

Fiscal Implications of Immigration - a Net Present Value Calculation*

Kjetil Storesletten[†]
IIES Stockholm University and CEPR

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[†]Tel: (+46) 8-163075; fax: (+46) 8-161443; email: kjetil.storesletten@iies.su.se.

1 Introduction

The inflow of immigrants to Western countries has surged over the last decades. This, together with rapidly ageing populations have spurred public interest in immigration issues. Some authors have argued that immigration could serve as a remedy for the fiscal pressure associated with an ageing population (Storesletten, 2000).¹ However, immigrants are often portrayed as a public burden. For example, in the 2001 election in Denmark, immigration policy emerged as a salient election issue and the perceived fiscal burden of immigrants was used as a major argument for curbing immigration.

Lessons from the U.S. suggest that the fiscal cost or gain on the average immigrant is small, while the picture is more dramatic if on conditions on age and education - young, high-skilled immigrants are expected to make large net contributions to government coffers, while low-skilled immigrants and retirees represent large cost (Lee and Miller, 1997, and Storesletten, 2000). The U.S. differs substantially from other Western countries, however. The U.S. has a small public sector (22% of GDP), low taxes, low unemployment, and a relatively limited social insurance system. Moreover non-refugee immigrants have quite restricted access to social insurance during the first years after arrival. In contrast, European welfare states feature large public sectors (on average 41% of GDP), high taxes, high unemployment, and generous social insurance.² In particular, the labor market performance of immigrants in Sweden is poor, relative to natives.³ It is therefore important to investigate whether the conclusions from the U.S. debate hold up for European welfare states.

This paper makes two contributions. First, it quantifies the fiscal impact of immigration for a typical European welfare state - Sweden. Second, it adds to the tools for assessing the cost of immigration by introducing a break-even analysis in terms of expected

¹Moreover, at the 2001 European Union Summit in Gothenburg immigration was explicitly discussed as a tool to sustain welfare policies (Davidson, 2001).

²The figures on the size of public sector are taken from Persson and Tabellini (1999), and represent an average of central government expenditures as a fraction of GDP during 1990-99. "European welfare states" refers to an average across Austria, Belgium, Denmark, Finland, France, Germany, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden and the UK.

³For instance, immigrants in Sweden had about 6% higher rate of open unemployment than natives in 1995, and their employment rate was about 20% points below natives. Moreover, relative to other OECD countries, male immigrants had substantially lower employment rates than natives. Even female immigrants have much lower employment rates than natives, but here Sweden is more in line with other OECD countries.

employment rates. The choice of Sweden is motivated by two concerns. First, detailed data exist on immigrants' earnings and take-up of public benefits. Second, Sweden has a very large public sector and also a sizeable inflow of immigration: since 1989 annual immigration has been about 0.67% of the population (57,000).

An immigrant, as well as any native (Swede), incurs benefits and costs for public coffers every year of his/her remaining life. A typical sequence of net government benefits for a new immigrant is a short period with net costs right after immigration, followed by a long period with large tax revenues. After retirement, the net flow from government is usually negative (pension benefits, health care, etc.). Following Lee and Miller (1997) and Storesletten (2000), I compute the *net public gain* of a new immigrant as the discounted value of future tax payments less transfers and marginal government consumption, including the costs and contributions of future children. Thus, admitting a new immigrant is implicitly viewed as a public investment.

Storesletten (2000) computes the net gain of immigrants in a dynamic equilibrium closed economy framework that explicitly accounts for demographics and fiscal policy, along the lines of Auerbach and Kotlikoff (1987). The immigration surplus literature takes the analysis one step further, incorporating immigrants' general equilibrium effect on natives' welfare via employment and wages (see Borjas, 1994, or Canova and Ravn, 1999, for a dynamic macro exercise). While general equilibrium restrictions provide valuable insights, they do, however, make the model costly to solve, thus forcing the modeler to include relatively few elements of heterogeneity. For a small, relatively open economy such as Sweden, however, it seems fruitful to start by abstracting from the general equilibrium price effects of immigration. It might be more questionable to fix individual behavior, abstracting from the distortions on individual behavior associated with general equilibrium effects on taxes.

