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Impacts of Immigration on Aging Welfare-State
An Applied General Equilibrium Model for France[*]

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Abstract

Immigration is often seen as an instrument of adaptation for aging countries. In this paper, we evaluate, using a dynamic general equilibrium model, the contribution of migration policy in reducing the tax burden associated with the aging population in France. Four variants, compared to a baseline scenario based on official projections, are simulated with the aim to quantify the immigration effects on the French social protection finances. The first variant assesses the economic effects of immigration in France as projected into official forecasts. The three other variants are built on the same more ambitious annual flows of immigrants (corresponding to net migration that have characterized the second great wave of immigration in France in the twentieth century). These three variants only distinguish in terms of the skill structure of new migrants. We show that the age and skill structure of immigrants are the key feature that mainly determine the effects on social protection finances. Overall, these effects are all the more positive in the short-medium term that the migration policy is selective (in favor of more skilled workers). In the long term, beneficial effects of a selective policy may disappear. But the financial gains from more consequent migration flows are relatively moderated in comparison of demographic changes it implies.

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1 Introduction

France, like many European countries, is undergoing a process of population aging that is induced by the combined effect of lower birth rates and continually longer life expectancy. This new demographic change is temporary amplified by the aftershock of generations of *baby boomers*. After having provoked a transitory decrease in population age, these generations have now accelerated population aging as these *baby boomers* reach retirement age. With a welfare system essentially based on upward redistribution, population aging will weigh heavily on France's public finances. It is estimated that France will experience a transition from its current situation of approximately five retirees for every ten workers to eight retirees for every ten workers by 2050. The majority of reports and studies on this subject (Conseil d'Orientation des Retraites (2010) among others) agree on the magnitude of the burden that aging will place on the pension system. Therefore, the portion of the GDP necessary to finance pensions will increase from 11.6% in 2000 to more than 14.6% in 2050, resulting in a financing gap of almost 1.7% of the GDP. However, it is actually the entire set of expenditures for social welfare that will be affected by population aging, including not only health care expenditures but also family and unemployed expenditures.

Accentuated by the financial crisis of 2008-2009, concerns about the rising debt burden negatively impacts Europeans' perceptions of migrants, as indicated by data from the European Social Survey (Boeri & Brucker (2005)). These negative perceptions are associated with the notion that migrants, as beneficiaries of redistribution systems from social welfare programs, are a financial burden. These potential adverse effects have to be compared to labour market needs coming from a stagnant working-age population, the probable occurrence of sectoral shortages, and the increasing number of dependent elderly. The need to mitigate, as much as possible, the announced negative effects of population decline on economic activity has led the debate on a policy of "replacement migration". Acting on the flows of immigrants, rather than on fertility rates, has the double advantage of having a rapid effect and of being more manageable by public authorities.

Therefore, this debate on replacement migrations arrives at the same time as that of selective migrant policies. Two arguments are generally given to promote such a shift in the immigration policy. A quota system ensures a better match between the supply of foreign labor and the specific needs of the host economy. In addition, the selection of skilled entrants into the country not only increases the workforce but also increases human capital. The second argument often given is relative to the net contribution of immigrants to public finances. Most studies[1] indicate a relatively neutral effect of immigration on public finances. The magnitude of this effect, however, is dependent on the level of skills and on the age distribution of the immigrants. This is precisely the contribution of selective immigration to the reduction of the tax burden of population aging that we wish to evaluate.

There is significant literature on the impact of immigration on the labor market, on public finances, on economic growth, and on inequalities[2]. However, the majority of these studies adopt the framework of partial equilibrium and are subject to three major drawbacks. First,

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[1]See Auerbach & Oreopoulos (2000) on the United States; Bonin, Raffelhüschen & Walliser (2000) on Germany; Collado, Iturbe-Ormaetxe & Valera (2003) on Spain; and Chojnicki (2006), (2011), and Monso (2008) on France.

[2]For a survey of literature on the economic effects of immigration, see Borjas (1999), Brücker, Epstein, Mc Cormick, Saint-Paul, Venturini & Zimmerman (2002), and Chojnicki (2004).

the partial equilibrium framework, by definition, poorly captures the interdependencies between different markets or the response of natives to an immigration shock. Indeed, the geographic mobility of natives, the changes in their labor supply, and their educational choice must be integrated in the framework in order to properly capture the impact of immigration. Second, the absence of a unified framework makes the dissociation between minor and major effects from immigration extremely complicated. Although the largest strand of literature focuses on the labor market impact of immigration, this effect is possibly less important in size than fiscal responses or growth enhancing impacts. Finally, in the absence of a precise welfare criterion, partial equilibrium models fail at providing a global assessment of the effect of immigration on natives' well-being. A fully micro-founded general equilibrium model is required to derive the immigration impact on natives' level of utility.

Our model attempts to overcome these shortcomings. Most of the ingredients of the immigration literature are included in a harmonized framework where firms, the government, and heterogeneous households interact:

- The entry of new workers affects productivity of production factors (and hence wages and return to saving). Redistribution occurs from workers to suppliers of physical capital.

- Another redistribution between workers is also occurring. Immigrants are generally less skilled than natives; their arrival causes downward pressure on the wages of unskilled workers and increases pressure for training.

- The budgetary impact of immigration depends on the type of migrant considered, the age distribution of immigration flows, and also their skill level.

- Through its impact on wages, interest rates, and taxation, immigration induces indirect effects on natives' choices of labor supply, human capital investment, and saving.

The AGEM (Applied General Equilibrium Model) approach allows simultaneous assessment of all the mechanisms described above and their interactions. Two studies, Storesletten (2000) and Fehr, Jokisch & Kotlikoff (2004), adopt a relatively similar analytical framework. Compared to these two studies, our model has several distinguishing characteristics:

- It is based on a complex socio-demographic block consisting of 48 different types of individuals in each period according to their age, education level, and place of birth. This block can reliably reproduce the past and future French demographic structure.

- In our model, migrants and natives differ in terms of human capital, financial wealth, and eligibility to receive social aid. Fehr et al. (2004) consider that a migrant will automatically adopt the characteristics of a native upon crossing the border. In the model of Storesletten (2000), immigrants, whatever their skill level, enter the U.S. without any capital.

- The manner in which immigrants affect wages and inequality depends strongly on the choice of a production function. An important characteristic of our model is that labor in efficiency units consists of three components: raw labor, experience, and education level. This approach is similar to the Mincerian model on wage determination. Rather than assuming the existence of multiple labor markets (for low-skilled

workers, youth, etc.), we assume that workers of different age, skill, and origin offer different combinations of human capital and experience. The education and experience level of immigrants are different from those of natives; therefore, these two categories of workers become imperfect substitutes in the labor market.

- Inspired by neoclassical principle, our model assumes that markets are balanced by the free adjustment of prices, with the exception of the labor market. We adopt the wage-setting/price setting (WS-PS) approach to determine the equilibrium between levels of real wages and unemployment at the aggregate level. There are wage negotiations between (homogeneous) firms and unions that lead to a real wage determined by applying a mark-up. These negotiations take place independently by two unions representing the interests of unskilled workers and skilled workers, respectively.

- Our framework is based on accurate modeling of the French welfare system as it provides the basis of concerns for population aging and eventual excessive utilization of the system by immigrants.

The benchmark scenario (baseline) is built from the INSEE's demographic projections of 2006. Four alternative scenario were performed with the aim to better quantify the effects of immigration on the finances of social welfare in France. The first variant assumes that net immigration flows are zero from 2010 and for all subsequent years ("without immigration" scenario). The gap between the two scenario measure the economic situation with and without immigration planned for the period. The three other variants take the opposite view, making a more ambitious effort to measure the effects of immigration as a function of its skill structure. We study the effects of an additional inflow that may be considered as "realistic" (corresponding to flows that have characterized the second great wave of immigration in France in the 20th century between 1954 and 1961). Only the degree of selectivity, in terms of the skill structure of new immigrants, allows us to distinguish among these three scenarios.

We show that immigration, as projected in official forecasts, reduces the tax burden of an aging population. In its absence ("without immigration" variant), the financing need of social protection at the end of the century increases from 3% to approximately 5% of GDP. These benefits are mainly linked to the younger age distribution of net flows compared to the total French population and affect, principally and not surprisingly, the two pillars of welfare system most sensitive to demographic changes: pensions and health care. For similar reasons, a more ambitious immigration policy would contribute to reducing the tax burden of an aging population. However, the financial gains are relatively moderate in comparison to the demographic evolution it implies: a reduction of this burden between 20% and 30% depending on its degree of selectivity for a 16% to 20% increase in the working age population; in the same time, the number of immigrants in this population will double by the end of the century. A more selective policy (in favor of skilled workers) can amplify these gains in the short to medium term while reducing demographic changes in proportions that remain relatively low. Importantly, and contrary to popular belief in the public debate, this improvement is only temporary. In the longer term, demographic changes related to a more selective immigration (especially from lower fertility rates and longer life expectancy from skilled migrants) outweigh its benefits relative to a non-selective policy.

The rest of this article is structured as follows. The model is outlined in Section 2. The calibration method and data used are described in Section 3. Section 4 presents the

simulation results of the baseline. Section 5 assesses the impact of different migration scenarios on main macroeconomic aggregates and on social protection finances. Section 6 concludes.

2 An AGEM-OLG model with heterogeneous agents

To assess the impact of immigration on the public finances, it is necessary to accurately describe the demographic and economic environment in which migrants interact with native. For this, we develop an applied general equilibrium model with overlapping generations (AGEM-OLG) of heterogeneous agents in line with the work of Auerbach & Kotlikoff (1987). The basic structure of the model is an augmented version of that developed in Chojnicki, Docquier & Ragot (2009) for the US.

2.1 Demographics

The demographic block provides an accurate representation of the structure of the French population by age, education level, and place of birth[3]. At each period, the population consists of eight adult cohorts ranging in age from between 15 to 24 years (denoted as cohort 0) to between 85 and 94 years (denoted as cohort 7). One period of the model is 10 years. Cohort t is composed of individuals aged 0 at period t.

There are two sources of heterogeneity within each cohort. The first one concerns educational attainment. We distinguish low-skill, medium-skill, and high-skill individuals. These skill levels are respectively denoted by the superscripts $S = L, M, H$. The second one refers to country of origin/birth: we distinguish natives and immigrants (first generation). In the spirit of Storesletten (2000), immigrants' children are considered as natives. These categories are respectively denoted by the subscripts $X = N, M$;

At time t, the population aged j $(j = 0, ..., 7)$ of skill S $(S = L, M, H)$, from origin X $(X = N, M)$ is denoted by $P_{X,j,t}^S$. For the sake of simplicity, we assume that individuals give birth to their children at age 30, in the middle of their second adult period of life. Fifteen years after their birth, these children become new adults. Consequently, children born at time t (by adults of cohort $t - 1$) reach age 15 at time $t + 2$. Fertility differs across skill and origin groups. At time t, the number of children per individual in a specific skill and origin class is denoted by $n_{X,t}^S$. Young agents take decisions about their level of education. At time t, the proportions of young individuals opting for low, medium, and high education are respectively denoted by π_t^L, π_t^M and π_t^H. As explained below, π_t^M and π_t^H are endogenously determined on the basis of the expected lifetime income associated with these educational levels. A change in the skill level of immigration flows then implies a change in the education choices of natives.

At each period, new immigrants are entering the country. The variable $I_{0,t}^s$ measures the number of young immigrants entering in France at age 0 with a skill level S. At the same time, a proportion of natives and immigrants leaves the country. The variables $\xi_{N,j,t}^S$ and $\xi_{M,j,t}^S$ respectively measure net emigration rates (emigrants minus immigrants compared to the previous period population size) among natives and immigrants of skill S at age j.

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[3]Immigrants are defined as individuals who were foreign-born and who do not have French citizenship at birth.

These rates are positive for natives and they can be positive or negative for immigrants. Finally, some individuals die at each age. Mortality rates are allowed to vary between skill groups. We denote by $\beta_{j,t}^S$ ($j = 1, ..., 7$) the proportion of individuals of skill S dying between age $j - 1$ and age j.

