\frac{1+\beta}{1-\tau_t} - \lambda_1\frac{1+\varepsilon}{\varepsilon+\alpha}\frac{k_{t+1}}{1-\tau_t} - \lambda_2 + \lambda_3 \tag{5.38}$$

$$\frac{\partial L}{\partial \gamma_t} = 0 = -\alpha\frac{1+\varepsilon}{\varepsilon+\alpha}\frac{1+\beta}{1+\gamma_t} + \lambda_1\frac{k_{t+1}}{1+\gamma_t}\left(\frac{n-m}{1+n+\gamma_t(1+m)} - \alpha\frac{1+\varepsilon}{\varepsilon+\alpha}\right) - \lambda_4 + \lambda_5 \tag{5.39}$$

$$\begin{aligned}\frac{\partial L}{\partial k_{t+1}} &= 0 = \left(\frac{\beta(1+\beta)}{1+\beta f(\tau(k_{t+1}))} - \frac{\lambda_1 k_{t+1}}{1-f(\tau(k_{t+1}))}\right)\frac{\partial f(\tau_{t+1})}{\partial \tau_{t+1}}\frac{\partial \tau(k_{t+1})}{\partial k_{t+1}} \\ &-\frac{\beta(1-\alpha)}{\Psi+\alpha}\frac{1}{1-\tau\left(k_{t+1}\right)}\frac{\partial \tau(k_{t+1})}{\partial k_{t+1}} + \frac{1}{k_{t+1}}\left(-\beta\frac{\varepsilon(1-\alpha)}{\varepsilon+\alpha}\right) - \lambda_1\end{aligned} \tag{5.40}$$

$$k_{t+1} = \frac{\beta}{1+\beta}\frac{\varepsilon}{1+\varepsilon}\frac{(1+\gamma_t)w_t l_t(1-\tau_t)(1-f(\tau(k_{t+1}))}{1+n+\gamma_t(1+m)} \tag{5.41}$$

$$\tau_t - 1 \leq 0,\ \lambda_2 \geq 0 \text{ and } \lambda_2(\tau_t - 1) = 0 \tag{5.42}$$

$$-\tau_t \leq 0,\ \lambda_3 \geq 0 \text{ and } \lambda_3(-\tau_t) = 0 \tag{5.43}$$

$$\gamma_t - 1 \leq 0,\ \lambda_4 \geq 0 \text{ and } \lambda_4(\gamma_t - 1) = 0 \tag{5.44}$$

$$-\gamma_t \leq 0,\ \lambda_5 \geq 0 \text{ and } \lambda_5(\gamma_t) = 0. \tag{5.45}$$

Substituting for λ_1 from equation (5.40) into equations (5.38) and (5.39), we derive the following equations:

$$\frac{\partial L}{\partial \tau_t} = -\lambda_2 + \lambda_3 = 0 \tag{5.46}$$

$$\frac{\partial L}{\partial \gamma_t} = \frac{(1+\beta)}{1+\gamma_t}\left(\frac{-n+m}{1+n+\gamma_t(1+m)}\right) - \lambda_4 + \lambda_5 = 0. \tag{5.47}$$

Because $m > n$, it follows from equation (5.47) that γ_t has a corner solution. The solution for the tax rate, on the other hand, τ_t, may be bounded or not, meaning that $\tau_t = \tau(k_t) \in [0,1]$[31]. Substituting the solutions for the tax and openness rate into the indirect utility of the young, we obtain that the optimal solution for the openness rate is $\gamma_t = 1$.

The optimal solutions should also satisfy the second-order sufficient condition, meaning that the bordered Hessian of the Lagrangian should be negative definite. Because the solution of the immigration quotas is a corner solution where the largest immigration quota maximizes the young voter's indirect utility function, the bordered Hessian of the Lagrangian is equal to:

$$-g_\tau\left(g_\tau \frac{\partial^2 L}{\partial^2 k_{t+1}} - g_k \frac{\partial^2 L}{\partial k_{t+1}\partial \tau_t}\right) + g_k\left(g_\tau \frac{\partial^2 L}{\partial \tau_t \partial k_{t+1}} - g_k \frac{\partial^2 L}{\partial^2 \tau_t}\right), \tag{5.48}$$

where g_τ and g_k are the derivatives of the constraint of the capital per (native-born) worker from equation (5.41) with respect to τ_t and k_{t+1}, respectively. The bordered Hessian can be rewritten in the following way:

$$(\frac{1+\varepsilon}{\varepsilon+\alpha})^2 \frac{1}{(1-\tau_t)^2} \frac{2x(1+\frac{1-\alpha}{\alpha}\tau_t)(1-\tau_t)\left(\frac{1-\alpha}{\alpha}\right)}{\left((1+\beta)\frac{1-\alpha}{\alpha}(1-\tau_t)-\frac{\beta(1-\alpha)}{\varepsilon+\alpha}(1+\frac{1-\alpha}{\alpha}\tau_t)\right)^2(1+\frac{1-\alpha}{\alpha}\frac{1}{1+\beta}\tau_t)^2} \tag{5.49}$$

$$\left(\begin{array}{c} x(1+\frac{1-\alpha}{\alpha}\tau_t)(1-\tau_t)\left(\frac{1-\alpha}{\alpha}\right)+ \\ \left((1+\beta)\frac{1-\alpha}{\alpha}(1-\tau_t)-\frac{\beta(1-\alpha)}{\varepsilon+\alpha}(1+\frac{1-\alpha}{\alpha}\tau_t)\right)(1+\frac{1-\alpha}{\alpha}\frac{1}{1+\beta}\tau_t)(1+\beta) \end{array}\right).$$

Denote by $[\tau_1, \tau_2]$ the range of the tax rate for which the bordered Hessian of the Lagrangian is negative definite. Because τ_1 is always negative, and the tax rate is defined over the range $\tau \in [0,1]$, the range of the capital optimal solution for the tax rate, $\tau(k_t)$, is defined in the range $k_t \in [k(\overline{\tau}), k(0)]$, where the function $k(\tau)$ is decreasing in τ.

Chapter 6

Elements of Strategic Voting with Multiple Groups

6.1 Introduction

In the preceding chapter, we study a dynamic politico-economic model. It features a political conflict between two groups: the young and the old voters. For many settings, particularly with dynamic macroeconomic politico-economic models, a political conflict between two groups suffices to demonstrate the underlying nature and features of politically-determined policies. However, for the case of the welfare state, which typically engages in both *inter-* and *intra-*generational redistribution, there is no longer just one-dimensional conflict such as young versus old. Therefore, in this chapter, we will take a small digression to lay down the theoretical foundations on which we will build a dynamic politico-economic model featuring two dimensions of heterogeneity: age and income.

The initial motivation for our politico-economic setup is the class of models with citizen-candidate structure. Before the introduction of the citizen-candidate structure, earlier models in the fields of public choice and political economics utilize heavily the Downsian candidate setup that leads to the result of platform convergence of the candidates (Downs (1957)). This model assumes purely office-motivated candidates competing for a single office post. The competition to win the election will drive the policy platforms of all the candidates to the bliss point of the median voters, trying to attract as many votes as possible.[32] Thus, the campaign among the candidates boils down to pursuing what drives the preferences of the median voter and what may shift the distribution of voters. Moreover, the complete convergence in platforms does not seem to be observed in practice in most elections. Furthermore, candidates must arise from the citizen body and citizens are presumed to have some preferences for the policy chosen, regardless of the number of voters. Hence, assuming that candidates are only office-motivated misses out key policy determinants of voting models. The citizen-candidate model stands on the other end of the spectrum. First studied by Osborne and Slivinski (1996) and Besley and Coate (1997), the citizen-candidate model seeks to endogenize the candidates' selection from within the body of the citizens, and to study how the policy is ultimately determined.

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

6.2 Many candidates

Consider an economy with a continuum of citizens, normalizing the population size to one. The citizens are divided into N groups, indexed by $i \in \{1, 2, \ldots, N\}$, and each has a mass of $\omega_i \geq 0$, where $\sum_{i=1}^{N} \omega_i = 1$. We imagine N to be relatively small. This means that, with a large population, people with similar interests often get grouped together. This setup abstracts from the possibility that one individual may belong to more than one group, sharing many interests.[33]

To highlight the mechanics of the model, suppose that the voters must collectively choose a one-dimensional policy (that is, $p \in P = \mathbb{R}$).[34] We assume that any two citizens belonging to the same group will have identical preference over the policy. The representative citizen from group i has a preference defined over the policy space, represented by the utility function $v^i(p)$. These preferences are "singled-peaked" and we let p_i^* denotes group i's preferred policy.