Here, the analysis is done in a simple framework that can include a large amount of heterogeneity and can address a wide range of questions. For example, the model is used to examine how the net government gain of admitting an immigrant depends on gender and age at time of immigration. In order to focus on the fiscal aspects of immigration, I construct a rich model of the government. The framework is an overlapping generations model allowing for a dynamic analysis of fiscal policy, including the pension system and a detailed model of public transfers and taxes. In contrast, production and individual behavior are modelled as simple as possible. Individual behavior is fixed, as in Lee

and Miller (1997), i.e., labor effort, propensities to consume, fertility, and employment are kept constant over time, and wages and interest rates are exogenous. In this case, the only effect on natives' welfare is precisely immigrants' effects via government fiscal policy.

The central "equilibrium" condition is that taxes on labor income adjust so that the current government expenditure policy is sustained over time. Note that each generation bears the same tax burden in the sense that, from the outset, tax rates are constant over time, and wages and government consumption and transfers per person are growing at a constant rate.⁴ It is imperative to stress that this is not a welfare analysis but rather a dynamic accounting exercise of government revenues and expenditures. The model is parameterized using the data from Ekberg (1995) and several waves of the Swedish Survey of the Labor Force data on foreign born workers. Substantial uncertainty is associated with forecasts of future earnings of immigrants, and the work is probably best understood as a tool to help determine which factors influence the government gain on immigration.

The analysis suggests that the potential gains from immigration are large, especially for immigrants who are 20-30 years old at the time of immigration to Sweden: on average more than 200,000 SEK per immigrant, or about \$23,500 (using the SEK-USD exchange rate per February 2003). For immigrants older than 50 and younger than 10, the net cost is substantial; in some cases over 1.5 million SEK. An *average* new immigrant represents a net government loss of 175,000 SEK (\$20,500), given the baseline parameterization.

The results depend crucially on how immigrants fare on the labor market and, in particular, on the expected labor participation rate for new immigrants. My findings could therefore also be expressed in terms of "break-even participation rates", i.e. the participation rate for which the net present value is zero so the immigration "investment" breaks even. For male immigrants of age 27 the break-even participation rate is as low as 50%, while the average for all 27 years old immigrants is 60%. In comparison, the average participation rate for foreign born individuals in Sweden is 67% and 83% for natives (1995 figures).

⁴This approach differs from a "Generational Accounting" exercise in that here, taxes and benefits *prior* to the first period of the model are not taken into account (see Auerbach, Gokhale and Kotlikoff, 1991). Thus, taxes are constant across agents and time, as opposed to the Generational Accounting approach where tax rates at each point in time may be cohort-specific.

The results for Sweden are similar to those for the U.S. in terms of the qualitative shape of the age profile of NPV contributions to government, measured at the age of arrival. The magnitudes, however, are different – Lee and Miller (1997) and Storesletten (2000) report substantially larger gains per immigrant to the U.S.

The paper is organized as follows: Section 2 outlines the model framework, Section 3 accounts for the parameterization of the model, and the results are reported in Section 5. Section 6 concludes.

2 Model

2.1 Demography

The economy is populated by agents who live up to 100 years. Agents of age i differ in gender, labor force status, national origin and age at the time of immigration. An immigrant is defined as a foreign-born person currently residing in Sweden. Natives were born in Sweden and “immigrated” at age 0. Children of immigrants are assumed to be identical to natives. Månsson and Ekberg (2000) show that when controlling for parental income and education, second generation immigrants in Sweden are virtually identical to natives. However, second generation immigrants to Sweden fare on average worse than natives, due to poor parental performance. In Section 4.4 I explore the implications of an alternative, extreme assumption, namely that there is no intergenerational assimilation at all. The immigration policy specifies the annual inflow of future immigrants and their age, gender, and national origin. For simplicity, I assume that the future immigration policy is identical to the policy in 1995.