The dynamic of population is then determined by the set of 48 equations per period (for 8 age groups, 3 skills groups and 2 origins). The number of young natives (aged 15 to 24) of skill S, $P_{N,0,t}^S$, sums up children of natives and immigrants from generation $t - 2$ (weighted by the probability to belong to the skill group S). The number of young new immigrants, $P_{M,0,t}^S$, is exogenous:

$$P_{N,0,t}^S = \pi_t^S \sum_{S'} \left[P_{N,1,t-2}^{S'} n_{N,t-2}^{S'} + P_{M,1,t-2}^{S'} n_{M,t-2}^{S'} \right]$$
$$P_{M,0,t}^S = I_{0,t}^S$$

Regarding subsequent age cohorts, we use a simple dynamic process that takes into account mortality changes, in-migration and out-migration. The sizes of cohorts aged 1 to 7 are given by (for $S = L, M, H$ and $X = N, M$):

$$P_{X,j,t}^S = \beta_{j,t}^S (1 - \xi_{X,j,t}^S) P_{X,j-1,t-1}^S$$
$$j = 1, ..., 7$$

2.2 Technology

The production sector plays a crucial role as it defines how the immigrants compete with the natives in the labor market. Rather than considering the existence of multiple labor markets (for the low, medium, and high skilled, for young and old workers, etc.), we assume that workers belonging to different age, skill, and origin groups offer different combinations of schooling and experience. The interest of this approach is that the number of competing factors is independent of the number of groups considered[4]. Formally, in each period, a representative firm uses labor in efficiency units (Q_t) and physical capital (K_t) to produce a composite good (Y_t). We consider a Cobb-Douglas production function with constant returns to scale:

$$Y_t = A_t K_t^{1-\varphi} Q_t^{\varphi} \tag{1}$$

where φ measures the share of labor income in national output and A_t denotes an exogenous process determining the total factor productivity. Arising from the mincerian literature on the determination of wages, the amount of labor in efficiency units (Q_t) explicitly aggregates attributes of native workers and immigrants. It is based on the work of Ben-Porath (1967), Card & Lemieux (2001), and Wassmer (2001a). As discussed in Chojnicki et al. (2009), the choice of this production function strongly influences the impact of

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[4]This differs from the approach of Card & Lemieux (2001), which aggregates age-specific levels of human capital in a CES function. The number of nested CES functions depends on the number of cohorts considered.

immigration on the supply side. The quantity of efficiency unit of labor combines raw labor, experience, and education according to a CES nested transformation function:

$$Q_t = [L_t^\rho + \mu E_t^\rho + \Theta_t \ H_t^\rho]^{1/\rho} \tag{2}$$

where L_t measures the physical work, E_t represents experience and H_t denotes education. The parameter ρ is the inverse of the elasticity of substitution among these attributes, and μ is a fixed parameter of preference for experience. Finally, Θ_t is an exogenous skill-biased technical progress.

The representative firm behaves competitively on the factor markets and maximizes its profit[5]:

$$PROF_t = Y_t - (r_t + d)K_t - w_t^L L_t - w_t^H H_t - w_t^E E_t \tag{3}$$

where d is the depreciation rate of physical capital; r_t is the interest rate[6]; and w_t^L, w_t^H and w_t^E are the marginal productivity associated with raw labor, education, and experience, respectively. The conditions for profit maximization are:

$$
\begin{aligned}
r_t &= (1 - \varphi)A_t K_t^{-\varphi} Q_t^{\varphi} - d & (4)\\
w_t^L &= \varphi A_t K_t^{1-\varphi} Q_t^{\varphi/\rho - 1} L_t^{\rho - 1} & (5)\\
w_t^E &= \varphi A_t K_t^{1-\varphi} Q_t^{\varphi/\rho - 1} \mu E_t^{\rho - 1} & (6)\\
w_t^H &= \varphi A_t K_t^{1-\varphi} Q_t^{\varphi/\rho - 1} \Theta_t H_t^{\rho - 1} & (7)
\end{aligned}
$$

Clearly, the supply of experience and education influences the rates of return of these two factors.

2.3   Preferences

Individuals have an uncertain life expectancy resulting from the probability of dying at the end of each period of life. They maximize an expected life-cycle utility function that only depends on consumption expenditures. Based on De la Croix & Docquier (2007), we use a time-separable logarithmic utility function:

$$E(U_{X,t}^S) = \sum_{j=0}^{7} \Delta_{j,t+j} \ln(c_{X,j,t+j}^S) \tag{8}$$

where $c_{X,j,t+j}^S$ is the consumption of generation t at age j of a consumer of skill S and origin X. The term $\Delta_{j,t+j} = \prod_{s=1}^{j} \beta_{s,t}$ $(j = 1, ..., 7)$ is the cumulative probability of being

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[5]At each date, the composite good is taken as the numeraire. The spot price is thus normalized to one.

[6]Considering that domestic investment is financed by domestic savings, we neglect the possibility that an asynchronous aging between the major industrialized nations could affect capital flows. Thus, we retain here the assumption of a closed economy, and the interest rate adjusts to balance the national financial market.

alive at age j (evaluated relative to age 0) and such that $\Delta_{0,t+0} = 1$.

In the spirit of Arrow-Debreu, we postulate the existence of a market for each contingent consumption. That is, we assume that every individual has the opportunity to insure himself against uncertainty at the beginning of his/her life. Agents born at time t must select the optimal plan for contingent consumption that maximizes expected utility under their budget constraint and given the sequence of contingent prices[7]. The budget constraint requires equality between the expected value of expenditures and revenues. For a native, this budget constraint is written as follows:

$$\sum_{j=0}^{7} R_{j,t+j}\Delta_{j,t+j} \left[c_{N,j,t+j}^{S}(1 + \tau_{t+j}^{c}) - T_{N,j,t+j}^{S} \right] \tag{9}$$
$$= \left[\omega_{j,t+j}^{L} + \omega_{j,t+j}^{E}e_{N,j,t+j}^{S} + \omega_{j,t+j}^{H}h_{N,j,t+j}^{S} \right] \ell_{N,j,t+j}^{S}$$

where τ_{t+j}^{c} is the tax rate on consumption in period $t + j$, $p_{j,t+j}$ is the price of a unit of good when the individual is still alive at age j; $T_{X,j,t+j}^{S}$ denotes the amount of social transfers received at age j; $\ell_{X,j,t+j}^{S}$ measures labor supply at age j; $e_{N,j,t+j}^{S}$ and $h_{N,j,t+j}^{S}$ are education and experience stock at period $t + j$; $\omega_{j,t+j}^{L}$, $\omega_{j,t+j}^{H}$ et $\omega_{j,t+j}^{E}$ represent contingent net wages after taxes related to raw labor, education, and experience, respectively. With r_{t}, the interest rate between dates t and $t + 1$, the discount factor applied to income and expenditures is given by

$$R_{j,t+j} \equiv \prod_{s=t+1}^{t+j} (1 + r_{s}(1 - \tau_{s}^{k}))^{-1}$$

with the convention $R_{0,t} = 1$.

The maximization of expected utility [8] in [9] determines the law of evolution of consumer spending throughout the consumer's life:

$$c_{X,j+1,t+j+1}^{S} = \frac{(1 + r_{t+1})(1 + \tau_{t}^{c})}{(1 + \tau_{t+1}^{c})} \; c_{X,j,t+j}^{S} \qquad \forall X; \forall S; \forall j = 0, ..., 6 \tag{10}$$

The implicit asset holdings $a_{X,j,t+j}^{S}$ is given by the difference between income and the consumption of the individual:

$$p_{0,t}a_{X,0,t}^{S} = \left(\omega_{0,t}^{L} + \omega_{0,t}^{E}e_{X,0,t}^{S} + \omega_{0,t}^{H}h_{X,0,t}^{S} \right) \ell_{X,0,t}^{S}$$
$$- p_{0,t} \left[c_{X,0,t}^{S}(1 + \tau_{t}^{c}) - T_{X,0,t}^{S} \right]$$
$$R_{j,t+j}\Delta_{j,t+j}a_{j,t+j}^{S} = R_{j,t+j}\Delta_{j,t+j}a_{X,j-1,t+j-1}^{S} +$$
$$\left(\omega_{j,t+j}^{L} + \omega_{j,t+j}^{E}e_{X,j,t+j}^{S} + \omega_{j,t+j}^{H}h_{X,j,t+S}^{S} \right) \ell_{X,j,t+j}^{S}$$
$$- p_{j,t+j} \left[c_{X,j,t+j}^{S}(1 + \tau_{t+j}^{c}) - T_{X,j,t+j}^{S} \right]$$

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[7]Mortality is the only source of uncertainty. As mortality rates vary by age and educational level, prices and wages only depend on these characteristics.

We assume that immigrants have the same wealth as natives of the same skill and age when they enter the country. This means that low-skilled immigrants enter the country with a low degree of wealth, while an immigrant with higher skills will bring more wealth. This methodological choice is relatively close to that of Fehr et al. (2004) but differs from Storesletten (2000), who assumed that immigrants bring no wealth. However, this choice has only a marginal role in the results, as 70% of immigrants enter France before age 35 in 2005, that is, at the beginning of the period of wealth accumulation. The age structure and education of immigrants is significantly different from that of natives, and immigration affects the capital stock per worker. Immigrants entering at age $j > 0$ adopt the same behavior as natives of the same cohort.

2.4 Educational decisions

Through its effect on wages, interest rates, and tax rates, immigration induces behavioral changes among natives. Our model accounts for the effect on natives' education decisions.

Natives choose their level of education or, equivalently, the duration of their studies. The exogenous variable, $0 \leq \overline{u}_S \leq 1$ (as $\overline{u}_L < \overline{u}_M < \overline{u}_H$), measures the proportion of time that a native with a level of education S must devote to his/her education between the ages of 15 and 24. As mentioned previously, the proportion of people terminating their studies before their baccalaureate (π_t^L) is exogenous. This assumption is based on the fact that the decision to quit school is often made at the family level. For individuals who have reached an intermediate education level, the choice of the number of years of study is performed by comparing the gains and costs of a longer education. The monetary gain is measured by expected lifetime labor income, $E(Z_t^S)$, derived from the budget constraint [9]:

$$E(Z_t^S) \equiv \sum_{j=0}^{7} \left(\omega_{j,t+j}^L + \omega_{j,t+j}^E e_{X,j,t+j}^S + \omega_{j,t+j}^H h_{X,j,t+j}^S \right) \ell_{X,j,t+j}^S$$

The effort required for graduation is assumed to be proportional to the opportunity cost of education, $\lambda \omega_{0,t}^L \overline{u}_S (1 - v_t)$, where v_t denotes the rate of subsidy on the cost of education and λ is a scale variable determining the ability to educate. This ability, λ, is distributed uniformly over $\left[\underline{\lambda}, \overline{\lambda} \right]$.

The following condition defines the range of λ over which tertiary education dominates secondary education:

$$E(Z_t^H) - \lambda \omega_{0,t}^L \overline{u}_H (1 - v_t) \geq E(Z_t^M) - \lambda \omega_{0,t}^L \overline{u}_M (1 - v_t)$$

This condition can be rewritten as

$$\lambda < \lambda_t^c \equiv \frac{E(Z_t^H) - E(Z_t^M)}{\omega_{0,t}^L \left[\overline{u}_H - \overline{u}_M \right] \left[1 - v_t \right]} \tag{11}$$

where λ_t^c is the critical level of ability below which tertiary education dominates secondary education in the cohort t.

Therefore, the proportions of agents opting for primary, secondary, and tertiary education are given by

$$\pi_t^L = \overline{\pi}_t^L$$

$$\pi_t^M = (1 - \overline{\pi}_t^L)\frac{\overline{\lambda} - \lambda_t^c}{\overline{\lambda} - \underline{\lambda}} + \varepsilon_t$$

$$\pi_t^H = (1 - \overline{\pi}_t^L)\frac{\lambda_t^c - \underline{\lambda}}{\overline{\lambda} - \underline{\lambda}} - \varepsilon_t$$

where $\overline{\pi}_t^L$ is the exogenous share of young unskilled workers and ε_t denotes a iid. stochastic process.

2.5 Wage and unemployment

Following d'Autume & Quinet (2001), we adopt a WS-PS approach to determine the levels of real wages and equilibrium unemployment at the aggregate level. We assume that wage negotiations between firms and labor unions lead to a real wage determined by applying a mark-up. These negotiations occur independently by two unions representing the interests of unskilled workers (level of education L) and skilled workers (levels of education M and H), respectively. The union representing the interests of unskilled workers is bringing claims about the level of base wage (w_t^L), while the union representing the skilled workers negotiates the part of the wages associated with education level w_t^{H}[8]. Claims of employees consist in applying a mark-up on the reservation wage that grows at the same pace as productivity, A_t, to ensure the existence of a structural unemployment in the long-term. In addition, this mark-up is expected to decrease with the level of the average unemployment rate in the economy, thereby resulting in an erosion of effective bargaining power of unions in case of a shortage of labor demand. Thus, we have

$$\log(w_t^L) = \frac{1}{2}\log(w_{t-1}^L) + \frac{1}{2}(a_u\bar{\Phi}_t^L + \log(A_t) + \Lambda_t^L)$$

$$\log(w_t^H) = \frac{1}{2}\log(w_{t-1}^H) + \frac{1}{2}(a_u\bar{\Phi}_t^{MH} + \log(A_t) + \Lambda_t^H)$$

where $\bar{\Phi}_t^L$ and $\bar{\Phi}_t^{MH}$ represent the average unemployment rate associated with unskilled workers and skilled workers, respectively, with

$$\bar{\Phi}_t^L = \left(aj\_cho_t^L \sum_{j=0}^{4}\sum_{X=N,M} P_{X,j,t}^L q_t \Phi_{X,j,t}^L\right) / \left(\sum_{j=0}^{4}\sum_{X=N,M} P_{X,j,t}^L q_t\right)$$

$$\bar{\Phi}_t^{MH} = \left(aj\_cho_t^{MH} \sum_{j=0}^{4}\sum_{X=N,M} P_{X,j,t}^M q_t \Phi_{X,j,t}^M + P_{X,j,t}^H q_t \theta_{X,j,t}^H\right) / \left(\sum_{j=0}^{4}\sum_{X=N,M} P_{X,j,t}^M q_t + P_{X,j,t}^H q_t\right)$$

where $\Phi_{X,j,t}^S$ denote unemployment rates by age, origin, and education level coming from employment surveys and $aj\_cho_t^L$ and $aj\_cho_t^{MH}$ are, respectively, uniform distributions

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[8]Therefore, the negotiations of a union, for example those representing the interests of unskilled workers, will also slightly influenced, by a second-order effect, the level of wages and unemployment of skilled workers.

variables to ensure that the average rate of unemployment of the unskilled workers $(\bar{\Phi}_t^L)$ and skilled workers $(\bar{\Phi}_t^{MH})$ resulting from the intersection of WS and PS curves is equal to the weighted average unemployment rate for the two workforce groups.