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

Each citizen has a single vote that can be cast for a candidate. In particular, because voters from the same group have identical preference, they will vote identically.[35]

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

6.3 Sincere Voting

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

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

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

6.4 Strategic Voting

Strategic voting relaxes the assumption of sincere voting. People are no longer required to vote for the candidate they like most, but rather they take into account the probability of that candidate winning the election. A voter is said to be voting *strategically* if she votes for the candidate with a policy platform that maximizes her expected utility, where the expectation is taken over all the candidates and their probability of winning the election. Moreover, the votes must be consistent with the induced probability of winning of each candidate. Formally, voting decisions $\mathbf{e}^* = (e^{1*}, \ldots, e^{N*})$ form a *voting equilibrium*[36] if

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

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

It is important to contrast the strategic voting scenario with the sincere counterpart. We do this by a couple of examples, which will also demonstrate how the probability a candidate would win is determined, $\mathcal{P}^j(\mathbf{e}^*)$. Under sincere voting, voters assume that the policy of their most-preferred candidate will be implemented with probability one, while under strategic voting, the probability depends on how other groups vote. A special case arises when a certain group form more than 50% of the population. In this case, the winning candidate, who will also represent the preference of the median, will belong to this group, irrespective of the voting profiles of the other groups. Therefore, the probability that its candidate will win is 1. One can easily construct other examples with different conclusions. For example, let $N = 3$, and $\omega_i = \frac{1}{4}, \frac{1}{3}, \frac{5}{12}$ for $i = 1, 2, 3$ respectively. No one group consists of more than 50% of the population; group 3 is the largest. However, if group 1 and 2 both dislike the policy preferred by group 3, they could collude to surpass 50% and win the election. The implemented policies will be decided by the voting equilibrium. If collusion means voters from group 1 and group 2 both vote from group 2's candidate, the ideal policy of group 2 will be implemented in equilibrium. The probability of winning for candidates representing group 1 and 2 are $\mathcal{P}^1(\mathbf{e}^*) = 0$ and $\mathcal{P}^2(\mathbf{e}^*) = 1$. Likewise, group 1 and 2 could both vote for group 1's representative candidate, hence resulting in policy preferred by group 1 in equilibrium. In this case, the probability of winning for candidates representing group 1 and 2 are reversed $\mathcal{P}^1(\mathbf{e}^*) = 1$ and $\mathcal{P}^2(\mathbf{e}^*) = 0$. By either collusions, the preferred policy of the largest group, group 3, will be blocked in equilibrium. These two voting equilibrium will generate $\mathcal{P}^3(\mathbf{e}^*) = 0$.

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

6.5 Conclusion

We lay down in this chapter some basic elements of the theory of strategic voting with multiple groups. This layout is employed in the next chapter to analyze the dynamic migration and welfare state formation. With two skill types and two age groups, there are potentially four coalitions. The novelty of the analytic framework that we describe here is the possibility of strategic voting, as apposed to sincere voting. In the latter each individual votes for her ideal policy. In the former each individual votes for the policy that is best for her among those that are likely to be implemented.

Chapter 7

Migration and *Inter*- and *Intra*-generational Distribution Policy

7.1 Introduction

In Part I, we considered the very basic elements of intra-generational redistribution, with no regards to inter-generational conflicts. In chapter 2 and 3, we dealt exclusively with intra-generational redistribution, whereas, in chapter 5, we dealt exclusively with inter-generational redistribution. 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 intra-generational 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 the 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.[37] In particular, the redistribution policy must have in mind both *inter* and *intra*-generational aspects, resembling a full-fledged welfare-state system.

As in chapter 5, we employ a two-period, overlapping-generations model. The old cohort retires, while the young cohort works. There are, as in Part I, two skill levels: skilled and unskilled. The welfare-state is modeled simply as in Part I, 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. As in Chapter 5, we characterize subgame-perfect Markov politico-economic equilibria consisting of the tax rate (which determines the demogrant), skill composition and the total number of migrants. We distinguish between two voting behaviors: sincere and strategic voting (see Chapter 6). As illustrated in that chapter, 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.

7.2 Analytical Framework

Consider an economy consisting of overlapping generations. Each 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).

7.2.1 Preferences and Technology

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

$$U^y(c_t^y, l_t^i, c_{t+1}^o) = c_t^y - \frac{\varepsilon (l_t^i)^{\frac{1+\varepsilon}{\varepsilon}}}{1+\varepsilon} + \beta c_{t+1}^o,\ i = s, u \tag{7.1}$$

$$U^o(c_t^o) = c_t^o, \tag{7.2}$$

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.[38] 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 only when $1 = \beta(1+r)$, where r is the interest rate. We indeed assume that the interest rate r equals $\frac{1}{\beta} - 1$ and individuals have no incentive to either save or dissave. Fore simplicity, we set saving at zero.[39] 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

$$l_t^i = \left(A_t w^i (1-\tau)\right)^{\varepsilon}, \ i = s, u, \tag{7.3}$$

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.[40] For simplicity, the production function is linear:

$$Y_t = w^s L_t^s + w^u L_t^u, \tag{7.4}$$

where L_t^i is the aggregate labor supply of skill $i = s, u$. Labor markets are competitive, ensuring the wages going to the skilled and unskilled workers are indeed equal to their marginal products, w^s and w^u, respectively. We naturally assume that $w^s > w^u$. Note that the linear specification of the production function fixes the wage rates which become invariant to the social-welfare and migration policies.

As before, we denote the per-capita benefit 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):

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

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 migrants entering the country in period t.

Migrants are assumed to have identical preferences 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 skill type of labor is given by

$$L_t^s = [S_t + \sigma_t \mu_t] \, N_t l_t^s \tag{7.5}$$

and

$$L_t^u = [1 - S_t + (1 - \sigma_t)\mu_t] \, N_t l_t^u, \tag{7.6}$$

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

7.2.2 Dynamics

The dynamics of the economy are given by two dynamic equations: one governs the *aggregate* population, while the other governs the *skill* composition dynamics. Because skills are not endogenous within the model, we assume for simplicity that the offspring replicate exactly the skill level of their parents.[41] That is,

$$\begin{aligned} N_{t+1} &= [1 + n + (1 + m)\mu_t] \, N_t \\ S_{t+1} N_{t+1} &= [(1 + n)S_t + (1 + m)\sigma_t \mu_t] \, N_t, \end{aligned} \tag{7.7}$$

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[42]. Combining the two equations in (7.7) together, we get the dynamics of the labor supply of skilled native-born as follows:

$$S_{t+1} = \frac{(1+n)S_t + (1+m)\sigma_t\mu_t}{1+n+(1+m)\mu_t}. \tag{7.8}$$

Equation (7.8) 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 the (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.

7.2.3 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 per-capita benefit b_t in the same period. Therefore, the equation for the demogrant, b_t, is given by

$$b_t = \frac{\tau_t\left((S_t+\sigma_t\mu_t)w^s N_t l_t^s + (1-S_t+(1-\sigma_t)\mu_t)\,w^u N_t l_t^u\right)}{(1+\mu_t)\,N_t + \left(1+\mu_{t-1}\right)N_{t-1}}, \tag{7.9}$$

which upon some manipulation reduces to

$$b_t = \frac{\tau_t\left((S_t + \sigma_t\mu_t)w^s l_t^s + (1 - S_t + (1-\sigma_t)\mu_t)\, w^u l_t^u\right)}{1 + \mu_t + \frac{1+\mu_{t-1}}{1+n+\mu_{t-1}(1+m)}}, \tag{7.10}$$

where the individual's labor supplies are given above in equation (7.3). It is straightforward to see that a larger σ_t increases the demogrant (recall that $w^s l_t^s > w^u l_t^u$). That is, a higher skill composition of migrants brings about higher tax revenues, and, consequently, enables more generous welfare state, other things being equal. Similarly, upon differentiation of b_t with respect to μ_t, we can conclude that a higher volume of migration enables a more generous welfare system, if the share of the skilled among the migrants exceeds the share of the skilled among the native-born workers ($\sigma_t > S_t$).

7.3 Political Economy Equilibrium: Sincere Voting

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

We focus on "sincere voting," where individuals vote according to their *sincere* preferences 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.[43] 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 private saving, so that all the old care only about the size of the demogrant and thus have identical interests).

