QUANTIFYING THE IMPACT OF IMMIGRATION ON THE SPANISH WELFARE STATE*

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A B S T R A C T

The Spanish population will experience a significant aging in the coming years. This demographic change will impose a heavy burden on the national budget. In particular, expenditure on pensions and health care will grow much faster than productivity. Some authors believe that immigration could alleviate the fiscal burden on future generations by making the Spanish population younger. We use the methodology of Generational Accounting to quantify the impact of immigration on the Spanish Welfare State, by simulating alternative scenarios according to different quotas of immigrants. Our results suggest that immigration could have a positive and significant effect.

Keywords: Immigration, fiscal policy, generational accounting, Welfare State.

1 Introduction

Over the last decades, the demographic scenario in the developed countries has changed dramatically. Declining fertility and increased longevity bring about population decline and population aging, and this tendency is expected to worsen in the future. According to population projections by the United Nations (1999), 33 countries will reduce in population during the period 2000-2050. The population of the European Union (EU) will decrease from 371.9 million people in 1995 to 331.3 million by 2050, a 10.9% loss. Also in the EU, the proportion of people aged 65 and over will rise from 15.6% in 1995 to 29% by 2050. For Spain, the perspectives are particularly worrying. According to the UN projections, total population will decline from 39.6 million in 2000 to 30.2 million in 2050, a 24% loss. The proportion of people aged 65 and over will rise from 17% in 1995 to 37% in 2050. Even if we consider the more optimistic projections made by Fernández-Cordón (2000), the expected population in 2050 will be 34.5 million, a 13.6% loss and the proportion of people aged 65 and over will reach 33% by 2050.

These projected changes in the Spanish population raise serious concerns about the viability of the current fiscal policy. On the one hand, the aging of the population will deteriorate the national budget, since the elderly are net beneficiaries of the tax-transfer system. In particular, expenditure in pension benefits and health care will rise. Furthermore, the decline in fertility will reduce the proportion of net tax payers across the population.

Recently, some authors have argued that the inflow of immigrants could attenuate the negative effects of population aging. This opinion reflects the popular belief that a large inflow of immigrants makes the population of the host country younger. The reason is that the age structure of immigrants is younger than that of the natives, as Table 1 shows for the case of Spain, confirming the popular belief. We are not merely interested in the pure demographic impact of immigration, but also in the economic impact it will have in Spain. Specifically, we wish to study the quantitative effect of immigration on the Spanish fiscal policy in the long run. We therefore need to adopt a dynamic perspective.[1]

Some previous studies have used a dynamic framework to capture the long-run

[1] Surveys on the empirical effects of immigration in the host country have been presented by Borjas (1994), LaLonde and Topel (1996), and Smith and Edmonston (1996).

impact of immigration. Most of these studies have focused on the US economy. Borjas (1995) gives an estimate of the benefits that the host country derives from immigration, mainly from production complementarities between immigrant workers and other factors of production. According to Borjas, although there are some benefits from immigration, they are relatively small. The book by Smith and Edmonston (1996) is a thorough study of the various effects of immigration. In particular, they study its long-run fiscal impact. They conclude that the effect an immigrant makes, varies greatly depending on his age on arrival. Immigrants who arrive at the ages of 10 to 25 produce the most positive effects for natives. On average, they find that the effect is strongly positive at the federal level, but negative at the state and local levels. Lee and Miller (2000), arrive at similar conclusions. Storesletten (2000) calibrates a general equilibrium overlapping generations model, explicitly taking into account the differences between immigrants and natives. The reason for using a general equilibrium approach is that the inflow of immigrants might well increase interest rates and decrease wages, due to the increase in the labor/capital ratio.[2] He computes the net government gain, in present value, of admitting one additional immigrant. He finds that the optimal policy should be to increase the inflow of middle-aged, high- and medium-skilled immigrants. If, however, the age and skills of the new immigrants were at the level of current immigrants already living in the US, an increased inflow of immigrants would not help to balance the budget in the long-run.

The study closest to ours is that of Auerbach and Oreopoulos (2000), which analyzes the dynamic effects of immigration within the framework of Generational Accounting. They also find that the effects of current immigration to the US, in fiscal terms, are relatively modest. The effect is positive but extremely small, relative to the size of the overall fiscal imbalance. Finally, Bonin, Raffelhüschen and Walliser (2000) perform a similar exercise for Germany. Contrary to previous studies, they find a positive and significant effect of immigration on the intertemporal government budget.

In this paper, we also use Generational Accounting, which was originally developed by Alan J. Auerbach, Jagadeesh Gokhale and Laurence J. Kotlikoff in the early

[2] However, the empirical evidence seems to suggest that the effect of immigration on wages and unemployment rates of natives is negligible. See Lalonde and Topel (1996) and Smith and Edmonston (1996), and Dolado, Jimeno and Duce (1997) for the case of Spain.

nineties.[3] Generational Accounting is a new method to assess the long-term fiscal position of the government. It is a useful tool for assessing the size of the redistribution between present and future generations. It calculates, in present value, what the typical member of each generation and sex can expect to pay in net taxes (taxes net of transfer payments received), in his/her remaining lifetime. The book by Auerbach, Kotlikoff and Leibfritz (1999) presents Generational Accounting analyses for 17 different countries.

There are also some previous works on Generational Accounting in Spain. In particular, the work by Berenguer, Bonin and Raffelhüschen (1999), which is part of a larger study supported by the European Commission, analyzes several European countries. The methodology of Generational Accounting was also applied by Bonin, Gil and Patxot (2001) to the study of the Spanish pension system and by Abío, Berenguer, Bonin, Gil and Patxot (2001) to the reduction of current deficit.

In this paper, we focus on the effects of immigration on the Spanish Welfare State. We simulate alternative scenarios by considering different quotas of immigrants. In particular, we consider three different scenarios. In the benchmark scenario we assume a net immigration of 30.000 individuals per year, which is the current quota in Spain. In the second scenario we assume that net immigration is zero after the base year. Finally, in a third scenario, we consider an "increased" net immigration of 100.000 individuals per year. Contrary to Auerbach and Oreopoulos (2000), we find that increasing the number of new immigrants would substantially lower the burden on future natives. This result is in line with the evidence for Germany, presented in Bonin, Raffelhüschen and Walliser (2000). We believe that the reason for this apparently contradictory result is due to the fact that in Spain, as in Germany, the imbalance in the current fiscal policy is very high, while in the US it seems to be relatively small, mainly because, in the US, the problem of an aging population is less dramatic than in Germany or Spain.

The structure of the paper is as follows: In Section 2, we briefly describe the methodology of Generational Accounting and we explain how to accommodate immigrants in that framework. In Section 3, we present the assumptions concerning population projections and fiscal projections for the period that we are analyzing.

[3] A detailed description of the Generational Accounting methodology can be found in Auerbach, Gokhale and Kotlikoff (1991) and Auerbach, Gokhale and Kotlikoff (1994).

In Section 4, we present our main results concerning the overall dynamic effect of immigration in the three scenarios considered. Finally, in Section 5, we summarize and conclude.

2 Methodology

Generational Accounting is based on the government's intertemporal budget constraint, which can be expressed as follows:

$$\sum_{s=t}^{\infty} \frac{T_s}{(1+r)^{s-t}} \equiv \sum_{s=t}^{\infty} \frac{G_s}{(1+r)^{s-t}} + B_t, \tag{1}$$

where t is the base year, T_s is total tax revenue in year s, G_s is government expenditure in year s, B_t is the government's outstanding net debt in year t, and r is the real interest rate. Equation (1) is an identity. It states that all government expenditure will be paid out of taxes, either today or in the future. Following the Generational Accounting methodology, government expenditure is split into government consumption and government transfers to the individuals. Government transfers represent that part of G_s that can be attributed to particular individuals. For example, pension benefits paid by the social security administration, unemployment benefits, and also in-kind transfers such as education and health services. All the remaining expenditure (i.e., that cannot be attributed to particular individuals), is included under the name of government consumption.