Λ_t^L and Λ_t^H are adjustment variables, calibrated during the transition phase, so as to reproduce the historical rate of unemployment (also from employment surveys) and to ensure convergence in 2030 of the actual rate of unemployment to a long term unemployment rate 5.2% for unskilled workers and 3.8% for skilled workers. These figures correspond, given the population structure, to an average unemployment rate of 4.5% in 2030, compatible with the target hypothesis of the central scenario of the Conseil d'Orientation des Retraites (2010) (with a more distant time horizon). a_u is the long-term elasticity of the cost of labor to the employment rate. We use a value of -1.2, which is in line with d'Autume & Quinet (2001).

2.6 Labor supply, education, and experience

The time invested in education determines pattern of labor supply, education, and experience. The vector of raw labor supply for an agent of the generation t is written as

$$\ell_{X,t}^S = (q_t(1-\overline{u}_S),\ q_{t+1},\ q_{t+2},\ q_{t+3},\ q_{t+4}(1-\alpha_{t+4}),\ 0,\ 0,\ 0) \tag{12}$$

where q_t denotes the exogenous rate of activity in t and α_{t+4} represents the time spent in retirement (exogenous) during the fifth period of life (between ages 55 and 64). The variable q_t is mainly introduced to capture the rise in women participation rate.

As in Wassmer (2001b), we assume that the experience of an individual, $e_{X,t}^S$, is an aggregate of his/her past employment experiences such that

$$\begin{aligned}
e_{X,t}^S \ = \ & (0,\ (1-\overline{u}_S)q_t\theta_e^1,\ (1-\overline{u}_S)q_t\theta_e^2 + q_{t+1}\theta_e^1, \\
& (1-\overline{u}_S)q_t\theta_e^3 + q_{t+1}\theta_e^2 + q_{t+2}\theta_e^1, \\
& (1-\overline{u}_S)q_t\theta_e^4 + q_{t+1}\theta_e^3 + q_{t+2}\theta_e^2 + q_{t+3}\theta_e^1,\ 0,\ 0,\ 0)
\end{aligned} \tag{13}$$

where $\theta_e^j \in (0,1)$ represents 1 minus the depreciation rate of experience over time.

Educational human capital, $h_{X,t}^S$, transforms the investment during the first period of life in units of effective labor as a function with decreasing returns. This vector is written as

$$h_{X,t}^S = \left(0,\ \epsilon\overline{u}_S^\psi,\ \epsilon\overline{u}_S^\psi,\ \epsilon\overline{u}_S^\psi,\ \epsilon\overline{u}_S^\psi,\ 0,\ 0,\ 0\right) \tag{14}$$

where $\epsilon > 0$ and $\psi \in (0,1)$ characterize the production function of human capital.

The aggregate quantities of raw labor (L_t), experience (E_t), and education (H_t) are given by

$$L_t = \sum_{j=0}^{7} \sum_{X=N,M} \sum_{S=L,M,H} P_{X,j,t}^S \ell_{X,j,t}^S \qquad (15)$$

$$E_t = \sum_{j=0}^{7} \sum_{X=N,M} \sum_{S=L,M,H} P_{X,j,t}^S \ell_{X,j,t}^S e_{X,j,t}^S \qquad (16)$$

$$H_t = \sum_{j=0}^{7} \sum_{X=N,M} \sum_{S=L,M,H} P_{X,j,t}^S \ell_{X,j,t}^S h_{X,j,t}^S \qquad (17)$$

2.7 The public sector

The vector of public transfers, $\overline{T}_{X,t}^S$, consists of subsidies to education, pensions, health costs, unemployment benefits, housing costs, family allowances, and social assistance spendings:

$$
\overline{T}_{X,t}^S = \begin{pmatrix}
v_t q_t \overline{u}_S \omega_{0,t}^L + \gamma_{san,X,0}^S g_t^{san} \Delta_t^{PIB} + \gamma_{cho,X,0}^S g_t^{cho} \Phi_{X,0,t}^S aj\_cho_t^S + \gamma_{\log,X,0}^S g_t^{\log} + \gamma_{caf,X,0}^S g_t^{fam} \\
+\gamma_{rmi,X,0}^S g_t^{rmi}, \\
\gamma_{san,X,1}^S g_t^{san} \Delta_t^{PIB} + \gamma_{cho,X,1}^S g_t^{cho} \Phi_{X,1,t}^S aj\_cho_t^S + \gamma_{\log,X,1}^S g_t^{\log} + \gamma_{caf,X,1}^S g_t^{fam} + \gamma_{rmi,X,1}^S g_t^{rmi}, \\
\gamma_{san,X,2}^S g_t^{san} \Delta_t^{PIB} + \gamma_{cho,X,2}^S g_t^{cho} \Phi_{X,2,t}^S aj\_cho_t^S + \gamma_{\log,X,2}^S g_t^{\log} + \gamma_{caf,X,2}^S g_t^{fam} + \gamma_{rmi,X,2}^S g_t^{rmi}, \\
\gamma_{san,X,3}^S g_t^{san} \Delta_t^{PIB} + \gamma_{cho,X,3}^S g_t^{cho} \Phi_{X,3,t}^S aj\_cho_t^S + \gamma_{\log,X,3}^S g_t^{\log} + \gamma_{caf,X,3}^S g_t^{fam} + \gamma_{rmi,X,3}^S g_t^{rmi}, \\
\alpha_{t+4}\gamma_{ret,X,4,t+4}^S + \gamma_{san,X,4}^S g_t^{san} \Delta_t^{PIB} + (1-\alpha_{t+4})\gamma_{cho,X,4}^S g_t^{cho} \Phi_{X,4,t}^S aj\_cho_t^S + \gamma_{\log,X,4}^S g_t^{\log} \\
+\gamma_{caf,X,4}^S g_t^{fam} + \gamma_{rmi,X,4}^S g_t^{rmi}, \\
\gamma_{ret,X,5,t+5}^S + \gamma_{san,X,5}^S g_t^{san} \Delta_t^{PIB} + \gamma_{\log,X,5}^S g_t^{\log} + \gamma_{caf,X,5}^S g_t^{fam} + \gamma_{rmi,X,5}^S g_t^{rmi}, \\
\gamma_{ret,X,6,t+6}^S + \gamma_{san,X,6}^S g_t^{san} \Delta_t^{PIB} + \gamma_{\log,X,6}^S g_t^{\log} + \gamma_{caf,X,6}^S g_t^{fam} + \gamma_{rmi,X,6}^S g_t^{rmi}, \\
\gamma_{ret,X,7,t+7}^S + \gamma_{san,X,7}^S g_t^{san} \Delta_t^{PIB} + \gamma_{\log,X,7}^S g_t^{\log} + \gamma_{caf,X,7}^S g_t^{fam} + \gamma_{rmi,X,7}^S g_t^{rmi}
\end{pmatrix}
$$
$$(18)$$

where $\gamma_{risque,X,j}^S g_t^{risque}$ represents the total age-related transfers made by the government to agents of age j, level of education S, and origin X for retirement (ret), health (san), unemployment (cho), housing (log), family (fam), and social assistance (rmi). The variable $\gamma_{risque,X,j}^S$ describes the profile of social aid by age, education, and origin, and g_t^{risque} is a scale variable capturing the generosity of welfare programs.

The endogenous variable, $\gamma_{ret,X,j,t+j}^S$, measures pension benefits allocated to each full-time retiree from generation t in period $t+j$ ($j=4$ to 7), and α_{t+4} denotes the elderly participation rate. Following current legislation, we assume that the pension is proportional to the average wage during the last twenty years of work[9] such that

$$\gamma_{ret,X,j,t+j}^S = \eta_{t+4}\eta_X \frac{1}{3} \sum_{k=2}^{4} \left[\omega_{k,t+k}^L + \omega_{k,t+k}^E e_{X,k,t+k}^S + \omega_{k,t+k}^H h_{X,k,t+k}^S \right] \qquad (j=4,...,7)$$

where η_{t+4} denotes the replacement rate capturing the generosity of the pension system and η_M is a parameter capturing the relative pension of an immigrant compared to that of a native with the same characteristics ($\eta_N = 1$). Retirement pensions are implicitly indexed to price following rencent reforms.

---

[9]In fact, this is the average annual wage of the 25 best years of careers.

The evolution of health expenditures is based on the size and structure of the population (captured by the profile $\gamma_{san,X,t}^S$) and the growth rate of the GDP (Δ_t^{PIB}). According to estimates by Mahieu (2000) and Azizi & Pereira (2005), we assume a price elasticity of health expenditures equal to one. Thus, an increase of 1% of the GDP, assuming all other things being equal, implies a 1% increase in health spendings. This does not mean that health expenditures are evolving at the same rate as the GDP. Other factors such as the changing age and skills structure of the French population also influence health expenditures.

Unemployment expenditures are derived directly from the application of unemployment rates by age, skill, and origin ($\Phi_{X,j,t}^S aj\_cho_t^S$) to individual profiles of unemployment benefits ($\gamma_{cho,X,t}^S$). All other social expenditures (housing, family, and social assistance) are modeled as a function of age, skills, and origin profiles and are adjusted uniformly to replicate the macroeconomic aggregates.

The government issues bonds and levies taxes on labor income (τ_t^w), on consumer spending (τ_t^c), and on capital income (τ_t^k) to finance public transfers and public consumption. Social transfers are also supported by a number of specific social security contributions, including social contributions (cot_t) based on work income[10] and General Social Contribution (csg_t) based on both wages and capital income. We consider, therefore, four major expenditure categories: education subsidies, social transfers (pensions, health, unemployment, housing, family, and welfare), non age specific general government consumption, and interest on public debt. The government budget constraint can be written as follows:

$$
(\tau_t^w + cot_t + csg_t)(w_t^L L_t + w_t^E E_t + w_t^H H_t) + \tau_t^c C_t + (\tau_t^k + csg_t)r_t K_t + D_{t+1}
$$
$$
= \sum_j \sum_X \sum_S P_{X,j,t}^S \overline{T}_{X,j,t}^S + \vartheta_t Y_t + (1 + r_t)D_t \qquad (19)
$$

where D_t represents the public debt at the beginning of period t, ϑ_t is the share of government consumption (non-individualized) in GDP, and $\overline{T}_{X,j,t}^S$ is the total transfers previously defined according to age, origin, and skill level.

Several fiscal rules can be used to balance the budget constraint (adjusted by taxes, expenditures, and the public debt). We assume that the path of debt/GDP ratio is given and the apparent tax on wages (τ_t^w) adjusts to balance the budget.

Considering T_t^{risque} as the total transfers paid in period t, we can define the following for each risk considered:

---

[10]Social contributions paid by employers are not explicitly introduced. We, therefore, assume that all social contributions are paid by employees.

$$
\begin{aligned}
T_t^{ret} &= \sum_j \sum_X \sum_S P_{X,j,t}^S \alpha_{t+j} \gamma_{ret,X,j,t+j}^S \\
T_t^{san} &= \sum_j \sum_X \sum_S P_{X,j,t}^S \gamma_{san,X,j}^S g_t^{san} \Delta_t^{PIB} \\
T_t^{cho} &= \sum_j \sum_X \sum_S P_{X,j,t}^S \gamma_{cho,X,j}^S g_t^{cho} \Phi_{X,j,t}^S aj\_cho_t^S \\
T_t^{caf} &= \sum_j \sum_X \sum_S P_{X,j,t}^S (\gamma_{\log,X,j}^S g_t^{\log} + \gamma_{fam,X,j}^S g_t^{fam}) \\
T_t^{rmi} &= \sum_j \sum_X \sum_S P_{X,j,t}^S \gamma_{rmi,X,j}^S g_t^{rmi}
\end{aligned}
$$

For each risk there is a special fund that is financed autonomously. These funds include a retirement fund, a fund for health expenditures, a fund for unemployment, a fund for family benefits and housing, and a fund for social assistance expenses. The last one is directly funded from the state budget and, therefore, does not receive specific funding.