Agents face longevity uncertainty. Fertility and mortality rates for each age, gender and immigration group are assumed to be fixed over time. Once in Sweden, immigrants are assumed to never return to their home countries. The sensitivity of this assumption is explored below.

Given the immigration policy, the demographical evolution is determined; immigration is pinned down, the number of births is given by the size of each female cohort in a given year, and mortality is age- and gender-specific.

2.2 Labor market and labor force status

Children and retirees do not work. Working age individuals are either participating or not participating in the labor force. If participating, agents are either employed or unemployed, and if employed, agents are either working or on leave (for sickness, rehabilitation or child care). The labor force status is exogenous to the agents, so employment and work leave are not subject to choice. To simplify even further, I assume that upon leaving childhood (or, for immigrants, when first entering Sweden) each agent draws a random variable that determines his/her labor market status for all future: either permanently out of the labor force or permanently in. All agents in the labor force with the same age, gender, country of origin and age at the time of immigration are unemployed a fraction u of the year, take work leave p of the year and work $(1 - u - p)$ of the year. Group-specific unemployment and participation rates u and p do not change over time.⁵ To streamline the notation, let m denote the agent's type, consisting of participation status, gender, national origin, and age at the time of immigration.

Earnings for a type m agent of age i is given by $W_t e_{i,m} (1 - u_{i,m} - p_{i,m})$, where W_t is the average wage per "efficiency unit" in period t , and $e_{i,m}$ as the number of efficiency units for type m of age i . Agents who are not participating in the labor market have $e_{i,m} = 0$. The e 's are fixed over time, while W_t is assumed to grow at a constant rate z . Thus, there is no crowding out of jobs or general equilibrium changes in wages due to immigration. Several empirical studies have investigated the extent to which immigration leads to higher native unemployment and lower wages for natives. The overall conclusion is that immigration has little or no effect on native labor markets, see Borjas (1994) for a review.⁶

Using a calibrated neoclassical growth model, Canova and Ravn (1999) focus on the general equilibrium effects of low-skilled immigration. Their findings confirm that price effects are small, but find that in welfare state economies, the aggregate effects can be large, due to the distortions associated with tax increases required to finance the increased pressure on the welfare system. In Section 4, I show that immigrants represent a large burden on public coffers. Thus had the analysis been performed in a general

⁵The quantitative results would be identical if agents were to face a participation lottery each period.

⁶However, one could get a rough estimate of the adverse labor market effects without writing down a full scale general equilibrium model by using estimates of elasticities of native employment and wages to a rise in labor supply as an upper bound on the effects of an inflow of immigrants.

equilibrium setting, taxes would be higher. I therefore conjecture that my partial equilibrium exercise with fixed behavior underestimates the society's cost of immigration. Quantifying this effect is left for future research.

2.3 Fiscal policy

The role of the government is to formulate fiscal and immigration policies, given that the fiscal policy must be sustainable. Fiscal policy consists of a government consumption rule, a tax system, and a transfer system, including a pension system.

The public consumption rule determines government purchases of goods and services as a function of output per capita and population:

$$G_t = (1 + z)^t \sum_{i,m} g_{i,m} \mu_{i,m,t}, \quad (1)$$

where $\mu_{i,m,t}$ is the number of group i, m agents in period t and $g_{i,m}$ is government cost per agent in the initial year. Government costs per group i, m individual are growing at the same rate as wages.

The tax system specifies a constant tax rate on consumption, τ_c , a payroll tax τ_w , a pension contributions tax rate τ_p on earnings, and a tax rate $\tau_e(x)$ on taxable earnings x net of τ_p , given by

$$\tau_e(x) = \begin{cases} \underline{\tau_e} & \text{for part of } x \leq \text{SEK } 180,000 \\ \underline{\tau_e} + 0.20 & \text{for part of } x \text{ in excess of SEK } 180,000. \end{cases}$$

This description closely resembles the current Swedish tax code. See Agell, Englund and Södersten (1996) for a more detailed account. I abstract from capital income taxation since the net revenues of such taxes are about zero, after deducting capital subsidies.