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

$$S_t > \frac{1}{2} \tag{7.11}$$

and

$$S_t > \frac{1+\mu_{t-1}}{1+n+\mu_{t-1}(1+m)}, \tag{7.12}$$

respectively. It can be shown that, because $n < m \leq 1$, 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:

$$1 - S_t > \frac{1+\mu_{t-1}}{1+n+\mu_{t-1}(1+m)}. \tag{7.13}$$

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

$$\frac{1+\mu_{t-1}}{1+n+\mu_{t-1}(1+m)} \geq \max\{S_t, 1-S_t\}. \tag{7.14}$$

7.3.1 Equilibrium Policy Rules

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 policy choice in any period to the policy choice of the preceding period (τ_{t-1}, σ_{t-1}, and μ_{t-1}). This policy choice depends on the current state of the economy, S_t. Thus, we are looking for a triplet policy function $(\tau_t, \sigma_t, \mu_t) = \Phi(S_t, \tau_{t-1}, \sigma_{t-1}, \mu_{t-1})$, which is a solution to the following functional equation

$$\Phi(S_t, \tau_{t-1}, \sigma_{t-1}, \mu_{t-1}) = \underset{\tau_t, \sigma_t, \mu_t}{\arg\max} V^d \left\{ S_t, \tau_t, \sigma_t, \mu_t, \Phi(S_{t+1}, \tau_t, \sigma_t, \mu_t) \right\} \quad (7.15)$$

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

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

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

We can show that the outcomes of the policy rule are:

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

$$\sigma_t = \begin{cases} 1 & \text{, if either the skilled or unskilled group} \\ & \text{is the largest and } S_t < \frac{1}{1+n} \\ \widehat{\sigma} < \frac{1}{2} & \text{, if the skilled group is the largest and } S_t \geq \frac{1}{1+n} \\ 1 & \text{, if the old group is the largest} \end{cases} \tag{7.16}$$

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

where

$$J = \frac{(S_t + \sigma_t \mu_t)\left(\frac{w_t^s}{w_t^u}\right)^{1+\varepsilon} + 1 - S_t + (1-\sigma_t)\mu_t}{1 + \mu_t + \frac{1+\mu_{t-1}}{1+n+\mu_{t-1}(1+m)}}, \tag{7.17}$$

$$\Psi = b_t^u + \beta b_{t+1}^o - \widehat{b}_t, \tag{7.18}$$

where we denote by $\widehat{b}_t$ the per-capita benefit in period t with $\mu_t = 1 = \sigma_t$, and by b_t^u the per-capita benefit 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 denotes 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

$$\langle \widehat{\sigma}, \widehat{\mu} \rangle = \underset{\sigma_t, \mu_t}{\arg\max} V_t^s = \frac{(A_t w_t^s)^{1+\varepsilon}}{1+\varepsilon} + \beta b_{t+1}^o \tag{7.19}$$
$$\text{s. t.} \qquad (1+n)S_t - 1 \le \mu_t(1 - (1+m)\sigma_t).$$

When the solution to the problem in (7.19) is interior, we can describe it by

$$\frac{\frac{\partial V^s}{\partial \sigma_t}}{\frac{\partial V^s}{\partial \mu_t}} = \frac{\widehat{\mu}(1+m)}{(1+m)\widehat{\sigma} - 1}. \tag{7.20}$$

There are also two possible corner solutions: $\langle \widehat{\sigma}, \widehat{\mu} \rangle = \langle 0, (1+n)S_t - 1 \rangle$ and

$\langle\widehat{\sigma},\widehat{\mu}\rangle=\left\langle\frac{2-(1+n)S_t}{1+m},1\right\rangle$.

7.3.2 Migration and Tax Policies: Interpretation

Based on equations 7.11-7.18 , Figure 7.1 illustrates the equilibrium policy rules, as a function of the share of skilled in the population.

[insert figure 7.1 here]

The intuition for the equilibrium policy rules is as follows. The skilled are the net contributor to the welfare state, whereas 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 into the economy because of the tax contribution this generates to the welfare system.

It is interesting to note that, although the unskilled young are, like the old, net beneficiaries of 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 (with no skill differentiation). 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.[44]

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 skills 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 to 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 (7.17) that $\frac{\partial \tau_t^u}{\partial \sigma_t} > 0$, and there exists $\overline{\sigma}$ such that, for any $\sigma_t < \overline{\sigma}$, we have $\frac{\partial \tau_t^u}{\partial \mu_t} < 0$. Conversely, for any $\sigma_t > \overline{\sigma}$, we would get an expansion of the welfare state, because $\frac{\partial \tau_t^u}{\partial \mu_t} > 0$.[45] 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.

figure captions:

Figure 7.1: Equilibrium policy Rules as a function of the share of Skilled in the population

7.4 Conclusion

In this chapter, we develop 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.

As in chapter 5, 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.

7.5 Appendix 7A: 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

$$e_t^{i*} = \arg\max \left\{ \sum_{j \in \{s,u,o\}} \mathcal{P}^j(e_t^i, \mathbf{e}_{-it}^*) V^i \left(\Phi_t^j, \Phi_{t+1}, \mathbf{e}_{t+1} \right) \mid e_t^i \in \{s,u,o\} \right\} \tag{7.21}$$

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

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

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

Clearly, each individual prefers the ideal policies of their representative candidate. Strategic voting opens up the possibility of not voting for the most preferred candidate in order to avoid the least favorable candidate. For period t skilled young, they prefer the least amount of taxes and some migration in period t+1. Thus, they will prefer the policy choice of the unskilled over the old candidate. As for the old retirees, the higher the transfer benefits, the better. Clearly, the unskilled candidate promises some benefits whereas the skilled promises none, so they would choose the policies of the unskilled over the skilled.

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

$$\frac{(w^u)^{1+\varepsilon}}{1+\varepsilon} = \frac{((1-\widetilde{\tau})w^u)^{1+\varepsilon}}{1+\varepsilon} + \frac{\widetilde{\tau}(1-\widetilde{\tau})^{\varepsilon}\left((S_t+\sigma_t\mu_t)(w^s)^{1+\varepsilon} + (1-S_t+(1-\sigma_t)\mu_t)(w^u)^{1+\varepsilon}\right)}{1+\mu_t+\frac{1+\mu_{t-1}}{1+n+\mu_{t-1}(1+m)}}. \tag{7.22}$$

We know that such a tax policy exists, because, taking the 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:

$$\Phi(S_t, \tau_{t-1}, \sigma_{t-1}, \mu_{t-1}, \mathbf{e}_t^*) = \underset{\tau_t, \sigma_t, \mu_t}{\arg\max} \quad V^d\left(S_t, , \tau_t, \sigma_t, \mu_t, \Phi(S_{t+1}, \tau_t, \sigma_t, \mu_t, \mathbf{e}_t^*)\right) \tag{7.23}$$

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

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

$$\begin{aligned} e_t^{i*} &= \mathbf{e}^*\left(S_t, \tau_{t-1}, \sigma_{t-1}, \mu_{t-1}, \mathbf{e}_{t-1}^*\right) \qquad (7.24) \\ &= \underset{e_t^i \in \{s,u,o\}}{\arg\max} \sum_{j \in \{s,u,o\}} \mathcal{P}^j(e_t^i, \mathbf{e}_{-it}^*) V^i\left(\Phi_t^j, \Phi(S_{t+1}, \tau_t, \sigma_t, \mu_t, \mathbf{e}_t^*), \mathbf{e}^*\left(S_{t+1}, \tau_t, \sigma_t, \mu_t, \mathbf{e}_t^*\right)\right), \end{aligned}$$

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 $\Phi_t^j = \langle \tau_t^j, \sigma_t^j, \mu_t^j \rangle$ 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 sincere 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

$$
\begin{aligned}
e_t^{s*} &= \begin{cases} s & \text{, if } S_t \geq \frac{1+\mu_{t-1}}{1+n+\mu_{t-1}(1+m)} \\ u & \text{, otherwise} \end{cases} \\
e_t^{u*} &= u \qquad\qquad (7.25) \\
e_t^{o*} &= \begin{cases} o & \text{, if } \frac{1+\mu_{t-1}}{1+n+\mu_{t-1}(1+m)} \geq \max\{S_t, 1-S_t\} \\ u & \text{, otherwise} \end{cases}
\end{aligned}
$$

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

$$\Phi_t = \left(\tau_t = \frac{1-\frac{1}{J}}{1+\varepsilon-\frac{1}{J}}, \sigma_t = 1, \mu_t = \frac{2+n-2(1+n)S_t}{m}\right), \tag{7.26}$$

where $J = J(\mu_t, \sigma_t, S_t, \mu_{t-1})$ is as in equation (7.17).

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 redistributive. When $\frac{1}{1+\varepsilon} \leq \widetilde{\tau}$, we can show that we have an equilibrium of the following form

$$
\begin{aligned}
e_t^{s*} &= \begin{cases} s & \text{, otherwise} \\ u & \text{, if } \frac{1+\mu_{t-1}}{1+n+\mu_{t-1}(1+m)} \geq S_t \geq \frac{1+\frac{n-m}{2}}{1+n} \end{cases} \\
e_t^{u*} &= \begin{cases} u \begin{cases} \text{, if } 1 - S_t \geq \frac{1+\mu_{t-1}}{1+n+\mu_{t-1}(1+m)}, \text{ or} \\ \frac{1+\mu_{t-1}}{1+n+\mu_{t-1}(1+m)} \geq S_t \geq \frac{1+\frac{n-m}{2}}{1+n} \end{cases} \\ o \qquad \text{, otherwise} \end{cases} \\
e_t^{o*} &= o
\end{aligned}
\tag{7.27}
$$

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

$$
\Phi_t = \begin{cases} \left(\tau_t = \frac{1-\frac{1}{J}}{1+\varepsilon-\frac{1}{J}}, \sigma_t = 1, \mu_t = \frac{2+n-2(1+n)s_t}{m}\right) & \text{, if } \frac{1+\mu_{t-1}}{1+n+\mu_{t-1}(1+m)} \geq S_t \geq \frac{1+\frac{n-m}{2}}{1+n} \\ \left(\tau_t^* = \frac{1}{1+\varepsilon}, \sigma_t = 1, \mu_t = 1\right) & \text{, otherwise} \end{cases}
\tag{7.28}
$$

where $J = J(\mu_t, \sigma_t, S_t, \mu_{t-1})$ is as in equation (7.17) and $\widetilde{\tau}$ is given implicitly in equation (7.22).