The next step is to assign government transfers and tax payments to every generation by age, sex and nativity.[4] In the terminology of Generational Accounting, this means constructing the accounts for current and future generations. The account in year t of a generation born in year k, is the present value of the stream of taxes (net of transfers) that they will pay to the government over their remaining life span. We call it $N_{t,k}$. If the maximum length of life is D, the accounts of existing generations in the base year are $N_{t,t}, N_{t,t-1}, .., N_{t,t-D}$. The first one $(N_{t,t})$ is the account of those born in the base year, while the last one $(N_{t,t-D})$ is the account of those born D years ago, i.e., the oldest generation alive in the base year. The accounts of future generations are $N_{t,t+1}, N_{t,t+2}$, etc. As such, we can rewrite identity (1) as:

$$\sum_{s=0}^{D} N_{t,t-s} + \sum_{s=1}^{\infty} N_{t,t+s} \equiv \sum_{s=t}^{\infty} \frac{G_s}{(1+r)^{s-t}} + B_t, \tag{2}$$

[4] To ease notation, we will skip sex and nativity subscripts in this presentation.

where now, G_s denotes government consumption in the year s. The intertemporal budget constraint in (2) expresses the fact that the total liabilities of government cannot exceed the sum of the present value of net payments made by current and future generations. The first term in the left-hand side represents the total amount of net taxes paid by existing generations, while the second term represents total contributions of future generations. The account of a generation born in year k can be written as follows:

$$N_{t,k} = \sum_{j=\max\{t,k\}}^{k+D} P_{j,k} T_{j,k} (1+r)^{-(j-t)}, \qquad (3)$$

where $P_{j,k}$ is the number of individuals born in year k who are still alive in year j, and $T_{j,k}$ represents the average net tax payments made in year j by a member of the generation born in year k. As we take t as our base year, the summation begins in year t, for generations born before the base year. For those born in year $k > t$, the summation begins in year k.

We shall now explain how the different terms in Equation (2) are estimated. To estimate government consumption, we first calculate per capita government consumption in the base year, from the government's accounts. Secondly, we assume that per capita government consumption grows along with productivity at rate g per year. Finally, we use our population projections to calculate $G_t, G_{t+1}, .., G_{t+k}$, etc. Government debt is directly obtained from the government's accounts.

The left-hand-side of Equation (2) is estimated using two different approaches that differ on how the changes in fiscal policy needed to restore the balance of the government's intertemporal budget constraint are implemented. The first approach is the traditional approach employed in the literature of Generational Accounting. It consists of estimating the accounts for existing generations under the assumption that current fiscal policy will remain fixed for those generations. The sum of the accounts for future generations is then calculated as a residual from Equation (2). This approach implies that future generations will absorb the entire adjustment required to fill the gap in the intertemporal budget constraint. We believe that this is a useful benchmark, since it provides information on the size of the existing imbalance. The main flaw in this approach, however, is that it seems implausible that fiscal policy will change only for those generations born after the base year, while it remains unchanged for those generations born in the base year or earlier. We therefore explore an alternative approach proposed by Auerbach and Oreopoulus (2000), in which fiscal policy is assumed to change immediately, and any imbalance arising from Equation (2) will be paid by both current and future generations.

Under both approaches, we first estimate the average net tax payments for all living generations in the base year. This means estimating the terms $T_{t,t}, T_{t,t-1}, .., T_{t,t-D}$ of Equation (2). To do so, we use micro-data and the aggregate figures derived from the government's accounts.

In the traditional approach, per capita net tax payments for currently living generations are projected through productivity growth. That is, the average net tax payment of an individual aged s in year $t+k$ $(T_{t+k,t+k-s})$, is simply the average net tax payment of an individual aged s in year t $(T_{t,t-s})$ multiplied by $(1+g)^k$. We then use population projections together with these estimates to calculate the accounts for all living generations in the base year. As mentioned above, once we have estimated the present value of government consumption, government debt and the accounts for currently living generations, we obtain the sum of the accounts for future generations as a residual. The next step is to divide the burden among the future generations. We use the following procedure. We study how much fiscal policy should be changed in order to restore the balance of the government's intertemporal budget constraint. In particular, we calculate which is the proportional increase in all taxes and/or the cut in all transfers that future generations will pay and/or receive to balance the intertemporal government budget constraint. If no change is needed, this means that the government's long-run fiscal position is balanced. If an increase in taxes and/or a decrease in transfers is needed, this means that current fiscal policy is not sustainable. Under this method, the change in fiscal policy can have a different impact on males as on females, and on natives or immigrants.

Under the alternative approach, fiscal policy is assumed to change immediately. We first calculate the burden on existing and future generations under the current fiscal policy. Then, we consider a proportional increase in all taxes and/or a cut in all transfers that all generations will pay and/or receive until the intertemporal government budget constraint is balanced.

3 Assumptions Underlying Generational Accounts Calculations

To produce generational accounts for Spain, we require population projections, taxes and transfers profiles in the base year, government expenditure and government debt in the base year. Our definition of government includes the central, the regional and the local governments. We have chosen 1998 as our base year, due to data availability.

3.1 Population

We construct population projections for the period 1998-2197, assuming that the population remains stationary thereafter.[5] To construct these projections, we need to make some assumptions on the behavior of the life expectancy and the fertility rate in future, as well as assumptions about the age structure of future immigrants. We do not make any distinction between immigrants and natives in terms of life expectancy and fertility rate. The reason is that there is no available data on the life expectancy and the fertility rate of immigrants in Spain.[6] According to our micro-data, the main difference between natives and immigrants is in their average labor income. The reason is two-fold. Firstly, because the percentage of employed people is larger among immigrants, and secondly, because in comparing immigrant workers to native workers, we observe that the average labor income of the former is lower.

We assume that life expectancy will rise within the period that we are studying. In Figure 1 we present the trend in life expectancy. In particular, we assume that life expectancy will rise from 74.7 years in 1998, to a limit expectancy of 78.5 for males, and from 81.9 in 1998 to 85 for females.[7] These numbers are quite similar to those of Fernández-Cordón (2000).

We also assume that the fertility rate will rise in the following years. In 1998, the fertility rate in Spain was 1.165,[8] the lowest in the European Union. We perform two

[5] To calculate the accounts for current generations, we only need population projections up to 2098, because our maximum life-span is 100 years. However, we need population projections to infinity to calculate the present value of future government expenditures and the per capita accounts for future generations.

[6] To test for the robustness of our results, we have repeated our simulations using a value for the fertility rate of immigrants that is a 50% higher than the fertility rate of natives in the base year. The impact on the results is rather small. The reason is that immigrants are always a small fraction of the total population.

[7] In the Appendix we describe, in detail, the construction of the survival rates, by age and sex.

[8] According to data from INE, "Movimiento natural de la población" (http://www.ine.es).

distinct projections for the fertility rate. Under a low fertility scenario, we assume that the fertility rate will rise to 1.5 in the year 2015 and will stay at that level thereafter. This is our benchmark scenario and it corresponds, roughly, to the current average fertility rate in the European Union. We also present a high fertility scenario, in which the fertility rate reaches 1.8 in the year 2020, and from that year onwards, it remains constant. We set this value because it corresponds approximately to the current average fertility rate in the Scandinavian countries. In Figure 2, we plot our fertility rate projections under both scenarios.

We first construct the age and sex profile for current immigrants in the base year. We consider immigrants to be *individuals from under-developed countries, who arrived in Spain when they were older than twelve.* We do not consider people from developed countries as immigrants,[9] because their tax and transfer profiles are similar to those of the natives. Secondly, we exclude individuals who arrived in Spain when they were younger than twelve, because we think that they have had the same education opportunities as the Spaniards and, therefore, will not differ much from the natives. The Spanish Statistics Office (INE) provides information on the number of immigrants by sex, age groups[10] and country of origin. In 1998, there were 389,333 legal immigrants from under-developed countries living in Spain. However, as far as we know, there are no official figures on the number of immigrants according to age when they first arrived in Spain. We obtained this information from the Spanish Labor Force Survey (Encuesta de Población Activa, EPA). The EPA is a large survey that is carried out each quarter, since the early seventies, and is representative of the Spanish population. The sample size is around 60,000 households (200,000 people) and one sixth of the households is renewed each quarter. We pool together all the data for 1999 (four quarters) and the available data for 2000 (the first three quarters). The total number of observations is 1.318,708. The number of immigrants from underdeveloped countries is 7,085, and of those, 5,407 came to Spain when they where older than twelve (0.41 percent of the total sample). We first calculate the proportion of immigrants within this sample by age-sex groups and then use these proportions to allocate the 389,333 immigrants that were living in Spain in 1998. Secondly, we calculate the proportion of immigrants in each age-sex group that arrived

[9] Most of the residents in Spain who were born in developed countries are from the EU.