Agents receive three types of transfers – welfare payments $b_{i,m}$, work-related transfers $h_{i,m}$, and pensions. Welfare payments are not taxed and are paid to non-participating agents only. Work-related transfers refer to compensation for parental leave, rehabilitation, sick leave, and unemployment benefits, and these benefits are proportional to wages. Since wages and welfare benefits grow at rate z , transfers in period t are $(1 + z)^t b_{i,m}$ and $(1 + z)^t h_{i,m}$. More details are provided in Section 3.3.

The pension system is a version of the new Swedish pension system.⁷ Old age pension benefits are a function of the “pension stock”, a weighted sum of taxable earnings times the pension contributions tax rate τ_p . The stock is indexed by the rate of growth in average earnings, so the law of motion for the pension stock is, for workers, $E_{t+1} = (1 + z)E_t + \tau_p W_t e_{i,m}$, where $W_t e_{i,m}$ is the individual’s earnings in year t .⁸ The pension tax rate is $\tau_p = 18.5\%$, and $\frac{2}{18.5}$ of the pension stock is forced saving and can be paid out over the first 5 years after retirement at the earliest. I assume that everyone chooses this option. The regular old-age pension benefit during retirement for an agent with pension stock E_t is E_t/D_{65} , where D_{65} is expected remaining lifetime for a 65 year old person. For convenience, the pension stock is assumed to be indexed by z also after retirement, so the old-age pension is growing at rate z during retirement.

The Swedish pension system contains a set of benefits not directly linked to previous earnings: sickness pension, early retirement pension, widow/widower benefits, child pensions, handicap-pension, and pension housing support. These transfers are assumed to grow at rate z and are modelled as age dependent lump sum transfers to non-participants. Finally, the pension system guarantees a minimum pension benefit indexed to average wage growth. This level was 67400 SEK in 1992.

2.4 Individual consumption

In order to calculate consumption tax revenues, it is necessary to predict consumption for each agent. To simplify the analysis, I assume that agents have no bequest motives and can hedge mortality risk on perfect annuities markets. In this case there are no bequests, and agents consume all of their lifetime income before death. Newly arrived immigrants and newborn agents are assumed to have zero wealth.

Preferences over consumption are assumed to be of the constant relative risk aversion class. Since the interest rate and tax rates are constant, and wages and transfers grow-

⁷For simplicity, I assume that the new system is implemented immediately. This lowers the pension benefits for people born before 1953, which might lead to underestimating the tax τ_e required to sustain current fiscal policy. However, the Swedish pension reform set aside a large fund earmarked for financing this part of the transition, which I have excluded when measuring the Swedish government debt.

⁸The planned Swedish system will also give “accumulated wage” for child rearing, care for sick relatives etc. I have abstracted from this because even average native women participating in the labor force fall under the guaranteed minimum pension benefits after the first five years of retirement, so the marginal effect on wages for e.g. child rearing would be very small for most individuals.

ing at a constant rate z , utility maximization yields age-dependent but time-invariant propensities to consume out of lifetime wealth, defined as discounted after-tax earnings and transfers. Denote these propensities as $\{\xi_{i,m}\}_{i=1}^{100}$. Instead of modelling the consumption-savings choice explicitly, I simply estimate $\{\xi_{i,m}\}_{i=1}^{100}$ from the average cross-sectional consumption profile in Sweden in 1990. The consumption of an agent of type i, m is then given by

$$c_{i,m} = \frac{\xi_{i,m}}{(1 + \tau_c)} \sum_{i=1}^{100} \pi_{i,m} R^{-i} (1 + z)^i \{(1 - \tau_e)(1 - \tau_p) (W_0 + h_{i,m}) e_{i,m} + b_{i,m}\},$$

where R is the gross interest rate and $\pi_{i,m}$ is the unconditional probability of surviving until age i . The summation defines lifetime wealth and, due to the annuity markets, this is computed by taking the expectations over longevity. For an agent immigrating at age I , the summation starts at $i = I$, and the survival rates are adjusted accordingly.

