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The fiscal impact of 30 years of immigration in France: an accounting approach[*]

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Abstract

This article aims to evaluate the net contribution of immigration to the public finances of France between the late 1970s and the early 2010s. We developed an accounting method that disaggregates the primary deficit into the specific contributions of immigrant population and native population. We show that the net contribution of immigrants is generally negative over a relatively long period, but remains at an extremely low level ($\pm 0.5\%$ of the french GDP, reduced to $\pm 0.2\%$, with the exception of 2011). The relatively negligible effect of immigrants on the public accounts is explained by a favourable demographic structure offsetting their lower net individual contribution. However, the 2008 financial crisis has significantly degraded the economic condition of immigrants. The net *per capita* contribution of EU immigrants has significantly declined since 2000 and is now similar to values from third country immigrants.

JEL Classification: E62, F22, H62.

Keywords: International migration, public finances, social protection

1

1   Introduction

During 2015, over one million refugees applied for asylum in Europe, a figure without precedent since World War II. This "migration crisis" was not an isolated event, since its underlying political tensions, internal conflicts as well climatic determinants have not vanished. For this reason, we should expect at least increasingly more significant migratory flows in years to come, even in the absence of single migratory event of the same magnitude. More generally, the migration issue, and in particular the costs associated with integration, has moved to the centre stage of recent political debates, as exemplified by the British vote for Brexit in June 2016, the election of Donald Trump in the United States in November 2016, or the parliamentary elections in Germany in September 2017, among others. In the three cases above, the political debate revolved around the number of migrants that economies could "reasonably" accommodate, and in particular around their potential cost.

Although the migrant issue was relatively unaddressed during the last presidential election in France, it nevertheless remains a topic of concern to French citizens. A survey conducted by the Ipsos Institute in 25 countries in 2017[1] revealed that 86% of French citizens attributed a negative impact to immigration (compared to 79% for all countries). Such concerns were confirmed by the Transatlantic Trends international survey in 2011[2] where 53% of French respondents either agreed or strongly agreed with the statement that "immigrants are a burden to social services", compared to 63% of British and American people, but only 49% of Germans. The series of surveys over time indicates a trend towards increasingly negative views on immigration. Faced with the evolution of public opinion in relation to immigration and the perception of its impact on public finances, the political response has been typically fast and often involves pledges to restrict access of immigrants to social welfare, as evidenced for example by the permission given by the European Council on February 18 and 19, 2016 for David Cameron to limit or suspend certain social benefits of European workers for up to seven years.

Paradoxically, although such measures have burgeoned following an increase in the proportion of people who think that immigrants represent a cost to the state budget and the finances of social protection, studies measuring such alleged costs only appeared relatively recently (in the last 20 years) and remain scarce to this day. This article aims to evaluate the net contribution of immigration to public finances in France since the late 1970s. In previous analyses in France, Chojnicki (2011) and Chojnicki (2013) showed that in 2005 the contribution of immigrants to public finances was positive, despite their

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[1]http://www.ifop.com/media/poll/3869-1-study_file.pdf

[2]http ://www.gmfus.org/publications/transatlantic-trends-2011

over-representation in some areas of social protection. In that year, immigration had a positive although moderate impact (estimated in €3.9 billion) on public finances.

The first contribution of our study is to generalise this approach over a longer period to evaluate the impact of immigration as a function of economic conjuncture (for example, after the 2008 financial crisis) and of changes in age structure and qualifications of the immigrant population over time. Previous studies have as a rule focused on a single year and therefore cannot address the evolution over time of the impact of immigration. In contrast, our study relied on data from a relatively long time series with a harmonised methodology for each year.

This article also helps to improve the method of accounting for the impact of immigration on public finances through a finer decomposition of revenue and expenditure components of public administration. Our essentially accounting methodology consists in quantifying the benefits that immigrants extract from the public system (social spending, health, education, pensions) as well as their contribution to various levies. Based on data from microeconomic surveys, we reconstruct the resulting net contribution of immigrants to public finances at the individual and then general level at seven time points between 1979 and 2011.

We show that the net contribution of immigration is overall negative for the whole period, but remains relatively low (under 0.5% of the French GDP). Between 1979 and 2011, immigration has never determined the magnitude and evolution of budget balances. Furthermore, the increase in migratory flows over the last decade has not caused any deterioration in the economic condition of migrants relative to natives. However, immigrants have been more strongly affected by the financial crisis of 2008; which resulted in a more extreme decrease in their net contribution to public finances compared to natives. Our results show that the individualised contribution of immigrants is positive except for the years 1995 and 2011, which followed recessions. By distinguishing immigrants from the European Union or a third country, we demonstrate a relative improvement in the economic condition of the latter between 2001 and 2011. Finally, decomposition by age group shows a more pronounced ageing of EU immigrants, resulting in an increase in net beneficiaries relative to net contributors.

The following section presents a literature review on the fiscal impact of immigration. Next, section 3 describes the accounting method applied to estimate the contribution of each population category to public finances. Section 4 presents our dataset as well as the assumptions adopted during data analysis. Section 5 assesses the immediate effects of immigration on public finances and proposes a decomposition to evaluate the contribution of each population to the temporal evolution of the primary balance *per capita*, as well as the demographic and fiscal factors that explain the difference between *per capita*

contributions of natives and immigrants for each studied year. Section 5 also provides an analysis of the sensitivity of the results to assumptions regarding the second or next generation of immigrants or natives, and regarding the allocation of expenditure resulting from the provision of public goods.

2   Literature review

The economic literature on the relationship between immigration and public finances is very recent, especially with regards to a focus on European countries. Studies of the topic have multiplied over the last 20 years, and approach it through three distinct perspectives.

The first is to evaluate the relative probability of an immigrant, compared to a local citizen, of resorting to a social protection scheme. International studies, which adopt this approach, reveal relatively different results depending on the analysed country. In Europe, the report by Brücker et al. (2002) points in general to a stronger dependence of immigrants on unemployment benefits, except in a few countries (UK, Greece, Spain, Portugal and Germany). More recently, Huber and Oberdabernig (2016) study of 16 European countries showed that the over-dependence of immigrants on social benefits is reduced when differences in income and individual or household characteristics are taken into account. In Germany, many other studies have confirmed the absence of a residual effect linked to migrant status (Riphahn, 1999; Castronova et al., 2001). The results are equally clear in the case of Ireland and the United Kingdom, where immigrant populations appear to be less dependent on social protection (Barrett and McCarthy, 2008; Dustmann and Frattini, 2014). In France, studies are still rare but demonstrate that if we control for differences in observable features of populations (family size and skill level in particular), immigrants still show a stronger tendency to receive unemployment benefits and welfare benefits over the study periods (Chojnicki et al., 2010).

The second branch of this literature, which includes this study, addresses the issue from an accounting framework. The aim is to compare the benefits that immigrants derive from the public sector with their contribution to compulsory levies. The outcome of this type of study depend largely on the chosen methodology, the time period considered, assumptions on what to retain and to exclude from calculations, the public services defined as pure public goods, and the demographic unit (individuals or households). This approach (see Preston, 2014 for a review of recent literature) leads to the conclusion of a relative fiscal neutrality of immigrants. This result is largely explained by significant differences in the age structure of the two populations (native and immigrant). Immigrants are more concentrated in age groups still in working life, during which individuals irrespective of origin (native or immigrant) pay more taxes, levies and contributions than they receive

in the form of benefits and public transfers. Their net contribution to public finances, the difference between contributions and benefits, is therefore positive. The shares of both young and older individuals are relatively smaller in the immigrant population; and those are the two age cohorts during which collected amounts are more important than paid amounts.

The third approach, more ambitious but also more sensitive to model assumptions, abandons the static dimension of the accounting method in order to adopt a dynamic and intertemporal framework (the measurement of impact considering the entire life cycle of immigrants). This approach, grounded on the life cycle, has aroused great interest in the context of demographic ageing in industrialised countries. The studies of Lee and Miller (1997) and Lee and Miller (2000) in the United States, Storesletten (2003) in Sweden and Monso (2008) in France allowed for an estimation of the net present value of different generations of immigrants over their whole life cycle. Other recent studies, based on the method of generational accounting, were carried out in order to study the impact of a change in migration policy on the average fiscal burden borne by different cohorts. Results of studies differ somewhat depending on whether they refer to the United States (Auerbach and Oreopoulos, 2000) or to European countries (see for example Bonin et al., 2000 for Germany, Collado et al., 2004 for Spain, Mayr, 2005 for Austria or Chojnicki, 2013 for France). In fact, studies carried out on European countries suggest a positive and significant effect of immigration on the intertemporal public budget, while this impact is relatively weak in the case of the United States. The reason for such seemingly contradictory results across countries is essentially due to the much more pronounced process of demographic ageing in Europe than in the United States. Over the same decade (2000-2010), dynamic computable general equilibrium models have been applied to studies of the effects of macroeconomic closure, absent from previous analyses. For example, immigration has not only a direct effect on public finances, but also a potential impact on labour market supply, which modifies the remuneration of production factors and thus engenders indirect effects on public finances. General equilibrium approaches aim at dealing more globally with the question of the impact of immigration on budgets of host countries, and have extended the analysis to the question of the potential role of immigration policies given the challenges posed by demographic ageing (Storesletten, 2000; Fehr et al., 2004; Chojnicki et al., 2011; Chojnicki and Ragot, 2015; Hansen et al., 2017).

This article assesses, through an accounting approach, the net contribution of immigration to public finances in France between the late 1970s and the early 2010s. Therefore, it is clearly part of the second branch of the literature on the fiscal impact of immigration. The work resulting from this accounting approach converge towards the conclusion of a

low impact of immigration on public budgets. For example, Rowthorn (2008) shows that, in developed countries, the total net contribution of immigrants to public finances generally varies between ±1% of GDP depending on assumptions and economic conditions. The OECD (2013) finds an even smaller range of ±0.5% of GDP for most of its member countries, with the exception of Switzerland and Luxembourg where the net contribution of immigrants is close to 2% of GDP, and Germany, where in contrast there is a negative net contribution of immigrants estimated in -1.1% of GDP. Chojnicki (2013) showed, based on data from 2005, that the total net contribution of immigrants to French public finances was not negative despite their over-representation in some segments of social protection. In that year immigration even had a positive (although very modest) impact on public finances (+0.2% of GDP).

Most if not all the studies above conducted the accounting exercise for a single year. However, results are sensitive to economic conditions, degree of generosity of social protection, weight of taxation, as well as the size, age structure, origins and qualifications of the immigrant population. All these factors may explain why results vary between countries or over time. The aim of this article is precisely to measure immigrant contribution to public finances in France over a relatively long period. To our knowledge, there are no studies either in France or abroad carried out over a time horizon as long as the one evaluated here (1979-2011). The most similar study to ours is by Dustmann and Frattini (2014) on the United Kingdom, which also addresses the problem by including some longitudinal elements (covering the years 1995-2011). In contrast to Dustmann and Frattini (2014), who infer individual contributions by means of a preliminary econometric step that estimates differential probabilities (native vs. immigrant) of receiving public subsidies and paying taxes and levies, our study directly determines the evolution of individual contributions by age, origin and level of qualification over time on the basis of microeconomic surveys available for the years of interest.

3   An accounting approach to the contribution of immigrants to public finances

The adopted approach seeks to quantify the fraction of public revenues and expenditures that can be attributed to different groups in the resident population. For our question of interest, we implement the approach by distinguishing natives from immigrants. In section 4, it will be shown that differential contributions are very sensitive to the age and level of qualification of individuals. Consequently, our decomposition of the population also takes into account the ages and levels of qualification in the two populations.

The purely accounting methodology consists of disaggregating the budget of the public administrations between what attributed to natives and immigrants. We start with macroeconomic data. The primary balance S of public administrations is defined as the difference between total government revenue T and public expenditure G, excluding interest charges on the debt[3]:

$$S = T - G \qquad (1)$$

Government revenues derive from different categories of taxes, levies and contributions; similarly, public expenditure takes various forms (transfers, benefits, etc.)[4]. Some of the public revenues and expenditures can be individualised (in the sense that they can be explicitly attached to an individual) while others are not. The n individual levies are indexed i ($i = 1, \cdots, n$), and the m individual transfers are indexed j ($j = 1, \cdots, m$). The total public revenue (and expenditure) can thus be broken down into T^i levies (and G^j transfers) that can be individualised according to origin, age and level of qualification, and other taxes $\bar{\bar{T}}$ (or other public expenditure $\bar{\bar{G}}$) that cannot be individualised due to their nature (public good for certain categories of expenditure) or lack of available data:

$$T = \left(\sum_{i=1}^{n} T^i + \bar{\bar{T}} \right) \quad \text{and} \quad G = \left(\sum_{j=1}^{m} G^j + \bar{\bar{G}} \right) \qquad (2)$$

The disaggregated macroeconomic data are derived from national accounts and public administration accounts.

At individual level, the data from available microeconomic surveys allow us to identify 6 categories of levies and 7 categories of transfers[5]. These are the same categories retained at the macroeconomic level ($n = 6$ and $m = 7$). It is also possible to discriminate their amount by age (a) of individuals, level of qualification (q) and origin (o) as native ($o = N$) or immigrant ($o = I$). We define $\bar{a}$ as the age limit of life, and $\underline{a}$ as the age limit from which an individual is subject to compulsory levies ($\underline{a}=16$ years). For the years at the end of the study period (from 2001 on), it is even possible to differentiate between two immigrant subpopulations, namely those from another EU country and those from a third country. Processing individual data from these surveys makes it possible to calculate the average individual amount in each of these levies ($\tilde{\tau}^i_{o,a,q}$) and transfers ($\tilde{g}^j_{o,a,q}$) according to

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[3]In order to simplify the notation and given that all variables used to define the total budgetary contribution of year t are data of the same year t, we decided not to show the time indices.

[4]In the following, taking the point of view of individuals, we define *levies* simply as the total of compulsory payments, and *transfers* as the total of received transfers, benefits and miscellaneous public expenditure.

[5]Detailed descriptions are presented in section 4.2.

origin, age and the level of qualification. Based on the demographic data, we calculate the size of the subpopulations by origin, age and level of qualification ($P_{o,a,q}$). By matching the subpopulations to the previously calculated average individual amounts, we obtain the aggregates of different levies and transfers, reassembled from the survey data:

$$\tilde{T}^i = \sum_{a=\underline{a}}^{\overline{a}} \sum_q P_{N,a,q} \tilde{\tau}^i_{N,a,q} + \sum_{a=\underline{a}}^{\overline{a}} \sum_q P_{I,a,q} \tilde{\tau}^i_{I,a,q} \tag{3}$$

$$\tilde{G}^j = \sum_{a=0}^{\overline{a}} \sum_q P_{N,a,q} \tilde{g}^j_{N,a,q} + \sum_{a=0}^{\overline{a}} \sum_q P_{I,a,q} \tilde{g}^j_{I,a,q} \tag{4}$$

The aggregates reassembled from survey data are not equivalent to the corresponding macroeconomic amounts in the national accounts. Therefore, we uniformly adjust each amount $\tilde{\tau}^i_{o,a,q}$ and $\tilde{g}^j_{o,a,q}$ to restore the equality between the reassembled aggregate and its value in the national accounts. This assumes that the true individual values by origin, age and level of qualification are directly proportional to their observed values in survey data, and that the coefficients of proportionality depend not on the origin, age or level of qualification, but only on the type of levies or transfers. The adjustment factors ϵ^i and ϵ^j are therefore obtained as follows:

$$\epsilon^i = \frac{T^i}{\tilde{T}^i} \quad \text{and} \quad \epsilon^j = \frac{G^j}{\tilde{G}^j} \tag{5}$$

We then deduce the average individual amounts adjusted of levies and transfers by origin and level of qualification:

$$\tau^i_{o,a,q} = \epsilon^i \tilde{\tau}^i_{o,a,q} \quad \text{and} \quad g^j_{o,a,q} = \epsilon^j \tilde{g}^j_{o,a,q} \tag{6}$$

To return to our initial question (what is the contribution of each subpopulation according to origin to the primary deficit?), we must subdivide the non-individualised aggregates. These aggregates cannot be individualised by age and level of qualification in any case, but may be for some of their components differentiated by origin, on the basis of whether they are paid or received by natives or immigrants[6]:

$$\bar{\bar{T}} = \bar{T} + \bar{T}_N + \bar{T}_I \quad \text{and} \quad \bar{\bar{G}} = \bar{G} + \bar{G}_N + \bar{G}_I \tag{7}$$

Several strategies are possible for implementing this breakdown. In this study, we decided to assign amounts that are not specific to an origin ($\bar{T}$ and $\bar{G}$) simply in proportion

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[6]As an example, in the application that follows we have the amounts of retirement pensions paid to non-residents and their partition into pensioners of French nationality and those of foreign nationality. In contrast, we do not have their breakdown by age and level of qualification.

to the respective weight of each subpopulation, irrespective of the level of qualification and age. This amounts to considering that every individual, regardless of origin, age or qualification level, benefits from the same amount of the total expenditure and contributes at the same level to the total income:

$$\bar{\tau} = \frac{\bar{T}}{\sum_o \sum_{a=\underline{a}}^{\bar{a}} \sum_q P_{o,a,q}} \quad \text{and} \quad \bar{g} = \frac{\bar{G}}{\sum_o \sum_{a=0}^{\bar{a}} \sum_q P_{o,a,q}} \tag{8}$$

where $\bar{\tau}$ is the average individual amount (identical for all categories of individuals) of other levies and $\bar{g}$ is the average individual amount (identical for all categories of individuals) of other transfers.