[10] The age-groups are: younger than 16, from 16 to 24, from 25 to 44, from 45 to 64, and older than 64.

in Spain when they were older than twelve, and we use these proportions to estimate the number of immigrants by age-sex groups. Finally, we consider as natives all the children that the immigrants will have, after settling in Spain. That is, we assume that the characteristics of the second generation of immigrants are indistinguishable from those of the natives.[11] Under these assumptions, we construct population projections for the period 1998-2197, both for natives and for those immigrants who were resident in Spain in 1998.

To complete our population projections, we need to make assumptions about the number of immigrants arriving in Spain. We consider three different scenarios regarding future immigration. The first scenario involves annual net immigration of 30,000 individuals. This is our benchmark scenario and it reflects the current quota of immigrants in Spain. In the second scenario, we consider the case of zero net immigration after the base year. Finally, the third scenario incorporates an annual net immigration of 100,000 individuals. Under the first and the last scenarios, we have to construct population projections for future immigrants. The reason why we have to distinguish between current and future immigrants is because the future immigrants did not belong to the "existing" generations in the base year. To construct population projections for future immigrants, we assume that new immigrants will be younger than 65 and their age-sex profiles will mimic the age-sex profiles of current immigrants in 1998.[12] Hence, we use the proportion of immigrants in each age-sex group derived from the EPA survey to allocate new immigrants to the different age-sex cohorts.

3.2 Fiscal Projections

Aggregate taxes and transfers are taken from several sources. Most of them come from the report "Actuación económica y financiera de las Administraciones Públicas", published by the Ministerio de Hacienda-Intervención General de la Administración del Estado (IGAE). Table 2 summarizes the public budget in the base year 1998.

We distinguish between four main categories of taxes: direct taxes, value added tax (VAT), excise taxes and social security contributions. Direct taxes include income tax, property tax and corporate tax. According to the "small-country" assumption,

[11] This assumption rests on empirical evidence from the US (Chiswick (1977, 1978)), and Germany (Gang and Zimmermann (2000)).

[12] New immigrants who arrive when they are younger than twelve are considered natives.

we assume that taxes on mobile corporate capital are borne by local, fixed factors. Transfer payments are categorized into direct monetary transfers (pensions, unemployment benefits, etc.), health and education. For each of these items, the aggregate amounts are distributed according to age, sex, and nativity profiles. The remainder of government expenditure, after subtracting all tax payments not allocated to particular individuals, is labelled as government consumption.

To construct the accounts, we also need the value of the outstanding public debt which, in 1998, amounted to 340,414 million euros, 64.7 percent of GDP, according to the Banco de España (2000). Finally, we assume an annual productivity growth rate of 1.5 percent and a discount rate of 5 percent in the long run. We have chosen these figures as they are quite comparable to those used in most of the studies included in Auerbach, Kotlikoff and Leibfritz (1999). We test the robustness of our results by repeating the simulations under alternative discount and growth rate assumptions. The alternative assumptions are 1 and 2 percent for the productivity growth rate and 3 and 7 percent for the discount rate.

3.3 Construction of relative age-profiles

Relative age-profiles for taxes paid and transfers received are calculated through micro-data. Our two main sources of data were the European Community Household Panel Survey (ECHP) and the Spanish Consumer Expenditure Survey (Encuesta de Presupuestos Familiares, EPF). The ECHP survey presents comparable micro-level (persons/households) data on income, living conditions, housing, health and work in the EU. This survey covers all EU member states and it follows the same private households over consecutive years from 1994 onwards. For our study, we have used data on 6,522 Spanish households in the 1995 wave. The EPF is a large cross-sectional survey and provides very detailed information on family expenditures, household characteristics and personal income. This survey was carried out in 1990/91 on a sample of 21,155 households and is quite representative of the Spanish population.

The age-profiles are calculated as follows. First, we calculate initial profiles of average taxes paid or transfers received by sex and age for immigrants and natives, using the micro-data. We then derive the micro-based total taxes paid or transfers received by each group, by multiplying the averages by the number of people in the population on each age-sex-nativity cohort. Typically, when we add-up the micro-based figures for the entire population, we find that they do not coincide with the corresponding government budget figures represented in Table 2. We therefore construct our final profiles of taxes paid or transfers received by each group by allocating the exceeding amounts, proportionally, to the initial profiles. All these profiles are represented in Figures 3-18. In the horizontal axis we represent age and in the vertical axis, the average amount paid or received, in thousands of euros, by sex and nativity.

3.3.1 Direct Taxes

The age-profiles for direct taxes (Income Tax and Social Security Payments) are calculated from income data taken from the ECHP. The personal income data recorded in this survey are net of taxes and social security payments. As an approximation, we have calculated the age-profiles by sex and nativity for income tax, proportional to total personal net income, and for social security payments, proportional to labor income. In Figures 3 and 4, we present Income Tax and Social Contributions respectively.

The ECHP is not a very large survey and the number of immigrants is therefore rather small. As such, the figures for average income by sex and age for immigrants are not very reliable.[13] For this reason, we have used an alternative approach to calculate average income by sex and age for immigrants. We have calculated average labor income for employed immigrants and employed natives, and the ratio between the two is 0.8.[14] However, we are interested in estimating average labor income by age, sex and nativity for the entire population, and not merely for employed people. We should also check therefore, whether there are differences in employment rates between immigrants and natives. We have used the EPA survey to calculate employment rates by age, sex and nativity. We have found that the employment rates are higher for immigrants than for natives, for young cohorts and for those close to retirement age, and are very similar for middle age cohorts. Then, we have used the employment rates from the EPA survey and the labor income data from the ECHP to estimate average labor income, by sex and age, for both natives and immigrants. We first calculate the average labor income, by sex and age, for employed natives from 16 to 64 years of age. We then assume that average labor income, by sex and age, for

[13] Once we divide the sample of immigrants by sex and age, the number of individuals in each cell is rather small.

[14] Remarkably, Schmidt (1997) finds exactly the same ratio for Germany.

employed immigrants, is 80 percent of the average for natives. Finally, we multiply these averages by the employment rate for each cohort to obtain their average labor income by age, sex and nativity, for the entire population.

We have also calculated average non-labor income, for immigrants and natives, and we find that there are no substantial differences between these two figures. Therefore, we have calculated average non-labor income, by age and sex, for the entire sample, and we have assigned these averages to both immigrants and natives. Average total income for each cohort, is then the sum of average labor and non-labor income.

3.3.2 Indirect Taxes

For indirect taxes we have used the EPF data. As already mentioned, the EPF data provides very detailed information on household expenditure (it covers 918 goods). Different goods are taxed at different rates and the exhaustive good classification of the EPF allows us to calculate the VAT paid by each family quite well.[15] Hence, we first calculate VAT paid by the household using appropriate rates for each good. We then allocate VAT to each adult in the family, proportional to his/her income. We also use the EPF data to calculate the excise taxes that are paid on certain goods such as beer, spirits, tobacco, electricity, vehicles, gasoline, and some types of insurance. Unfortunately, there is no information on nativity in this survey. As such, we could not directly derive any VAT profile for immigrants and natives. What we did was to calculate the average VAT paid, by sex and age, using the EPF, and considered these figures as the relative VAT profile for natives. We then used the ratio of average total income for immigrants and natives, by sex and age, that we had obtained from the ECHP, and multiplied the profile for natives by these ratios, to estimate the relative VAT profile for immigrants. We use the same approach to calculate the excise taxes profiles. In Figures 5 to 11 we present the age profiles for indirect taxes.