It should be clear that lifetime wealth for each type of agents entering the economy grows at rate z , and that consumption inherits the same property, i.e. $c_{i,m,t} = (1 + z)c_{i,m,t+1}$. The resulting distribution of financial assets is referred to as the steady-state distribution. For agents alive at time $t = 0$, however, financial wealth at time $t = 0$ and previous work history might imply a different lifetime wealth. To simplify matters, I assume that the distribution of asset holdings and pension stocks at time $t = 0$ coincide with the steady-state distributions.

2.5 Government budget

In order for the fiscal policy to be sustainable, the government's intertemporal budget constraint must be satisfied:

$$B_0 = \sum_{t=0}^{\infty} R^{-t} (T_t - G_t - P_t), \quad (2)$$

where B_0 is initial government debt, G_t is government consumption in period t , T_t is total tax revenues, and P_t is aggregate transfers. This is the only "equilibrium" restriction of the model.

The current Swedish fiscal policy has $\tau_e = 30\%$, which turns out to violate the solvency requirement (2). In order to make the fiscal policy sustainable, one can either increase

taxes or lower spending. I have chosen to take spending as exogenous and increase taxes until the long run budget is balanced. In the experiments, I keep all tax rates constant except the tax on earnings, τ_e . The government gain of admitting new immigrants is not very sensitive to which of the taxes that are subject to change. Since immigrants to Sweden generally have lower employment rates than natives, it represents a slight negative bias for government benefits of immigrants.

2.6 Net present value calculations

Let $s_{i,m,t}$ denote tax payments less transfers and marginal government expenditures for a type i, m agent in period t , given the equilibrium tax τ_e . The expected present value of future tax payments less government expenditures for a type m agent of age I at time t is then

$$\sum_{i=I}^{100} \frac{\pi_{i,m}}{\pi_{I,m}} R^{I-i} s_{i,m,t+i-I}. \quad (3)$$

This figure does not include the cost of potential children. To compute the net gain to government of getting one extra agent of type m and age i at time $t = 0$, one must also incorporate the net government gain of the children the agent will give birth to.

Let $\text{NPV}(0, N)$ denote the net gain of a newborn child in the initial period, where N denotes natives. This gain must be growing at rate z , and since the net gain includes contributions of the agent's future children, grandchildren etc., it is given by

$$\text{NPV}(0, N) = \sum_{i=0}^{100} \pi_{i,N} R^{-i} \left(s_{i,N,i} + \phi_{i,N} (1+z)^i \text{NPV}(0, N) \right), \quad (4)$$

where $\phi_{i,N}$ denotes the annual fertility for an i years old native woman. Equation (4) yields $\text{NPV}(0, N) = \sum_{i=0}^{100} \pi_{i,N} R^{-i} s_{i,N,i} / (1 - \sum_{i=0}^{100} \pi_{i,N} \phi_{i,N} R^{-i} (1+z)^i)$.⁹

The expected discounted net government gain of getting one extra agent of type m of age I can now be calculated. Recall that, by assumption, children of immigrants are

⁹The condition $R > 1 + z + n$, where n is the long-run population growth rate, rules out rational Ponzi schemes and is sufficient to guarantee that $\sum_{i=0}^{100} \pi_{i,N} \phi_{i,N} R^{-i} (1+z)^i < 1$.

identical to natives, so $\text{NPV}(I, m)$ is given by

$$\text{NPV}(I, m) = \sum_{i=I}^{100} \frac{\pi_{i,m}}{\pi_{I,m}} R^{I-i} \left(s_{i,m,t+i-I} + \phi_{i,m} (1+z)^{i-I} \text{NPV}(0, N) \right). \quad (5)$$

3 Parameterization of the model

3.1 Population

Fertility and mortality for Swedish natives are fixed at 1992 levels. In lack of good measurements, I assume that immigrants and natives have the same fertility and mortality rates. The results are not very sensitive to this assumption.