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

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

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

$$e_t^{u*} = \begin{cases} u & \text{, otherwise} \\ s & \text{, if } \frac{1+\mu_{t-1}}{1+n+\mu_{t-1}(1+m)} \geq \max\{S_t, 1-S_t\}. \end{cases} \quad (7.29)$$

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

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

$$\Phi_t = \begin{cases} \left(\tau_t = 0, \sigma_t = 1, \mu_t = \frac{2+n-2(1+n)S_t}{m}\right) & \text{, if } \frac{1+\mu_{t-1}}{1+n+\mu_{t-1}(1+m)} \geq \max\{S_t, 1-S_t\} \\ \left(\tau_t = \frac{1-\frac{1}{J}}{1+\varepsilon-\frac{1}{J}}, \sigma_t = 1, \mu_t = \frac{2+n-2(1+n)S_t}{m}\right) & \text{, otherwise} \end{cases} \quad (7.30)$$

where $J = J(\mu_t, \sigma_t, S_t, \mu_{t-1})$ is as in equation (7.17) and $\widetilde{\tau}$ is given in equation (7.22).

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 has the size of the welfare state less-than-or-equal to that in the intermediate policy equilibrium, hence we refer to it as "Right-wing." When the tax preferred by the old is excessive from the perspective of the unskilled, the political process could implement the policies preferred by the skilled in order to avoid the worst possible outcome. This happens when the old voters constitute the largest group, and the unskilled voters vote strategically for the skilled candidate. In other cases, however, the policies preferred by the unskilled will be implemented, irrespective of the identity of the largest group in the economy.

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

Part III

Host Country's Gains from Migration and the Source Country Policy Response

Chapter 8

Is the Net Fiscal Burden a Good Measure of the Gains from Immigration?

8.1 Introduction

Following its recent enlargements from 15 to 25 countries, and later to 27 countries, the European Union is likely to face a rise in welfare migration. The expansion increases European population from 380 millions to 450 millions, ahead of the US 300 millions. But by 2050, the US will have almost caught up, according to current forecasts. The main reasons are that European women have fewer children, and the US migration policy is less restrictive.

Hans-Werner Sinn (Financial Times, July 12^{th}, 2004) puts the European migration problem succinctly:

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

Indeed, we demonstrate in chapter 2 that the generosity of the welfare state, as by itself, drives out skilled migration and drives in unskilled migration.

Europe, both "old" and "new", faces also a severe aging problem. This shakes the financial soundness of the welfare state, especially its old-age security and medical health components, because there are fewer workers asked to support increasing numbers of retirees (that is, the dependency ratio is rising). Note that migration of young workers (as distinct from retirees), even when driven in by the generosity of the welfare state, slows down the trend of increasing dependency ratio. However, intuition suggests that even though unskilled migration improves the dependency ratio, it nevertheless burdens the welfare state. This is, as evidence described in the preceding chapter suggests, because unskilled migrants are typically net beneficiaries of a generous welfare state. Though the net fiscal effect of the unskilled migrating generation is usually negative, it is nevertheless not always a good measure of the gains or the losses to the native-born population from migration. In evaluating benefits of unskilled migration to the current (as well as the future) native-born population, it is important to assess the very long-term effect of this migration on the fiscal system. One has to take into the account the infinite horizon of the economy, as distinct from the finite lives of its individuals. When the migrants' descendants gradually integrate into the economy, the current native-born population (both workers and retirees), as well as all future generation, may well gain from unskilled migration.[46]

8.2 The Dynamics of the Gains from Migration

To study the dynamics of the gains from migration, we employ a simplified version of the overlapping-generations model of chapter 5 and 7. Because we do not focus on labor-leisure choices in this chapter, we simplify the analysis by assuming a fixed labor supply - one unit by each agent. Individuals are born either skilled or unskilled and live for two periods. When young, they supply one unit of labor, consumes and saves for retirement. When old, they retire and live on their private savings and social security benefits.[47]

The social security system is "pay-as-you-go" (PAYG), where in every period the government levies a flat tax on the young's wage income (at the rate of τ), which fully finances a social security benefit (b) paid to the old. With no loss of generality, we maintain τ constant over time and we let b_t adjust so as to keep the period-by-period balance for the PAYG social security system.

We assume that the utility of the representative individual is of the Cobb-Douglas form:

$$U\left(c_t^y, c_t^o\right) = \log\left(c_t^y\right) + \beta \log(c_t^o), \tag{8.1}$$

where c_t^y is the consumption of the young in period t, c_t^o is the consumption of the old (born in period t) in period $t+1$, and $\beta \in [0,1]$ is the discount factor.

The transfer payment to the old at period t, b_t, is financed by collecting a flat income tax rate, $\tau \in [0,1]$, from the young individual's wage income at the same period, w_{it}, where w_{it} denotes the wage rate in period t of an individual of skill level $i = s, u$. The interest rate and savings of a young individual with skill i at period t are given by r and s_{it}, respectively. The budget constraints of a young individual of skill level i in period t are given by:

$$s_{it} + c_{it}^y = (1-\tau) w_{it} \tag{8.2}$$

$$c_{it}^o = (1+r) s_{it} + b_{t+1}. \tag{8.3}$$

These two constraints may be combined into one lifetime constraint as follows:

$$c_{it}^y + \frac{c_{it}^o}{1+r} = (1-\tau) w_{it} + \frac{b_{t+1}}{1+r}, \text{ for } i = s, u. \tag{8.4}$$

Maximization of the utility function (8.1) subject to the budget constraint

(8.4) gives rise to an indirect utility function of a young individual, $V\left((1-\tau)w_{it}, r, b_{t+1}\right)$, which depends on the net wage, the interest rate and the old-age social security benefit. For an old individual in period 0, utility depends only on r and b_0.

As in chapters 2 and 3, we denote the proportion of skilled individual in the native-born population by S. With no loss of generality, we normalize the size of the native-born young population in period 0 to one. We will consider just one wave of migrants, μ, in period 0. The migrants are all young and the proportion of the skilled among them is denoted by σ. Each migrant brings $1+m$ offsprings, where $m > n$, the birth rate of the native-born. We assume that the offspring of the migrants are perfectly assimilated into the native-born population both in terms of birth rate and skill distribution, so that the proportion of skilled young individual (including the offsprings of the migrants from period 0) in period 1 and on is S. We assume that $n < r$, so that our economy is dynamically efficient.

We assume free international borrowing and lending that the rate of interest is exogenously given for this economy in each period; and we further assume that it does not vary over time.

A single all-purpose good is produced each period by two inputs, skilled and unskilled labor (L_s and L_u, respectively), according to a constant-returns-to-scale production function

$$Y = F(L_s, L_u), \tag{8.5}$$

where

$$L_{st} = \begin{cases} S + \sigma\mu, & \text{for } t = 0 \\ S\left[1 + n + \mu(1+m)\right], & \text{for } t = 1 \\ S\left[1 + n + \mu(1+m)\right](1+n)^{t-1}, & \text{for } t \geq 2. \end{cases} \tag{8.6}$$

$$L_{ut} = \begin{cases} 1 - S + (1-\sigma)\mu, & \text{for } t = 0 \\ (1-S)\left[1 + n + \mu(1+m)\right], & \text{for } t = 1 \\ (1-S)\left[1 + n + \mu(1+m)\right](1+n)^{t-1}, & \text{for } t \geq 2. \end{cases} \tag{8.7}$$

The wage rates are determined by the marginal productivity:

$$\frac{\partial F}{\partial L_i} = w_i, \text{ where } i = u, s. \tag{8.8}$$

The old-age transfer in a PAYG system is given in each period by:

$$b_t = \begin{cases} \tau\left\{(S + \sigma\mu)w_{s0} + \left[1 - S + (1-\sigma)\mu\right]w_{u0}\right\}(1+n), & \text{for } t = 0 \\ \frac{\tau\{S(1+n+\mu(1+m))w_{s0} + (1-S) + (1-\sigma)(1+n+\mu(1+m))w_{u0}\}}{1+\mu}, & \text{for } t = 1 \\ \tau[Sw_{st} + (1-S)w_{ut}], & \text{for } t \geq 2 \end{cases} \tag{8.9}$$

where the population growth rate would disappear for $t \geq 2$, because the offspring of the migrants have fully assimilated into the native-born and there is no more migration.

We now examine the welfare implications of migration. The latter affects the well-being of the native-born not only through the fiscal balances in the economy (that is, through the social security benefit, b), but also through relative wages (recall that r is exogenously given).