3.3.3 Transfers

Direct monetary transfers received by each group have been calculated using the ECHP data. This data set provides information on direct transfers received by each adult member of the family. Direct transfers are disaggregated into unemployment

[15] The EPF data for food and alcohol that we have used has been corrected for the bulk purchases effect according to Peña and Ruiz-Castillo (1998).

benefits, pensions, family allowances and other transfers. However, in this study we have considered total transfers received by each adult and we have calculated the age-profile for total transfers for immigrants and natives, using a similar approach to that used for direct taxes. We first calculated the average total transfers for immigrants and natives, the ratio between the two being 0.9. Secondly we computed the average total transfers, by sex and age, for natives. Finally, we multiplied the profile for natives by 0.9, to estimate average total transfers, by sex and age, for immigrants.

To construct the profile for education we need per capita expenditure by level of education, and enrolment rates by age, sex and nativity. We first calculate per capita expenditure by level of education, using data from the Spanish Ministry of Education. We then use the enrolment rates, by age and sex, provided by the OECD. Unfortunately, these enrolment rates do not distinguish between immigrants and natives. According to the EPA survey, the proportion of students differ sharply between immigrants and natives, and we have used the proportion of students by age, sex and nativity, derived from the EPA survey, and the enrolment rates provided by the OECD, to estimate the enrolment rates by age, sex and nativity. Finally, we combined per capita expenditure, by level of education, with enrolment rates by age, sex and nativity, to derive the education profile.

We could not find reliable data for Spain to construct the health profile. Instead, we have used the profile for Belgium.[16] This is because Belgium and Spain have similar age structures and, thus, the distribution of health expenditures by age and sex must be very similar in both countries. However, we have also used the data contained in Alonso and Herce (1998),[17] to check for consistency. We found that both profiles were roughly similar, except for the case of children below one year. In the data in Alonso and Herce, health expenditure per capita for children below one year was twice the expenditure using the data from Belgium. We believe that the reason for this discrepancy is that Alonso and Herce only took health expenditure within hospitals into account including, in particular, all the expenditure in premature babies, which inflates the corresponding amount. The health profile is assumed to be identical for immigrants and natives. In Figures 13 to 15, we present the profiles for transfers. Finally, we present the age profiles for all per capita taxes, transfers and

[16] These data were kindly provided by Arnaud Dellis.

[17] Alonso and Herce (1998) report data on per capita health expenditure by age groups. However, they do not disaggregate by sex.

net taxes in Figures 16 and 18.

4 Results

As we have two different fertility projections and three different quotas of immigrants, we have six different scenarios. Our benchmark scenario is that of low fertility and 30,000 immigrants per year. Moreover, we study two different approaches for the implementation of the necessary changes in fiscal policy.

Tables 3 to 6 show the results of the paper. The upper part of Table 3 shows the per capita Generational Accounts for existing generations by sex and nativity. They present the typical life-cycle pattern found for other countries. The accounts increase during childhood and youth, peaking at around the age of 25. Above that age, accounts start to decrease, because the remaining period within the labor force gets shorter and social security transfers are less discounted. Around the age of 50, accounts become negative (45 for women), and they reach a minimum at around 65. Above that age, they rise again, due to the short period of the remaining life-span.

The very large differences between men and women is worth mentioning. This is primarily due to the low participation of women in the labor market. However, it is also due to our tax incidence assumptions.[18] Differences between natives and immigrants are also significant. These differences arise mostly from taxes paid, not from benefits received. At each age, immigrants earn less than natives and, thus, pay lower taxes (see Figures 16 and 17).

The results in Table 3 correspond to the traditional approach of Generational Accounting, in which the whole existing imbalance is paid only by future generations and we consider a proportional increase in all taxes and a decrease in all transfers. In the bottom part, we present the burdens on future generations for alternative immigration policies and different fertility scenarios. In the benchmark case with low fertility and 30,000 immigrants per year, the account for a male born in 1999 is 93,624 euros, which is 82.7 percent higher than the account for a male born in 1998. Compared to the results for other countries in Auerbach, Kotlikoff and Leibfritz (1999), we see that this imbalance is comparable to the existing imbalance in Germany and Italy but higher than in the remaining countries covered in that study, except

[18] As we explained above, we allocate VAT and excise taxes among adult members within a household, proportional to their income.

Japan.

We can compare the burden on future generations under different fertility-rate assumptions. The first thing to be considered is that an increase in the fertility rate has two opposite effects on the per capita burden of future generations. On the one hand, an increase in the population implies an increase in total government consumption, since we are assuming that government consumption per capita is constant. On the other hand, the larger the population is, the lower the per capita contribution will be for a given total burden. The total effect of higher fertility on future generations is, at best, quite modest. In the scenario with no immigration after the base year, it reduces the burden on future generations by 3.5 percent. Under a high immigration policy, the reduction in the burden of future generations is only a 0.5 percent. The reason is that, as shown in the table, the average amount that an immigrant pays is larger than the amount paid by a new-born native. Therefore, when the number of new immigrants is large, the first effect mentioned above almost offsets the second.

If we now compare the burden on future generations under different immigration policies, we can see that the larger the number of new immigrants, the lower the burden on future generations and this effect is quite large. For instance, under the scenario with 100,000 immigrants per year and low fertility, the per capita burden on future generation is reduced by 14.2 percent compared to our benchmark. This is because the average new immigrant arrives when he is 34, and, at that age, his remaining lifetime contribution is very large. In 1998, we estimate that the present value of the average contribution of a male immigrant during his remaining life-time is 107,399 euros, while the corresponding figure for a female immigrant is 13,278 euros.

In Table 4 we present alternative methods of allocating the imbalance. In the first four columns of the table we follow the traditional approach in the literature of Generational Accounting. That is, we assume that all the imbalance is allocated to future generations alone. Therefore, the accounts for current generations are the same as in Table 3. In the benchmark scenario, all taxes would have to rise and all transfers would have to fall by 24.2 percent. Notice that this method of allocating the imbalance does not imply the same increase in the burden for men as for women, or for immigrants as for natives. In the last four columns of Table 4, we explore the alternative approach, by considering an immediate change in fiscal policy that affects both current and future generations. Now the accounts change also for currently living generations. The increase in taxes and the decrease in transfers needed to fill the gap is 4.1 percent.

In Table 5, we present the contribution of the generations born in 1998 and 1999, for different quotas on immigrants and alternative changes in fiscal policy. For simplicity, we present only the scenario with low fertility. The alternative fiscal tools that we consider are: A proportional increase in all taxes, a proportional decrease in all transfers, and the combination of both. The left-hand side of the table corresponds to the case in which all the burden falls on future generations while, on the right-hand side, we present the results for an immediate change in fiscal policy. The first thing to be considered is that a cut in all transfers increases the burden on females more than an increase in all taxes, and the opposite can be said for males. The reason is that there are huge differences in the tax profiles between women and men, while differences in the transfer profiles are quite small (see Figures 16 and 17). If we now compare the alternative immigration policies, we can see that immigration contributes to alleviating the burden on future generations under all the different fiscal policies that we have considered in our analysis. However, the contribution of one additional immigrant is higher when the number of new immigrants changes from zero to 30,000, than when it changes from 30,000 to 100,000. The contribution of immigrants has, therefore, decreasing returns.

Finally, we present in Table 6 the results of our simulations for alternative discount and productivity rates. We present the percentage change in all taxes and transfers under the three immigration scenarios (zero, 30,000 and 100,000 immigrants per year), and the two fiscal policy scenarios (all the burden is payed by future generations and an immediate change in fiscal policy) that we have analyzed along the paper. We want to stress that, for all the combinations that we have considered, generational accounts remain unbalanced. Furthermore, in all the cases, an increase in the number of immigrants will significantly lower the per-capita fiscal burden payed by current and future generations. Under the assumption that all the imbalance is paid by future generations, the size of the gain decreases when either the interest rate decreases or the growth rate increases. However, under the assumption of an immediate change in fiscal policy, the effect of an increase in the interest rate on the size of the gain is not monotone. The same can be said about an increase in the growth rate.