Based on this set of hypotheses, we can now disaggregate the primary balance between the total contribution of natives (S_N) and immigrant (S_I), with $S = S_N + S_I$:

$$S_N = \left[\left(\sum_i \sum_{a=\underline{a}}^{\bar{a}} \sum_q P_{N,a,q}(\tau^i_{N,a,q} + \bar{\tau}) \right) + \bar{T}_N \right] - \left[\left(\sum_j \sum_{a=0}^{\bar{a}} \sum_q P_{N,a,q}(g^i_{N,a,q} + \bar{g}) \right) + \bar{G}_N \right] \tag{9}$$

and

$$S_I = \left[\left(\sum_i \sum_{a=\underline{a}}^{\bar{a}} \sum_q P_{I,a,q}(\tau^i_{I,a,q} + \bar{\tau}) \right) + \bar{T}_I \right] - \left[\left(\sum_j \sum_{a=0}^{\bar{a}} \sum_q P_{I,a,q}(g^i_{I,a,q} + \bar{g}) \right) + \bar{G}_I \right] \tag{10}$$

4   Data

The validity of our accounting approach fully depends on the quality and level of detail of the collected individual data. We saw in the previous section that the calculation of net contributions to public finances as a function of origin requires three categories of data:

- demographic data disaggregating the French population according to origin, age and qualification level ($P_{o,a,q}$);

- individual profiles of levies and transfers by origin, age and qualification level ($\tilde{\tau}^i_{o,a,q}$ and $\tilde{g}^j_{o,a,q}$);

- macroeconomic data providing the disaggregation of the government budget according to the different categories of transfers and levies ($T^i, G^j, \bar{T}, \bar{G}, \dots$).

4.1 Demographic data

4.1.1 Evolution of the French population

We preserve the usual definition of immigrant. By immigrant we understand any person born abroad who did not have French nationality at birth. Thus, individuals born abroad and having later acquired French nationality are included in the definition. In contrast, this definition does not include individuals born abroad but of French nationality at birth (mainly consisting of repatriates from Algeria in the early sixties). Finally, children of immigrants born in France do not satisfy the definition (they have not crossed borders) and are therefore not considered immigrants. Section 5.4 presents a sensitivity analysis where contributions are estimated under the assumption that children under 16 with at least one immigrant parent are assigned to the immigrant population (*2nd generation* scenario).

Table 1: Evolution of the French population

|	1979	1985	1989	1995	2001	2006	2011
Total Population (millions)	53.481	54.895	56.270	57.753	59.267	61.400	63.070
Share of immigrants (in % of total population)	7.32	7.29	7.26	7.34	7.30	8.12	8.62
UE immigrants					2.76	2.84	2.83
Third-country immigrants					4.54	5.27	5.79
Share of 0-16							
in % of total population	26.06	24.70	23.39	22.24	21.44	20.92	20.80
in % of native population	27.33	25.95	24.62	23.49	22.69	22.27	22.24
in % of immigrant population	10.00	8.82	7.66	6.46	5.52	5.63	5.46
in % UE immigrants					2.95	4.03	4.99
in % third-country immigrants					7.08	6.50	5.69
Old age dependency ratio (65+/ 17-64)							
Total population	23.20	20.72	21.81	23.98	25.84	26.47	27.15
Native population	23.31	20.82	21.89	24.15	26.16	27.01	27.78
Immigrant population	22.15	19.70	21.06	22.27	22.66	21.69	21.96
EU immigrants					38.94	43.23	44.00
Third-country immigrants					14.16	12.32	13.42

<u>Source</u> : French population censuses. Authors' calculations.

Table 1 traces the evolution of the French population from 1979 to 2011 using the population censuses of 1982, 1990, 1999, 2006 and 2011. In the census, each person is asked about place and country of birth as well as nationality at birth, which allows for clear identification of the immigrant population. In order to work on data from the same years, we supplemented data from the censuses with the registry office data[7]. Our study domain is the metropolitan France.

The share of the immigrant population in France remained broadly constant at 7.3%

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[7]We use registry office data for each year to partition the population by age. We then derive the partition by origin and qualification level by supplementing registry office data with census data. We apply a linear interpolation between two censuses when they do not match data from our microeconomic surveys.

Figure 1: Immigration flows in France (1994-2008)
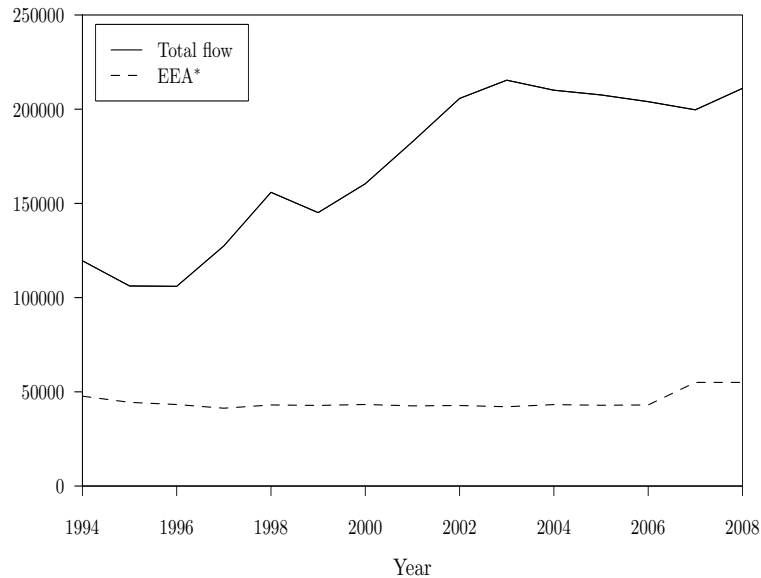
*The perimeter of the European Economic Area (EEA) is changing with the enlargements of 2004 and 2007.
<u>Source</u>: Ined.

of the total population between 1979 and 2001 (Table 1). In the 2000s, it is observed a significant increase in this share, reaching 8.6% in 2011 (more than 5.5 million people). This increase is due to a significant inflection of migration flows over recent years (Figure 1). Amounting to between 105,000 and 120,000 annual entries until 1996, this flow has witnessed a progressive increase to 215,000 new arrivals in 2003 before stabilising at around 200,000. As shown in Figure 1, the number of arrivals originating from another member state of the European Economic Area has remained broadly stable throughout the period; it is therefore the increase in the number of migrants from a third country that is at the basis of this inflexion in migration flows and increase in the share of non-EU27 migrants in the total population (see Table 1)[8].

4.1.2   Age structure of the French population

Table 1 highlights some significant characteristics of the age structure of the French population and its evolution over the studied period. The share of under-16s is much lower among immigrants than in natives (remember that children of immigrants born in France are classified as native). The weight of this age group tends to decline much more

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[8]Only the last three waves of the Families Budget survey allow us to distinguish between immigrants from other EU countries and from third countries. Previous surveys do not provide the same level of detail regarding birth place of individuals. In the following, when referring to the EU immigrant population, we include all immigrants from any of the 27 member states in the EU-28.

markedly over time in the immigrant population (almost halving from 10% to 5.46%) compared to the native population (whose share fell from 26.06% to 20.80%).

The evolution of the dependency ratio, defined here as the ratio between the over 65s and the working age population, provides a summarising measure of the phenomenon of demographic ageing. The weight of seniors (65 years and over) in relation to the working age population (17-64 years) has significantly increased over the studied period (+4 percentage points), while overall it has remained constant, and even slightly decreased at the end of the period for the immigrant population due to its constant rejuvenation caused by migratory flows consisting of relatively young individuals[9]. This trend in the immigrant population as a whole hides very contrasting patterns as a function of origin. The dependency ratio is very high for EU immigrants and grew between 2001 and 2011 from 38.9% to 44%. This ratio instead is very low among immigrants from third countries at around 13%.

Figure 2 shows the age partition of the French population (distinguishing between immigrants/natives) for four years (1979, 1989, 2001 and 2011), as well as the evolution of the average age in each of the two subpopulations. It should be noted that the age structure of the immigrant population is clearly different from the natives. As mentioned above, young people are underrepresented in this population since by definition immigrants are not born in France, and few migrants arrive with children. In contrast, there is a greater concentration of immigrants in the working age categories. Moreover, we note that recently their percentage among the over 50s has considerably increased: as in the case of the natives, the age pyramid of immigrants tends to gradually widen at the top (a manifestation of "ageing at the top"). On the other hand, the phenomenon of ageing is much less pronounced among immigrants whose average age remained largely stable at 46 years during the last decade, whereas it has increased from 37.8 years to 39.4 years for the natives. It should be kept in mind that the higher average age of immigrants is not explained by a larger proportion of older people, but by a very low proportion of under-16s.

However, the age structure of the immigrant population is not homogeneous across areas of origin. Figure 6 (Appendix A) shows that the EU immigrant population is older than in third countries over the whole period, and that the age gap has amplified over time as indicated by a shift to the right in the EU immigrants curve and by a growing share of older individuals in this population.

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[9]Between 1994 and 2008, over 70% of immigrants to France were under the age of 35.

Figure 2: Population distribution by age (as percentage of population) and average age

(a) 1979

(b) 1989

(c) 2001

(d) 2011
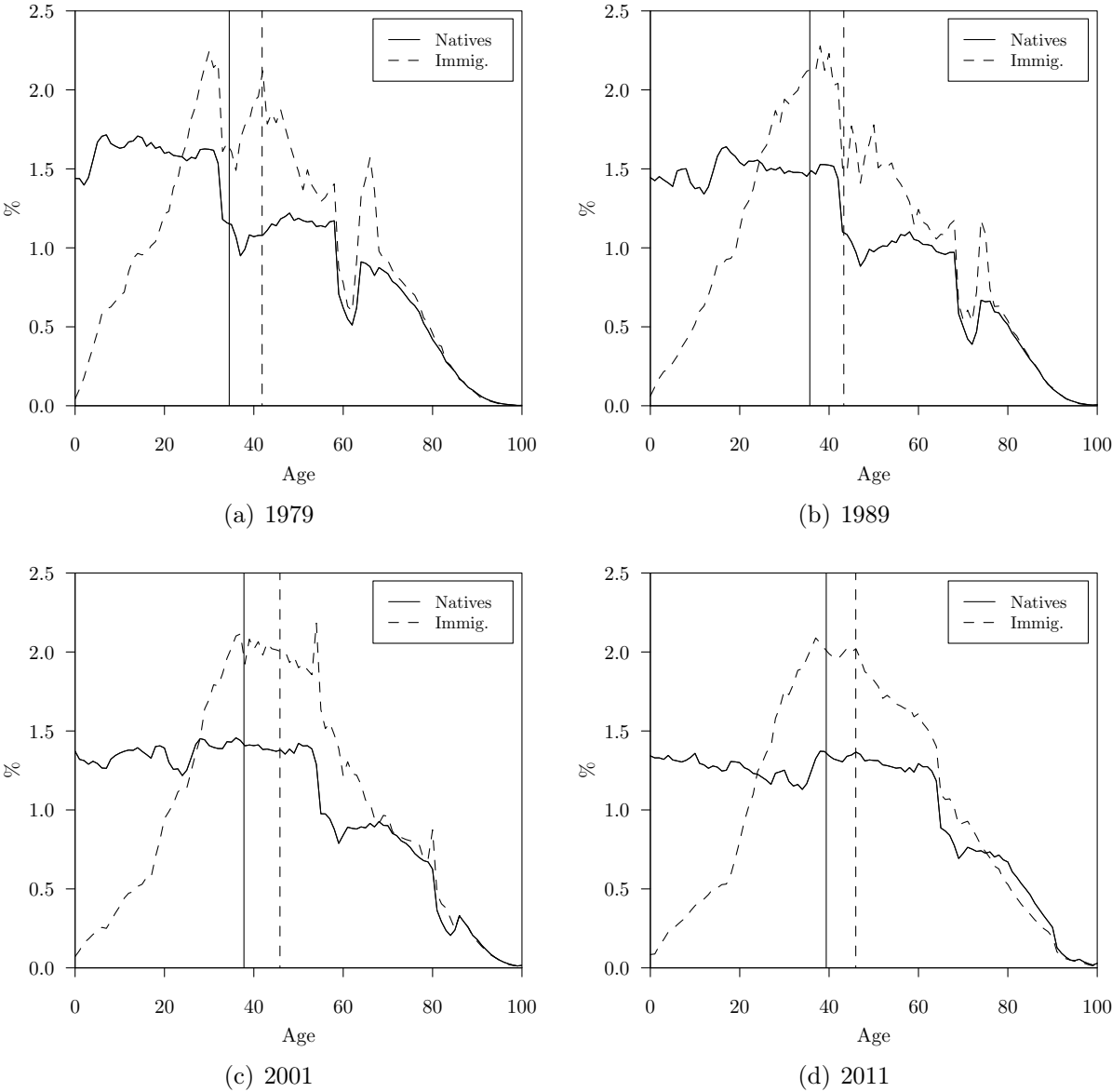
Source: Authors' calculations.

In 2011 (panel d), the proportion of 38-year-olds was 1.4% in the native population, and 2.1% in the immigrant population. Average age of natives (vertical line) was 39.4 years, and 46 years for immigrants.

4.1.3 Structure by qualification level of the French population

The last characteristic of immigrants that we need to emphasise in order to fully understand their impact on public finances concerns their level of qualification. Currently, immigrants are generally less skilled than natives, despite the fact that their level of education is steadily increasing. To understand this, consider three major levels of education: all people with a diploma below the baccalaureate are classified as low skilled (LS); those with a level of education between the baccalaureate and bac+2 level belong to the medium skilled (MS), and finally those who have a level of study higher than bac+3 are classified as highly skilled (HS).

Figure 3: Distribution by qualification level for people over 25 years of age
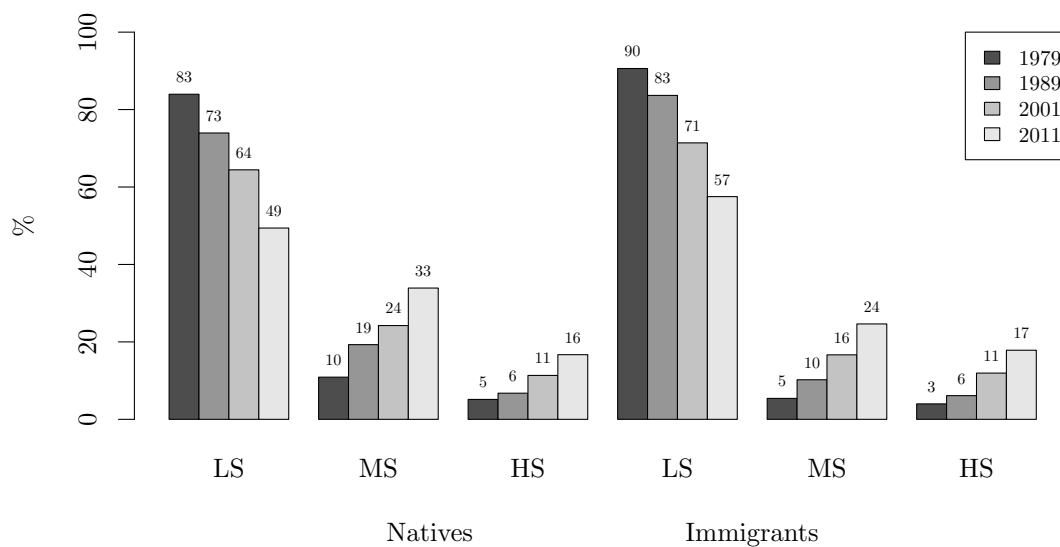
Source : Population censuses, Authors' calculations.
In 2011, 49.4% of the natives were low-skilled, 33.9% medium-skilled and 16.7% highly skilled. Figures in immigrants were respectively 57.5%, 24.6% and 17.9%.