8.3 Fixed Wages

As a first approximation of the welfare effects of migration, we consider only its impact on social security benefits. For this purpose, we assume that the production function in equation (8.5) is linear:

$$F(L_s, L_u) = L_s + qL_u, \tag{8.10}$$

where $q < 1$. That is, there is a perfect substitution between skilled and unskilled labor, with unskilled labor has a fraction $q < 1$ of the productivity of skilled labor. In this case, the wages are given by:

$$w_s = 1, \text{ and } w_u = q, \text{ for all } t. \tag{8.11}$$

In this case, equation (8.9) for the social security benefit becomes:

$$b_t = \begin{cases} \tau\left\{(S+\sigma\mu) + \left[1-S+(1-\sigma)\mu\right]q\right\}(1+n), & \text{for } t=0 \\ \frac{\tau\{S(1+n+\mu(1+m))+(1-S)+(1-\sigma)(1+n+\mu(1+m))q\}}{1+\mu}, & \text{for } t=1 \\ \tau[S+(1-S)q]. & \text{for } t\geq 2 \end{cases} \tag{8.9a}$$

8.3.1 Gains from Migration

The well-being of the old in period 0 (born in period -1), when the wave of migrants occurs, depends only on b_0. As is straightforward to see from equation (8.9a), the benefit b_0 depends positively on μ, no matter what is the skill composition (σ) of the migrants. That is, even when all migrants are unskilled (namely $\sigma = 0$), still the old in period 0 are better-off. Naturally, the gain is higher when σ is higher.

Turning to the generation born in period 0, when the migrants arrive, his well-being is affected only by b_1. It follows from equation (8.9a) that b_1 depends positively on m. That is the higher the birthrate of the first generation of migrants, the better-off is the generation born in period 0. Because $m > n$, it also follows from equation (8.9a) that b_1 depends positively on μ. That is, the generation born in period 0 (both its skilled and unskilled members) benefits from migration. It also follows from equation (8.9a) that for $t \geq 2$, b_t is unaffected by the migration wave of period 0. That is, generations born in period 1 and onwards are unaffected by migration. Naturally, if migration waves repeat themselves, then all future generations gain too.

8.3.2 The Net Fiscal Burden

We have shown in the preceding subsection that migration, whether skilled or unskilled, makes the native-born better-off. However, we show in this subsection that focusing the welfare implications of migration on its net fiscal burden is misleading. Specifically, we demonstrate here that the gains that were shown to accrue to the native-born in the preceding sub-section hold even though there may be a net fiscal burden of migration, especially the one biased to the unskilled.

A migrant pays a social security tax in period 0 when she arrives, and receives an old-age benefit of b_1 when she retires in the next period. The net fiscal burden of an unskilled migrant is therefore equal to

$$NFB_u = -\tau q + \frac{b_1}{1+r}. \tag{8.12}$$

Substituting for b_1 from equation (8.9a) yields

$$NFB_u = \frac{\tau(1+\mu)}{1+r} w_u \left\{ (1+g_0)\frac{\overline{w}}{w_u} - (1+r) \right\}, \tag{8.13}$$

where $g_0 = \frac{n+\mu m}{1+\mu}$ is the population growth rate from period 0 to period 1 and $\overline{w} = S + (1-S)q = Sw_s + (1-S)w_u$ is the average wage in period 1. Now, if m and/or μ are large enough (so that g_0 is large enough) and/or $\frac{\overline{w}}{w_u}$

is large enough, the the net fiscal burden of an unskilled migrant is positive. Nevertheless the native-born gain from migration, even if purely unskilled[48].

8.4 Variable Wages

With variable wages, migration affects the well-being of the generations born at $t \geq 0$ also through the change in wages, and not only through the change in old-age security benefits. Note, however, that the production function exhibits constant returns to scale so that wages depend only on the ratio of the skilled and unskilled labor force. Because migration in period 0 does not change this ratio in period $t \geq 1$, then wages do not change in these periods. That is, they remain at their pre-migration levels. Hence, migration does not affect the well-being of the generations born in period $t \geq 1$.

Note from equation (8.9) that b_0 is equal to $\tau Y_0(1+n)$. Because migration in period 0 increases Y_0, the old in period 0 benefit from it (irrespective of its skill composition). The young in period 0 are affected through the change in wages in period 0 and through the change in b_1. As in subsection 3.3.1, b_1 rises with migration. As with respect to the change in wages, it depends on the skill composition of migration, as discussed in chapter 4.

In any event, here too the net fiscal burden does not properly capture the gains from migration.

8.5 Conclusion

A relevant and hotly debated issue is whether illegal migration is beneficial. Noting that such migration is a migration to jobs and not a welfare migration (because by their very illegal nature, the migrants are "ex-territorial" with respect to the welfare state), Friedman (YouTube) argued that it is beneficial for the host country[49].This chapter demonstrates that in an infinite horizon economy even legal welfare migration may prove to be beneficial to the host country.

Chapter 9

The Generosity of the Welfare State: Fiscal Competition

9.1 Introduction

So far the source country played a passive role. It merely served as a reservoir of migrants for the host (destination) country. That is, it provided exogenously given, upward sloping, supply curves of unskilled and skilled would-be migrants to the host country. In this chapter we address the issue of wether tax competition lead to a "race to the bottom". In a basic tax-competition model competition may lead to such a downward race because of three mutually reinforcing factors. First, in order to attract mobile factors or prevent their flight, tax rates on them are reduced. Second, the flight of mobile factors from the relatively high tax to the relatively low tax countries shrinks the tax base in the relatively high tax country. Third, the flight of the mobile factors from the relatively high tax country is presumed to reduce the remuneration of the immobile factors, and, consequently, their contribution to the tax revenue [50].

In contrast, in our model the mobile factor is labor of various skills. These factors consider not only their economic returns when making their migration decision, but rather also the social benefits offered by the countries. Importantly, also, the decisive voter who determine the tax rates is concerned about the effect of migration on factor rewards and fiscal burden. The paper analyzes fiscal competition with and without migration in a two-country, political-economy, model with labor of different skills. The paper assigns an active fiscal role for both the host and the source countries in shaping policies concerning the generosity of the welfare state. It models a migration host country stylistically as a member of the core EU welfare state, with tax financed benefits, and political - economy based immigration policies. The source country is modelled as an accession EU country (in the EU enlargement to 27 states), with its own welfare state (tax-benefit) policy [51].

To simplify matters, the two countries are assumed to be identical; except that the total factor productivity in the host country is assumed to be higher than that of the source country. This productivity gap is indeed the driving force behind migration. We let the host and the source country engage in fiscal competition. Using numerical simulations we examine how the migration and tax policies are shaped. That is, how they are different according to whether the skilled, or the unskilled, are in power. We also analyze how tax policies differ between the regimes of free migration and controlled migration.

Because the economy of the host country is identical to the one described in chapter 4, we go directly to the description of the economy of the source country.

9.2 The Source-Country Economy

To simplify, we assume that the economies of the source country and the host country are identical, except for a higher productivity factor in the host country (e.g., all the other technology and preference parameters are identical). Also, each resident of the source country has an individual-specific cost of migration. This cost (denoted by c^* and measured in utility terms) varies across individuals as in section 2.3.1 due to individual characteristics such as age, family size, forms of portable pensions, etc. For each skill group (their *total* size normalized to one) c^* is distributed uniformly over the interval $[0, \overline{c}^*]$. Throughout an asterisk $(*)$ denotes the source country variables.

The description of the source country economy is similar to that of the host country economy, as described in chapter 4. Production is as in equation (4.1), except for a different total productivity factor:

$$Y = A^* L_s^{*\alpha^*} L_u^{*(1-\alpha^*)}, 0 < \alpha < 1, \tag{9.1}$$

where $A^* < A$ but $\alpha^* = \alpha$. The competitive wage rates are given by equation (2.2) with asterisks attached to the variables. The aggregate labor supplies in the source country are different than in the host because the former is "sending" what the latter is receiving:

$$L_s^* = (S^* - \sigma\mu) l_s^* \tag{9.2}$$

$$L_u^* = (1 - S^*(1-\sigma)\mu) l_u^*$$

We assume the same pre-migration skill composition in the two countries, that is, $S^* = S$

Total population in the source country is

$$N^* = 1 - \mu. \tag{9.3}$$

The utility function of source function residents is given by equation (4.2), with asterisks attached to the variables.

The competitive equilibrium wage rates are given by:

$$
\begin{aligned}
w_s^*(\sigma, \mu; A^*, S^*) &= A^*(\alpha^* \delta^{*\epsilon} \theta^{*(1-\alpha)})^{\frac{1}{1+\epsilon^*}} \qquad (9.4)\\
w_u^*(\sigma, \mu; A^*, S^*) &= A^*((1-\alpha^*)\delta^{*\epsilon} \theta^{*(-\alpha^*)})^{\frac{1}{1+\epsilon^*}}\\
\text{where } \delta^* &\equiv (\alpha^*)^{\alpha^*}(1-\alpha^A)^{1-\alpha^*}\\
\text{and } \theta^* &\equiv \frac{1 - S^* - (1-\sigma)\mu}{S^* - \sigma\rho}.
\end{aligned}
$$

Note that $\epsilon^* = \epsilon$. Similarly to the condition in equation (2.10), We also assume that

$$
\frac{\alpha^*(1 - S^* - (1-\sigma)\mu)}{(1-\alpha^*)(S^* - \sigma\mu)} > 1, \qquad (9.5)
$$

so that $w_s^* > w_u^*$.