The current paper computes the net government gain of admitting one additional immigrant. This marginal change has no aggregate effect and the experiment is independent of the regular immigration policy. The current immigration policy is assumed to be sustained, which implies a long run population growth rate of 0.91%. I use the Swedish population in 1992 as a starting point for the population process.

3.2 Earnings, unemployment and participation

Labor force age is 17-64, and all agents in the labor force are assumed to retire at age 65. Earnings, participation, unemployment, and work leave for future immigrants are imputed assuming that they will be exactly equal to current immigrants, conditional on country of origin, gender, age and number of years since immigration. This approach abstracts from cohort effects in immigrants' earnings (see Borjas, 1994, for a good account of cohort effects). The cross-sectional data underlying Ekberg (1995) are used to estimate annual earnings for natives and every immigrant group described in the Appendix, conditional on age and gender. The earnings profile during the first 11 years for a new immigrant is estimated from the group that came to Sweden during 1980-1991. The profile for his/her next 10 years is estimated using data from the group that came during 1970-79, etc. Annual growth rate in wages is set to $z = 1.5\%$, the OECD average growth rate in wages since 1970.

Participation rates and unemployment rates are taken from the survey “Arbetskraftsundersökelsen” (henceforth “AKU”) from January to June 1995. See the Appendix for further details. The estimated rates of open unemployment are 6.8% and 4.7% for native men and women, and 12.5% and 8.3% for immigrant men and women, respectively. Participation rates are 83.7% and 79.5% for native men and women, and 70.1% and 61.5% for immigrant men and women, respectively. Note that participation and unemployment rates are implicitly assumed to be similar for every immigrant group, since the AKU data set does not identify national origin.

3.3 Government transfers

I now specify the work-related transfers. According to the National Social Insurance Board (1995), parents get on average 500 days of paid parental leave for every newborn kid, and 89% of the parental leave is used by the mother. The compensation is set to 90% of labor earnings for the first 410 days and 60 SEK per day for the last 90. This is recorded as a transfer to parents. I assume that fathers are on average 2 years older than mothers.

Expected sick leave (conditional on age and gender) for natives is estimated as expected length of sick leave times the expected number of leaves. Immigrants and natives are assumed to have the same rates of age- and gender-specific sick leave. Compensation rates are as of 1995. A similar approach is followed for rehabilitation compensation. The replacement rate for unemployment benefits is set to 75%.

The data underlying Ekberg (1995) identify welfare payments $b_{i,m}$ for natives and every immigrant group in 1991. To this, I add child subsidies and student subsidies, as well as the part of pension benefits not directly income dependent, described in Section 2.3.

3.4 Taxes and government consumption

Employer tax is 38% of the annual labor compensation paid by the employer. Labor compensation is estimated annual earnings minus parental leave compensation and the part of sickness compensation paid by the government. Consumption tax τ_c is set to 27%. The tax rate on labor income sustaining fiscal policy is $\underline{\tau}_e = 37\%$ (in the first income bracket). Initial government debt is 95% of GNP and the real interest rate is set

to 3.5%.¹⁰

Government consumption conditional on age and gender, $g_{i,m}$, are taken from Ekberg (1995). It is difficult to allocate some government “fixed” costs, such as defense spending and infrastructure, to particular age groups, and it is not obvious how new immigrants influence this class of expenditures. Following Borjas (1994) and Gustafsson and Larsson (1997), I assume that these costs increase proportionally when an additional immigrants enter the country. In Section 4.4 I show that the results are quite sensitive to this assumption.