All other funds receive funding based on three sources: (i) social contributions (based on wages), (ii) earmarked taxes (mainly constituted by the *csg* and based on wages and capital income), and (iii) public contributions.

$$
\begin{aligned}
Solde_t^{risque} = T_t^{risque} &- (\cot_t^{risque} + csg_t^{risque})(w_t^L L_t + w_t^E E_t + w_t^H H_t) - csg_t^{risque} r_t K_t \\
&- cpub_t^{risque} \cot_t^{risque}(w_t^L L_t + w_t^E E_t + w_t^H H_t)
\end{aligned}
$$

where $\cot_t^{risque}$ and csg_t^{risque} denote the rates of social contributions and taxes earmarked for each of the social risks, respectively. $cpub_t^{risque}$ represents the public contribution for each of the funds, expressed here as a proportion of social contributions. We do not impose that each social aid fund is balanced. $Solde_t^{risque}$ moves freely given the demographic and economic changes (but the public debt in the GDP is fixed; the apparent tax on wages (τ_t^w) adjusts to balance the inter-temporal budget constraints of the government).

3 Baseline calibration

The dynamic calibration process involves collecting data for the evolution of observed exogenous variables, fixing some constant parameters and choosing paths for the unobserved exogenous variables.

3.1 Demographic data

In the baseline, the demographic block is calibrated to reproduce the available socio-demographic data. Between 1900 and 1960, we do not distinguish between immigrants and natives. Since 1970, we explicitly model the impact of immigration on the population structure by age and education. Historical data on the age distribution of population before 1970 is provided by Vallin & Meslé (2001). For the period from 1970 to 2005, the age,

14

skill and origin structure is obtained from the population censuses of 1968, 1982, 1990, 1999 and 2005.

To calibrate fertility, mortality, and net emigration rates, we use the following method. Data from population censuses allow us to determine the proportion of people who are low-, medium-, and highly-skilled among young people (π_t^L, π_t^M and π_t^H). In the baseline, these shares are set to their observed values, and the educational endogenous process is calibrated to reproduce their historical path. As we consider monozygotic agents, fertility rates are calibrated such that the number of young people in each period corresponds exactly to the observations. The breakdown by age, sex, and origin for 2005, the starting point of our population projections, are derived from the permanent sample census of the population. These population projections are made by taking the assumptions of the central scenario of the latest projections from INSEE and extending them to 2100 for the purposes of the model, thus fixing the rates of mortality, fertility rates, and the net immigration to their value of 2050 (see Chojnicki (2011) for more details). The data on fertility differentials by education level and origin ($n_{X,t}^S$) are obtained from the national survey on health in 1993 (Enquête soins/santé). Death rates by age and educational level ($\beta_{j,t}^S$) are calculated on the basis of life tables by age over the period 1900 to 2005 by Vallin & Meslé (2001) and official projections of the population by Robert-Bobée (2006) from 2005 to 2050. Differences in mortality by level of education are evaluated using estimates of standardized mortality indicators (SMR) by educational level and age from Monteil & Robert-Bobée (2005).

Starting from the structure by age, educational level, and origin of the population in 1970, the demographic block is used to identify the two exogenous processes for which we have no data, i.e. the net emigration rates of natives and immigrants ($\xi_{N,j,t}^S$ and $\xi_{M,j,t}^S$ $\forall j, S$) between 1970 and 2100. The future distribution of population by skill level is based on official forecasts of the Ministère de l'Éducation Nationale (2002).

3.2   Observed exogenous processes

The elderly participation rate, α_{t+4}, is computed using data on the effective age of retirement from Blondal & Scarpetta (1997) and the COR. Overall participation rates, q_t, are based on Wassmer (2001b). With regard to public finances, three types of taxes are included in the model: taxes on labor income (τ_t^w), on capital income (τ_t^k), and on consumption (τ_t^c). These tax rates are calibrated so that the proportions of different income in the GDP correspond to the observations. We use official estimates (Insee (2009)), giving a rate of 2.9% of the GDP for the income tax, 3.4% for capital income, and 11.4% for consumption taxes in 2000. The evolution of these taxes reproduces the historical evolution of tax revenue as a percentage of the GDP. Between 1900 and 2000, the ratio of debt to the GDP is set exogenously to the observed values and the observations stem from OECD statistics.

We distinguish between two main categories of expenditures in addition to interest charges. They are public transfers related to age, $\gamma_{risque,X,j}^S$, and the public consumption expenditure (with ϑ_t being the part of these expenditures in the GDP). The historical evolution of non-age specific spendings is based on OECD statistics, and the proportion is held constant for future years. With respect to age-specific transfers, we take the profiles of age, educational level, and origin of Chojnicki (2011). These profiles include health costs, unemployment, housing, family allowances, and social assistance spending. Within each

age, education level, and origin, the profile is corrected by an adjustment factor, g_t^{risque}. Indeed, we assume that the profiles of transfers are constant over time and are adjusted by changes in g_t^{risque} to reproduce the evolution of public transfers in the GDP until 2010, according to statistics from official reports on social welfare. For the following decades, the evolution of the share of pensions and health expenditure in the GDP, respectively, reproduced projections of the Conseil d'Orientation des Retraites (2010) and the projections of Raynaud, Caussat & Hada (2007). The generosity of other social transfers, captured by g_t^{risque}, is kept constant, and the evolution of the share of transfers in the GDP is calculated endogenously. Finally, the rate of subsidy on tertiary education, v_t, is estimated by De la Croix & Docquier (2007).

3.3   Parameters

The share of labor income in the GDP, φ, is fixed at 0.7. The parameter μ of the production function is a non-important scale parameter given the later choice Θ_t, it is set at 0.5. The parameter ρ is found to be of particular importance as it determines the degree of substitution between unskilled labor, education, and experience. We retain a value of 0.7, implying an elasticity of substitution of 3.33 ($= 1/(1 - \rho)$). This value corresponds to the elasticity of substitution between skilled and unskilled workers from conventional production functions. The rate of depreciation of capital, d, is equal to 0.4 and implies a depreciation rate of 5%.

The depreciation rate of experience is based on median hypothesis of Wassmer (2001b) giving an annual rate independent of the age of 3%. This implies that $\theta_e^1 = 0,737$, $\theta_e^2 = (\theta_e^1)^2$, etc. The parameter, ψ, is the elasticity of substitution of educational capital to investment in education. It determines the concavity of the relationship between income and education level. By setting its value to 0.75, we reproduce, correctly, the income differences among low-, medium-, and highly-skilled workers. The scale parameter in the production function of human capital, ϵ, is set to 1.2 so as to give an adequate wage profile. The parameter η_M measures the retirement pension of an immigrant relative to that of a native. This ratio is calculated using data from the family budget survey of 2006 and is set to 0.75.

Finally, the lower and upper bounds of the distribution of skills in education, $\underline{\lambda}$ and $\overline{\lambda}$, are calibrated to reproduce the historical evolution of the skill structure. We estimate these parameters by a standard OLS regression.

3.4   Unobserved exogenous processes

To identify the unobserved exogenous processes, our methodology follows two steps. Starting from the baseline (matching French demographic and economic trends), we use the model to identify several unobserved processes such as the total factor productivity (A_t), the skill-biased technical progress (Θ_t), the scale factor of pensions benefit (η_t), the scale factors of age-specific social transfers (g_t^{risque}), and the scale factors of the rate of unemployment among unskilled and skilled workers (Λ_t^L and Λ_t^H). These six exogenous processes are used to reproduce six variables directly related to the following endogenous variables: the GDP growth rate, the wage gap between highly-skilled and low-skilled individuals aged 45, the share of pension expenditures in the GDP, the share of other social transfers in the GDP, and the unemployment rates for unskilled and skilled workers. The historical growth

rate of the GDP stems from Maddisson (2001) and is set at 20% per decade. The wage gaps at age 45 between highly-skilled and low-skilled workers comes from the Employment Surveys from 1960 to 2007.

Basically, this methodology involves swapping six exogenous variables with six endogenous variables as a preliminary identification step. This resembles the recursive approach (back-solving) of Sims (1990) for general stochastic equilibrium models. We use a similar idea of treating exogenous processes as endogenous, not to solve the model but as a calibration mechanism in a deterministic framework. This procedure allows us to calibrate the model dynamically and is more rigorous than performing the calibration in a hypothetical steady state as is done in most AGE models, such as that of Auerbach & Kotlikoff (1987)).

4   The baseline scenario

4.1   The population

New demographic perspectives place France in a better position compared to its principal partners of the European Union. This particular situation is the result of two recent changes. First, the fertility rate has remained at a higher level since the beginning of 2000, and second, over the same period, net immigration has been significantly revised upwards. The central scenario projections from INSEE (Robert-Bobée (2006)) incorporate these changes by adopting a total fertility rate that remains at 1.9 children per woman rather than the 1.8 children per woman used in previous projections and an annual net immigration flow identical to that found for the years 2004 and 2005, that is, 100,000 persons per year. This is exactly twice the number used in previous projections. Another development must be reported, as it accentuates the positive development for the financing of pension. On the basis of new developments in the last 15 years, rather than the last 30, the pace of mortality decline is more moderate, which implies in 2050 a life expectancy at birth for men of 83.8 years (84.3 in previous projections) and for women 89 years (91 in previous projections).

The French population at the beginning of the century is marked by the following facts:

- The total population of France in 2050 should be approximately 70.6 million, an increase of over 11 million people compared to 2000 (Table 1). This increase continues in the second half of the century, but at a slower pace, with a total population reaching 74.8 million in 2100. The specter of declining population is no longer a concern if these new demographic assumptions are confirmed in the future.

- This positive outlook is reflected in the evolution of the working-age population, which experienced a sharp increase (+5.3%) over the last decade, rising to 40.5 million individuals in 2010 (2.1 million more than in 2000). It is expected to begin a slightly downward trajectory, reaching an estimated 40 million people by 2040.

- If one accepts the traditional image of the "scissors effect" (an increase in the number of elderly and a reduction of the working-age population) to characterize the demographic prospects anticipated in the early 2000s, one must note that new projections only retain increase in longevity. However, the data in Table 1 show that it is, indeed, this longer life expectancy that is the main cause of the aging population. The

dependency ratio is a good indicator of this process. It should increase from 25.5% in 2000 to over 44% in 2050.

- Finally, with a positive net immigration of 100,000 people per year, the share of immigrants in the total population is expected to grow continuously over the first half of the century, from 7.3% in 2000 to 9.1% in 2050, while it is expected to decline slightly in the second half.

- Insert Table 1 -

These demographic changes are accompanied by a profound change in the education distribution of the working-age population (see Table 2). In the coming decades, maintenance of the education level of native youth at current levels will drive an increase in skills of active cohorts (ages 15 to 64). The group of highly skilled natives is expected to increase from 25.2% in 2000 to approximately 37% in 2050, medium-skilled natives from 16.9% to 33.7%, and low-skilled natives will systematically decrease 28.5 points (from 57.9% to 29.4% in 2100). This process of increasing educational standards, which is not unique to France, is also found in the immigrant population. The share of highly skilled immigrants is expected to increase from 17.6% in 2000 to 28.1% in 2100, and the share of low-skilled immigrants will shrink from 72.1% to 45.5% over the same period. In terms of percentage points, changes in these two populations are similar. However, the initial situation, characterized by an education distribution of immigrants far less favorable than that of natives, shows that immigration undermines the global improvement of skills of the working-age population (see Table 2).

- Insert Table 2 -

4.2   The social protection budget

Demographic changes are marked by a growth in population throughout the century, with an average annual growth rate of 0.23%. However, growth slows after 2050 as the average annual growth rate in the second half of the century is 0.11% versus 0.35% for the first half, thus resulting in a much smaller increase in the working-age population (average annual growth rate of 0.11% over the entire period). This rate actually becomes slightly negative in 2030 and 2040. These two contrasting trends can be explained by the phenomenon of aging in France, as the dependency ratio would increase from 25.4% in 2000 to 44.3% in 2100, and by the important transformation of the skill distribution of the working-age population, as the number of low-skilled workers is almost halved over the century.