Figure 3 shows the partition among these three levels of qualification for population aged 25-65 as revealed by the censuses. Regardless of origin, there is a similar tendency of improvement in qualification levels over time, with a very sharp drop in the weight of the low skilled offset by an increase in the weights of the medium and highly skilled. For all years, the low skilled population remains significantly larger (proportionately) in the immigrant population than in the native population. For example, in 2011 this category represented 57% of immigrants against 49% of natives. The opposite is true for the medium skilled population over the whole period (24% for immigrants versus 33% for natives in 2011). Finally, the weight of the highly skilled is broadly comparable in the two subpopulations over the whole period (being even slightly higher for the immigrant

population in 2011).

4.2   Data from microeconomic surveys

The individualised state transfers mainly include the expenditure in social protection and education. Traditionally, six major subdivisions of social protection expenditure are recognised, corresponding to the different risks as defined by the social protection accounts:

- *old age-survival risk*, which includes contributory pensions of direct entitlement, supplementary pensions (compulsory and voluntary), survivors' pensions, early retirement, minimum old-age pension, and pensions for war veterans or war victims;

- *sickness-disability-occupational hazard risk*, including dependent elderly aids, allowances for disabled adults, disability pensions, special education allowance (AES) and the totality of health expenditure (doctors, dentists, assistants, tests and analyses, pharmaceutical purchases, hospitalisation, glasses and contact lenses);

- *unemployment risk*, which includes allowances paid either through ASSEDIC (Association for Employment in Industry and Commerce), FNE (National Employment Fund), employers or any other body;

- *family-maternity risk*, which includes basic family allowances, family supplements, school allowance (ARS), young child allowance (APJE), day-care aid, parental education allowance (APE), single-parent allowance (API), family support allowance (ASF), approved maternal assistant's allowance (AFEAMA), adoption allowance (ADA), parental presence allowance (APP), young child reception allowance (PAJE), bursaries and scholarships, and allowances paid by municipalities or any social body;

- *housing risk* including personalised housing benefit (APL) and social or family housing allowances (ALF and ALS);

- *poverty-exclusion risk*, which included until 2009 the minimum integration income (RMI), the specific solidarity income (RSO) and the minimum activity income (RMA). As of 2009, it became the active solidarity income (RSA) including the hardship benefits (base RSA) and the activity RSA;

To these social protection expenditures are added the education expenditures, which equally represent transfers towards a clearly identified age group. We thus have a total of 7 categories of individualised transfers ($m = 7$).

From the side of the public administration revenues, 6 categories of levies are defined ($n = 6$):

- personal income tax (IRPP);

- consumption taxes (TVA, customs duties, other taxes on products);

- local taxes (residence tax and property tax);

- capital income taxes (levy on savings income, real estate income and investment revenue income);

- CSG (general social contribution) and the CRDS (contribution to repayment of social debt);

- social contributions (employees and employers).

Almost all of these data (with the exception of education and health expenditures) come from the Family Budget Survey. This survey is carried out every five years by INSEE. Its aim is to reconstitute all household accounts: recording of total expenditure, consumption and resources of the surveyed household. After excluding individuals under the age of 16, the samples were 30,416, 19,752, 20,297 and 23,729 individuals in 2011, 2006, 2001 and 1979 respectively (Table 2). Samples from 1985 to 1995 only refer to household reference people and their spouses, if applicable. Indeed, information on nationality is only available for these individuals. As a result, the samples were 18,802, 15,341 and 20,459 individuals in 1995, 1989 and 1984 respectively. The identification of the immigrant population is done through examining the question about place of birth in the 2001 to 2011 surveys, and the question about nationality in the surveys from 1979 to 1995[10].

Table 2: Composition of the surveys

Year	Total individuals	Natives	%	Immigrants	%
Family Budget Survey 1979	23,729	22,704	95.7%	1,025	4.3%
Family Budget Survey 1985	20,488	18,615	90.9%	1,873	9.1%
Family Budget Survey 1989	15,859	14,437	91.0%	1,422	9.0%
Family Budget Survey 1995	18,802	17,190	91.4%	1,612	8.6%
Family Budget Survey 2001	20,297	18,324	90.3%	1,973	9.7%
Family Budget Survey 2006	19,752	17,502	88.6%	2,250	11.4%
Family Budget Survey 2011	19,361	17,066	88.1%	2,295	11.9%
Health and medical care survey 1981	21,003	19,755	94.1%	1,248	5.9%
Health and medical care survey 1992	20,214	18,827	94.1%	1,387	6.9%
ESPS 2006	14,954	6,591	91.8%	590	8.2%
ESPS 2010	15,973	6,194	91.1%	606	8.9%

Source : Authors' calculations.

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[10]But French naturalised people are regarded as immigrants according to this breakdown.

For each type of resource and expense, we calculated average individual profiles by age (by grouping individuals into five-year age brackets in order to sufficiently populate data cells), birth place (natives vs. immigrants[11]) and qualification level (LS, MS and HS). Some resources and expenses are clearly individualised in the survey: retirement, unemployment and RMI. But many others are defined at the household level and thus require assumptions prior to individualisation.

With respect to family allowances and RSA, we allocate amounts to the two main household members - namely the household reference person and his or her spouse - in proportion to their individual incomes. The individualised income is income in the broad sense, i.e. the sum of incomes from wage activity (wages, income from secondary activities, daily allowances), self-employment income and replacement income such as retirement pension or unemployment benefits. Next, the calculation of consumption taxes was based on the application of the different VAT rates to the consumption expenditure reported in the survey. As regards housing subsidies and local taxes, individualisation does not take into account the distribution of income within the household. We decided in this case to equally distribute the total amount between the first two adult units of the household.

For the IRPP, we first calculate a fictional tax at the individual level by using the scales applied to each income bracket and each year. Once the fictional tax is calculated, it is possible to deduce a distribution key for the disaggregation of taxes at the individual level. This key is then applied to the tax as reported in each of the evaluated surveys for the constituent members of a household.

The calculation of social contributions and the CSG-CRDS was made by reconstituting the gross income from activities using family budget surveys and then applying the rates for employee and employer social contributions valid during the survey year, according to income level (to take into account reductions in payroll taxes on low wages and exemption of certain expenses beyond social security caps) and employment type. We considered 5 fictional categories of individuals according to applied social contribution rates: non-executive employees in the private sector, executives in the private sector, civil servants, craftsmen and traders, and liberal professions. The rates used are those in place at the date of each survey. Concerning the CSG-CRDS, the prevailing rates are simply applied to gross income from activities and other types of income subject to payment of CSG (replacement income and capital income).

Health expenditure comes from the INSEE health and medical care survey in 1981 and 1992 and the Health and Social Protection Survey (ESPS) of the IRDES (Institute

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[11]As noted above, a distinction between European and non-EU immigrants is possible from 2001 onwards.

for Research and Documentation on Health Economy) in 2006 and 2010. Exception for the first years of life, we considered broad age classes (0 to 2 years, 3-4, 5-9, 10-14, 15-19, 20-29, 30-49, 50-59, 60-69, 70 and over) and pooled total health expenditures in order to estimate the total cost of health care. Data from these surveys were interpolated to generate profiles for the intervening years (1984, 1999 and 2001).

Finally, expenditure on education by age comes from the Ministry of National Education. Lacking more precise data, we considered that for a given age, education expenditure is the same irrespective of origin.

All survey data are used to construct the tax profiles ($\tilde{\tau}^i_{o,a,q}$) and transfers ($\tilde{g}^j_{o,a,q}$) individualised by age, origin and qualification level.

4.3 Macroeconomic framework data

Macroeconomic framework data represent the final set of data needed for the implementation of the accounting approach, as defined in section 3. Based on data from the national accounts and social protection accounts, we disaggregate total public revenue and expenditure in order to recover the categories of taxes and transfers resulting from the processing of the surveys (T^i and G^j).

Table 3 shows the breakdown of the public budget in the years when micro-economic surveys were available. Social contributions and indirect taxes are by far the main sources of public revenue. On the expenditure side, retirement and health have the largest weight on public accounts. The public administration budget is unbalanced over the projection horizon. As usually done in this type of analysis, interest charges on debt are excluded from current public consumption expenditure, and thus are not considered as an expenditure to be allocated to the individuals in the current period. Since interest on public debt accounts for an ever-increasing share of public expenditure, when it is subtracted from total expenditure the calculated primary balance is not systematically negative over the period, unlike the total balance. Our accounting approach consists in estimating the contribution of immigrants to the primary balance, which is achieved by evaluating in parallel the contribution of natives.

To this end, it is necessary to assess the respective contribution of natives and immigrants to the various components of public revenue and expenditure. For the categories of taxes and transfers individualised from the surveys, the method consists in calculating initially their total aggregate amount ($\tilde{T}^i$ and $\tilde{G}^j$), by combining the average individual profiles ($\tilde{\tau}^i_{o,a,q}$ and $\tilde{g}^j_{o,a,q}$) and the corresponding population sizes ($P_{o,a,q}$). By construction, these reconstituted aggregates do not correspond exactly to the aggregate data from national accounts (T^i and G^j) in Table 3. Each average individual profile is then uniformly calibrated ($\tau^i_{o,a,q}$ and $g^j_{o,a,q}$) so that these two aggregate values become identical, while

Table 3: Revenues and expenditures of public administrations (as % of GDP)

	1979	1984	1989	1995	2001	2006	2011
Revenue							
Personal income tax	3.5	3.9	3.3	3.4	3.2	2.9	2.5
Capital income tax	2.2	2.2	2.6	1.9	3.1	2.9	2.4
Indirect taxes	9.1	9.2	9.6	9.2	9.5	9.3	8.9
Local taxes	1.0	1.3	1.4	1.7	1.7	1.8	2.4
CSG-CRDS	0.0	0.0	0.0	1.2	4.4	4.5	4.7
Social contributions	18.6	20.4	20.0	20.3	17.9	18.2	18.8
Other revenues	10.1	11.5	10.1	11.2	10.2	10.9	10.9
Total revenue	44.6	48.4	47.0	48.9	50.0	50.6	50.6
Expenditure							
Health	7.3	7.9	7.5	8.2	8.5	9.0	9.6
Pension	9.5	10.7	10.8	12.3	12.5	12.9	14.4
Familly	2.9	3.2	2.8	2.9	2.8	2.8	2.8
Unemployment	1.5	2.4	2.1	2.2	2.0	1.9	1.9
Housing	0.4	0.7	0.8	1.0	0.9	0.8	0.8
Poverty-exclusion	0.1	0.1	0.2	0.5	0.5	0.6	0.8
Education	6.4	6.8	6.5	7.6	7.2	6.8	6.8
Other expenditures	10.1	10.9	9.3	9.4	7.8	9.8	10.5
Other expenditures - public goods	6.1	6.9	6.9	7.4	6.8	6.1	5.9
Interest charges on debt	0.6	1.6	2.0	3.0	2.7	2.4	2.5
Total expenditure	44.9	51.2	48.9	54.4	51.7	53.0	55.9
Budget balance	-0.4	-2.8	-1.9	-5.5	-1.7	-2.4	-5.3
Primary balance	0.2	-1.2	0.1	-2.5	1.0	0.0	-2.8

<u>Source</u> : Insee. Irdes. Authors' calculations.

preserving the specific characteristics of each profile (see equations 5 and 6).

A non-negligible proportion of public revenue (about 10% of GDP) and public expenditure (between 14 and 18% of GDP depending on the year) could not be identified on the basis of these surveys. As for the former ($\bar{\bar{T}}$), this essentially means the non-fiscal revenue of the state (resulting from dividends, interest on loans, fines, lotteries, etc.). Residual expenditures ($\bar{\bar{G}}$) include everything related to national defence, security, justice, culture, ecology, research, etc. Nonetheless, a fraction of them may be possibly allocated either to the immigrant population as a whole ($\bar{T}_I$ and $\bar{G}_I$) or the native population ($\bar{T}_N$ and $\bar{G}_N$), despite the fact that they cannot be individualised by age or qualification level. This is how we have already proceeded in the case of pensions paid to non-residents.

In fact, non-resident beneficiaries (who are not included in the Family Budget Survey) received some of those pensions, whose amount can be found in the statistical reports of the Center for European Liaisons and International Social Security (CLEISS). These non-residents are not necessarily former immigrants. A study by Drees (Christel and

Deloffre, 2008) for the year 2008 reveals that 90% of these beneficiaries are foreigners[12], who received 83% of the total amount paid. Based on this breakdown[13] and the CLEISS data, such pensions received by non-resident foreigners amounted in 1979 to €1.483 billion (at constant 2005 prices) and reached €5.291 billion (at constant 2005 prices) in 2011. These amounts are therefore allocated to the immigrant population (even if they no longer reside within the national territory), although they cannot be broken down by age and level of qualification. The calibration of the profiles of average individual retirement pension (the corresponding $g_{o,a,q}^{j}$) was applied to the total retirement pensions[14] minus the pensions paid to non-residents (foreign or French), which are integrated into the $\bar{G}_o$.

We adopt the same allocation strategy in relation to the proportion of public spending on real assistance to social housing operations, which amounted to €2.704 billion in 2011 (at constant 2005 prices). These are broken down between immigrants and natives in proportion to their respective share among the occupants of social housing units. The 2006 Insee housing survey provides occupation shares in that year: 83.5% of social housing units are occupied by natives and 16.5% by immigrants. The survey also allows a breakdown between immigrants from the EU (3%) and third countries (13.5%)[15]. However, we do not have any information to carry out a breakdown by age and level of qualification. These amounts are therefore allocated to concerned populations as a whole and not at the individual level.

For the remaining public revenues and expenditures that cannot be broken down between immigrants or natives ($\bar{T}$ and $\bar{G}$), we had to define a sharing rule so that we could take into account the entire public budget. For example, military expenditures are relatively independent of population size and therefore little affected by the migration process. In contrast, other expenses such as those of Justice or the Ministry of the Interior could vary more than proportionally if the immigrant population is over-represented. The lack of relevant statistics does not however allow us to adopt the same method of determination of the relative situation of immigrants that we applied in particular to social expenditures. The selected method here consists then in breaking down the residual

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[12]The remaining 10% are thus paid to retired French people residing abroad.

[13]This study was carried out only for the year 2008. As we did not have information for the other years of our accounting exercise, we applied this partition key for each of the periods. The breakdown between immigrants from the European Union or a third country for the years 2001, 2006 and 2011 was based on the country in which the pensions were paid. We then adopted the assumption that these former immigrants have returned to their country of origin.

[14]In Table 3, the *Pension* row represents the totality of public spending on pensions, including amounts paid to non-residents.

[15]As in the case of pensions paid to non-residents, this allocation formula is only available for a single year (2006), which is therefore equally applied for every period covered by our study.

expenditure and income uniformly over the total population (natives plus immigrants)[16].
An alternative strategy found in the literature is to fully allocate public expenditure
assimilated to public goods to the native population (as in the case of national defence
spending, public research spending, etc.). We discuss in more detail the reasons and
implications of this choice in section 5.4 on sensitivity analysis, in which we evaluated a
scenario (called *public goods*) that affects these expenditures as public goods to natives
only.