5 Conclusions

The main purpose of this study was to analyze the impact of immigration in the Spanish Welfare State. We have used the Generational Accounting methodology to address this issue. We have calculated the accounts for existing generations in 1998 (our base year) and the main conclusion is that the imbalance under current fiscal policy is rather large and is comparable to the imbalance in other European countries, like Germany and Italy. We have considered alternative immigration policies. The main conclusion is that, contrary to the results for the US in Auerbach and Oreopoulos (2000), a higher number of immigrants will substantially help to alleviate the fiscal burden on future generations in Spain. This evidence is in line with the results for Germany in Bonin, Raffelhüschen and Walliser (2000).

The main drawback of this paper is the lack of data on the characteristics of immigrants in Spain, mainly about their incomes. However, we think that we have estimated average income for immigrants in the best possible way, and hopefully, in the near future, the Spanish Statistics Office will carry-out an exhaustive survey on immigrants, which will allow us to verify our results.

Women's participation in the labor market in Spain has been increasing substantially for the last two decades. However, it is still quite low compared to other European countries. Most of the empirical research in the area points to a further increase in female labor force participation in the near future. Therefore, it will be particularly interesting to analyze the effect of an increase in female labor force participation on the Spanish Welfare State, within the Generational Accounting framework, and see whether the positive effect of immigration found in our paper is offset by an increase in female labor force participation. However, we think that this issue is out of the scope of this paper, and we leave it for future research.

To conclude, we have developed a flexible tool that allows us to perform different experiments concerning policy instruments. One experiment that we believe is particularly interesting is to study different types of immigration policies. For instance, should Spain try to attract immigrants of a particular type, of a particular educational level, age or sex? These questions can be properly addressed within our framework and are left to future research.

Appendix: Construction of Projections for the Survival Rates

We take the latest survival rates published by the Instituto Nacional de Estadística (1997) as our starting point. We adopt these survival rates as the survival rates for the base year 1998. To compute the survival rates for all subsequent periods, we use the following procedure: We fix life expectancy at birth, in the limit, at 78.5 years for men and 85 for women. These are the same figures used by Fernández-Cordón (2000). For simplicity, we assume that from the base-year to the limit, all male (female) survival rates by age increase in the same proportion. That is, if $p^0_{x,i}$ is the base-year survival rate of an individual of age $x = 0, .., 100$ and sex $i = M, F$, the survival rate in the limit will be $p^\infty_{x,i} = \alpha_i p^0_{x,i}$. With the above values for life expectancy in the limit, we get $\alpha_M = 1.00124$ and $\alpha_F = 1.00088$. Then, for each age and sex, we have already fixed survival rates in both the base-year and the limit, which we will use as the last year. To compute all the survival rates between those two extremes, we assume that they improve through time at a decreasing rate. In particular, we use the following equation:

$$p^t_{x,i} = (1 - e^{-bt})p^\infty_{x,i} + e^{-bt}p^0_{x,i},$$

for $0 \leq t \leq \infty$, where $p^t_{x,i}$ is the survival rate of an individual aged x in year t. We simply need to give some value to the parameter b. We propose a very simple procedure. Suppose that we call $\widehat{t}$ the number of years that it will take to fill exactly half of the gap between $p^0_{x,i}$ and $p^\infty_{x,i}$ (notice that $p^t_{x,i} \leq p^\infty_{x,i}$ for all t). Then, it is easy to see that the value of b will be:

$$b = -\frac{1}{\widehat{t}} \ln(\frac{1}{2}).$$

For our calculations, we will fix $\widehat{t} = 20$, and therefore $b = 0.0346574$.

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Table 1: Age structure of immigrants and natives, Spain 1998

	Natives	Immigrants
Proportion of individuals aged 0-15	16.75	14.61
Proportion of individuals aged 16-64	66.99	82.85
Proportion of individuals aged 65 and over	16.27	2.54

Source: Spanish Statistics Office (INE).

Table 2: Public Revenue and Expenditure in Spain 1998

(millions of euros and percentage of GDP)[19]

Revenue		Expenditure	
Direct Taxes	55,690 (10.6)	Monetary Transfers	67,371 (12.8)
Social Contributions	68,755 (13.1)	Pensions	53,995 (10.3)
Indirect Taxes	58,640 (11.1)	Unemployment Benefit	8,261 (1.6)
VAT	27,624 (5.2)	Other Mon. Transfers	5,115 (0.9)
Excise	15,642 (3.0)	Health	29,508 (5.6)
Insurance	0,717 (0.1)	Education	23,476 (4.5)
Other Indirect	14,655 (2.8)	Government Consumption	70,973 (13.5)
Other Revenue[20]	5,229 (0.9)	Interest Payments	22,606 (4.3)
Other[21]	12,128 (2.3)		
Deficit	13,492 (2.6)		
Total	213,934 (40.7)	Total	213,934 (40.7)

Source: Authors' calculations from IGAE (Intervención General de la Administración del Estado) and Ministerio de Educación, Cultura y Deporte.

[19] According to IGAE, total revenue in 1998 was 219.703 millions of euros (41.8% of GDP). From that amount we have substracted some items that represent transfers among public institutions. These items amount to 5,766 millions (1% of GDP).

[20] It includes revenue from state lotteries, fines, etc.

[21] It includes government production and transfers from the European Union.

Table 3: Generational Accounts

Spain 1998 (Euros)

	Natives		Immigrants	
Age	Men	Women	Men	Women
0	51243	-15737	-	-
5	68171	-12207	-	-
10	96303	1331	-	-
15	130453	18030	110431	19231
20	165020	34117	136170	29153
25	185572	41341	147085	31694
30	184586	33423	143613	28545
35	165270	21429	127686	21330
40	131312	3497	101217	8047
45	84242	-15452	64249	-6400
50	32376	-32276	22458	-21209
55	-20609	-47772	-18896	-37403
60	-60477	-59620	-48401	-51567
65	-79838	-65880	-68481	-59485
70	-71617	-62581	-62108	-56822
75	-58295	-56781	-51049	-51851
80	-46615	-53240	-41611	-49280
85	-32731	-37017	-29237	-34143
90	-24217	-25891	-21577	-23796
95	-15763	-16144	-14386	-14984
100	-6671	-6663	-	-
Average Immigrant in 1998			107399	13278
	Low Fert., 30,000 Immig. per year			
Generation born in 1999	93624	10427	161999	43261
% difference	82.7		50.8	225.8
	High Fert., 30,000 Immig. per year			
Generation born in 1999	91453	9162	159093	41831
% difference	78.5		48.1	215.1
	Low Fert., No immig. (after 1998)			
Generation born in 1999	102277	15466		
% difference	99.6			
	High Fert., No immig. (after 1998)			
Generation born in 1999	98720	13394		
% difference	92.7			
	Low Fert., 100,000 Immig. per year			
Generation born in 1999	80343	2694	144214	34518
% difference	56.8		34.3	160.0
	High Fert., 100,000 Immig. per year			
Generation born in 1999	79951	2465	143689	34260
% difference	56.0		33.8	158.0

Table 4: Generational Accounts

Low Fertility, 30,000 Immigrants per year

Spain 1998 (Euros)