The indirect utility function is given by (4.4) with asterisks attached to the variables. The government budget constraint is given by

$$
b^* = \frac{\tau^*(1-\tau^*)^{\epsilon^*}(\alpha^*)^{\epsilon^*\alpha^*}(1-\alpha^*)^{\epsilon^*(1-\alpha^*)}A^{*(1+\epsilon^*)}(S^* - \sigma\mu)^{\alpha^*}(1 - S^* - (1-\sigma)\mu)^{1-\alpha^*}}{1-\mu}. \qquad (9.6)
$$

9.3 Determinants of Migration

Each resident in the source country, skilled or unskilled, decides whether to migrate to the host country or stay in her source country, depending on where her utility is higher (taking into account migration costs). Consider first a skilled resident with migration cost of c^*. If she stays in her source country, her utility level is $V_s(\tau^*, \sigma, \mu)$. If she migrates to the host country she enjoys a utility level of $V_s(\tau, \sigma, \mu) - c^*$. Thus, there will be a cutoff level of the cost, denoted by $\widehat{c_s}^*$,such that all skilled persons with c^* below $\widehat{c}_s^*$ will migrate and all others stay behind. The cutoff level of the cost is given by:

$$V_s(\tau^*, \sigma, \mu) = V_s(\tau, \sigma, \mu) - \widehat{c}_s^*. \tag{9.7}$$

The number of skilled migrants (m_s) is therefore given by

$$m_s = S^* \widehat{c}_s^* / \overline{c}^* \tag{9.8}$$

Similarly, for the unskilled too there will be a cutoff level of the migration cost, denoted by $\widehat{c}_u^*$ which is given by

$$V_u(\tau^*, \sigma, \mu) = V_u(\tau, \sigma, \mu) - \widehat{c}_u^*. \tag{9.9}$$

The number or unskilled migrants (m_u) is then given by

$$m_u = (1 - S^*) \widehat{c}_u^* / \overline{c}^*. \tag{9.10}$$

Hence, the total number of migrants, (μ) is given by

$$\mu = m_s + m_u = (S^* \widehat{c}_s^* + (1 - S^*)\widehat{c}_u^*)/\overline{c}^*, \tag{9.11}$$

and the share of the skilled migrants in the total migration is given by

$$\sigma = m_s/(m_s + m_u). \tag{9.12}$$

With the model described by (9.1)-(9.11) we are ready to formulate various interactions between the source and the host-country.

9.4 Migration and Fiscal Competition

Each one of the two countries determines its tax-benefit policy ((τ, b) and (τ^*, b^*)) by majority voting. That is, the policy is determined by maximization of the (indirect) utility function of the skilled or the unskilled, depending on which of the two groups forms a majority. In doing so, voters in each country take the tax-benefit policy of the other country as given (Nash-equilibrium). Also, voters take into account that migration takes place according to the mechanism described in the preceding sub-section.

9.4.1 The Model Equations

To simplify the exposition we assume that the two countries are identical in the technology and preferences parameters, except from the productivity factors, A and A^*. We assume that $A > A^*$. This productivity advantage is the driver of migration flows from the source country to the host country in our stylized model.

The indirect utility functions of the skilled and the unskilled in the host country, respectively, can be computed as:

$$V_s = (1-\tau)^{1+\varepsilon}\frac{A^{1+\varepsilon}}{1+\varepsilon}(\alpha)^{1+\alpha\varepsilon}(1-\alpha)^{(1-\alpha)\varepsilon}\left(\frac{(1-S)+\mu(1-\sigma)}{S+\sigma\mu}\right)^{1-\alpha}+\ln(b) \tag{9.13}$$

$$V_u = (1-\tau)^{1+\varepsilon}\frac{A^{1+\varepsilon}}{1+\varepsilon}(\alpha)^{\alpha\varepsilon}(1-\alpha)^{1+(1-\alpha)\varepsilon}\left(\frac{S+\mu\sigma}{(1-S)+\mu(1-\sigma)}\right)^{\alpha}+\ln(b) \tag{9.14}$$

The per-capita benefit is given by:

$$b(\tau;A) = \frac{\tau(1-\tau)^{\varepsilon}}{1+\mu}(\alpha)^{\alpha\varepsilon}(1-\alpha)^{(1-\alpha)\varepsilon}A^{1+\varepsilon}(S+\sigma\mu)^{\alpha}[(1-S)+\mu(1-\sigma)]^{1-\alpha} \tag{9.15}$$

Similarly, the source-country indirect utility functions and per-capita benefit are:

$$V_s(\tau^*;A^*) = (1-\tau^*)^{1+\varepsilon}\frac{A^{*1+\varepsilon}}{1+\varepsilon}(\alpha)^{1+\alpha\varepsilon}(1-\alpha)^{(1-\alpha)\varepsilon}\left(\frac{(1-S)-\mu(1-\sigma)}{S-\sigma\mu}\right)^{1-\alpha}+\ln(b^*(\tau^*;A^*)) \tag{9.16}$$

$$V_u(\tau^*; A^*) = (1-\tau^*)^{1+\varepsilon}\frac{A^{*1+\varepsilon}}{1+\varepsilon}(\alpha)^{\alpha\varepsilon}(1-\alpha)^{1+(1-\alpha)\varepsilon}\left(\frac{S-\mu\sigma}{(1-S)-\mu(1-\sigma)}\right)^{\alpha}+\ln(b(\tau^*; A^*)) \tag{9.17}$$

$$b(\tau^*; A^*) = \frac{\tau^*(1-\tau^*)^{\varepsilon}}{1+\mu}(\alpha)^{\alpha\varepsilon}(1-\alpha)^{(1-\alpha)\varepsilon}A^{*1+\varepsilon}(S-\sigma\mu)^{\alpha}[(1-S)-\mu(1-\sigma)]^{1-\alpha} \tag{9.18}$$

The migration (incentive compatible) equations are[52]:

$$V_s(\tau^*; A^*) = V_s(\tau; A) - \hat{c}_s^* \tag{9.19}$$

$$m_s = S\hat{c}_s^*/\bar{c}^* \tag{9.20}$$

$$V_u(\tau^*; A^*) = V_u(\tau; A) - \hat{c}_u^* \tag{9.21}$$

$$m_u = (1-S)\hat{c}_u^*/\bar{c}^* \tag{9.22}$$

Finally, the definitions of σ and μ are:

$$\mu = m_s + m_u \tag{9.23}$$

$$\sigma = \frac{m_s}{m_s + m_u} \tag{9.24}$$

We now turn to the analysis of the fiscal-competition problem.

9.4.2 Fiscal and migration competition

To fix ideas we consider the case where the skilled are in the majority in both the source and the host countries.

The fiscal-competition Nash-game is as follows:

(I) The Host Country

$\text{Max}_{\{V_s,\tau,b,\sigma,\mu,\hat{c}_u^*,\hat{c}_s^*,m_s,m_u\}}(V_s)$

Subject to equations (9.13),(9.15),(9.19)-(9.24)

(II) The Source Country

$\text{Max}_{\{V_s,\tau^*,b^*\}}(V_s)$

Subject to equations (9.14) and (9.18)

Note that while the host-country regulate immigration, the source-country does not attempt to regulate the emigration outflows. The fiscal competition nash-equilibrium is the solution to (I) and (II).

We now compare the equilibrium policies (determining the generosity of the welfare state) with the policies that will ensue in the absence of migration; that is, when μ is set at zero. We carry this comparison via numerical simulation.

9.5 The Identity of the Decisive Voter and Fiscal and Migration Competition: Simulations

Consider first the case where the skilled are the majority (in both countries). As the productivity gap rises, the skilled majority in the host country opts to raise the volume of migration, and to decrease the share of skilled migrants. This is because the rise in the productivity gap strengthens the positive effect on the marginal productivity of all complementary inputs (unskilled labor) and generates also strong negative effects on the marginal productivity of all competing inputs (skilled labor). Things are different in the case where the unskilled are the majority (in both countries). As the productivity gap rises, the unskilled majority in the host country opts for a larger share of skilled among the migrants, and also a larger volume of migration.

Figures (9.1) and (9.2) describe the effect of a rise in the productivity gap and of migration on the tax rates and per-capita benefits, respectively, in the two countries for the case in which the skilled are in the majority (in both countries). Note that the host-country has a lower tax rate with a larger per-capita benefit, compared to the source-country, thanks to its productivity advantage. In other words, the productivity advantage implies that the host country can provide more generous benefits than the source country with a smaller tax rate.