5 The contribution of immigrants to French public finances

Before describing our results on the overall contribution of immigrants to the primary
budget balance, we present the adjusted individual profiles of taxes and transfers.

5.1 Profiles of paid taxes, received transfers and net budgetary contribution

Based on our treatment of the survey data and using the aggregated national accounts
data discussed in the preceding section, we calculated the adjusted profiles by age, origin
and qualification level for each type of taxes and transfers. We discuss profiles of level of
qualification (*cf.* Figure 7, appendix B) and origin (*cf.* Figures 8 and 9, appendix C).

Three main lessons emerge from the profiles:

(i) *A marked disparity in individual net contributions by age.* A first interpretation of
these profiles follows from observed disparities related to age. The different transfers are
addressed to very specific age groups. Similarly, the revenues that fund these transfers
are also characterised by partitions specific to age. To the extent that our system of social
protection generally works on a Pay-as-you-go basis (meaning that expenditure is financed
by current taxes and contributions rather than through capitalisation of past revenues), a
major consequence of such substantial redistribution is the existence of implicit transfers
between different contemporaneous age groups. Overall, it is therefore the inactive young
and especially the inactive elderly who are the main beneficiaries of the system. As a
result, they engender a negative net contribution, receiving more transfers than they pay
as taxes, regardless of origin or qualification level (*cf.* Figures 7, 8 and 9 in appendix).
On the other hand, most individuals aged between 20 and 65 exhibit a positive net contribution. Detailed consideration of age structure in different subpopulations is therefore

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[16]Only for people over 16 with regard to taxes (see equations 8).

essential when assessing their overall contribution to public finances.

(ii) *A disparity in individual net contributions by level of qualification.* Level of qualification is another important source of differentiation between individuals in terms of their net contribution to public finances. Regardless of year and age, the average amount of taxes paid by the most skilled individuals is significantly higher. For example, in 2006 a highly skilled 50-year-old individual paid an average of just over €46,000 in taxes, compared to around €20,000 for the low-skilled (*cf.* Figure 7 in appendix B). In contrast, while received transfers are relatively similar between qualification levels before age 60, over that age the average amount received by highly skilled individuals is significantly higher, and over the age of 65 years the values are respectively €33,000 and €21,000. As a result, the positive net contribution of a highly skilled person over the whole active life is significantly higher. However, at older ages the negative net contribution of a highly skilled individual represents a heavier burden on public finances.

(iii) *A disparity in individual net contributions by origin.* When we compare age profiles according to origin, relatively large disparities are observed. The main differences are clearly evident on the contribution side. For example, the total taxes paid in 2006 by a 40-year-old immigrant is just under one-fifth less than what is paid by a similarly aged native (*cf.* Figure 8 in annex C). This result can largely be explained by the qualification structure, which is less favourable for immigrants. Differences in patterns of transfer appear to be smaller. Beyond the age of 60-65, the average transfers received by immigrants are significantly lower than for natives, in particular due to lower retirement pensions resulting from less complete professional careers. In contrast, such transfers are slightly higher during working life, mostly due to a higher likelihood of unemployment in the immigrant population. Overall, by subtracting received transfers from paid levies at each age, the age structure of net taxes can be derived (Figure 8). Whatever the year in question, the net taxes of an immigrant of working age are clearly lower than those of a native whereas the opposite occurs after 55-60 years (*cf.* Figure 9 in appendix C).

Rather than qualification structure, it is the country of origin that explains disparities within the immigrant population. Both in 2001 and 2006, extra-community immigrants were generally more qualified, yet produced a lower net contribution at any age than EU immigrants. The main explanation lies in the more successful integration of European immigrants into the labour market. In 2014 (according to data from the INSEE labour force survey), the overall unemployment rate in France was 9.9%, but only 9.1% for natives against 17.2% for all immigrants. Nonetheless, the high unemployment rate of immigrants hides a very strong heterogeneity by country of origin, with values of 20.7% for third country nationals against only 9.3% for EU nationals.

5.2 Net aggregated contributions by origin

By considering together the taxes and transfers adjusted by age, origin and level of qualification and the size of the studied sub-populations (*cf.* equations 9 and 10) in each year, we obtained the instantaneous net contribution of both immigrant and native populations to the public administration budget (Table 4; see also Appendix E). The main consequences are:

Table 4: Net contribution to public finances

	1979	1984	1989	1995	2001	2006	2011
Overall contribution (in billions of 2005 euros)							
Primary balance	**2.40**	**-13.33**	**0.95**	**-34.73**	**16.85**	**0.17**	**-51.35**
Natives	3.61	-11.33	0.33	-31.83	17.25	1.55	-42.55
Immigrants	-1.21	-2.01	0.62	-2.90	-0.40	-1.38	-8.80
EU immigrants					2.79	0.54	-3.29
Third countries immigrants					-3.19	-1.92	-5.51
Contribution in % of GDP							
Primary balance	**0.24**	**-1.22**	**0.07**	**-2.50**	**1.04**	**0.01**	**-2.84**
Natives	0.36	-1.03	0.03	-2.29	1.07	0.09	-2.35
Immigrants	-0.12	-0.18	0.05	-0.21	-0.02	-0.08	-0.49
EU Immigrants					0.17	0.03	-0.18
Third countries Immigrants					-0.20	-0.11	-0.30
Taxes/transfers ratio in %							
Natives	100.9	97.8	100.1	95.2	102.4	100.2	95.2
Immigrants	96.5	95.0	101.4	94.3	99.4	98.2	88.7
EU Immigrants					111.0	101.9	88.5
Third countries Immigrants					91.6	96.0	88.8
Net contribution per capita (in 2005 euros)							
All residents	**44.9**	**-242.9**	**16.8**	**-601.4**	**284.3**	**2.8**	**-814.1**
Natives	72.8	-222.5	6.3	-594.9	314.0	27.5	-738.2
Immigrants	-309.1	-501.9	151.4	-684.4	-91.8	-277.8	-1618.1
EU Immigrants					1704.5	307.5	-1843.2
Third countries immigrants					-1184.8	-593.8	-1508.2
Contrib. to primary balance per residents (in 2005 euros)							
Natives	67.5	-206.3	5.8	-551.2	291.0	25.3	-674.6
Immigrants	-22.6	-36.6	11.0	-50.2	-6.7	-22.5	-139.5
EU Immigrants					47.1	8.7	-52.1
Third countries immigrants					-53.8	-31.3	-87.4

i) With the exception of 1989, the overall net contribution of immigration to the public administration budget has always been negative, varying between -€400 million in 2001 to -€8.8 billion in 2011. Compared to the natives, the net contribution of immigrants is lower due to the relative weight of immigrants in the French population as a whole (between 7.3% and 8.6% depending on the year). The contribution of natives varied between -€42.55 billion in 2011 and €17.25 billion in 2001. In 2011 the net contribution of immigrants was particularly low, but this was also when natives produced their most negative contribution. The year 1995 also followed a period of severe recession in France, and is equally marked

by very negative net contributions for both populations. In comparison, negative net contributions in 2011 decreased by 33% for natives and over 200% for immigrants. The crisis of 2008 undoubtedly had a significant negative impact on the contribution to public finances of both immigrants and natives, but has more strongly affected the fiscal situation of the former.

ii) Another important result is the decomposition of net contributions from EU and third country immigrants. The positive net contribution of EU immigrants in 2001 (€2.8 billion) largely outweighs the negative contribution of non-EU immigrants (-€3.2 billion). This difference tends to gradually vanish, with the net contribution of EU immigrants substantially deteriorating over time. This reversal partially stems from the increase in the share of inactive people (young and old) among EU immigrants, resulting in an increase in net beneficiaries of the social transfer system (Table 1 and Figure 6).

iii) From the late 1970s until today, the immigrant population has never been the source of primary fiscal deficits in France. In all years exhibiting a negative primary balance (1984, 1995 and 2011), the contribution of natives was also negative. Similarly, when the contribution was negative for immigrants and positive for natives, the aggregate balance was positive (1979, 2001 and 2006).

iv) Over the entire studied period, immigration has never determined the extent and evolution of the primary fiscal balance (Figure 4). The contribution of immigrants as a percentage of GDP is relatively small, varying between ±0.5% of the GDP. This is consistent with previous studies in other countries reviewed in our literature section and similar to values for OECD member countries. This level is reached only after the financial crisis of 2008 (in 2011), previously oscillating within a narrower range between ±0.2% (Figure 4). It should be remembered that the total primary balance as a percentage of GDP varies over the entire period from -2.8% (2011) to 1.1% (2001).

(v) The net contribution of the native and immigrant sub-populations naturally depends on their relative size. To remove the size effect, the second part of Table 4 presents two additional indicators that allow for a direct comparison between net contributions. The first indicator is the coverage rate, or ratio of total paid taxes to transfers received by each group (Equation 11, Appendix E). Although the rate does not offer new information regarding the imbalance between taxes and transfers (an overall negative contribution being associated with a tax to transfer ratio below 100%), it provides a measure of imbalance between the volume of paid taxes and received transfers by removing population size effects. In this respect, the situation of immigrants deteriorated significantly in 2011 following the financial crisis of 2008, with a total of paid taxes under 89% of total received transfers. It should be noted that this trend is identical for EU and third country immigrants. This indicator confirms a significantly worse scenario for immigrants after

Figure 4: Net contribution in % of GDP
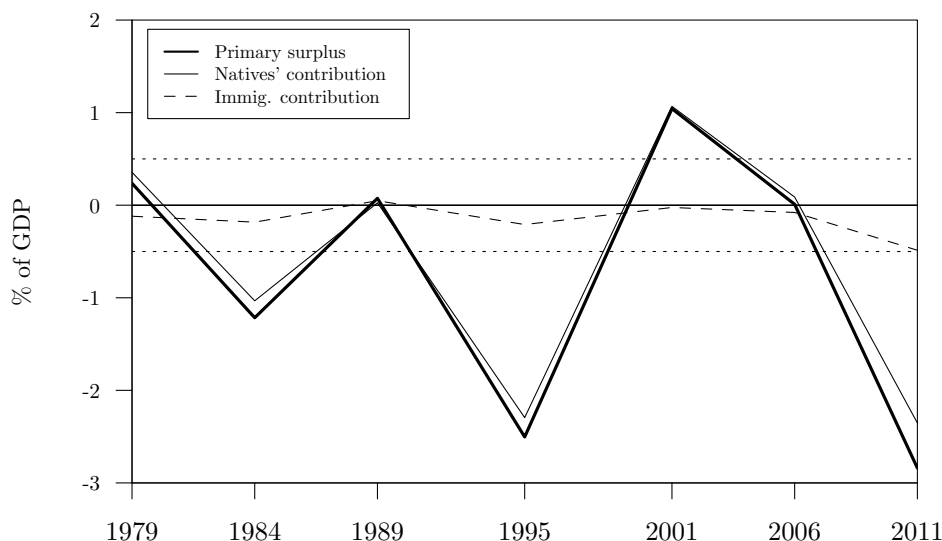
Source : Authors' calculations.

2008. Table 10 (Appendix D) demonstrates that the deterioration resulted mostly from a reduction in paid taxes (especially social contributions and CSG), supporting the idea that adjustments in the labour market after the 2008 crisis have penalised immigrants more than the native population, both in France and the European Union as a whole (Chojnicki et al., 2016).

(vi) The second indicator controlling for size effects is the net contribution *per capita*, or ratio between overall contribution and sub-population size (Equation 12, Appendix E). On average, an immigrant made a net contribution of -€502 to public finances in 1984, compared to -€223 by natives. The indicator also identifies differences between the years 2011 and 1995: while the average contributions of immigrants (-€685) and natives (-€595 euros) were relatively similar in 1995, the difference is more than twofold in 2011 (-€1,618 for immigrants against -€738 for natives). This trend affected immigrants as a whole, either from the EU (-€1,843) or third countries (-€1,508) in 2011.

vii) A final indicator (Equation 13, Appendix E) in Table 4 partitions the average primary balance *per capita* (provided by the previous indicator) between natives and immigrants[17]. For example, the primary deficit of €34 billion in 1995 (constant 2005 values) was equivalent to a deficit *per capita* (resident) of €601 euros, of which €551 were attributable to natives and €50 to immigrants. By 2011, there had been a strong deterioration in the fiscal situation of the immigrant population. Whereas in 1995 immigrants accounted for 8.3% of the primary deficit *per capita* (comparable to their fraction in the

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[17]Note that this indicator depends on sub-population sizes.

French population), this share has increased to over 17% in 2011.

5.3   Decomposition according to origin, age and qualification level

In order to best understand the results within our reference scenario, we developed a decomposition of the two indicators:

1. variation over time in primary balance per resident (difference in balance between two periods). This provides an answer to the question over the contribution of each population to the evolution of the primary balance *per capita*, both through changes in their fiscal characteristics and their demography.

2. the instantaneous gap between the *per capita* contributions of natives and immigrants. This answers a distinct question: which are the demographic and fiscal factors underlying differences between the *per capita* contribution of natives and immigrants in the studied years?

The method applied to the decompositions above is detailed in Appendix F. The decompositions take into account demographic and fiscal disparities between population categories: they therefore need to be applied to individualised contributions. Both for the primary balance *per capita* and the net contributions *per capita* according to origin, we added pensions paid abroad and social housing expenses that are not individualised (there is no difference between *per capita* values, irrespective of population). Table 5 distinguishes individualised from non-individualised calculations of net contributions *per capita*. The two decompositions will therefore refer only to the individualised component[18] of indicators (Table 5, bold lines).

When we consider only the individualised component, conclusions remain the same for the native population but differ for immigrants. In each of four years (1979, 1984, 2001 and 2006), the non-individualised contribution per head shifts the total net *per capita* contribution of immigrants towards negative values (while their individualised contribution remains positive). Moreover, benefits paid abroad to foreigners are enough to make the total contribution *per capita* of immigrants negative, in contrast to their positive individual contribution.

It is noticeable that the individualised net contribution *per capita* of immigrants is always positive except for two years following a strong recession (1995 and 2011). This remains true even after we add spending on social housing (deducing only pensions paid

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[18]The non-individualised contribution is always negative since it only includes transfers: pensions paid abroad and social housing expenses. Therefore it has always a negative impact on total net contribution *per capita*, regardless of population.

Table 5: Net contribution per capita (in 2005 euros)

	1979	1984	1989	1995	2001	2006	2011
			All residents				
Primary balance by resident	44.9	-242.9	16.8	-601.4	284.3	2.8	-814.1
Individualized contribution	141.7	-134.6	75.9	-533.5	368.8	98.3	-687.3
$\Delta_{t+1.t}$ **Individualized contribution**		**-276.2**	**210.4**	**-609.3**	**902.2**	**-270.4**	**-785.7**
Non individualized contribution	-96.8	-108.3	-59.1	-67.9	-84.4	-95.6	-126.8
of which - pensions paid abroad	-27.8	-34.5	-37.6	-45.5	-67.6	-74.9	-83.9
- social housing expenses	-69	-73.8	-21.4	-22.4	-16.9	-20.7	-42.9
			Natives				
Overall contribution per capita	72.8	-222.5	6.3	-594.9	314.0	27.5	-738.2
Individualized contribution	140.1	-149.7	32.5	-566.2	341.6	60.3	-683.3
Non individualized contribution	-67.3	-72.9	-26.3	-28.7	-27.7	-32.8	-54.9
of which - pensions paid abroad	-5.1	-6.4	-6.9	-8.4	-12.5	-14.0	-15.7
- social housing expenses	-62.2	-66.5	-19.3	-20.2	-15.2	-18.8	-39.2
			Immigrants				
Overall contribution per capita	-309.1	-501.9	151.4	-684.4	-91.8	-277.8	-1618.1
Individualized contribution	160.8	58.1	629.4	-119.5	713.5	529.3	-729.8
Non individualized contribution	-469.9	-560.0	-478.0	-564.9	-805.2	-807.1	-888.3
of which - pensions paid abroad	-314.2	-392.9	-429.3	-514.4	-767.2	-765.0	-806.3
- social housing expenses	-155.7	-167.1	-48.7	-50.5	-38.1	-42.1	-82.0
		Differences (native contribution - immig. contribution)					
Overall contribution per capita	381.9	279.4	-145.1	89.5	405.7	305.4	879.9
$\Delta_{N.I}$ **Individualized contribution**	**-20.7**	**-207.8**	**-596.9**	**-446.7**	**-371.8**	**-468.9**	**46.4**
Non individualized contribution	402.6	487.1	451.8	536.2	777.6	774.3	833.4
of which - pensions paid abroad	309.1	386.5	422.3	506.0	754.7	751.0	790.6
- social housing expenses	93.5	100.7	29.4	30.3	22.9	23.3	42.9

Source : Authors' calculations.

abroad). If we exclude the latter expenses (which are unrelated to immigrants in the country, although associated with past immigration), the fiscal situation *per capita* of immigrants is for each year much more favourable to French public finances compared to natives.