Thus, these changes will have effects on the economic activity and on the budget of social welfare. As shown in Table 3, the average human capital per worker increases substantially until 2050 and then stabilizes. Assuming the skill level of youth is maintained at the current levels, the baseline scenario foresees a rise in human capital in active cohorts. The growth is very strong between 2000 and 2010, which explains the significant increase of the GDP per capita over the same period (average annual growth rate of 2.7%). This then oscillates between an average annual growth rate of 0.8% (2030 to 2040) and 1.3% (2020 to

2030) under the effect of exogenous technical progress. Aging and declining unemployment rates cause a slight increase in workers' levels of experience when compared to 2000. While the experience premium remains almost stable (decreasing very slightly), the skill premium continues to grow slowly despite the increase in human capital. This is explained by the presence of the skill biased technical progress. Compared to the lack of a diploma, the baccalaureate degree generates a premium ranging from 117% to 121% between 2000 and 2040.

- Insert Table 3 -

The effects of aging are much more apparent in regard to the finances of social welfare and, more generally, to the public finances. As we have already noted, the social welfare system being based on upward distribution, the aging of the French population is resulting in a deterioration of social welfare funds (see Table 3). Social welfare expenditures will increase nearly 5.8 points of the GDP in 2050 compared to 2000 and 2.3 points compared to 2010, from 27.1% in 2000 to 30.6% in 2010 and 32.9% in 2050. This will stabilize around the value reached in 2050 over the second half of the century. Financing needs will reach (and stabilize at) 3% of the GDP from 2050 onward, while the budget for social protection was broadly balanced in 2000. We assume that the ratio of total debt on the GDP remains fixed at its 2000 level, which is obtained by adjusting the apparent tax on wages, excluding social security contributions and csg. The latter, due to the consequent increase in social transfers, grows continuously over the entire period from 7% in 2000 to 14.7% in 2100, corresponding to a tax burden of aging valued at approximately 7.5% of the tax rate on wages.

Table 4 describes more precisely the changes in the financing of social protection by disaggregating each of its five pillars: pensions, health care, family and housing, unemployment, and social assistance. The financing need for the social protection described above stems from the financial situation of retirement pensions and health care. Not surprisingly, these two pillars are the most sensitive to aging populations. The other three pillars remain in balance over the period from 2000 to 2010 and then emerge with budget surpluses, which are, nevertheless, insufficient to offset the needs of the other funds' deficits.

- Insert Table 4 -

The pension fund, thus calibrated, confirms the projections of financing needs made by the Conseil d'Orientation des Retraites (2010). Starting from a balanced position in 2000, the borrowing represents 0.5% of the GDP ten years later and 1.7% from 2030, and it then oscillates around 1.7% of the GDP from 2040 to 2100 (see Table 4). Health care fund spending, as a percentage of the GDP, increases until 2050 (from 9.4% in 2000 to 13.7%) and then stabilizes. The decrease in unemployment and the resultant increase in skill levels have positive effects at the beginning of the period on revenue of all funds that are partly financed by payroll taxes (except for expenditures of social assistance, which are directly financed from the state budget). Social contributions earn 1.5 point of the GDP during the first decade to stabilize at approximately 20% of the GDP. The General Social Contribution (csg) also increase by approximately 1 point of the GDP between 2000 and 2010 to reach and remain at approximately 6.6% of the GDP. It follows that from 2020, any additional pressure on these two funds spendings relative to GDP will translate into

an almost equivalent increase in borrowing. In 2050, the pension expenditure increases by 1.1 point of the GDP compared with 2010, and its net borrowing increases by 1.2 point of the GDP between these two years. During the same period, the fund sees its health care spending increase by 3.2 points of the GDP and net borrowing increases by 3.2 points. Thus, in 2050, the financing need for these two funds would amount to slightly less than 5 points of the GDP, while social welfare as a whole will have a funding requirement of 3 points. The difference is the sum of the surpluses of the other three funds: 0.7 point of the GDP for family housing, 1 point for unemployment insurance, and 0.1 point for funding expenditures of social assistance.

5 The impact of immigration on public finances

5.1 The demographic consequences of the four scenarios of the immigration policy

As stated in the introduction, we simulate four scenarios of the immigration policy. The first is built on the assumption of zero net flows after the year 2000 and for the entire length of the simulation. In other words, it describes the changing French demographics and economy without immigration. The comparison of the obtained results with those of the baseline measures the impact of immigration as reflected in official population projections and its contribution to the evolutions of the finances of the social welfare system. The other three scenarios are developed on the basis of an ambitious immigration policy that serves as a way to reduce the tax burden of an aging population. From a quantitative point of view, this policy seeks to regain immigration patterns similar to those observed during the second great wave of immigration from 1950 to 1960, which was approximately 0.35% of the total population. The level of flows remains the same for all three scenarios, that is, 100,000 people in 2000, approximately 200,000 thirty years later, and 228,000 at the end of the century; only the skills distribution changes. In the first variant (non-selective immigration policy), flows characteristics are identical to those of immigrants from the baseline scenario. In the second variant (neutral immigration), the immigration policy imposes a skills distribution on immigrants identical, in each period, to those of the entire French population of the baseline scenario. The last variant (selective immigration) considers an extremely selective immigration policy where the skills distribution of incoming people is similar to the generation of the most skilled natives, the generation aged between 25 and 34, for all periods of the baseline scenario.

Table 5 identifies the main demographic implications of each of the scenarios considered. Stopping immigration, the scenario without immigration, has a major effect on the French population. The total population, compared to the baseline, is reduced by approximately 10% in 2050 and over 22% by the end of the century. The effect is more pronounced for the working-age population at -11.5% and -24%, respectively. Immigrants in the French population aged 15 and over, not surprisingly, continue to decline. They represent only 3.8% of the population in 2050 compared with 10.7% in the baseline. Furthermore, there are no more immigrants in the French economy at the end of the century. Transitory effects on the skill distribution of immigrants are unfavorable as the suppressed inflow, relative to the baseline, has a higher level of skill than immigrants already in France. Similarly, new immigrants are relatively young and the dependency ratio deteriorates significantly from 46.9% in 2050 to 46.7% in 2100 compared to 43.4% and 42.7%, respectively, in the baseline.

Regarding ambitious immigration policies, the significant increase in immigrant flow leads to a continuous increase in the proportion of immigrants in the population 15 years of age and older. This amounts to 12.5% in 2020 (for all three variants) compared to 10.2% in the baseline and reaches a maximum (selective immigration) of 18.8% in 2080 versus 10% in the reference scenario. From 2040, the increase is even more important with a selective policy. This result is due to differential effects on the denominator, namely, the total population (15 years age and older), resulting from differences in fertility rates by skill level. This rate decreases with skill level. Thus, for an identical net flow of immigrants for the three variants, the population over 15 years of age increases by 10.1% in 2050 compared to the baseline for a non-selective policy and more than 19% at the end of the century versus 9.6% and 16.8%, respectively, for the most selective policy. Given the age structure of new immigrants between 25 and 64, the increase was even more pronounced for the working-age population, that is, between 10.9% and 11.5% in 2050 depending upon the policy's degree of selectivity. Consequently, these inflows allow a substantial alteration of the skill distribution of immigrants in the country. If the non-selective immigration variant leaves, by construction, the immigrants' skills virtually unchanged, both selective policies improve the skill distribution of immigrants. The variant selective immigration leads to a share of highly-skilled immigrants almost identical to those of natives in 2040. With the neutral immigration policy, the difference is relatively low between the two populations and stabilizes at 3% for the highly-skilled beginning in 2040.

What are the effects of the immigration policies on the dependency ratio? Table 5 indicates that these important changes in the composition of the French population will eventually result in a relatively moderate improvement in the dependency ratio; however, the reduction is temporary. It reaches its maximum improvement level in 2040, with a drop of approximately 2.7 percentage points. Note that the gain is greater with a non-selective policy. Neutral immigration variants and selective immigration actually lead to a deterioration in this ratio from 2080, while the non-selective variant still has a positive but limited (-0.2 percentage points) effect at the end of the century. These opposite effects, depending upon the level of selectivity of the policy, are again explained by the differentiation of the demographic parameters of each skill category. Part of the explanation lies in the fertility rate. The growth of the labor force over the length of the simulation is more important with a non-selective policy. Another part of the explanation lies in the fact that skilled individuals have a higher life expectancy than non-skilled individuals. This explains why the effects are similar at the beginning of the simulation but differ when additional immigrants age.

5.2 A France without immigration: impact on public finances

If immigration is stopped after 2000, the first effect is the decline in the GDP per capita relative to the baseline. As we saw in the previous section, a negative demographic shock affects the working population more than the population as a whole. Inflows consist of a systematically younger population than the entire French population. Their removal affects more people of working age and, thus, the numerator in the ratio that determines the

per capita GDP. Secondly, these inflows are consistently less skilled than the population already present in the country. Stopping immigration then also has the effect of increasing the skilled labor force and, thus, the average human capital per worker (see Table 6). The immediate effect on the labor market is that skilled labor is more abundant, and its relative wage decreases. Similarly, the skill premium also decreases slightly. However, the more important consequences are at the funding level for social welfare. The reduction in the GDP and the increasing dependency ratio both cause increased expenditures in social welfare as a percentage of the GDP. Compared to the baseline, the variant without immigration leads to increased spending by 1.3 point of the GDP in 2050, reaching 34.2%, and almost 2 points, that is, 34.8%, of the GDP by the end of the century. These increases result in an increased financing need that are practically equal. This amounts to 4.3% in 2050 and 4.9% in 2100 versus 3% for both periods in the baseline.

- Insert Table 6 -

In terms of tax rate on wages (recall that this payroll tax is adjusted to maintain a constant ratio of public debt), the suppression of immigration flows and, therefore, ultimately of immigrants in the French population increases the tax burden of an aging population. It increases more than 2 tax points in 2050 and 3 tax points at the end of the century. Immigration contributes to reducing the tax burden of aging, and the overall impact is, therefore, unequivocally positive on the finances of social protection.

If we examine more closely the various pillars of social welfare, Table 7 suggests that funds that are affected by the immigration policies are those that are most sensitive to the age distribution of the population: pensions and health care expenditures. The breakdown of the increased financing needs of social protection in 2050 is as follows: pensions -1.1%, health care 0.2%, family housing 0.2%, unemployment -0.3%, and social assistance 0.1%. This results in a much higher total financing requirement of 1.3 point of the GDP. The degradation of the finances of retirement is the main source of the overall effect.

- Insert Table 7 -

The structure of taxation and social security contributions is not changed in the variant. Moreover, the distribution of value added between labor and capital is not affected by the demographic shock. It follows that social contributions and the amount of *csg* perceived as a percentage of the GDP are broadly similar in the variant and the baseline. All effects, thus, pass on the expenditure side. The evolution of the financing need simply reflects that of expenditures (see Table 7).

5.3 The contribution of a selective immigration policy to finance social protection

The macroeconomic consequences of a more ambitious immigration policy are described in Table 8. The demographic shock is symmetric to that specified in the variant without immigration. However, the effects differ somewhat due to the predominantly transitory

positive impact on the dependency ratio, which is very sensitive to the skills distribution of new immigrants.

The selective policies translate systematically to an increase (compared to the baseline scenario) of the average human capital per worker over the period, while the non-selective policy, from 2030, leads to a moderate reduction in this variable. These developments with respect to skill level explain, systematically, the reduction of the skill premium in the case of selective policies as well as the minimal improvement with a non-selective policy. Note also that with the latter result, consistent flows of unskilled immigrants do not imply significant worsening of income inequality. This improvement of human capital, in the case of selective policies, accompanied by an increase of experience explains the moderate increase in the GDP per capita throughout the period. All of these developments are characterized by a transitory effect, positive or negative depending upon the variable of interest, that peaks around 2050 and then gradually diminishes (or even reverses in some cases).

- Insert Table 8 -

Whatever the degree of selectivity, the immigration policy improves public finances. The reduction of social transfers is more pronounced in the middle of the century, with a decrease of 1.2 and 1.1 point of the GDP for selective policies and 0.8 point for a non-selective policy. The aging of additional incoming immigrants eventually limits the benefits and inverts the hierarchy of the different policies. That is, a non-selective immigration policy reduced the social transfers by 0.5 point of the GDP at the end of the century. A neutral immigration policy causes a decrease of more than 0.2 point, while the most selective policy has virtually no effect, with a reduction of 0.1 point of the GDP. This reduction in public transfers, combined with favorable wage developments (substantial increase in the average wage), leads to a lower tax rate on wages of between 1.5 (non-selective immigration) and 2 (neutral immigration and selective immigration) tax points in 2050. For the reasons stated above, the reduction is lower at the end of the century and the largest gain requires the non-selection of immigrants.

We can, therefore, say that these more ambitious immigration policies would reduce the tax burden of aging in 2050 to just over 20% without selection criteria and to approximately 30% with a highly selective policy. While this, admittedly, is not negligible, it is relatively small when we compare these results with demographic changes implied by these flows. If we focus more specifically on the finances of different pillars of social protection (Table 9), we find the following trends.