[insert figure 9.1 here]

[insert figure 9.2 here]

Consider now the effect of an increase in the host-source productivity, holding the source-country productivity fixed, thereby raising the productivity gap. Tax rates in both the host and the source country fall. From Figure (9.2) we can see that the host-country benefits rise whereas the source-country benefits fall.

Comparing the migration with the no migration case, Figure (9.1) shows that migration raises the host-country tax rate, whereas it lowers the source-country tax rate. This is an unexpected result in view of the literature (see e.g. Chari and Kehoe (1990)). As far as the generosity of the welfare state is concerned, comparing again the migration and the no migration cases, Figure (9.2) shows that migration raises the host-country benefits but lowers the source-country benefits, as expected in view of the behavior of the tax rates.

[insert figure 9.3 here]

[insert figure 9.4 here]

Figures (9.3) and (9.4) describe the effect of the productivity gap and of migration on the tax rates and per-capita benefits, respectively, in the two countries for the case in which the unskilled are in the majority (in both countries). Note that as in the case where the skilled are in the majority, the host-country has a lower tax rate and higher per-capita benefit, compared to the source-country, thanks to effect of productivity on political-economy based tax rate.

Consider now the effect of an increase in the productivity gap described in Figures (9.3) and (9.4). As the host-country productivity advantage rises, the tax rate in the host country falls as in the case where the skilled where the majority. But now the tax rate in the source-country rises rather then falls. From Figure (9.4) we can see that as the host-country productivity advantage rises, the host-country benefits fall. As the tax rate in the source country rises, so do the benefits.

Comparing the migration with the no-migration cases, Figure (9.3) shows that migration lowers the host-country tax rate, as is indeed expected in view of the literature on factors mobility. However, in contrast to this literature, the tax rate in the source country is higher under migration than without migration. As far as the generosity of the welfare state is concerned, Figure (9.4) shows that the benefits behave in circumstance to the tax rates. As expected, the host country tax rate falls if migration is allowed because the native-born are reluctant to set high taxes, as the proceeds of these taxes serve to finance also benefits to immigrants ("fiscal leakage"), as in Razin ans Sadka (2002a) and (2002b).

9.6 Free vs. Controlled Migration

In the bulk of this chapter migration is assumed to be controlled by the host country. In this section we analyze the case of free migration. We compare the difference between the tax policies of the host and source country for the controlled (as in subsection 9.4.2) and free migration regimes.

Formally, free migration is incorporated into the model, by dropping the control variables $\sigma, \mu, \hat{C}_u^*, \hat{C}_s^*, m_s$,and m_u from the fiscal competition model in the previous section; and adding the migration equations (9.19)-(9.24) to the equilibrium equation set.

In the controlled migration regime the host country takes into account the migration equations which determine the volume and composition of migration, when setting its tax policy. But the source country which does have no direct policy towards migration, does not take into account the migration equations in setting its own tax policy. If migration is free, however, none of the countries "manipulate" the migration equations in setting its own tax policies.

Figure 9.5 compares the host-country tax rates, under free and controlled migration, for the case where the skilled-young is the largest voting group. Similarly, Figure 9.6 compares the source-country tax rates, under the controlled and free migration regimes, for the case where the largest group is the skilled-young. If the skilled-young is the largest group, the regime switch from free to controlled migration raises the tax rate in the host country, while it lowers the tax rate in the source country.

[insert figure 9.5 here]

[insert figure 9.6 here]

Similarly, Figures 9.7 and 9.8 compare the two migration regimes for the case where the unskilled-young is the largest voting group. In this case the regime switch from free to controlled migration lowers the tax rate in the host country and raises the tax rate in the source country.

Therefore, the ability to control migration affects the tax rates in the host and source countries differently. The tax effect crucially depends on which skill group is decisive.

[insert figure 9.7 here]

[insert figure 9.8 here]

figure captions:

Figure 9.1: The effect of migration on the source- and host-country taxes; skilled-young is the majority

Figure 9.2: The effect of migration on the source- and host-country per-capita benefit; skilled-young is the majority

Figure 9.3: The effect of migration on the source- and host-country taxes; unskilled-young is the majority

Figure 9.4: The effect of migration on the source- and host-country taxes; unskilled are in the majority

Figure 9.5: comparing the host-country tax rates under free and under controlled migration; skilled-young is the majority

Figure 9-6: comparing the source-country tax rates under free and under controlled migration; Largest group is the Skilled-Young

Figure 9.7: comparing the host-country tax rates under free and under

controlled migration; unskilled-young is the majority

Figure 9.8: comparing the source-country tax rates under free and under controlled migration; unskilled-young is the majority

9.7 Conclusion

In the preceding chapters we focused mainly on the host country. The source country played a passive role. It merely serves as a reservoir of migrants for the host (destination) country. That is, it provided exogenously given, upward sloping, supply curves of unskilled and skilled would-be migrants to the host country. Chapter 9 attempts to model the source country in a stylistic way as an accession country (following the EU enlargement to 27 states) with its own welfare (tax-benefit) policy. Similarly, the host country is modeled stylistically as one of the welfare states of the EU-15. There is a grace period between the 2004 and 2014 where EU-15 member states can regulate the migration flows from the accession countries. We let these two asymmetric countries (in terms of their productivity) engage in fiscal competition. The destination country votes also on immigration policies. Using numerical simulations we demonstrate that if the skilled voters are in the majority, the effect of migration is to increase the generosity of the host-country welfare state but to decrease the generosity of the source-country welfare state. If, however, the unskilled voters are in the majority, the effect of migration is to lower both the generosity of the host-country welfare state and the generosity of the source-country welfare state.

It is often argued that tax competition may lead to a "race to the bottom". This result may indeed hold in the case of factor mobility (such as capital). However, in this paper we emphasize the unique feature of labor migration, that may nullify the"race to the bottom" hypothesis. Labor migration is governed not only by net-of-tax factor rewards, but rather importantly also by the benefits that the welfare state provides. Taking this consideration into account, countries are less reluctant to impose taxes that finance benefits to their residents in the presence of migration. Employing simulation methods we can indeed demonstrate that migration need not lower taxes in the source country, and may even give rise to higher taxes.

Chapter 10

Epilogue

Throughout this book policy is shaped by a politico-economic setting rather than by a benevolent (social-welfare-maximizing) government; as used to be assumed in the traditional public economic literature. The political mechanism at work is of a direct democracy type.

There is, however, another strand of the literature which was not dealt with in this book: The influence of special interest groups on migration policy, as in Grossman and Helpman (2002) in the context of the trade policy. These interest groups employ tools such as campaign contributions and candidate endorsement to influence policy; see, e.g. Facchini, Razin and Willmann (2004), Facchini and Willmann (2005) and Facchini and Mayda (2008) for an application to migration policy.

This approach emphasizes the host country's role in shaping migration, very much as we do here, albeit through a different politico-economic mechanism. In reality, who is allowed into a country indeed depends on the active immigration policy on the part of the receiving countries. As we point out in chapter 1, they more often than not enact quotas, point systems, and the likes, in order to select those migrants whom they deem most desirable. This view presupposes that the host country is attractive for potential migrants and focuses on the demand side.

Unlike the majority-voting mechanism, used throughout the book, the Grossman-Helpman "trade for sale" approach models policy formation as being based on interest group politics. Facchini and Willmann (2004) apply this approach to international factor flows: migration of labor and inflows of capital. Domestic factors are assumed to lobby the government for price or quantitative restrictions limiting the inflow of foreign factors into the country. The government accepts contribution from the lobbies, which specify monetary transfers as a function of the policy to be chosen. The policy-maker trades off national welfare against lobbying contributions in selecting the optimal policy towards capital and labor mobility. Of particular importance in this context are complementarities and substitutability among factors. In particular, their study shows that if factors are close substitutes, then they lobby on behalf of each other. If they are complements, on the other hand, they lobby against protection for the other factors, because a larger inflow increases their own productivity and hence their wage.

Their mechanism works as follows: suppose that unskilled migrants and unskilled native-born workers are substitutes to each other; whereas both unskilled and skilled migrants are complementary to the native-born skilled workers. There are thus two domestic lobby groups that have conflicting interest in migration policy: the native-born unskilled workers lobby for restricting migration, whereas the native-born skilled workers lobby for a more liberal migration policy.

The respective interests of the two groups are determined by their pay-offs in the lobbying game. That is, they consider their wage net of the contribution they offer to pay the government in order to obtain their preferred policy. The wage of the native-born unskilled worker is decreasing in migration because migrants constitute a substitute. The wage of the native-born skilled, on the other hand, increases in migration as both factors are complementary. Both interest groups try to convey their preferences to the government by offering contributions that depend on the migration policy chosen. In particular, as the contribution offered by the unskilled lobby increases, the lower the number of migrants allowed to enter the country. Conversely, the skilled interest group's contribution increases in the number of migrants.