5.3.1 Decomposition of change over time of primary balance individualised by resident

The first decomposed indicator is the variation over time of the individualised primary balance per head[19] (Table 6). We focus our comments on the two periods associated with a significant deterioration of the primary balance *per capita*: the recession of the early 1990s (1995/89 change) and the 2008 crisis (2011/2006 change). The recession during the early 1990s resulted in change in the individualised primary balance from €75.9 in

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[19]While the comparison of the contribution *per capita* of natives and immigrants eliminates populations size effects, the evolution of the contribution per resident depends on the size. They are therefore not removed in the explanation of temporal variation.

1989 to -€533.4 in 1995, a variation of -€609.3. Both native and immigrant populations contributed to this deterioration, with a larger contribution by the former (-€554.8 or 91% of total). This is expected due to the effect of population size. As indicated above, the negative impact of natives stems solely from the negative trend in their tax structure (-€943.1) cancelling out positive demographic effects (€388.1). This is comparable to values for the immigrant population (once differences in population size are factored in), with a positive demographic impact (€31.4) nullified by a negative fiscal effect (-€85.6).

Table 6: Decomposition of the temporal evolution of the primary balance per resident (in 2005 euros)

	79-84	84-89	89-95	95-01	01-06	06-11
Evolution	**-276.2**	**210.4**	**-609.3**	**902.2**	**-270.4**	**-785.7**
Accountable to the natives	**-268.7**	**168.9**	**-554.8**	**841.4**	**-261.3**	**-679.8**
Demographic componant	382.0	275.1	388.1	418.9	415.6	-19.2
Fiscal componant	-650.7	-106.1	-943.1	422.4	-675.0	-662.2
Accountable to immigrants	**-7.5**	**41.5**	**-54.5**	**60.9**	**-9.2**	**-105.9**
Demographic componant	22.0	18.4	31.4	44.4	57.1	23.8
Fiscal componant	-29.5	23.0	-85.6	16.5	-68.1	-128.2
	Accountable to the natives					
Young (0-16)						
Total young people	**-141.6**	**-29.5**	**-279.7**	**-43.8**	**-80.2**	**-40.8**
Demographic componant	114.1	113.8	90.8	86.2	73.1	27.3
Fiscal componant	-255.7	-143.2	-370.6	-130.0	-153.4	-68.1
Working age people (17-64)						
Total working age people	**-56.4**	**397.2**	**212.7**	**1177.9**	**79.1**	**-477.7**
Demographic componant	209.1	236.8	466.5	512.4	469.1	23.6
Fiscal componant	-265.6	160.4	-253.8	665.5	-390	-501.3
of which - **Total LS**	**-171.6**	**4.7**	**-253.3**	**199.3**	**-504.4**	**-669.5**
Demographic componant	-164.7	-120.8	27.4	59.9	-296.3	-311.1
Fiscal componant	-6.9	125.5	-280.7	139.3	-208.1	-358.4
- **Total MS**	**111.0**	**290.5**	**145.4**	**345.3**	**196.8**	**28.1**
Demographic componant	279.1	270.3	205.8	164.5	362.4	123.7
Fiscal componant	-168.1	20.2	-60.4	180.9	-165.6	-95.6
- **Total HS**	**4.2**	**102.0**	**320.6**	**633.3**	**386.7**	**163.7**
Demographic componant	94.7	87.3	233.3	288.0	403.0	211.0
Fiscal componant	-90.6	14.7	87.3	345.3	-16.3	-47.3
Old people (65+)						
Total old people	**-70.6**	**-198.8**	**-488.1**	**-292.7**	**-258.3**	**-162.8**
Demographic componant	58.9	-75.5	-169.3	-179.6	-126.6	-70.0
Fiscal componant	-129.5	-123.3	-318.6	-113.1	-131.7	-92.7
of which - **Total LS**	**-9.7**	**-174.3**	**-351.8**	**-245.6**	**-93.0**	**-98.0**
Demographic componant	84.0	-34.6	-110.4	-108.8	55.6	41.1

(Table 6. continued)

	79-84	84-89	89-95	95-01	01-06	06-11
Fiscal componant	-93.7	-139.7	-241.4	-136.8	-148.6	-139.1
- Total MS	**-59.9**	**-3.8**	**-83.6**	**-35.6**	**-110.8**	**-70.6**
Demographic componant	-21.9	-36.1	-36.0	-41.3	-136.9	-73.9
Fiscal componant	-38.0	32.3	-47.5	5.7	26.1	3.3
- Total HS	**-1.0**	**-20.7**	**-52.7**	**-11.5**	**-54.5**	**5.8**
Demographic componant	-3.2	-4.8	-22.9	-29.5	-45.3	-37.2
Fiscal componant	2.2	-15.9	-29.7	18.0	-9.2	43.1
Accountable to immigrants						
Young (0-16)						
Total young people	**0.6**	**4.6**	**0.3**	**4.4**	**-10.0**	**-4.4**
Demographic componant	7.4	7.9	8.8	8.7	-6.3	-2.1
Fiscal componant	-6.8	-3.3	-8.5	-4.3	-3.7	-2.4
Working age people (17-64)						
Total working age people	**4.9**	**68.5**	**-38.7**	**111.9**	**24.7**	**-116.6**
Demographic componant	9.2	17.1	31.2	42.3	77.9	41.2
Fiscal componant	-4.3	51.5	-70	69.7	-53.2	-157.9
of which **- Total LS**	**7.5**	**32.9**	**-69.1**	**4.6**	**-21.5**	**-82.2**
Demographic componant	-11.9	-2.3	-7.6	-3.8	-7.6	-7.5
Fiscal componant	19.4	35.3	-61.5	8.4	-13.9	-74.7
- Total MS	**9.9**	**19.9**	**1.6**	**32.7**	**14.5**	**-26.7**
Demographic componant	11.8	12.5	17.3	15.2	33.0	15.8
Fiscal componant	-1.9	7.4	-15.7	17.5	-18.5	-42.6
- Total HS	**-12.5**	**15.7**	**28.8**	**74.6**	**31.7**	**-7.7**
Demographic componant	9.3	6.9	21.5	30.9	52.5	32.9
Fiscal componant	-21.8	8.8	7.2	43.8	-20.8	-40.6
Old people (65+)						
Total old people	**-13.1**	**-31.7**	**-15.9**	**-55.4**	**-25.7**	**16.6**
Demographic componant	5.4	-6.6	-8.7	-6.7	-14.5	-15.4
Fiscal componant	-18.6	-25.2	-7.2	-48.7	-11.2	32.1
of which **- Total LS**	**-7.3**	**-29.9**	**-11.3**	**-34.7**	**-21.8**	**12.9**
Demographic componant	6.4	-4.6	-5.3	-1.0	-0.4	-5.8
Fiscal componant	-13.7	-25.4	-6.0	-33.7	-21.4	18.7
- Total MS	**-3.8**	**-1.6**	**-1.4**	**-11.1**	**-4.3**	**2.7**
Demographic componant	-0.8	-1.6	-1.8	-2.5	-8.3	-5.2
Fiscal componant	-3.1	0.0	0.4	-8.6	4.0	8.0
- Total HS	**-2.0**	**-0.2**	**-3.2**	**-9.6**	**0.4**	**1.0**
Demographic componant	-0.2	-0.4	-1.6	-3.2	-5.8	-4.4
Fiscal componant	-1.8	0.2	-1.6	-6.4	6.2	5.4

Source : Authors' calculations.

During the 1990s recession, the young (-€279.7) and particularly the pensioners (-

€488.7) made the main contributions to the deterioration in the overall individualised primary balance *per capita* among natives (-€554.8). Changes in fiscal characteristics had a negative impact in both categories and added to the negative demographic impact of pensioners, and altogether exceeded the positive demographic effect of young natives. By contrast, active natives had a positive effect on the primary balance between 1995 and 2001, in spite of the negative effects of the recession on their fiscal profile (except for the high skilled). As for the immigrants, only the young had a positive impact (+€0.3) on the overall primary balance (-€54.5) due to their demographics, although moderated by a negative fiscal effect. Active immigrants (-€38.7) together with pensioners (-€15.9) have therefore contributed to the deterioration of the individualised primary balance in the early 1990s. Despite the positive contribution of medium (€1.6) and highly skilled (€28.8) workers, immigrants made a negative contribution due to the sharp deterioration observed among low-skilled immigrants (-€61.9). This negative effect, also observed among low-skilled native workers, was lower in absolute terms than the positive contributions by the other qualification levels. We thus observe very similar contributions (with the exception of young people) by the native and immigrant populations to the deterioration of public finances during the recession of the 1990s.

The 2008 crisis, unlike the recession of the early 1990s, engendered more discrepant contributions by natives and immigrants to public accounts deterioration. The main reason is an equal contribution by all immigrant workers irrespective of qualification level. The sharp deterioration in the fiscal situation of the three qualification categories has made the positive demographic impact of moderately and weakly qualified staff insufficient to maintain an overall positive impact, contrary to what happened in the early 1990s (and in contrast to the pattern in natives). The discrepancy between the recession of the 1990s and the crisis of 2008 confirms our suggestion that adjustments in the labour market following the 2008 crisis have affected immigrant workers more than native workers, especially in the medium and highly qualified categories.

5.3.2 Decomposition of the instantaneous gap between individualised *per capita* contribution by natives and immigrants

The second decomposed result is the difference between individualised net contribution of natives and immigrants. Table 7 displays a decomposition between differences in demographic structure (*demographic component*) and differences in individual net contribution profiles (*fiscal component*). Table 8 breaks down the fiscal component into differences in paid taxes and differences in received transfers.

First, we clarify the interpretation of estimated contribution gaps. A negative sign means a more beneficial net contribution to public finances from immigrants than natives.

This happens even when the net contribution is negative for both populations, but smaller in absolute value in immigrants. The same is true when the net contribution is positive for both populations, but higher in immigrants. The interpretation is straightforward when signs are opposite in immigrants and natives.

We note that the difference between individualised net contributions is always negative except in the last year (Table 7). This has two implications: i) over a continuous period of 30 years, immigrants had a more beneficial impact on public finances than natives; ii) the 2008 crisis marked the end of this period.

The first finding confirms results previously found in the literature. For all years including the last, the demographic component is negative while the fiscal component is positive (Table 7). Hence, the demographic structure of immigrants is more beneficial to public accounts than the native one. They are both concentrated in the active age classes (Figure 2) when the net contribution is positive (Figure 7). This is true although profiles of net individual contributions are more beneficial to natives (Figure 7) due to higher level of qualification (Figure 3) and less difficulty of integration into the labour market. Overall, the former effect outweighed the latter until the crisis of 2008.

The favourable immigrant demographic component is particularly evident for the young and active categories, where it is negative across the studied period (with the exception of the medium-skilled group during the 1990s). Young people also had a favourable fiscal component over the whole period, due to a lower level of individual received transfers (negative transfers component; Table 8). By contrast, the fiscal component of active workers is systematically positive (with a more beneficial fiscal structure in natives) irrespective of qualification level. Decomposition of the fiscal component shows that this is due to a difference in paid taxes always favourable to natives, and a difference in received transfers also favourable to them (i.e. lower than immigrants), except for the period between the late 1980s and the mid-1990s when the fiscal component exceeds the transfers component.

The role of immigrant pensioners is less straightforward. They have as a rule made a favourable contribution except in 1989 and 2001, mostly due to fiscal characteristics as their demographic component has been positive over the entire period (also with the exception of 1989 and 2001). As in the case of young people, the significantly lower level of received transfers compared to natives explains their more beneficial fiscal component, despite a lower level of paid taxes.

The crisis of 2008 marks a turning point in the relative contributions of natives and immigrants to public finances. The demographic component had as a rule outweighed the fiscal component, explaining the more favourable contribution of immigrants. By 2011, the noticeable increase in the fiscal component meant for the first time that this was no longer

Table 7: Decomposition of the instantaneous gap between per capita contribution of natives and immigrants (in 2005 euros)

	1979	1984	1989	1995	2001	2006	2011
	Individualized contribution per capita						
Natives	140.1	-149.7	32.5	-566.2	341.6	60.3	-683.3
Immigrants	160.8	58.1	629.4	-119.5	713.5	529.3	-729.8
Difference	**-20.7**	**-207.8**	**-596.9**	**-446.7**	**-371.8**	**-468.9**	**46.4**
	Decomposition of the gap						
Demographic componant	-1592.4	-1955.1	-2155.0	-2514.7	-3328.2	-3713.5	-3626.6
Fiscal componant	1571.7	1747.3	1558.2	2068.0	2956.4	3244.6	3673.0
	Accountable to young people (0-16)						
Total young people	**-1184.8**	**-1342.1**	**-1434.4**	**-1749.8**	**-1853.1**	**-1908.2**	**-1957.4**
Demographic componant	-1166.2	-1310.0	-1378.1	-1643.1	-1795.6	-1865.4	-1931.1
Fiscal componant	-18.6	-32.1	-56.3	-106.6	-57.5	-42.9	-26.3
	Accountable to working age people (17-64)						
Total working age people	**1433.3**	**1295.5**	**771.3**	**1564.4**	**1290.6**	**1489.2**	**2590.9**
Demographic componant	-606.7	-825	-1040.6	-1123.8	-1737.7	-1809.7	-1643.6
Fiscal componant	2040.2	2120.6	1811.8	2688.2	3028.3	3299.2	4234.5
of which **- Total LS**	**856.9**	**563.1**	**109.4**	**797.1**	**943.8**	**750.4**	**1015.2**
Demographic componant	-803.1	-977.7	-1227.0	-959.6	-980.0	-818.4	-550.6
Fiscal componant	1660.1	1540.9	1336.4	1756.7	1923.9	1568.9	1565.8
- Total MS	**532.5**	**514.8**	**551.9**	**695.7**	**617.6**	**777.7**	**1205.3**
Demographic componant	201.7	220.4	314.3	152.8	-13.4	-102.6	-173.8
Fiscal componant	330.9	294.4	237.5	542.9	631.0	880.4	1379.1
- Total HS	**43.9**	**217.6**	**110.0**	**71.6**	**-270.8**	**-38.9**	**370.4**
Demographic componant	-5.3	-67.7	-127.9	-317.0	-744.3	-888.7	-919.2
Fiscal componant	49.2	285.3	237.9	388.6	473.4	849.9	1289.6
	Accountable to old people (65+)						
Total old people	**-269.3**	**-161.1**	**66.4**	**-261.3**	**190.7**	**-50**	**-587**
Demographic componant	180.6	180	263.6	252.2	205.2	-38.4	-51.8
Fiscal componant	-449.9	-341.1	-197.3	-513.5	-14.4	-11.6	-535.2
of which **- Total LS**	**-194.8**	**-100.6**	**128.0**	**-115.0**	**102.7**	**41.7**	**-351.2**
Demographic componant	185.3	191.8	277.0	258.1	202.0	35.4	26.6
Fiscal componant	-380.1	-292.3	-149.0	-373.1	-99.3	6.3	-377.8
- Total MS	**-52.4**	**-64.5**	**-46.5**	**-118.3**	**-3.7**	**-98.3**	**-225.7**
Demographic componant	-4.6	-12.1	-14.1	-17.6	-25.4	-91.3	-96.6
Fiscal componant	-47.8	-52.4	-32.5	-100.7	21.8	-7.0	-129.2
- Total HS	**-22.1**	**4.0**	**-15.1**	**-28.0**	**91.7**	**6.6**	**-10.1**
Demographic componant	-0.1	0.3	0.7	11.7	28.6	17.5	18.2
Fiscal componant	-22.0	3.6	-15.8	-39.7	63.1	-10.9	-28.2

<u>Source</u> : Authors' calculations.

true. That was the first year where a positive fiscal component (since individual taxes paid by active natives were significantly higher than by active immigrants) exceeds the demographic component, even though the fiscal component of active workers is negative for the three qualification levels (with individual transfers received by active immigrants being lower than by active natives). The differences in the amount of paid taxes become so important after the 2008 crisis that demographic differences no longer suffice to make the net contribution of immigrants relatively more beneficial.