Regarding the pensions, the additional flows of immigrants, regardless of the distribution of skills, increase, in the short term, the number of contributors and change very little the number and distribution of inactive workers and the total amount of pensions. In the longer term, additional flows of older immigrants result in an increase in pensions, which is especially important as these new retirees are skilled. With selective policies, the revenues of contributors improve slightly, while in the medium term, the combination of a lower birth rate and a higher life expectancy outweighs the financial gains allowed by a non-selective policy. Thus, the financing need of the pension system at the end of the century is reduced by almost 0.5 point of the GDP (approximately a 30% decrease in financing need from the baseline) in the absence of selection, while this decrease is only 0.2 point of the GDP (about 10% of baseline) with the selective immigration variant. In the short-

to medium-term, selection on the basis of skills provides a reduction in the financing need equivalent to the policy based on the no selective policy.

<div align="center">- Insert Table 9 -</div>

For health expenditures, we must wait until 2040 for the beneficial effects to be actualized, although they remain moderate until the end of the century. Only the family-housing fund saw its financial situation deteriorate slightly as a result of increased inflows regardless of the skill system in place.

6 Conclusion

Immigration has many effects, most of which are generally positive, on the finances of social welfare in France. We have shown that immigration, as projected in official forecasts, reduces the tax burden of an aging population. In the absence of immigration, the financing need of social welfare increased by 2 GDP points from 3% to approximately 5%. These benefits are mainly the result of the age distribution of net flows, younger than French population as a whole, and principally affect, not surprisingly, the two pillars of social protection most sensitive to demographic changes: pensions and health care.

For similar reasons, a more ambitious immigration policy would contribute to reducing the tax burden of an aging population. However, the financial gains are relatively moderate in comparison to the demographic changes it implies. These changes include a reduction of this burden of between 20% and 30%, depending on its degree of selectivity, for a growing workforce of between 16% and 20%, while the proportion of immigrants in this population would double by the end of the century.

A more selective policy in favor of skilled workers can amplify these gains in the short to medium term while reducing demographic changes but in proportions that remain relatively low. Most importantly, and contrary to popular belief in the social debate, this improvement is temporary. In the longer term, demographic changes of a more selective immigration policy outweigh its positive effects when compared to a non-selective policy.

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Tables

Table 1: French population in the baseline (2000-2100)

	2000	2010	2020	2030	2040	2050	2060	2080	2100
Total population *(thousands)*	59 376	62 342	65 041	67 305	69 306	70 595	71 309	72 925	74 790
Working-age population *(15-64 years, in thousands)*	38 478	40 531	40 674	40 354	40 026	40 352	40 918	41 726	43 043
Share of immigrants *(in % of total population)*	7,3%	8,3%	8,7%	9,0%	9,1%	9,1%	9,0%	8,5%	8,3%
Old age dependency ratio *(65 years and more/15-64 years in %)*	25,5%	25,6%	32,4%	38,7%	44,1%	45,4%	45,1%	45,0%	44,3%

Source: authors' calculations

Table 2: Skill distribution of the working-age population (baseline, 2000-2100)

	2000	2010	2020	2030	2040	2050	2100
High skilled (15-64 years)							
Natives (a)	25,2%	29,3%	32,9%	35,9%	36,8%	36,9%	36,9%
Immigrants (b)	17,6%	21,5%	25,0%	27,0%	27,9%	28,1%	28,1%
Total population (c)	**24,6%**	**28,6%**	**32,1%**	**35,0%**	**35,9%**	**36,1%**	**36,1%**
Medium skilled (15-64 years)							
Natives (a)	16,9%	21,2%	25,6%	29,6%	32,9%	33,7%	33,7%
Immigrants (b)	10,3%	14,1%	18,2%	21,9%	25,4%	26,5%	26,5%
Total population (c)	**16,3%**	**20,5%**	**24,8%**	**28,8%**	**32,1%**	**33,0%**	**33,1%**
Low skilled (15-64 years							
Natives (a)	57,9%	49,5%	41,5%	34,5%	30,3%	29,4%	29,4%
Immigrants (b)	72,1%	64,4%	56,8%	51,1%	46,7%	45,5%	45,5%
Total population (c)	**59,1%**	**50,9%**	**43,1%**	**36,2%**	**32,0%**	**30,9%**	**30,8%**

(a) in percentage of total natives (15-64 years)
(b) in percentage of total immigrants (15-64 years)
(c) in percentage of total population (15-64 years)
Source: authors' calculations.

Table 3: Main macroeconomic aggregates (baseline, 2000-2100)

	2000	2010	2020	2030	2040	2050	2060	2080	2100
GDP per capita *(base 2000 = 1)*	1,00	1,31	1,50	1,73	1,86	2,12	2,29	2,90	3,67
Unemployment rate *(in %)*	11,4%	8,4%	5,1%	4,0%	3,6%	4,2%	3,7%	4,1%	4,1%
Unemployment rate- high + medium skilled *(in %)*	7,2%	5,6%	3,6%	3,0%	2,7%	3,3%	2,8%	3,2%	3,2%
Unemployment rate - low skilled (in %)	14,3%	11,2%	7,1%	5,7%	5,5%	6,1%	5,7%	6,0%	6,0%
Tax rate on wages *(excluding social contributions and csg, in %)*	7,0%	8,9%	11,5%	12,9%	13,8%	13,8%	14,2%	14,4%	14,7%
Average human capital per worker (base 2000=1)	1	1,130	1,246	1,333	1,384	1,389	1,386	1,387	1,388
Average experience per worker (base 2000=1)	1	1,035	1,029	1,025	1,014	1,018	1,013	1,010	1,011
Skill premium *(secondary school - in %)*	116,8%	118,9%	120,2%	120,8%	120,9%	120,9%	120,9%	121,0%	121,0%
Experience premium *(20 years of experience - in %)*	51,1%	50,6%	50,6%	50,7%	50,9%	50,8%	50,9%	50,9%	50,9%
Average wage for 15-65 years *(base 2000=1)*	1	1,116	1,276	1,510	1,675	1,928	2,060	2,615	3,251
Return on capital *(annual real interest rate - in %)*	3,82%	2,69%	3,02%	3,00%	3,37%	3,22%	3,87%	3,84%	3,89%

Source: authors' calculations.

Table 4: Social protection (baseline, 2000-2100)

	2000	2010	2020	2030	2040	2050	2060	2080	2100
Social protection expenditures *(in % of GDP)*	27,1%	30,6%	30,8%	31,8%	32,3%	32,9%	32,8%	33,0%	32,9%
Social contributions *(in % of GDP)*	18,5%	20,1%	20,0%	20,0%	19,9%	19,9%	19,8%	19,9%	19,8%
General Social Contribution *(in % of GDP)*	5,4%	6,5%	6,6%	6,6%	6,6%	6,6%	6,7%	6,7%	6,7%
Public contributions *(in % of GDP)*	3,2%	3,4%	3,4%	3,4%	3,4%	3,4%	3,4%	3,4%	3,4%
Financing needs *(in % of GDP)*	0,0%	-0,5%	-0,8%	-1,7%	-2,4%	-3,0%	-3,0%	-3,0%	-3,0%
Retirement (in % of GDP)									
- Expenditures	11,6%	13,5%	14,1%	14,6%	14,8%	14,6%	14,5%	14,5%	14,5%
- Financing needs	0,0%	-0,5%	-1,1%	-1,7%	-1,9%	-1,7%	-1,6%	-1,6%	-1,7%
Health (in % of GDP)									
- Expenditures	9,4%	10,5%	11,5%	12,5%	13,0%	13,7%	13,6%	13,6%	13,6%
- Financing needs	0,0%	0,0%	-1,0%	-2,0%	-2,5%	-3,2%	-3,1%	-3,1%	-3,1%
Family-Housing (in % of GDP)									
- Family expenditures	2,7%	3,1%	2,8%	2,6%	2,6%	2,6%	2,7%	2,7%	2,7%
- Housing expenditures	0,9%	1,0%	0,9%	0,8%	0,8%	0,8%	0,8%	0,8%	0,8%
- Financing needs	0,0%	0,0%	0,4%	0,7%	0,7%	0,7%	0,6%	0,6%	0,6%
Unemployment (in % of GDP)									
- Expenditures	2,0%	2,0%	1,2%	0,9%	0,8%	1,0%	0,9%	1,0%	1,0%
- Financing needs	0,0%	0,0%	0,8%	1,1%	1,2%	1,0%	1,1%	1,0%	1,0%
Social Assistance (in % of GDP)									
- Expenditures	0,4%	0,5%	0,4%	0,4%	0,4%	0,4%	0,4%	0,4%	0,4%
- Financing needs	0,0%	0,0%	0,1%	0,1%	0,1%	0,1%	0,1%	0,1%	0,1%

Source: authors' calculations.

Table 5: French population structure under alternative scenarios (2000-2100)

		2000	2010	2020	2030	2040	2050	2060	2080	2100
Population (15 years and more)	Baseline	47 959	50 775	53 360	55 725	57 397	58 188	58 838	59 954	61 494
(Thousands)	*Without immig. (b)*	*0,0%*	*-0,8%*	*-2,5%*	*-4,5%*	*-6,8%*	*-9,3%*	*-12,0%*	*-17,2%*	*-22,1%*
	Non-selective immig.(b)	*0,0%*	*0,4%*	*2,6%*	*4,9%*	*7,5%*	*10,1%*	*12,4%*	*16,0%*	*19,1%*
	Neutral immig. (b)	*0,0%*	*0,4%*	*2,6%*	*4,8%*	*7,2%*	*9,8%*	*12,0%*	*15,3%*	*17,8%*
	Selective immig. (b)	*0,0%*	*0,4%*	*2,6%*	*4,8%*	*7,2%*	*9,6%*	*11,7%*	*14,6%*	*16,8%*
Working-age population	Baseline	38318	40530	40466	40353	40025	40351	40919	41711	43052
(Thousands)	*Without immig. (b)*	*0,0%*	*-1,0%*	*-3,3%*	*-6,0%*	*-9,0%*	*-11,5%*	*-14,1%*	*-19,5%*	*-24,1%*
	Non-selective immig. (b)	*0,0%*	*0,6%*	*3,4%*	*6,4%*	*9,6%*	*11,5%*	*12,8%*	*16,3%*	*19,0%*
	Neutral immig. (b)	*0,0%*	*0,5%*	*3,4%*	*6,3%*	*9,3%*	*11,2%*	*12,3%*	*15,2%*	*17,3%*
	Selective immig. (b)	*0,0%*	*0,5%*	*3,4%*	*6,2%*	*9,2%*	*10,9%*	*11,9%*	*14,3%*	*16,1%*
Annual net migration flows	Baseline	100	100	100	100	100	100	100	100	100
(Thousands)	*Without immig.*	*100*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*
	Non-selective immig.	*100*	*184*	*193*	*201*	*208*	*214*	*219*	*228*	*236*
	Neutral immig.	*100*	*184*	*193*	*201*	*208*	*214*	*219*	*228*	*236*
	Selective immig.	*100*	*184*	*193*	*201*	*208*	*214*	*219*	*228*	*236*
Share of immigrants	Baseline	8,6%	9,7%	10,2%	10,5%	10,7%	10,7%	10,5%	10,0%	9,8%
(in % of population aged 15 years and more)	*Without immig. (a)*	*0,0%*	*-0,7%*	*-2,3%*	*-3,9%*	*-5,4%*	*-6,9%*	*-7,9%*	*-9,1%*	*-9,8%*
	Non-selective immig. (a)	*0,0%*	*0,4%*	*2,3%*	*4,0%*	*5,5%*	*6,9%*	*7,9%*	*8,5%*	*8,2%*
	Neutral immig. (a)	*0,0%*	*0,4%*	*2,3%*	*4,0%*	*5,6%*	*7,0%*	*8,0%*	*8,7%*	*8,5%*
	Selective immig. (a)	*0,0%*	*0,4%*	*2,3%*	*4,1%*	*5,6%*	*7,1%*	*8,1%*	*8,8%*	*8,7%*
Share of high skilled immigrants	Baseline	17,6%	21,5%	25,0%	27,0%	27,9%	28,1%	28,1%	28,1%	28,1%
(in % of immigrants aged 15-64 years)	*Without immig. (a)*	*0,0%*	*-0,4%*	*-0,8%*	*-0,7%*	*-0,2%*	*-0,1%*	*0,0%*	*0,0%*	*-*
	Non-selective immig. (a)	*0,0%*	*0,2%*	*0,4%*	*0,2%*	*0,0%*	*0,0%*	*0,0%*	*0,0%*	*0,0%*
	Neutral immig. (a)	*0,0%*	*2,2%*	*4,3%*	*5,5%*	*6,1%*	*6,3%*	*6,3%*	*6,4%*	*6,4%*
	Selective immig. (a)	*0,0%*	*4,2%*	*7,2%*	*8,2%*	*8,6%*	*8,9%*	*8,9%*	*8,9%*	*8,9%*
Share of low skilled immigrants	Baseline	72,1%	64,4%	56,8%	51,1%	46,7%	45,5%	45,5%	45,5%	45,5%
(in % of immigrants aged 15-64 years)	*Without immig. (a)*	*0,0%*	*1,0%*	*2,8%*	*3,4%*	*1,3%*	*0,1%*	*-0,2%*	*0,5%*	*-*
	Non-selective immig. (a)	*0,0%*	*-0,4%*	*-1,2%*	*-0,8%*	*-0,1%*	*0,0%*	*0,0%*	*0,0%*	*0,0%*
	Neutral immig. (a)	*0,0%*	*-3,8%*	*-7,8%*	*-10,1%*	*-10,9%*	*-11,3%*	*-11,4%*	*-11,5%*	*-11,6%*
	Selective immig. (a)	*0,0%*	*-8,5%*	*-15,1%*	*-16,8%*	*-16,1%*	*-16,2%*	*-16,2%*	*-16,2%*	*-16,2%*
Old age dependency ratio	Baseline	25,2%	25,3%	31,9%	38,1%	43,4%	44,2%	43,8%	43,7%	42,8%
(Pop 65+ / Pop 15-64 in %)	*Without immig. (a)*	*0,0%*	*0,3%*	*1,1%*	*2,3%*	*3,5%*	*3,6%*	*3,6%*	*4,2%*	*3,9%*
	Non-selective immig. (a)	*0,0%*	*-0,1%*	*-0,9%*	*-1,9%*	*-2,8%*	*-1,9%*	*-0,6%*	*-0,3%*	*-0,2%*
	Neutral immig. (a)	*0,0%*	*-0,1%*	*-0,9%*	*-1,9%*	*-2,7%*	*-1,7%*	*-0,4%*	*0,1%*	*0,6%*
	Selective immig. (a)	*0,0%*	*-0,1%*	*-0,9%*	*-1,8%*	*-2,6%*	*-1,6%*	*-0,2%*	*0,5%*	*0,9%*