	All Burden on Future generations				Immediate Change			
	Natives		Immigrants		Natives		Immigrants	
Age	Men	Women	Men	Women	Men	Women	Men	Women
0	51243	-15737	-	-	58997	-11220	-	-
5	68171	-12207	-	-	77090	-7108	-	-
10	96303	1331	-	-	106187	6710	-	-
15	130453	18030	110431	19231	141448	23715	119780	24074
20	165020	34117	136170	29153	177312	40101	146558	34313
25	185572	41341	147085	31694	198957	47446	158378	37081
30	184586	33423	143613	28545	198441	39366	155290	34014
35	165270	21429	127686	21330	178987	27192	139309	26790
40	131312	3497	101217	8047	144451	8995	112497	13397
45	84242	-15452	64249	-6400	96431	-10215	74906	-1163
50	32376	-32276	22458	-21209	43494	-27192	32360	-16084
55	-20609	-47772	-18896	-37403	-10493	-42653	-9625	-32321
60	-60477	-59620	-48401	-51567	-51468	-54421	-39863	-46549
65	-79838	-65880	-68481	-59485	-72117	-60721	-61227	-54588
70	-71617	-62581	-62108	-56822	-65241	-57852	-56123	-52330
75	-58295	-56781	-51049	-51851	-53394	-52651	-46447	-47925
80	-46615	-53240	-41611	-49280	-42942	-49610	-38141	-45813
85	-32731	-37017	-29237	-34143	-30170	-34431	-26818	-31673
90	-24217	-25891	-21577	-23796	-22322	-24082	-19792	-22075
95	-15763	-16144	-14386	-14984	-14530	-15016	-13196	-13900
100	-6671	-6663	-	-	-6149	-6198	-	-
Generation born in 1998	51243	-15737	107399	13278	58997	-11220	118310	18563
Generation born in 1999	93624	10427	161999	43261	57097	-10843	113126	19218
% Change (Taxes & Transf.)	24.2				4.1			

Table 5: Burdens on Newborns and Future Generations

Low Fertility

Alternative Immigration Policies

Spain 1998 (Euros)

	All Burden on Future generations				Immediate Change			
	Natives		Immigrants		Natives		Immigrants	
	Men	Women	Men	Women	Men	Women	Men	Women
30,000 Immigrants per year								
Generation born in 1998	51243	-15737	107399	13278	58997	-11220	118310	18563
Generation born in 1999	93624	10427	161999	43261	57097	-10843	113126	19218
% Change (Taxes & Transf.)	24.2				4.1			
Generation born in 1998	51243	-15737	107399	13278	59645	-12442	120461	18246
Generation born in 1999	98419	3929	176153	42547	57725	-12024	115255	18987
% Change (Taxes only)	42.1				7.0			
Generation born in 1998	51243	-15737	107399	13278	58076	-9484	115254	19015
Generation born in 1999	87172	19171	142951	44220	56205	-9163	110100	19546
% Change (Transfers Only)	56.7				10.0			
No immigration after 1998								
Generation born in 1998	51243	-15737	107399	13278	59457	-10952	118958	18877
Generation born in 1999	102277	15466			57542	-10583		
% Change (Taxes & Transf.)	28.9				4.4			
Generation born in 1998	51243	-15737	107399	13278	60162	-12239	121264	18551
Generation born in 1999	109040	8093			58225	-11828		
% Change (Taxes only)	51.3				7.4			
Generation born in 1998	51243	-15737	107399	13278	58461	-9131	115696	19338
Generation born in 1999	93537	24995			56577	-8823		
% Change (Transfers Only)	66.3				10.5			
100,000 Immigrants per year								
Generation born in 1998	51243	-15737	107399	13278	58001	-11800	116909	17885
Generation born in 1999	80343	2694	144214	34518	56134	-11404	111824	18583
% Change (Taxes & Transf.)	16.9				3.6			
Generation born in 1998	51243	-15737	107399	13278	58535	-12878	118734	17589
Generation born in 1999	82813	-2189	152782	33511	56650	-12445	113634	18364
% Change (Taxes only)	28.7				6.1			
Generation born in 1998	51243	-15737	107399	13278	57235	-10253	114288	18310
Generation born in 1999	76806	9687	131942	35961	55392	-9907	109226	18898
% Change (Transfers Only)	41.1				8.7			

Table 6: Sensitivity Analysis

Percentage change in taxes and transfers

Interest Rate	0.03	0.03	0.03	0.05	0.05	0.05	0.07	0.07	0.07
Growth Rate	0.010	0.015	0.020	0.010	0.015	0.020	0.010	0.015	0.020
				All Burden on Future Generations					
No inmigration after 1998	19.4	16.4	12.8	33.2	28.9	25.3	59.5	50.7	43.5
30,000 Immigrants per year	16.4	14.0	11.1	27.7	24.2	21.2	49.0	41.9	36.0
100,000 Immigrants per year	12.0	10.5	8.7	19.2	16.6	15.0	33.4	28.6	24.7
				Immediate Change					
No inmigration after 1998	5.0	5.3	5.3	4.3	4.4	4.5	4.4	4.3	4.2
30,000 Immigrants per year	4.8	5.0	5.1	4.0	4.1	4.3	4.2	4.1	4.0
100,000 Immigrants per year	4.2	4.5	4.8	3.5	3.6	3.8	3.7	3.6	3.5