Table 8: Decomposition of the tax component in the instantaneous gap between per capita contribution of natives and immigrants (in 2005 euros)

	1979	1984	1989	1995	2001	2006	2011
Overall fiscal componant	**1571.7**	**1747.3**	**1558.2**	**2068.0**	**2956.4**	**3244.6**	**3673.0**
Tax componant	1918.6	2190.6	2165.8	3099.1	2634	3137	5564
Transfer componant	-346.7	-443.2	-607.6	-1030.9	322.5	107.6	-1890.8
Accountable to young people (0-16)							
Total young people	**-18.6**	**-32.1**	**-56.3**	**-106.6**	**-57.5**	**-42.9**	**-26.3**
Tax componant	22.6	43.6	42.1	31.9	5.7	6.4	5.4
Transfer componant	-41.1	-75.7	-98.4	-138.5	-63.2	-49.2	-31.6
Accountable to working age people (17-64)							
Total working age people	**2040.2**	**2120.6**	**1811.8**	**2688.2**	**3028.3**	**3299.2**	**4234.5**
Tax componant	1721.7	1935.8	1897.1	2802	2404.5	2850.2	5336.5
Transfer componant	318.5	184.8	-85.4	-113.8	623.8	448.8	-1101.9
of which - **Total LS**	**1660.1**	**1540.9**	**1336.4**	**1756.7**	**1923.9**	**1568.9**	**1565.8**
Tax componant	1312.0	1368.4	1208.4	1679.8	1359.2	1303.5	2323.6
Transfer componant	348.1	172.5	127.9	76.9	564.6	265.3	-757.7
- Total MS	**330.9**	**294.4**	**237.5**	**542.9**	**631.0**	**880.4**	**1379.1**
Tax componant	320.8	317.5	384.2	679.3	596.6	761.9	1542.3
Transfer componant	10.1	-23.1	-146.7	-136.4	34.4	118.5	-163.2
- Total HS	**49.2**	**285.3**	**237.9**	**388.6**	**473.4**	**849.9**	**1289.6**
Tax componant	88.9	249.9	304.5	442.9	448.7	784.8	1470.6
Transfer componant	-39.7	35.4	-66.6	-54.3	24.8	65.0	-181.0
Accountable to old people (65+)							
Total old people	**-449.9**	**-341.1**	**-197.3**	**-513.5**	**-14.4**	**-11.6**	**-535.2**
Tax componant	174.3	211.2	226.6	265.2	223.8	280.4	222.1
Transfer componant	-624.1	-552.3	-423.8	-778.6	-238.1	-292	-757.3
of which - **Total LS**	**-380.1**	**-292.3**	**-149.0**	**-373.1**	**-99.3**	**6.3**	**-377.8**
Tax componant	168.3	146.1	148.1	175.4	125.2	188.4	140.7
Transfer componant	-548.4	-438.4	-297.1	-548.5	-224.4	-182.1	-518.5
- Total MS	**-47.8**	**-52.4**	**-32.5**	**-100.7**	**21.8**	**-7.0**	**-129.2**
Tax componant	-0.3	42.8	34.9	21.0	25.1	57.8	36.8
Transfer componant	-47.5	-95.2	-67.3	-121.7	-3.3	-64.7	-166.0
- Total HS	**-22.0**	**3.6**	**-15.8**	**-39.7**	**63.1**	**-10.9**	**-28.2**
Tax componant	6.3	22.3	43.6	68.8	73.5	34.2	44.6
Transfer componant	-28.2	-18.7	-59.4	-108.4	-10.4	-45.2	-72.8

Source : Authors' calculations.

5.4   Sensitivity analysis

Our results are relatively sensitive to two assumptions often debated in the literature:

1. Should children of immigrants born in France be assigned to the immigrant or the native population? We have so far adopted an approach based on *individuals* instead of *households*. Children born in France but living in immigrant households (where either the head or the couple is immigrant) and mixed households (where only a member of the couple is an immigrant) were therefore classified as natives. Other studies rely instead on a *household* approach and ascribe children up to the age of 16 to the immigrant population, and to native population after that age. The argument is that without immigrant parents these children would not be present in the country, and hence must be included in the immigrant population. To measure the sensitivity of the results to our assumption, we re-calculated the contributions of immigrants and natives to the public finances of the two sub-populations by adopting the alternative *household* approach ("second generation" scenario). We expect that the budget contribution of immigrants will be seriously degraded in this scenario, and improve in the native group. Second generation children (irrespective of generation) represent a strong negative net contribution, and in addition dramatically change the age structure of the immigrant population (and to a lesser degree of natives due to size effects).

   Figure 5 compares the age distribution of the two subpopulations according to the selected hypothesis. Adopting the second generation approach has a perceptible effect on the age distribution of the immigrant population. In order to avoid this age effect and preserve the intertemporal coherence in the status of individuals, we have therefore adopted the individual approach in our reference (baseline) scenario.

2. Which fraction of the non-individualised public expenditure should be allocated to immigrants? In the reference scenario, public expenses were uniformly attributed to the entire resident population, irrespective of the nature of expenses (including public goods). Here we adopted a *welfare* over an *origins* approach to expenditure. For example, established levels of defence expenses are independent from changes in immigrant numbers, and according to the *origins* approach they should not count as expenditure related to the immigrant population; however, both the latter and the native populations benefit from the internal and external security provided by such expenditure. For this reason, we adopted the *welfare* approach. However, in the accounting literature there are examples of studies based on the *origins* approach that consider the totality of expenses on the provision of public goods only to natives. The "public goods" scenario assesses the contributions by the two sub-

Figure 5: Age distribution of the population (as a % of the population) - baseline and 2nd generation scenarios

(a) Natives

(b) Immigrants
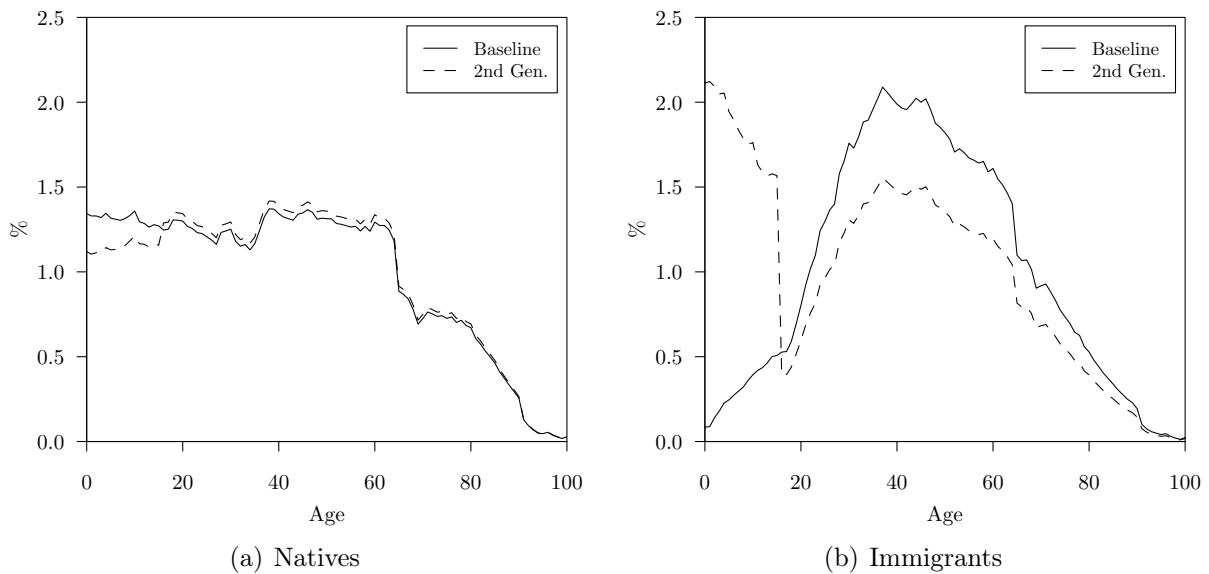
Source : Authors' calculations.

populations from this perspective. We include in such public goods expenditures all the expenditure on general services by governments[20] (except for the interest on public debt, since we are addressing only the primary deficit) and the total defence expenditure[21]. The two functions represent between 6.1% and 7.4% of GDP according to year (see Table 3, item "other expenditure - public goods"). Similar to the *second-generation* scenario, the *public goods* scenario improves the contribution of immigrants by reducing other expenses imputable to them, and degrades the native contribution. The purpose of the sensitivity analysis is to provide a measurement of changes in the assessment of such contributions.

Table 9 lists the net contribution to finances of the two sub-populations according to different scenarios. When second generation children under 16 are included, the net contribution of the immigrant population results strongly negative for all years. While in the reference scenario the net contribution oscillates between €0.62 billion in 1989 and -€8.8 billion in 2011, it is consistently below -€12.8 billion in the second generation scenario and nearly reaches -€30 billion in 2011. The coverage rate of received transfers by

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[20]The UN COFOG nomenclature of public expenditure by function group together the following expenses: operation of executive and legislative organs, financial and fiscal affairs, foreign affairs, external economic aid, general services, basic research, R&D in government general services, general services of public administrations n.c.a. and general transfers between public administrations.

[21]They include the following expenses: military defence, civil defence, military aid to countries foreigners, R&D in defence and defence n.c.a.

paid taxes never exceeds 78% and is under 70% in 2011. This translates into an average annual individual contribution of immigrants between -€2,235 in 1989 and -€4,062 in 2011. As a percentage of the GDP, the contribution of immigrants oscillates between -1% and -1.65%. In this scenario, the negative contribution of immigrants is the reason for the French primary deficit of 1984. The figures demonstrate that second generation children have an important bearing on the estimates, as well as the importance of choosing the population to which they are assigned.

Unsurprisingly, the *public goods* scenario leads to opposite results. The net contribution of immigrants to public finances is positive for the whole period, ranging between €7.6 billion in 2001 and €0.4 billion in 2011. Even after the crisis of 2008 their contribution remains positive, which is not the case for natives in the *second generation* scenario. As a percentage of GDP, their contribution is still positive between 0.1% (2011) and 0.55% (1989). Their average individual net contribution is always over €850, with the exception of 2011 (€69). As in the *second generation* scenario, Table 9 indicates that the choice of allocation of expenses relating to public goods provision strongly determines the obtained results. The public goods scenario is conducive to an extremely favourable role for immigrants in public finances, which would be the source of all primary budget surpluses in France during the studied period (1979, 1989 and 2001).

Table 9: Net contributions to public finances - Sensitivity analysis

	1979	1984	1989	1995	2001	2006	2011
Overall contribution (in billions of 2005 euros)							
Primary balance	2.40	-13.33	0.95	-34.73	16.85	0.17	-51.35
Natives							
Scenario - baseline	3.61	-11.33	0.33	-31.83	17.25	1.55	-42.55
Scenario - 2nd generation	16.48	2.33	13.77	-15.66	35.57	19.99	-21.62
Scenario - public goods	-0.96	-16.85	-6.08	-39.33	9.21	-7.14	-51.72
Immigrants							
Scenario - baseline	-1.21	-2.01	0.62	-2.90	-0.40	-1.38	-8.80
Scenario - 2nd generation	-14.08	-15.67	-12.82	-19.08	-18.72	-19.82	-29.72
Scenario - public goods	3.36	3.52	7.02	4.60	7.64	7.31	0.38
EU immigrants							
Scenario - baseline					2.79	0.54	-3.29
Scenario - 2nd generation					-2.42	-3.91	-7.22
Scenario - public goods					5.83	3.58	-0.28
Third countries immigrants							
Scenario - baseline					-3.19	-1.92	-5.51
Scenario - 2nd generation					-16.30	-15.92	-22.51
Scenario - public goods					1.81	3.72	0.65
Contribution in % of GDP							

(continued next page)

	1979	1984	1989	1995	2001	2006	2011
Primary balance	0.24	-1.22	0.07	-2.50	1.04	0.01	-2.84
Natives							
Scenario - baseline	0.36	-1.03	0.03	-2.29	1.07	0.09	-2.35
Scenario - 2nd generation	1.62	0.21	1.08	-1.13	2.20	1.14	-1.20
Scenario - public goods	-0.09	-1.54	-0.48	-2.83	0.57	-0.41	-2.86
Immigrants							
Scenario - baseline	-0.12	-0.18	0.05	-0.21	-0.02	-0.08	-0.49
Scenario - 2nd generation	-1.39	-1.43	-1.01	-1.37	-1.16	-1.13	-1.64
Scenario - public goods	0.33	0.32	0.55	0.33	0.47	0.42	0.02
EU immigrants							
Scenario - baseline					0.17	0.03	-0.18
Scenario - 2nd generation					-0.15	-0.22	-0.40
Scenario - public goods					0.36	0.20	-0.02
Third countries immigrants							
Scenario - baseline					-0.20	-0.11	-0.30
Scenario - 2nd generation					-1.01	-0.90	-1.24
Scenario - public goods					0.11	0.21	0.04
Taxes/transfers ratio in %							
Natives							
Scenario - baseline	100.9	97.8	100.1	95.2	102.4	100.2	95.2
Scenario - 2nd generation	104.1	100.5	102.5	97.6	105.0	102.5	97.5
Scenario - public goods	99.8	96.7	98.9	94.1	101.3	99.1	94.2
Immigrants							
Scenario - baseline	96.5	95.0	101.4	94.3	99.4	98.2	88.7
Scenario - 2nd generation	70.1	71.1	77.4	71.6	77.1	79.1	69.9
Scenario - public goods	111.3	110.1	119.0	110.6	113.8	110.8	100.5
EU immigrants							
Scenario - baseline					111.0	101.9	88.5
Scenario - 2nd generation					92.1	88.1	77.7
Scenario - public goods					126.1	114.2	98.9
Third countries immigrants							
Scenario - baseline					91.6	96.0	88.8
Scenario - 2nd generation					68.2	74.4	66.0
Scenario - public goods					105.5	108.8	101.5
Net contribution per capita (in 2005 euros)							
All residents	44.9	-242.9	16.8	-601.4	284.3	2.8	-814.1
Natives							
Scenario - baseline	72.8	-222.5	6.3	-594.9	314.0	27.5	-738.2
Scenario - 2nd generation	345.3	47.5	272.4	-302.2	669.0	365.3	-387.8
Scenario - public goods	-19.3	-331.1	-116.5	-735.0	167.7	-126.5	-897.4
Immigrants							

(Table 9. continued)

	1979	1984	1989	1995	2001	2006	2011
Scenario - baseline	-309.1	-501.9	151.4	-684.4	-91.8	-277.8	-1618.1
Scenario - 2nd generation	-2446.9	-2726.4	-2235.7	-3211.1	-3073.8	-2971.3	-4062.5
Scenario - public goods	857.8	880.0	1719.3	1085.4	1765.1	1466.6	69.0
EU immigrants							
Scenario - baseline					1704.5	307.5	-1843.2
Scenario - 2nd generation					-1139.7	-1832.9	-3409.8
Scenario - public goods					3561.4	2052.0	-156.0
Third countries immigrants							
Scenario - baseline					-1184.8	-593.8	-1508.2
Scenario - 2nd generation					-4109.6	-3505.4	-4328.2
Scenario - public goods					672.1	1150.6	178.9

Source : Authors' calculations.