(a) Percentage points of change compared to the baseline
(b) Change in percent of the baseline
Source: Authors' calculations.

Table 6: Main macroeconomic aggregates - scenario without immig. (2000-2100)

	2000	2010	2020	2030	2040	2050	2060	2080	2100
GDP per capita (base 2000 = 1)									
Baseline	1,00	1,31	1,50	1,73	1,86	2,12	2,29	2,90	3,67
Without immig. (b)	*0,0%*	*-0,3%*	*-0,8%*	*-1,0%*	*-1,4%*	*-1,4%*	*-1,6%*	*-2,5%*	*-2,6%*
Social protection expenditures (in % of GDP)									
Baseline	27,1%	30,6%	30,8%	31,8%	32,3%	32,9%	32,8%	33,0%	32,9%
Without immig. (a)	*0,0%*	*0,2%*	*0,6%*	*0,9%*	*0,8%*	*1,3%*	*1,1%*	*2,2%*	*1,9%*
Financing needs of social protection (in % of GDP)									
Baseline	0,0%	-0,5%	-0,8%	-1,7%	-2,4%	-3,0%	-3,0%	-3,0%	-3,0%
Without immig. (a)	*0,0%*	*-0,2%*	*-0,6%*	*-1,0%*	*-0,9%*	*-1,3%*	*-1,1%*	*-2,3%*	*-1,9%*
Unemployment rate (in %)									
Baseline	11,4%	8,4%	5,1%	4,0%	3,6%	4,2%	3,7%	4,1%	4,1%
Without immig. (a)	*0,0%*	*0,1%*	*0,4%*	*1,2%*	*-0,9%*	*1,2%*	*-1,1%*	*0,7%*	*-1,3%*
Tax rate on wages (excluding social contributions and csg, in %)									
Baseline	7,0%	8,9%	11,5%	12,9%	13,8%	13,8%	14,2%	14,4%	14,7%
Without immig (a)	*0,0%*	*0,4%*	*1,0%*	*1,6%*	*1,4%*	*2,1%*	*1,9%*	*3,5%*	*3,1%*
Average human capital per worker (base 2000 = 1)									
Baseline	1	1,130	1,246	1,333	1,384	1,389	1,386	1,387	1,388
Without immig. (b)	*0,0%*	*0,1%*	*0,5%*	*0,9%*	*2,0%*	*1,6%*	*2,3%*	*1,7%*	*2,1%*
Average experience per worker (base 2000 = 1)									
Baseline	1	1,035	1,029	1,025	1,014	1,018	1,013	1,010	1,011
Without immig. (b)	*0,0%*	*0,3%*	*0,6%*	*0,6%*	*0,0%*	*0,8%*	*0,5%*	*0,7%*	*0,1%*
Skill premium (secondary school - in %)									
Baseline	116,8%	118,9%	120,2%	120,8%	120,9%	120,9%	120,9%	121,0%	121,0%
Without immig. (a)	*0,0%*	*0,0%*	*-0,2%*	*-0,3%*	*-0,7%*	*-0,6%*	*-0,8%*	*-0,6%*	*-0,7%*
Experience premium (20 years of experience - in %)									
Baseline	51,1%	50,6%	50,6%	50,7%	50,9%	50,8%	50,9%	50,9%	50,9%
Without immig. (a)	*0,0%*	*0,0%*	*-0,1%*	*-0,1%*	*0,0%*	*-0,1%*	*-0,1%*	*-0,1%*	*0,0%*
Average wage for 15-65 years (base 2000 = 1)									
Baseline	1	1,116	1,276	1,510	1,675	1,928	2,060	2,615	3,251
Without immig. (b)	*0,0%*	*-0,7%*	*-1,9%*	*-3,0%*	*-2,4%*	*-3,3%*	*-3,9%*	*-7,3%*	*-7,7%*
Return on capital (annual real interest rate, %)									
Baseline	3,82%	2,69%	3,02%	3,00%	3,37%	3,22%	3,87%	3,84%	3,89%
Without immig. (a)	*0,0%*	*0,0%*	*0,0%*	*-0,1%*	*0,0%*	*-0,1%*	*0,0%*	*-0,1%*	*0,1%*

(a) Percentage points of change compared to the baseline
(b) Change in percent of the baseline
Source: Authors' calculations

Table 7: Social protection - Scenario *Without immig.* (2000-2100)

	2000	2010	2020	2030	2040	2050	2060	2080	2100
Retirement (in % of GDP)									
- Expenditures									
Baseline	11,6%	13,5%	14,1%	14,6%	14,8%	14,6%	14,5%	14,5%	14,5%
Without immig. (a)	*0,0%*	*0,1%*	*0,5%*	*0,7%*	*1,0%*	*1,1%*	*1,3%*	*1,8%*	*1,8%*
- Financing needs									
Baseline	0,0%	-0,5%	-1,1%	-1,7%	-1,9%	-1,7%	-1,6%	-1,6%	-1,7%
Without immig. (a)	*0,0%*	*-0,2%*	*-0,5%*	*-0,7%*	*-1,0%*	*-1,1%*	*-1,3%*	*-1,8%*	*-1,8%*
Health (in % of GDP)									
- Expenditures									
Baseline	9,4%	10,5%	11,5%	12,5%	13,0%	13,7%	13,6%	13,6%	13,6%
Without immig. (a)	*0,0%*	*0,1%*	*0,2%*	*0,1%*	*0,3%*	*0,2%*	*0,3%*	*0,5%*	*0,7%*
- Financing needs									
Baseline	0,0%	0,0%	-1,0%	-2,0%	-2,5%	-3,2%	-3,1%	-3,1%	-3,1%
Without immig. (a)	*0,0%*	*-0,1%*	*-0,2%*	*-0,1%*	*-0,3%*	*-0,2%*	*-0,3%*	*-0,6%*	*-0,7%*
Family-Housing (in % of GDP)									
- Family expenditures									
Baseline	2,7%	3,1%	2,8%	2,6%	2,6%	2,6%	2,7%	2,7%	2,7%
Without immig. (a)	*0,0%*	*0,0%*	*-0,1%*	*-0,1%*	*-0,1%*	*-0,1%*	*-0,2%*	*-0,1%*	*-0,1%*
- Housing expenditures									
Baseline	0,9%	1,0%	0,9%	0,8%	0,8%	0,8%	0,8%	0,8%	0,8%
Without immig. (a)	*0,0%*	*0,0%*	*0,0%*	*0,0%*	*-0,1%*	*-0,1%*	*-0,1%*	*-0,1%*	*-0,1%*
- Financing needs									
Baseline	0,0%	0,0%	0,4%	0,7%	0,7%	0,7%	0,6%	0,6%	0,6%
Without immig. (a)	*0,0%*	*0,0%*	*0,1%*	*0,1%*	*0,2%*	*0,2%*	*0,2%*	*0,2%*	*0,2%*
Unemployment (in % of GDP)									
- Expenditures									
Baseline	2,0%	2,0%	1,2%	0,9%	0,8%	1,0%	0,9%	1,0%	1,0%
Without immig. (a)	*0,0%*	*0,0%*	*0,1%*	*0,3%*	*-0,2%*	*0,3%*	*-0,3%*	*0,2%*	*-0,3%*
- Financing needs									
Baseline	0,0%	0,0%	0,8%	1,1%	1,2%	1,0%	1,1%	1,0%	1,0%
Without immig. (a)	*0,0%*	*0,0%*	*-0,1%*	*-0,3%*	*0,2%*	*-0,3%*	*0,3%*	*-0,2%*	*0,3%*
Social Assistance (in % of GDP)									
- Expenditures									
Baseline	0,4%	0,5%	0,4%	0,4%	0,4%	0,4%	0,4%	0,4%	0,4%
Without immig. (a)	*0,0%*	*0,0%*	*0,0%*	*0,0%*	*0,0%*	*-0,1%*	*-0,1%*	*-0,1%*	*-0,1%*
- Financing needs									
Baseline	0,0%	0,0%	0,1%	0,1%	0,1%	0,1%	0,1%	0,1%	0,1%
Without immig. (a)	*0,0%*	*0,0%*	*0,0%*	*0,0%*	*0,0%*	*0,1%*	*0,1%*	*0,1%*	*0,1%*

(a) Percentage points of change compared to the baseline
(b) Change in percent of the baseline
Source: Authors' calculations

Table 8: Main macroeconomic aggregates - scenarios *ambitious immigration policies* (2000-2100)