Figure 1: Life expectancy at birth

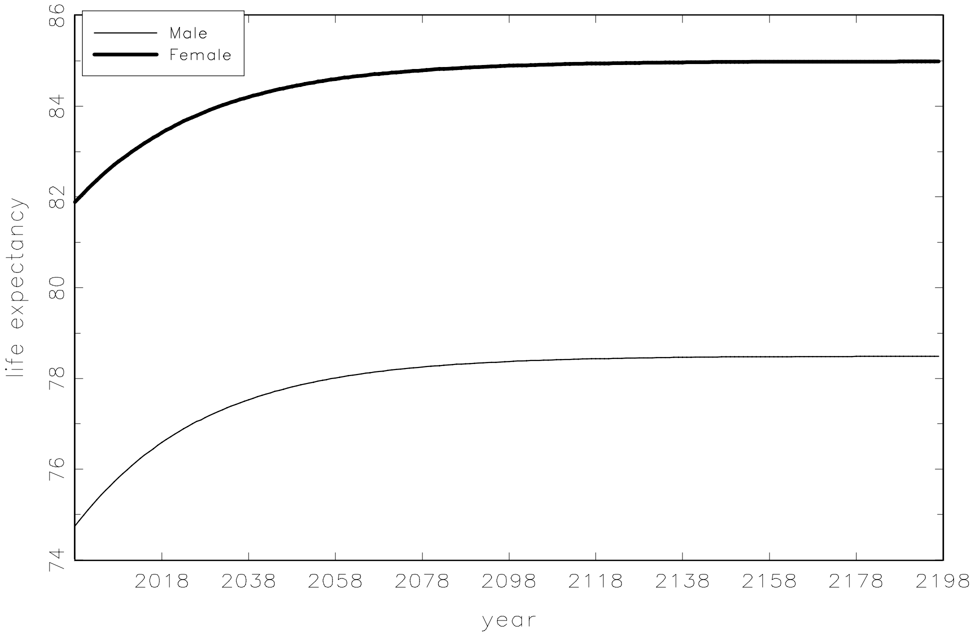


Figure 2: Fertility rate

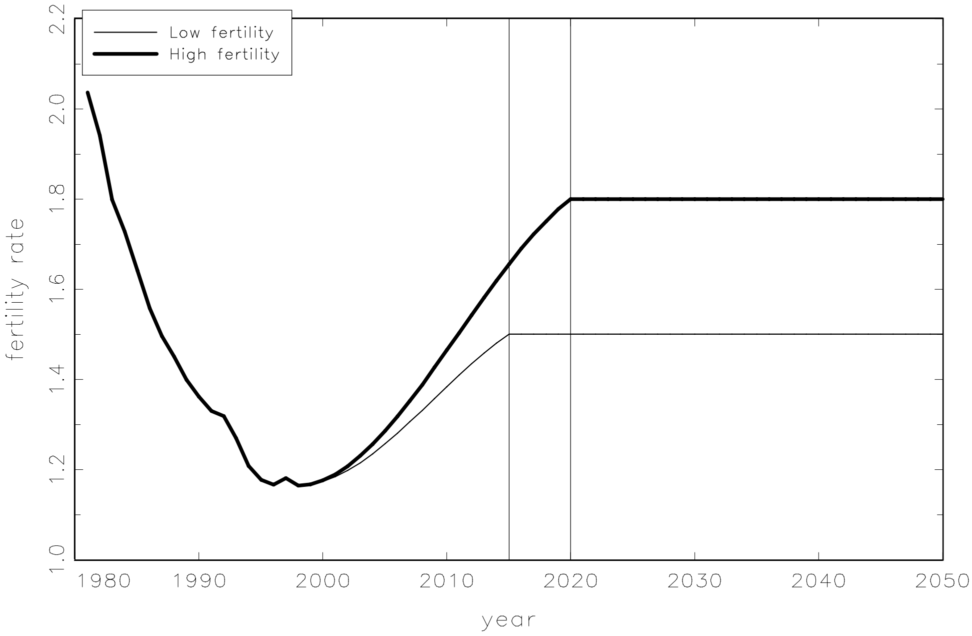


Figure 3: Income Taxes

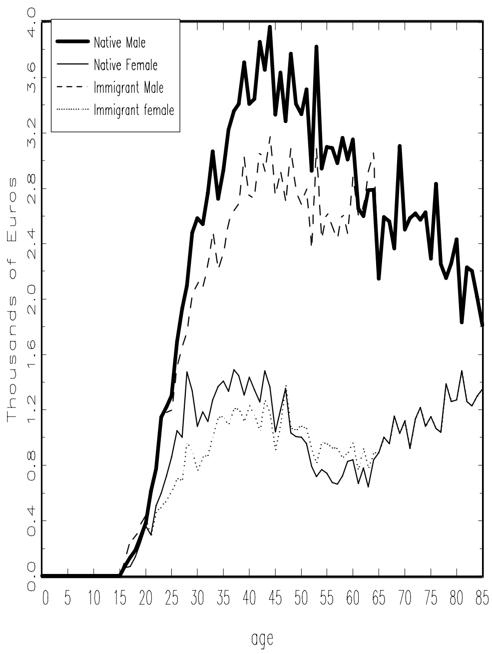


Figure 4: Social Contributions

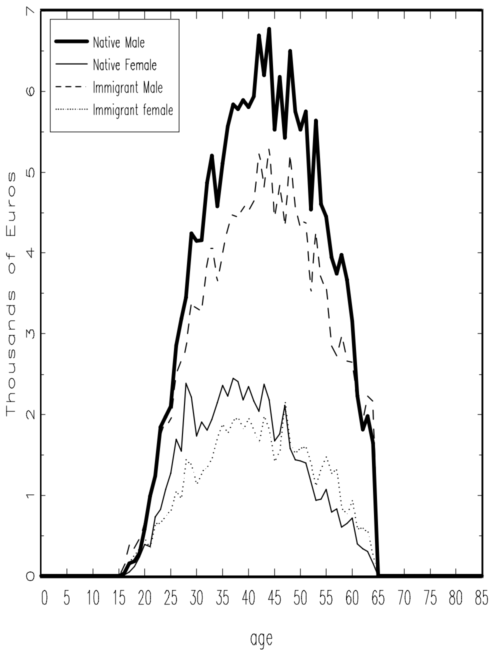


Figure 5: VAT

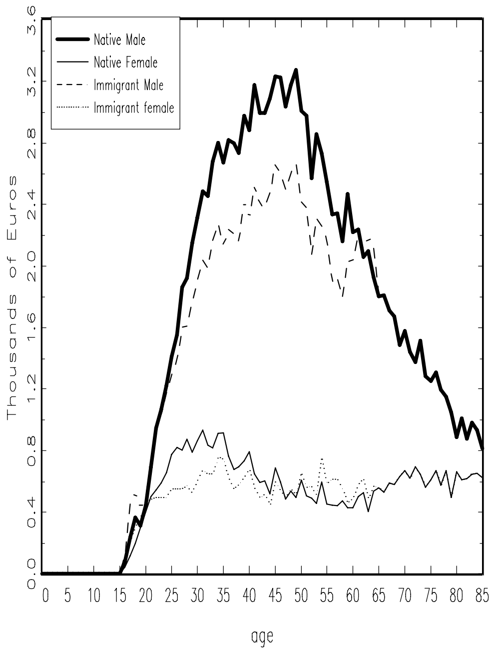


Figure 6: Spirits

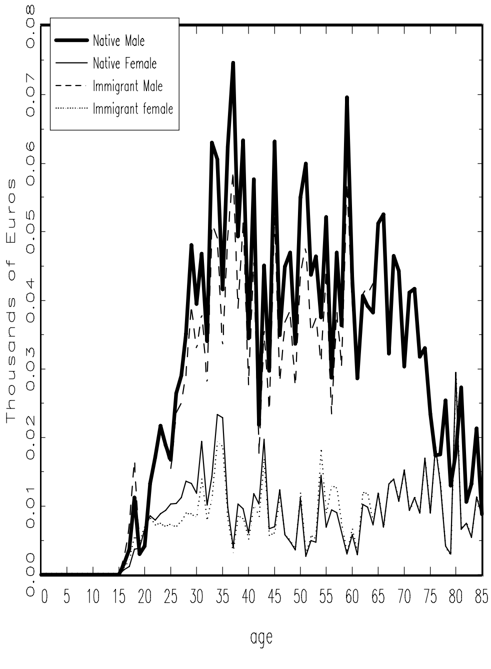


Figure 7: Beer

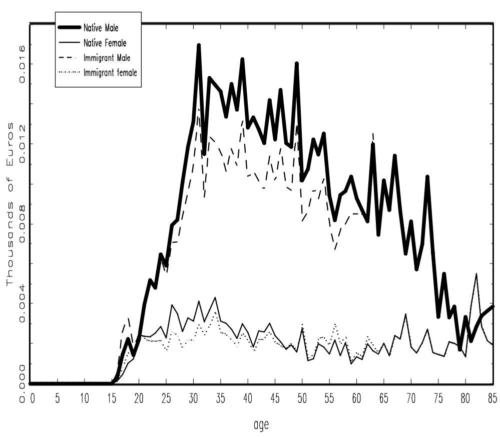


Figure 8: Tobacco

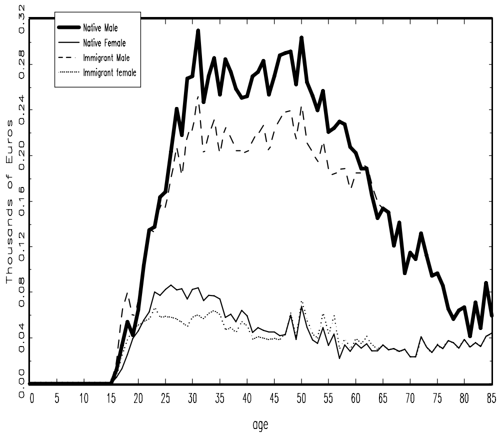


Figure 9: Electricity

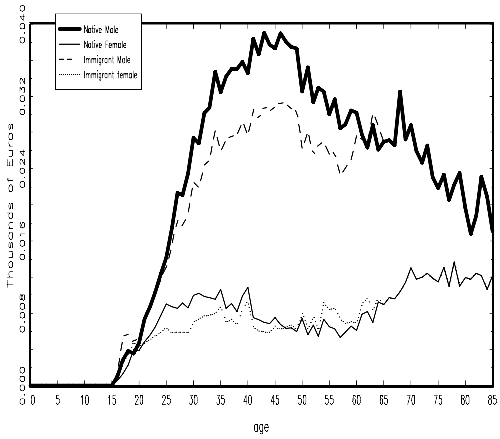