6 Conclusion

The contribution of immigration to French public finances between 1979 and 2011 is overall negative, but of low magnitude and contained within 0.5% of the GDP. As a percentage of the GDP the contribution is relatively small (between ±0.2%) if we exclude the year 2011 that followed the 2008 crisis. If we subtract the non-individual contribution (pensions paid abroad and social housing spending) to keep only the individualised part, the net contribution of immigrants becomes positive except for 1995 and 2011, years that followed a strong recession and economic crisis. The results show a strong dependence of net contribution on age and qualification structure of populations. The individualised net contribution by immigrants was for a long time more favourable to public finances than by natives, due to their age structure concentrated on active classes. With the crisis of 2008, the strong deterioration of individual tax profiles made the demographic component for the first time insufficient to generate a positive contribution by immigrants.

The sensitivity analysis has shown that results and conclusions depend on whether children of the second generation are assigned to the immigrant or native population, and on the imputation of either all or only part of the expenditures related to provision of public goods to the native population. Depending of the hypothesis, immigrants turn out to make a strongly negative contribution to public finances, or instead a very positive contribution at the origin of all primary budgetary surpluses in France over the studied period. The reference scenario that we have selected rests between the two extremes above. It is based on a treatment unaltered by the age of individuals (since children born in France are natives, whether they result from immigration or not) and on the allocation

38

of part of public goods expenditure to the immigrant population, since it also derives benefits from them.

A limitation of our study is to be based on microeconomic surveys, being therefore sensitive to sampling problems. However, our analyses spreading over seven points in time provide additional robustness to the results. Another limitation is that immigration effects are dynamical (including its demographic dimension), while our approach is static. Moreover, immigration does have not only direct effects on public finances but also potential impacts on the labour supply and demand for private sector goods, which can modify the remuneration of production factors or increase taxes, thereby engendering indirect effects on public finances. Our static study must thus be supplemented by an analysis based on a general balance approach to deal comprehensively and dynamically with the impact, over the last thirty years, of immigration on the French budget (Chojnicki et al., 2018).

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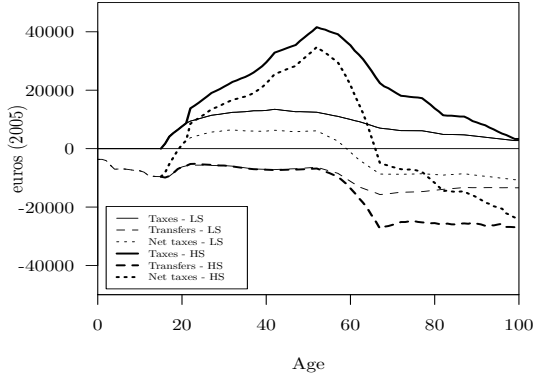# A   Age structure and qualifications of EU and non-EU immigrants

Figure 6: Age distribution of immigrants (in % of population considered) and average age
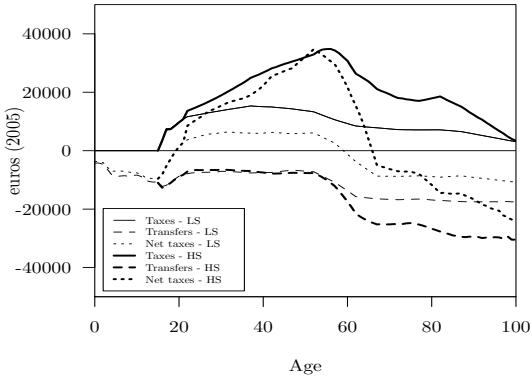

(a) 2001

(b) 2006

(c) 2011
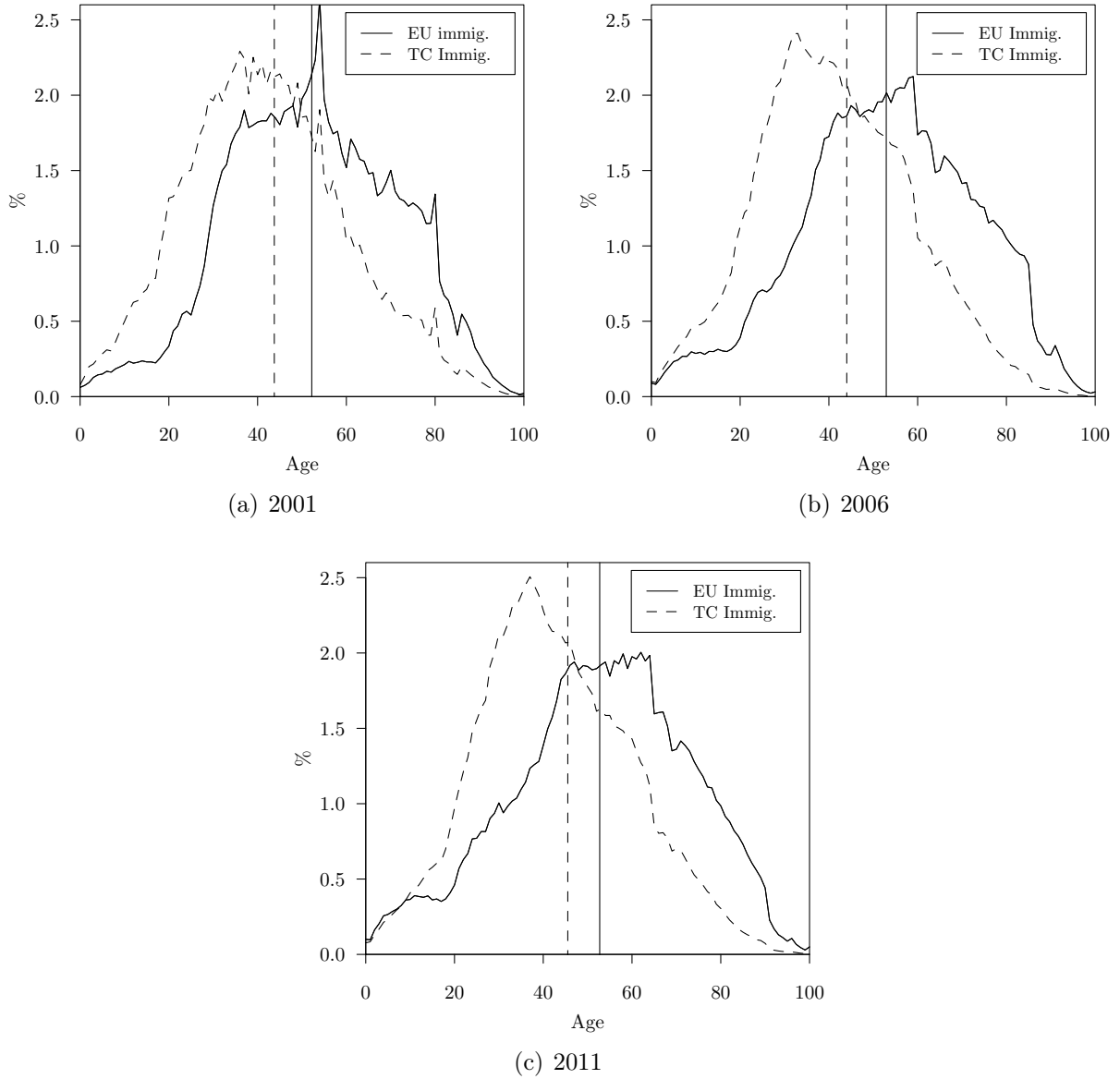
B Net budget contribution profiles by age and level of qualification
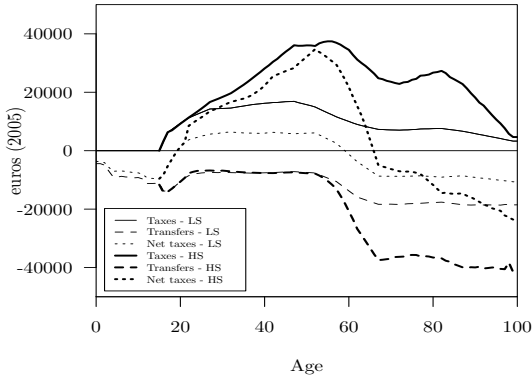
Figure 7: Taxes, transfers and net taxes according to level of qualification (in constant 2005 euros)
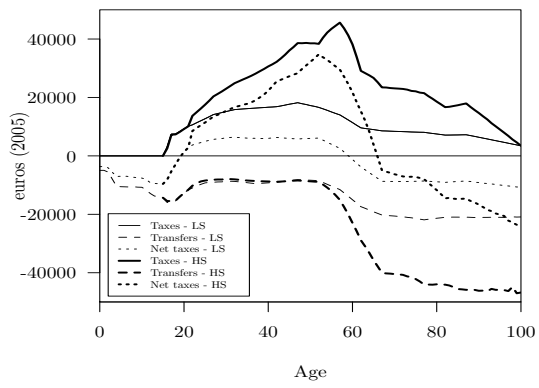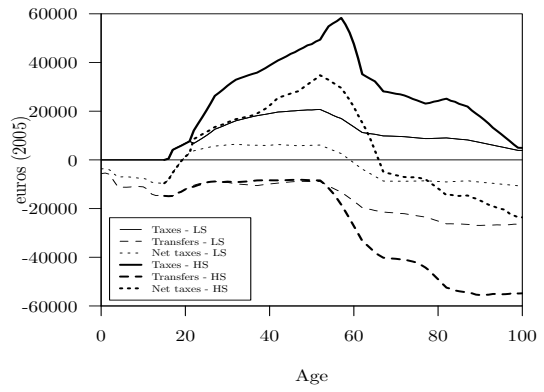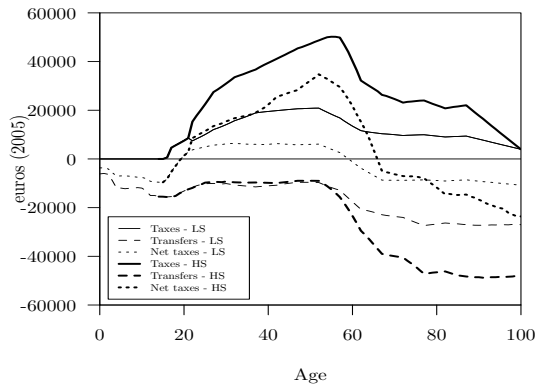

(a) 1979
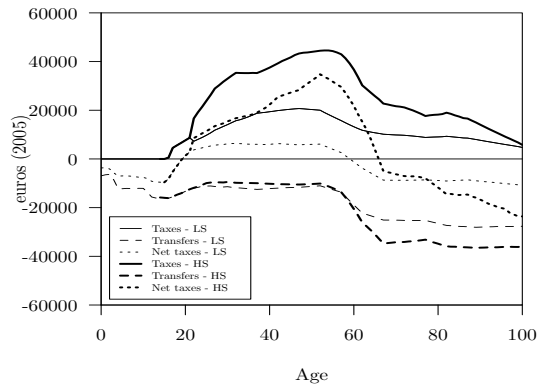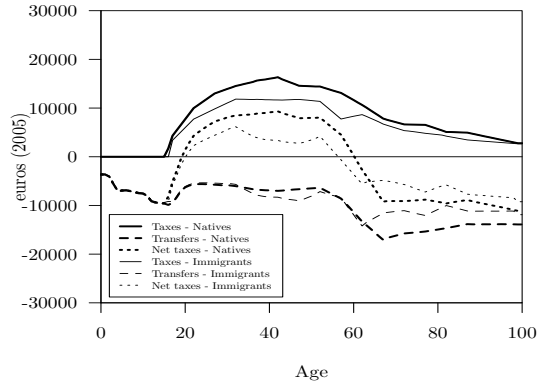

(b) 1984

(c) 1989

(d) 1995

(e) 2001

(f) 2006

(g) 2011

Source : Authors' calculations

C Net budget contribution profiles by age and origin

Figure 8: Taxes, transfers and net taxes according to origin (in constant 2005 euros)
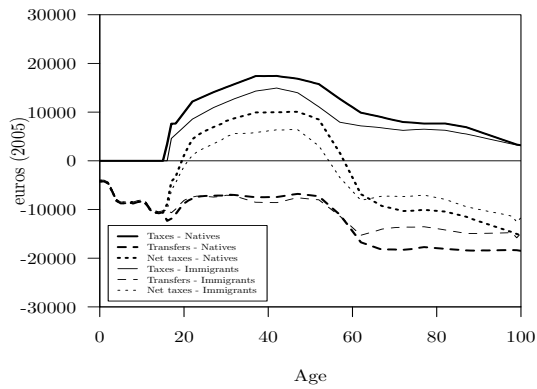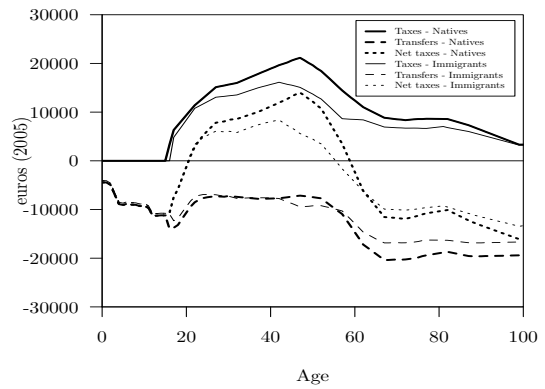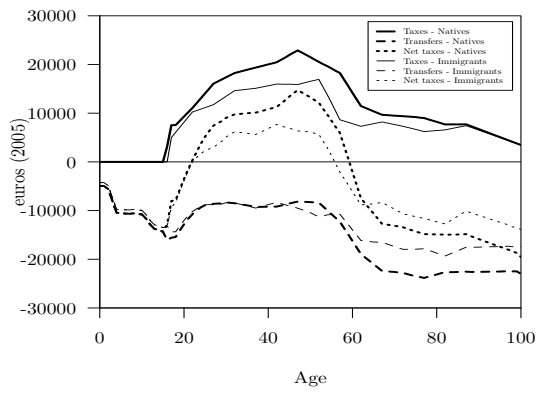

(a) 1979

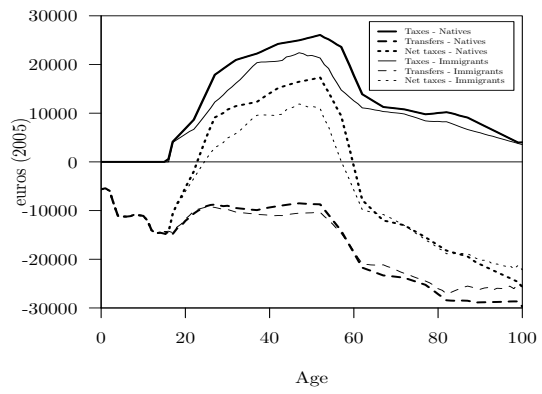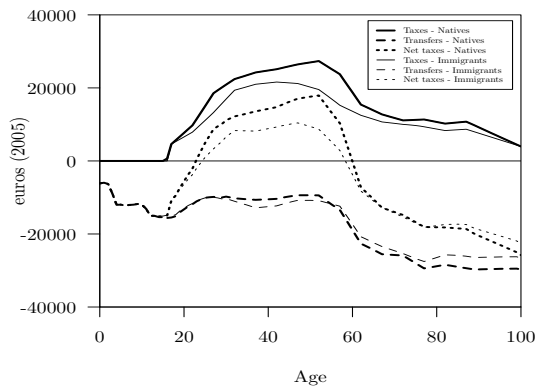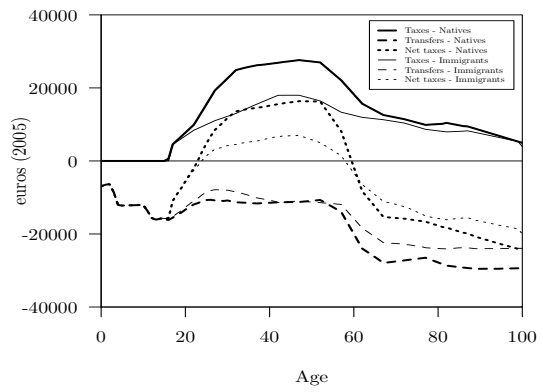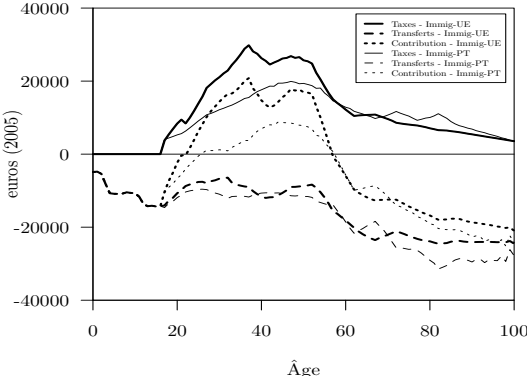
(b) 1984

(c) 1989

(d) 1995
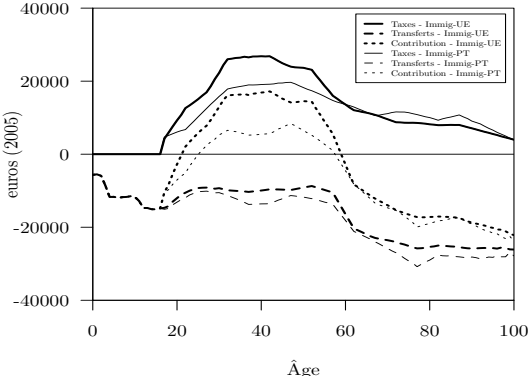
(e) 2001

(f) 2006

(g) 2011
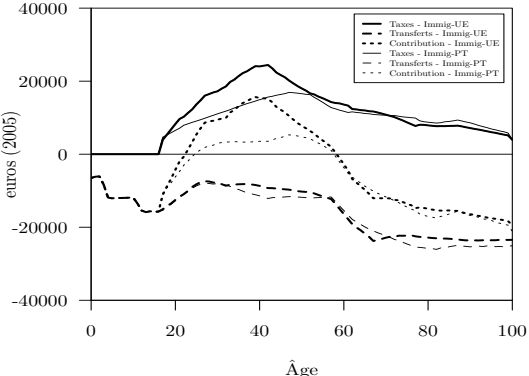
<u>Source</u> : Authors' calculations.