	2000	2010	2020	2030	2040	2050	2060	2080	2100
GDP per capita (base 2000 = 1)									
Baseline	1,00	1,31	1,50	1,73	1,86	2,12	2,29	2,90	3,67
Non-selective immig. (b)	*0,0%*	*0,2%*	*0,9%*	*1,7%*	*2,2%*	*1,4%*	*1,0%*	*0,7%*	*0,8%*
Neutral immig. (b)	*0,0%*	*0,4%*	*1,5%*	*2,4%*	*3,1%*	*2,7%*	*1,9%*	*2,0%*	*1,6%*
Selective immig. (b)	*0,0%*	*0,5%*	*1,9%*	*2,8%*	*3,5%*	*3,1%*	*2,3%*	*2,2%*	*1,7%*
Social protection expenditures (in % of GDP)									
Baseline	27,1%	30,6%	30,8%	31,8%	32,3%	32,9%	32,8%	33,0%	32,9%
Non-selective immig. (a)	*0,0%*	*-0,1%*	*-0,6%*	*-0,6%*	*-0,9%*	*-0,8%*	*0,1%*	*-0,7%*	*-0,5%*
Neutral immig. (a)	*0,0%*	*-0,2%*	*-0,7%*	*-1,2%*	*-0,8%*	*-1,2%*	*-0,3%*	*-1,0%*	*-0,2%*
Selective immig. (a)	*0,0%*	*-0,3%*	*-0,8%*	*-1,2%*	*-0,9%*	*-1,1%*	*-0,4%*	*-0,8%*	*-0,1%*
Financing needs of social protection (in % of GDP)									
Baseline	0,0%	-0,5%	-0,8%	-1,7%	-2,4%	-3,0%	-3,0%	-3,0%	-3,0%
Non-selective immig. (a)	*0,0%*	*0,1%*	*0,6%*	*0,6%*	*0,9%*	*0,8%*	*-0,2%*	*0,6%*	*0,5%*
Neutral immig. (a)	*0,0%*	*0,2%*	*0,7%*	*1,1%*	*0,8%*	*1,1%*	*0,2%*	*0,9%*	*0,1%*
Selective immig. (a)	*0,0%*	*0,3%*	*0,8%*	*1,2%*	*0,8%*	*1,1%*	*0,3%*	*0,7%*	*0,0%*
Unemployment rate (in %)									
Baseline	11,4%	8,4%	5,1%	4,0%	3,6%	4,2%	3,7%	4,1%	4,1%
Non-selective immig. (a)	*0,1%*	*-0,3%*	*-1,6%*	*0,5%*	*0,7%*	*-1,2%*	*3,4%*	*-0,3%*	*0,6%*
Neutral immig. (a)	*0,1%*	*-0,7%*	*-0,8%*	*-1,6%*	*1,9%*	*-0,8%*	*1,2%*	*-0,4%*	*1,9%*
Selective immig. (a)	*0,1%*	*-0,9%*	*-1,0%*	*-1,7%*	*1,7%*	*-0,3%*	*0,9%*	*0,0%*	*1,6%*
Tax rate on wages (excluding social contributions and *csg*, in %)									
Baseline	7,0%	8,9%	11,5%	12,9%	13,8%	13,8%	14,2%	14,4%	14,7%
Non-selective immig. (a)	*0,0%*	*-0,2%*	*-1,2%*	*-1,3%*	*-1,7%*	*-1,5%*	*-0,2%*	*-1,2%*	*-1,0%*
Neutral immig. (a)	*0,0%*	*-0,4%*	*-1,4%*	*-2,1%*	*-1,6%*	*-2,0%*	*-0,8%*	*-1,6%*	*-0,5%*
Selective immig. (a)	*0,1%*	*-0,5%*	*-1,5%*	*-2,2%*	*-1,6%*	*-2,0%*	*-1,0%*	*-1,4%*	*-0,4%*
Average human capital per worker (base 2000 = 1)									
Baseline	1	1,130	1,246	1,333	1,384	1,389	1,386	1,387	1,388
Non-selective immig. (b)	*0,0%*	*0,0%*	*0,3%*	*-0,2%*	*-0,7%*	*0,0%*	*-1,3%*	*-0,2%*	*-0,4%*
Neutral immig. (b)	*0,0%*	*0,7%*	*1,8%*	*2,7%*	*1,5%*	*2,5%*	*1,9%*	*2,4%*	*1,6%*
Selective immig. (b)	*-0,1%*	*1,5%*	*3,1%*	*3,9%*	*2,7%*	*3,4%*	*3,1%*	*3,2%*	*2,6%*
Average experience per worker (base 2000 = 1)									
Baseline	1	1,035	1,029	1,025	1,014	1,018	1,013	1,010	1,011
Non-selective immig. (b)	*0,1%*	*-0,2%*	*-0,4%*	*1,6%*	*2,3%*	*1,8%*	*3,1%*	*2,1%*	*2,3%*
Neutral immig. (b)	*0,1%*	*-0,5%*	*-0,2%*	*0,6%*	*2,5%*	*1,8%*	*2,3%*	*2,0%*	*2,6%*
Selective immig. (b)	*0,1%*	*-0,5%*	*-0,3%*	*0,6%*	*2,5%*	*2,0%*	*2,3%*	*2,2%*	*2,6%*
Skill premium (secondary school - in %)									
Baseline	116,8%	118,9%	120,2%	120,8%	120,9%	120,9%	120,9%	121,0%	121,0%
Non-selective immig. (a)	*0,0%*	*0,0%*	*-0,1%*	*0,1%*	*0,3%*	*0,0%*	*0,5%*	*0,1%*	*0,2%*
Neutral immig. (a)	*0,0%*	*-0,3%*	*-0,7%*	*-0,9%*	*-0,5%*	*-0,9%*	*-0,7%*	*-0,8%*	*-0,6%*
Selective immig. (a)	*0,0%*	*-0,5%*	*-1,1%*	*-1,4%*	*-0,9%*	*-1,2%*	*-1,1%*	*-1,1%*	*-0,9%*
Experience premium (20 years of experience - in %)									
Baseline	51,1%	50,6%	50,6%	50,7%	50,9%	50,8%	50,9%	50,9%	50,9%
Non-selective immig. (a)	*0,0%*	*0,0%*	*0,1%*	*-0,2%*	*-0,3%*	*-0,3%*	*-0,5%*	*-0,3%*	*-0,4%*
Neutral immig. (a)	*0,0%*	*0,1%*	*0,0%*	*-0,1%*	*-0,4%*	*-0,3%*	*-0,3%*	*-0,3%*	*-0,4%*
Selective immig. (a)	*0,0%*	*0,1%*	*0,0%*	*-0,1%*	*-0,4%*	*-0,3%*	*-0,3%*	*-0,3%*	*-0,4%*
Average wage for 15-65 years (base 2000 = 1)									
Baseline	1	1,116	1,276	1,510	1,675	1,928	2,060	2,615	3,251
Non-selective immig. (b)	*0,0%*	*0,8%*	*1,9%*	*2,8%*	*3,2%*	*2,5%*	*1,9%*	*2,5%*	*2,9%*
Neutral immig. (b)	*0,0%*	*0,9%*	*2,7%*	*3,7%*	*3,4%*	*4,3%*	*2,5%*	*4,0%*	*2,4%*
Selective immig. (b)	*0,0%*	*1,1%*	*3,0%*	*3,9%*	*3,6%*	*4,5%*	*2,8%*	*3,9%*	*2,0%*
Return on capital (annual real interest rate, %)									
Baseline	3,82%	2,69%	3,02%	3,00%	3,37%	3,22%	3,87%	3,84%	3,89%
Non-selective immig. (a)	*0,0%*	*0,0%*	*0,1%*	*0,0%*	*0,0%*	*0,1%*	*-0,2%*	*0,0%*	*-0,1%*
Neutral immig. (a)	*0,0%*	*0,0%*	*0,1%*	*0,1%*	*-0,1%*	*0,0%*	*-0,1%*	*-0,1%*	*-0,1%*
Selective immig. (a)	*0,0%*	*0,0%*	*0,1%*	*0,1%*	*0,0%*	*0,0%*	*-0,1%*	*-0,1%*	*-0,1%*

(a) Percentage points of change compared to the baseline
(b) Change in percent of the baseline
Source: Authors' calculations

Table 9: Social protection - scenarios *ambitious immigration policies* (2000-2100)

	2000	2010	2020	2030	2040	2050	2060	2080	2100
Retirement (in % of GDP)									
- Expenditures									
Non-selective immig. (a)	*0,0%*	*-0,1%*	*-0,4%*	*-0,8%*	*-0,9%*	*-0,8%*	*-0,6%*	*-0,6%*	*-0,5%*
Neutral immig. (a)	*0,0%*	*-0,1%*	*-0,5%*	*-0,9%*	*-1,0%*	*-0,8%*	*-0,6%*	*-0,5%*	*-0,4%*
Selective immig. (a)	*0,0%*	*-0,1%*	*-0,5%*	*-0,9%*	*-1,0%*	*-0,8%*	*-0,5%*	*-0,4%*	*-0,3%*
- Financing needs									
Non-selective immig. (a)	*0,0%*	*0,1%*	*0,4%*	*0,8%*	*0,9%*	*0,7%*	*0,6%*	*0,6%*	*0,5%*
Neutral immig. (a)	*0,0%*	*0,1%*	*0,5%*	*0,8%*	*1,0%*	*0,8%*	*0,6%*	*0,5%*	*0,3%*
Selective immig. (a)	*0,0%*	*0,1%*	*0,5%*	*0,8%*	*0,9%*	*0,7%*	*0,5%*	*0,4%*	*0,2%*
Health (in % of GDP)									
- Expenditures									
Non-selective immig. (a)	*0,0%*	*0,0%*	*0,1%*	*-0,2%*	*-0,4%*	*0,0%*	*-0,3%*	*-0,2%*	*-0,3%*
Neutral immig. (a)	*0,0%*	*0,1%*	*0,0%*	*0,0%*	*-0,4%*	*-0,3%*	*-0,2%*	*-0,4%*	*-0,4%*
Selective immig. (a)	*0,0%*	*0,1%*	*0,0%*	*0,0%*	*-0,4%*	*-0,3%*	*-0,2%*	*-0,4%*	*-0,3%*
- Financing needs									
Non-selective immig. (a)	*0,0%*	*0,0%*	*-0,1%*	*0,2%*	*0,4%*	*0,0%*	*0,3%*	*0,2%*	*0,3%*
Neutral immig. (a)	*0,0%*	*-0,1%*	*0,0%*	*0,0%*	*0,4%*	*0,2%*	*0,1%*	*0,4%*	*0,4%*
Selective immig. (a)	*0,0%*	*-0,1%*	*0,0%*	*0,0%*	*0,4%*	*0,3%*	*0,2%*	*0,4%*	*0,3%*
Family-Housing (in % of GDP)									
- Family expenditures									
Non-selective immig. (a)	*0,0%*	*0,0%*	*0,1%*	*0,1%*	*0,1%*	*0,1%*	*0,1%*	*0,1%*	*0,1%*
Neutral immig. (a)	*0,0%*	*0,0%*	*0,1%*	*0,1%*	*0,0%*	*0,0%*	*0,0%*	*0,0%*	*0,0%*
Selective immig. (a)	*0,0%*	*0,0%*	*0,0%*	*0,0%*	*0,0%*	*0,0%*	*0,0%*	*0,0%*	*0,0%*
- Housing expenditures									
Non-selective immig. (a)	*0,0%*	*0,0%*	*0,0%*	*0,0%*	*0,1%*	*0,1%*	*0,1%*	*0,1%*	*0,1%*
Neutral immig. (a)	*0,0%*	*0,0%*	*0,0%*	*0,0%*	*0,0%*	*0,0%*	*0,0%*	*0,0%*	*0,0%*
Selective immig. (a)	*0,0%*	*0,0%*	*0,0%*	*0,0%*	*0,0%*	*0,0%*	*0,0%*	*0,0%*	*0,0%*
- Financing needs									
Non-selective immig. (a)	*0,0%*	*0,0%*	*-0,1%*	*-0,1%*	*-0,1%*	*-0,2%*	*-0,2%*	*-0,2%*	*-0,1%*
Neutral immig. (a)	*0,0%*	*0,0%*	*-0,1%*	*-0,1%*	*-0,1%*	*-0,1%*	*-0,1%*	*-0,1%*	*-0,1%*
Selective immig. (a)	*0,0%*	*0,0%*	*0,0%*	*-0,1%*	*-0,1%*	*0,0%*	*-0,1%*	*0,0%*	*-0,1%*
Unemployment (in % of GDP)									
- Expenditures									
Non-selective immig. (a)	*0,0%*	*-0,1%*	*-0,4%*	*0,1%*	*0,2%*	*-0,3%*	*0,9%*	*-0,1%*	*0,1%*
Neutral immig. (a)	*0,0%*	*-0,2%*	*-0,2%*	*-0,4%*	*0,5%*	*-0,2%*	*0,3%*	*-0,1%*	*0,5%*
Selective immig. (a)	*0,0%*	*-0,3%*	*-0,3%*	*-0,4%*	*0,4%*	*-0,1%*	*0,2%*	*0,0%*	*0,4%*
- Financing needs									
Non-selective immig. (a)	*0,0%*	*0,1%*	*0,4%*	*-0,1%*	*-0,2%*	*0,3%*	*-0,9%*	*0,1%*	*-0,2%*
neutral immig. (a)	*0,0%*	*0,2%*	*0,2%*	*0,4%*	*-0,5%*	*0,2%*	*-0,3%*	*0,1%*	*-0,5%*
Selective immig. (a)	*0,0%*	*0,3%*	*0,3%*	*0,4%*	*-0,4%*	*0,1%*	*-0,2%*	*0,0%*	*-0,4%*
Social assistance (in % of GDP)									
- Expenditures									
Non-selective immig. (a)	*0,0%*	*0,0%*	*0,0%*	*0,0%*	*0,0%*	*0,1%*	*0,1%*	*0,1%*	*0,0%*
Neutral immig. (a)	*0,0%*	*0,0%*	*0,0%*	*0,0%*	*0,0%*	*0,0%*	*0,0%*	*0,0%*	*0,0%*
Selective immig. (a)	*0,0%*	*0,0%*	*0,0%*	*0,0%*	*0,0%*	*0,0%*	*0,0%*	*0,0%*	*0,0%*
- Financing needs									
Non-selective immig. (a)	*0,0%*	*0,0%*	*0,0%*	*0,0%*	*0,0%*	*-0,1%*	*-0,1%*	*-0,1%*	*0,0%*
Neutral immig. (a)	*0,0%*	*0,0%*	*0,0%*	*0,0%*	*0,0%*	*0,0%*	*0,0%*	*0,0%*	*0,0%*
Selective immig. (a)	*0,0%*	*0,0%*	*0,0%*	*0,0%*	*0,0%*	*0,0%*	*0,0%*	*0,0%*	*0,0%*

(a) Percentage points of change compared to the baseline
(b) Change in percent of the baseline
Source: Authors' calculations

Documents de travail récents

- Kirill Borissov, Stephane Lambrecht : "Education, Wage Inequality and Growth" [2011-1]