When determining the migration policy, the government considers the monetary offers, but also weighs aggregate welfare, as the latter plays an important role for its re-election. Consequently, the policy chosen is the one which maximizes a weighted sum of contributions and social welfare. Other applications of the "protection for sale" approach for migration policy employ a similar analytic framework.

Facchini and Mayda (2008) point out that there exists substantial variation across countries in terms of individual attitudes towards migration: In 1995, Canada and Ireland are the most open countries to migration (with, respectively, 20.61% and 19.10% of their population favouring an increase in the number of immigrants), whereas Latvia and Hungary are the most closed (with, respectively, 0.45% and 1.48% of their population supporting higher migration). In general, most Central and Eastern European countries have among the lowest percentages of voters favouring migration (Latvia, Hungary, Slovenia, Czech Republic). Among Wester European countries, Italy (3.55%) and Germany (2.54%) have the most hostile public opinion toward immigration. Besides Ireland, Spain is the Western European country whose citizenry is most receptive towards migrants (8.44%). Finally, in the United States, 8.05% of the population welcomes increases in migration.

It remains a challenge for the majority-voting mechanism and the "protection for sale" mechanism to explain this heterogeneity.

Notes

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

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

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

[4]See also Mayda (2006)

[5]Despite the legal provision for the free movement of labor among EU-15 (the old member countries), the level of cross-border labor mobility is low. Reasons cited for this include the existence of legal and administrative barriers, the lack of familiarity with other European languages, moving costs, inefficient housing markets, the limited portability of pension rights, problems with the international recognition of professional qualifications and the lack of transparency of job openings. The expansion of the EU to 25 member states in May 2004, was accompanied by concerns over the possibility of a wave of migration – particularly of the low-skilled – from the then ten new member states to the EU-15.

[6]The Financial Times puts it succinctly: "Over the next 10 years Germany faces a demographic disaster and migration could be part of the solution. As the birth rate dwindles and life expectancy goes on rising, the country's population is both declining and ageing. Unless this double-whammy is confronted head-on, the economy will collapse under the weight of an expensive

welfare state that lacks the productive workforce to finance it. Something has to be done – and fast – as Germany's leaders and parts of its economic elite are finally realizing. And now they have come up with a last-ditch plan to avert meltdown: a plan designed to harness the untapped resources of its migrant community, whose youth, ambition and skills Germany needs to keep its economic engine running." (FT June 27, 2008). See also Brucker et al (2001).

[7]Vaupel (2010) finds that mortality at advanced ages can be postponed, and indeed is being postponed, resolved a millenia-old debate about whether survival could be extended among the elderly. The evidence published since 1994 is compelling. Mortality has been postponed considerably, as a result not of revolutionary advances in slowing the process of ageing but of ongoing progress in improving health.

[8]We restrict attention to OECD countries in order to get a relatively homogeneous classification of skill levels.

[9]The parsimonious model is developed with the cross-section data is mind. The migration variable is the stock of migrants; not flows (as relevant for dynamic analysis).

[10]In the next subsection and henceforth we describe an upward sloping supply of type of would-be migrants. Our assumption in this section amounts to supposing that the host country can provide a utility level which is above the highest reservation utilities of the would-be migrants.

[11]For a related study, see Krieger (2003)

[12]Brueckner (2000) provides a review of empirical studies regarding welfare migration. Khoudour-Casteras provides evidence of the role played by the social legislation implemented by Bismarck during the 1880s in the decline in German emigration before World War I. He demonstrates that the effect of the gap between the "direct wages" (that is, labor earnings) in the US (the major destination for migration from Germany) is less significant in the emigration regression than the gap between the "indirect wages" (that is, social benefits). Indeed, the former gap was narrowing whereas the latter gap increased significantly due to Bismarck's social legislation.

[13]The accession treaties normally allow for the introduction of 'transitional measures'. For instance, transitional periods of 6 years, postponing free labor mobility were introduced with respect to Greece, Spain and Portugal. The transitional measures obliges the member states to declare whether they will open up their labor markets for workers from the newly accessed countries, or keep restrictions in place for several (limited) years. In the eastern accession of the EU-8 (Poland, Lithuania, Latvia, Estonia, the Czech Republic, Slovakia, Hungary and Slovenia) in 2004, the restrictions will definitely end on 30 April 2011. A similar scheme (known as '2+3+2' on account of the possible periods of restrictions) is in place with respect to workers from Romania and Bulgaria, which joined the EU on 1 January 2007. Most EU-15 Member States (with the exception of the United Kingdom, Ireland and Sweden) took the decision after the 2004 EU enlargement to maintain restrictions on the cross-border mobility of labor from the EU-8 (Malta and Cyprus were

excluded from these restrictions), which delayed the migrant flow between the EU-8 and EU-15 Member States for up to seven years. Portugal, Finland, Spain and from July 2006 also Italy decided to lift restrictions, while Belgium, Denmark, France, the Netherlands and Luxembourg decided to alleviate them. The restrictions remain unchanged in Austria and Germany.

[14]This historical sketch is based on the descriptions in Wikipedia of the Treaties of Rome, the E.U., the E.E.A. and the Four Freedoms.

[15]As explained in the data subsection below, the last two control variables do not add up to one because we omitted workers with less than 8 year of schooling.

[16]Indeed, this is the subject matter of the next chapter.

[17]Also, as indicated by Docquier and Marfouk (2006), data on migration flows are less reliable than stock data, because flow data disregard return migration movements.

[18]Note that the 16 European countries comprising the first group may be similar not just in terms of the mobility of migrants, but also in terms of the institutions (e.g. labor market policies, the importance of unions) that govern the labor markets in these countries. These institutions are presumably weaker in the second group of non-EU countries. However, the latter are source countries so that their weaker institutions have little bearing on the appeal of the host countries for immigrants.

[19]A similar approach is taken by Razin, Sadka, and Swagel (2002), but they restrict their attention to low-skill migration.

[20]More precisely, we show that these results hold, respectively, at the levels of σ that each skill type would have chosen, if given their opportunity.

[21]As indicated, the biases are opposite in the case where the welfare state can choose both the volume and the skill composition of migrants. Therefore, if we were to have both EU and non-EU countries in our sample, that is countries with both free and restricted-migration regimes, the biases of α_s and α_u would be ambiguous and, their estimates would be biased.

[22]Note, however, that a higher proportion of skilled migrants lowers the skilled wage, w_s. This is why the skilled do not always set $\sigma_s^c = 1$.

[23]This is the "fiscal leakage" effect that was first alluded to in Razin, Sadka and Swagel (2002a and 2002b).

[24]see also Chau (2003) and Menz (2008)

[25]This concept of voting assumes that individuals attempt by their voting today to manipulate the voting outcome in the future through the demographic structure of the population. Note that this concept is different from the concept of strategic voting employed in chapters 6 and 7. The latter assumes that votes do not vote "sincerely" in the sense that they do not vote for their ideal policy but rather for the best policy that my emerge from all potential coalitions.

[26]In a recent paper, Mateos-Planas (2010) similarly analyzes the demographic effects on the mix of tax rates on labor and capital, using a closed economy overlapping-generations model where tax rates are voted without past commitments, every period.

[27]Note that this type of utility function implies that there are no income effects on the demand for leisure.

[28]A ceiling for μ is set equal to one, which means that the number of migrants cannot surpass the number of native-born young.

[29]See Samuelson (1958).

[30]In Chapter 2 we also demonstrate the existence of a positive effect of the generosity of the welfare state on the skill composition of migration, due to the fiscal benefits that are afforded by skilled migrants.

[31]Note that the utility with $\tau_t = 1$ is equal to minus infinity. Thus, the range for the tax rate is $[0, 1)$.

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

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

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

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

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

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

[38]This functional form of U^y is similar to the one used in Part I.

[39]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.

[40]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.

[41]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.

[42]For a related work see Krieger (2004)

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

[44]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%.

[45]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.

[46]This point was independently shown in Razin and Sadka (1999), and Sinn (2001).

[47]The model is based on Razin and Sadka (1999, 2000). See also a life-cycle extension in Lacomba and Lagos (2010).

[48]Kniegen (2004) and Lacomba and Lagos (2010) relax some of the assumptions, which provide some neunces to the above results. In Lacomba and Lagos (2010), only younger workers may be against imigration because their retirement period happens to coincide with that of the immigratns.

[49]For a textbook analysis of the benefits of labor migration see Razin and Sadka (1997)

[50]For a general-equilibrium fiscal-competion model of Europe, with capital mobility, see Mendoza and Tesar (2005). The paper demonstrates the limitation of the race-to-the-bottom result when factor rewards are variable.

[51]Recall that a grace period between 2004 and 2014 exists where an EU-15

member state can regulate the immigration flows from the accession countries. Thus, in the interim period national policies are allowed for inter-EU migration.

[52]We assume that the distribution of the reservation utilities is uniform, defined on the range $[0,\bar{c}^*]$, for eah skill level. $\hat{c}_i^*$ is the cutoff reservation utility for skill level i, i = s,u

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