Figure 10: Gasoline

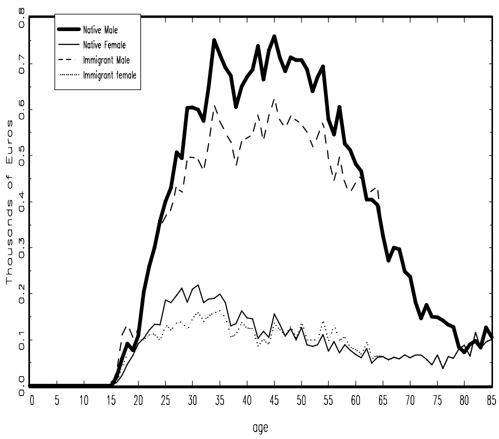


Figure 11: Vehicles

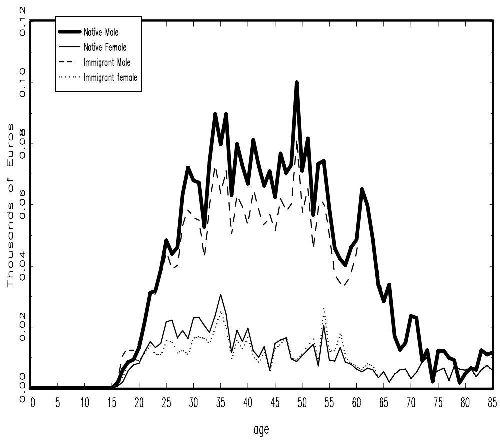


Figure 12: Insurances

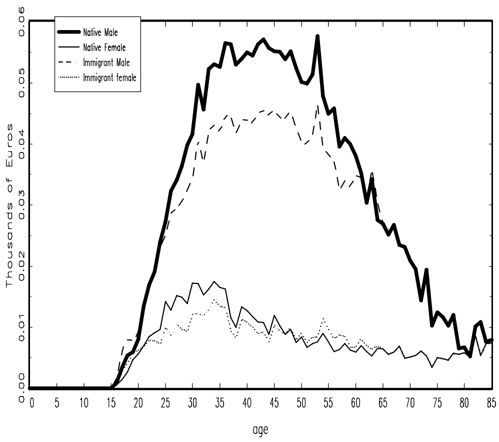


Figure 13: Direct Transfers

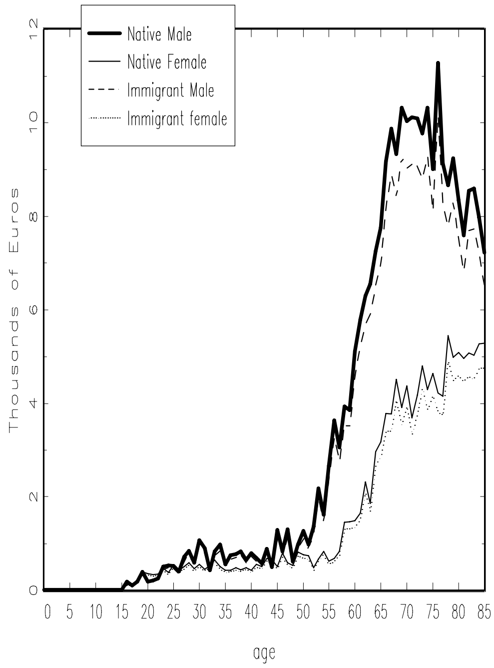


Figure 14: Health

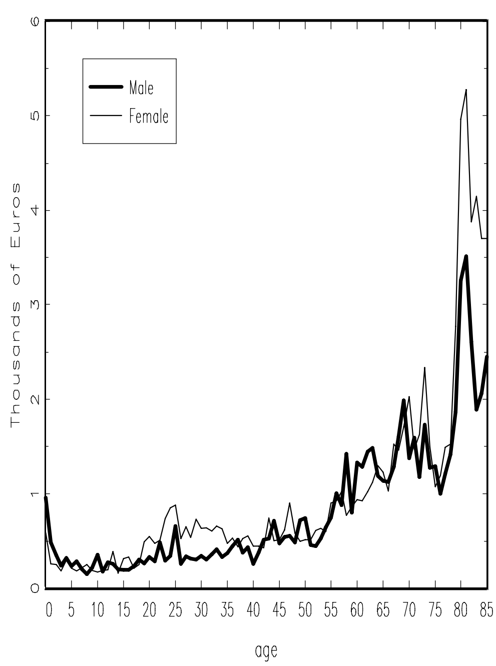
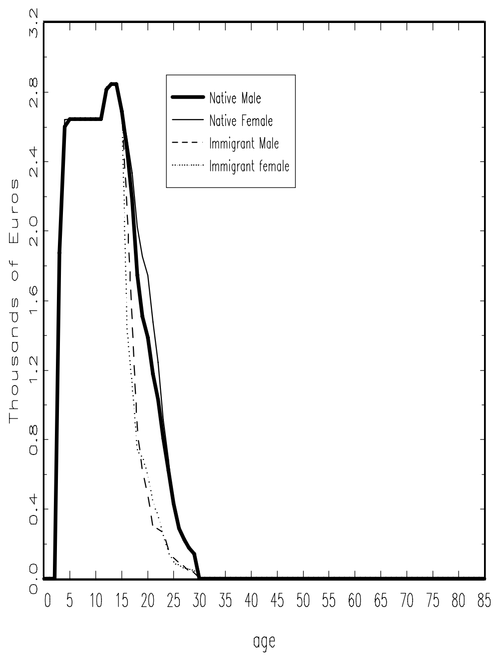


Figure 15: Education



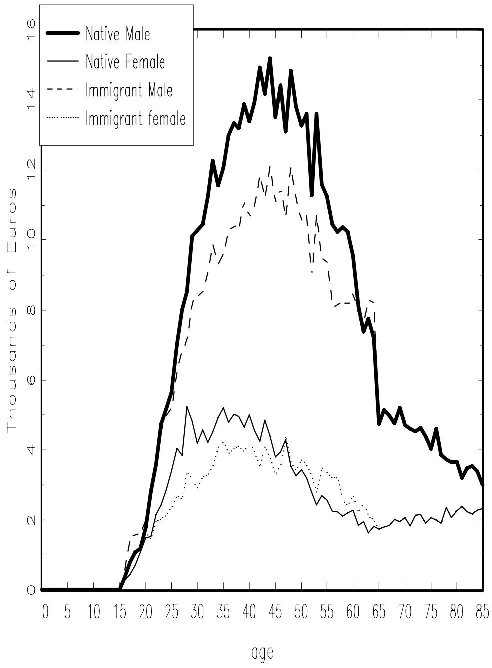


Figure 16: Per Capita Taxes

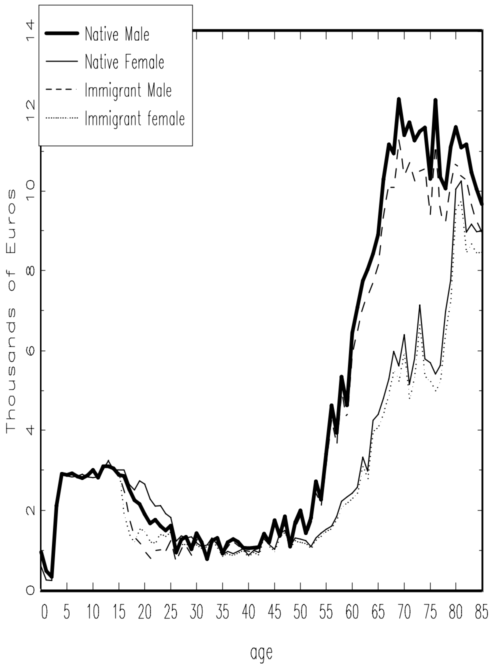


Figure 17: Per Capita Transfers

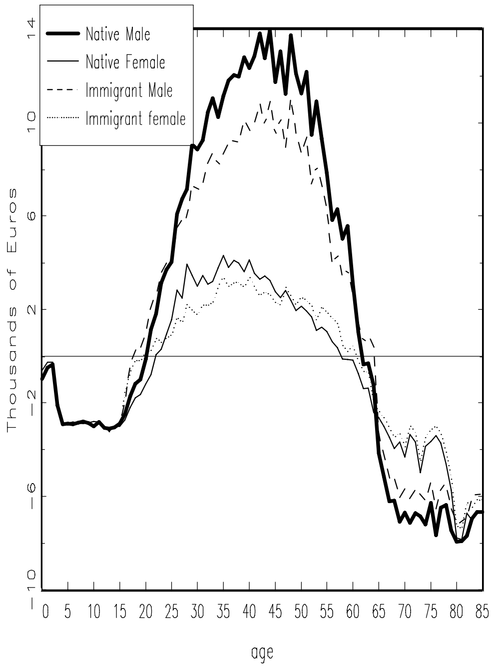


Figure 18: Per Capita Net Taxes