Figure 9: Taxes, transfers and net taxes according to origin of immigrants (in constant 2005 euros)

(a) 2001

(b) 2006

(c) 2011

Source : Authors' calculations.

D   Net individual contributions disaggregated by type of taxes and transfers

Table 10: Disaggregation of individual net contributions (2005 euros)

	1979	1984	1989	1995	2001	2006	2011
				Natives			
Personal income tax	681	806	770	836	872	851	720
Capital income tax	417	462	615	472	849	840	708
Indirect taxes	1,724	1,822	2,156	2,225	2,538	2,633	2,515
Local taxes	195	255	316	408	452	527	700
CSG-CRDS	0	0	0	290	1,204	1,291	1,362
Social contributions	3,563	4,081	4,510	4,911	4,898	5,240	5,613
Other revenues	1,884	2,253	2,256	2,646	2,745	3,076	3,065
(a) Total of individualized taxes	**8,465**	**9,678**	**10,623**	**11,788**	**13,558**	**14,459**	**14,682**
Health	-1,410	-1,593	-1,723	-2,042	-2,306	-2,572	-2,721
Pension	-1,805	-2,127	-2,426	-2,948	-3,327	-3,652	-4,165
Familly	-487	-600	-595	-645	-713	-740	-819
Unemployment	-249	-454	-461	-496	-507	-505	-538
Housing	-83	-134	-159	-215	-218	-200	-216
Poverty-exclusion	-19	-21	-43	-100	-129	-137	-188
Education	-1,260	-1,410	-1,527	-1,903	-2,052	-2,047	-2,054
Other expenditures	-3,011	-3,489	-3,657	-4,006	-3,966	-4,546	-4,665
(b) Total of individualized transfers	**-8,325**	**-9,828**	**-10,591**	**-12,354**	**-13,217**	**-14,399**	**-15,366**
Pensions paid abroad	-5	-6	-7	-8	-13	-14	-16
Social housing expenditures	-62	-67	-19	-20	-15	-19	-39
(c) Total of non individualized expenditures	**-67**	**-73**	**-26**	**-29**	**-28**	**-33**	**-55**
Total expenditures (b+c)	**-8,392**	**-9,901**	**-10,617**	**-12,383**	**-13,244**	**-14,432**	**-15,421**
Net individualized Contribution (a+b)	**140.1**	**-149.7**	**32.5**	**-566.2**	**341.6**	**60.3**	**-683.3**
Net contribution (a+b+c)	**73**	**-223**	**6.3**	**-595**	**314**	**28**	**-738**
				Immigrants			
Personal income tax	474	466	532	554	890	655	805
Capital income tax	405	277	330	297	799	627	420
Indirect taxes	1,792	1,970	2,320	2,178	3,108	3,085	3,016
Local taxes	166	230	270	329	474	537	713
CSG-CRDS	0	0	0	262	1,264	1,295	1,057
Social contributions	3,260	3,909	4,550	4,492	4,694	5,124	2,935
Other revenues	2,333	2,774	2,764	3,234	3,354	3,735	3,727

(Tableau 10, continued)

	1979	1984	1989	1995	2001	2006	2011
(d) Total of individualized taxes	**8,430**	**9,627**	**10,766**	**11,346**	**14,583**	**15,059**	**12,672**
Health	-1,070	-1,266	-1,443	-1,094	-2,300	-2,630	-2,946
Pension	-1,355	-1,851	-2,102	-2,419	-3,351	-3,191	-2,789
Familly	-1,376	-1,185	-1,045	-1,437	-1,542	-1,450	-580
Unemployment	-666	-778	-729	-967	-942	-866	-566
Housing	-102	-244	-321	-447	-626	-535	-482
Poverty-exclusion	-44	-49	-101	-241	-304	-458	-527
Education	-645	-706	-738	-855	-838	-854	-847
Other expenditures	-3,011	-3,489	-3,657	-4,006	-3,966	-4,546	-4,665
(e) Total of individualized transfers	**-8,269**	**-9,569**	**-10,136**	**-11,466**	**-13,869**	**-14,530**	**-13,402**
Pensions paid abroad	-314	-393	-429	-514	-767	-765	-806
Social housing expenditures	-156	-167	-49	-51	-38	-42	-82
(f) Total of non individualized expenditures	**-470**	**-560**	**-478**	**-565**	**-805**	**-807**	**-888**
Total expenditures (e+f)	**-8,739**	**-10,129**	**-10,614**	**-12,030**	**-14,674**	**-15,337**	**-14,290**
Net individualized contribution (d+e)	**160.8**	**58.1**	**629.4**	**-119.5**	**713.5**	**529.3**	**-729.8**
Net contribution (d+e+f)	**-309**	**-502**	**151**	**-684**	**-92**	**-278**	**-1618**

Source : Authors' calculations.

Table 11: Disaggregation of individual net contributions of immigrants (2005 euros)

	2001	2006	2011
	EU immigrants		
Personal income tax	1,123	803	1,208
Capital income tax	1,023	880	508
Indirect taxes	3,296	3,274	3,227
Local taxes	556	692	923
CSG-CRDS	1,403	1,523	1,216
Social contributions	6,342	5,533	3,304
Other revenues	3,446	3,798	3,745
(a) Total of individualized taxes	**17,189**	**16,504**	**14,131**
Health	-2,820	-3,389	-3,690
Pension	-5,003	-4,903	-4,557
Familly	-912	-825	-249
Unemployment	-807	-597	-455
Housing	-336	-217	-204
Poverty-exclusion	-236	-111	-317
Education	-388	-505	-627
Other expenditures	-3,966	-4,546	-4,665
(b) Total of individualized expenditures	**-14,468**	**-15,095**	**-14,764**
Pensions paid abroad	-998	-1,080	-1,165
Social housing expenditures	-18	-22	-45
(c) Total of non individualized expenditures	**-1,017**	**-1,102**	**-1,210**
Total expenditures (b+c)	**-15,484**	**-16,197**	**-15,974**
Net individualized contribution (a+b)	**2,721**	**1,409**	**-633**
Net contribution (a+b+c)	**1,705**	**308**	**-1,843**
	Third countries immig.		
Personal income tax	747	575	608
Capital income tax	663	490	377
Indirect taxes	2,993	2,984	2,912
Local taxes	424	454	611
CSG-CRDS	1,179	1,172	979
Social contributions	3,692	4,903	2,755
Other revenues	3,299	3,701	3,717
(d) Total of individualized taxes	**12,997**	**14,279**	**11,959**
Health	-1,983	-2,220	-2,582

(Table 11, continued)

	2001	**2006**	**2011**
Pension	-2,346	-2,266	-1,926
Familly	-1,925	-1,787	-742
Unemployment	-1,024	-1,010	-619
Housing	-802	-707	-617
Poverty-exclusion	-346	-645	-629
Education	-1,111	-1,042	-955
Other expenditures	-3,966	-4,546	-4,665
(e) Total of individualized expenditures	**-13,505**	**-14,224**	**-12,736**
Pensions paid abroad	-627	-595	-631
Social Housing expenditures	-50	-53	-100
(f) Total of non individualized expenditures	**-677**	**-648**	**-731**
Total expenditures (e+f)	**-14,181**	**-14,872**	**-13,468**
Net individualized contribution (d+e)	**-508**	**54**	**-777**
Net contribution (d+e+f)	**-1,185**	**-594**	**-1,508**

Source : Authors' calculations.

E Relevant Indicators

Since the net contribution to the public finances of each group according to origin ($o = N$ for natives and $o = I$ for immigrants) depends on their relative size, we propose two indicators to neutralise size effects:

- the ratio (in percentage) between total paid taxes and received transfers by each group. It can be interpreted as the share of received transfers by a group covered by the taxes they paid:

$$p_o = \frac{\left(\sum_i \sum_{a=\underline{a}}^{\overline{a}} \sum_q P_{o,a,q}(\tau_{o,a,q}^i + \overline{\tau}) \right) + \overline{T}_o}{\left(\sum_j \sum_{a=0}^{\overline{a}} \sum_q P_{o,a,q}(g_{o,a,q}^i + \overline{g}) \right) + \overline{G}_o} \times 100 \tag{11}$$

When the ratio is under 100%, the net contribution of the group is negative. The value of the indicator provides information on the magnitude of the gap between total group taxes and transfers;

- the second indicator expresses the net contribution *per capita*:

$$s_o = \frac{S_o}{\sum_{a=0}^{\overline{a}} \sum_q P_{o,a,q}} \tag{12}$$

It measures the average net contribution for each population category.

We have also calculated a third indicator that decomposes the primary balance per resident (s) into the components attributable to natives (s^N) and immigrants (s^I):

$$s^o = \frac{S_o}{\sum_o \sum_{a=0}^{\overline{a}} \sum_q P_{o,a,q}} \tag{13}$$

Therefore

$$s = \frac{S_N + S_I}{\sum_o \sum_{a=0}^{\overline{a}} \sum_q P_{o,a,q}} = s^N + s^I \tag{14}$$

Unlike the previous ones, the third indicator preserves the effect of population size. The component of the primary balance per resident attributable to either of the two populations is defined as the product of individual net contribution of a population and its share in the total population:

$$s^o = \frac{S_o}{\sum_{a=0}^{\overline{a}} \sum_q P_{o,a,q}} \frac{\sum_{a=0}^{\overline{a}} \sum_q P_{o,a,q}}{\sum_o \sum_{a=0}^{\overline{a}} \sum_q P_{o,a,q}} = s_o \frac{\sum_{a=0}^{\overline{a}} \sum_q P_{o,a,q}}{\sum_o \sum_{a=0}^{\overline{a}} \sum_q P_{o,a,q}} \tag{15}$$

F   Decomposition

The methodology to perform the decompositions of main results was borrowed from the theory of indices (Biggeri and Ferrari, 2010). We applied the particular decomposition proposed by Bennet (1920) to:

1. **variation over time of the primary balance per resident** (or difference in balance between two periods). The primary balance per resident (Equation 14) can also be written as:

$$s_t = \frac{\sum_o \sum_{a=0}^{\overline{a}} \sum_q P_{o,a,q,t} ci_{o,a,q,t}}{P_{tot,t}} = \sum_o \sum_{a=0}^{\overline{a}} \sum_q p_{o,a,q,t} ci_{o,a,q,t} \qquad (16)$$

with $P_{tot,t} = \sum_o \sum_{a=0}^{\overline{a}} \sum_q P_{o,a,q,t}$ being the total population, $p_{o,a,q,t} = \frac{P_{o,a,q,t}}{P_{tot,t}}$ the fraction of a population category in the total population, and $ci_{o,a,q,t} = (\tau_{a,o,q,t} - g_{a,o,q,t})$ its individual contribution.

The contribution *per capita* of each of the two populations is then:

$$s_{o,t} = \frac{\sum_{a=0}^{\overline{a}} \sum_q P_{o,a,q,t} ci_{o,a,q,t}}{\sum_{a=0}^{\overline{a}} \sum_q P_{o,a,q,t}} \qquad (17)$$

The variation in the primary balance between periods $t+1$ and t is:

$$\Delta_{t,t+1}(s) = s_{t+1} - s_t = \sum_o \sum_{a=0}^{\overline{a}} \sum_q p_{o,a,q,t+1} ci_{o,a,q,t+1} - \sum_o \sum_{a=0}^{\overline{a}} \sum_q p_{o,a,q,t} ci_{o,a,q,t} \qquad (18)$$

Such variation can be decomposed as proposed by Bennet (1920) after a modification by Coene (2004):

$$\Delta_{t,t+1}(s) = \sum_o \sum_{a=0}^{\overline{a}} \sum_q \Delta_{t,t+1}(ci_{o,a,q})\left(\frac{p_{o,a,q,t+1} + p_{o,a,q,t}}{2}\right) \qquad (19)$$
$$+ \sum_o \sum_{a=0}^{\overline{a}} \sum_q \Delta_{t,t+1}(p_{o,a,q})\left(\frac{(ci_{o,a,q,t+1} - s_{t+1}) + (ci_{o,a,q,t} - s_t)}{2}\right)$$

The first term of this decomposition measures the fiscal component of the temporal variation, or the part explained by the evolution of individual net tax contributions ($ci_{o,q,a}$) of each population category between the two periods. The second

term estimates the demographic component, or the part derived from the evolution of demographic weights ($p_{o,a,q}$) of each category of population between these two periods[22].

2. **the instantaneous gap between the contribution *per capita* of natives and immigrants** (difference between the contribution *per capita* in each group over a given period):

$$\Delta_{N,I}(s_t) = s_{N,t} - s_{I,t} = \frac{\sum_{a=0}^{\bar{a}} \sum_q P_{N,a,q,t} ci_{N,a,q,t}}{\sum_{a=0}^{\bar{a}} \sum_q P_{N,a,q,t}} - \frac{\sum_{a=0}^{\bar{a}} \sum_q P_{I,a,q,t} ci_{I,a,q,t}}{\sum_{a=0}^{\bar{a}} \sum_q P_{I,a,q,t}} \quad (20)$$

and writing the fraction of the age category a and the qualification q in the population o as $p_{o,a,q,t}^a = \frac{P_{o,a,q,t}}{\sum_{a=0}^{\bar{a}} p_{o,a,q,t}}$, the difference can be decomposed into:

$$\Delta_{N,I}(s_t) = \sum_{a=0}^{\bar{a}} \sum_q \Delta_{N,I}(ci_{o,a,q,t}) \frac{(p_{N,a,q,t}^a + p_{I,a,q,t}^a)}{2} + \sum_{a=0}^{\bar{a}} \sum_q \Delta_{N,I}(p_{o,a,q,t}^a) \frac{(ci_{N,a,q,t} + ci_{I,a,q,t})}{2}$$
$$(21)$$

The first term measures the component derived from differences in tax characteristics between the two populations (*fiscal component*), and the second measures the component explained by their differences in age structure (*demographic component*). These two terms can be further split into elements attributing the decomposition to fiscal and demographic differences between age categories and qualification levels. The fiscal component can be disaggregated and then measure what can be attributed either to differences in taxes or in transfers.

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[22]Following the methodology proposed by Coene (2004), the term for the demographic component of the temporal evolution of the balance per resident takes into account the difference in the contribution of each population to the contribution per resident in each period. This extension does not change the measurement of the two components compared to Bennet's standard decomposition. By contrast, it leads to a different breakdown of the total demographic component between the different categories of population (natives vs. immigrants).