4 Results

4.1 Baseline results

Figure 1 shows the age-profile of $s_{i,m,1995}$ for natives and average immigrants who immigrate at age 1. During their working years (21-64) both natives and immigrants bring surplus to government coffers, albeit immigrants contribute less than natives, due to lower wages, lower labor force participation, and higher welfare payments. Not surprisingly, both immigrants and natives are net burdens when young (1-20) and when old (65+). Natives represent a slightly bigger burden than immigrants during retirement since natives earn more during their working life and therefore receive a larger pension than immigrants.

I proceed to compute discounted net government gain of Swedish newborn and new immigrants. The expected net gain of a Swedish newborn baby is -46,000 SEK. How can fiscal policy be sustainable if the net gain of a newborn is negative? The explanation is that even though the newborn children represent a net cost, the adult population alive in the initial period represent a positive gain, large enough to pay for the future children as well as service the initial debt. For example, the NPV of remaining annual

¹⁰In comparison, the implicit pension debt amounts to 250% of GDP. Following Storesletten, Telmer and Yaron (1999), this figure is computed as the present value of future pension liabilities, assuming no further contributions are made and that those who have contributed to the pension system during a fraction x of their working life will receive a fraction x of the pension benefits they would have gotten had they remained in the system.

contributions for a 25 years old native ($\{s_{i,N}\}_{i=25}^{100}$) is about 1.6 million SEK.¹¹

Figure 2 (middle graph) reports the expected net government gain of admitting an i years old average immigrant to Sweden. These weighted averages of $NPV(i, m, 1995)$ are computed using the same composition of gender and source country as for immigrants during the period 1980-91. The horizontal axis represents age at the time of immigration. The net gain of a Swedish newborn is plotted as an asterisk * on the vertical axis. The upper and lower graphs in Figure 2 represent the NPV of male and female immigrants, respectively. Since the cost of children are attributed to the mother, Figure 2 exaggerates the cost of women relative to men.

According to these measurements, the discounted net government gain of admitting a 20-30 years old immigrant is roughly 200,000 SEK. A back of the envelope calculation suggests that an inflow of 6.2 million 20-30 years old immigrants would represent a net government gain of the same size as the current debt. However, the costs of old and very young immigrants are substantial – up to 1.5 million SEK for a 66 years old immigrant. These findings are due to the fact that the pension system, health care, child care and schooling are very expensive programs. Young immigrants who enter with education from abroad have a large positive effect, even though they fare worse on average than natives in the labor market.

In order to measure the expected net gain of an average immigrant, I weigh the graph in Figure 2 with the age distribution of new immigrants to Sweden. The resulting figure is -175,000 SEK, or a cost of \$20,500.

In a comparable study for the U.S., Lee and Miller (1997) find the average net government gain of new immigrants to be about \$80,000, or more than \$100,000 higher than the figures for Sweden reported here.¹² The main reason for this large discrepancy is that immigrants to the U.S. fare quite well in the labor market, relative to their counterparts in Sweden: the employment rate of immigrants in the U.S. is comparable to natives, while the difference between natives and immigrants in Sweden is large. More-

¹¹Here, taxes are set, from the outset, at a constant level such that fiscal policy is sustainable. However, if future taxes instead were to increase slowly, so that the tax level 30-40 years from now would be substantially higher than $\tau_e = 0.37$, then newborn children would constitute a larger gain, while current adults would contribute less.

¹²Their benchmark discount rate is 4%. With discount rate of 8%, the average gain falls to \$6,000, which is similar to the \$7,400 reported in Storesletten (2000). However, once general equilibrium effects are taken into account, the net effect of an immigrant is negative (Storesletten, 2000).

over, immigrant workers in Sweden earn 37% less than natives, while the comparable figure for U.S. is only 20% (source: Borjas (1990) and AKU data for 1995). These effects are amplified by Sweden having larger government sector, higher tax rates, and more redistribution to non-working individuals.¹³

4.2 Net present value versus cash flow approach

The NPV approach for computing net gain on immigrants differs substantially from the more standard “cash flow” approach, that computes the annual cost of immigrants by simply adding the revenues and deducting the expenditures incurred in one particular calendar year for all immigrants who live in the host country that year. Examples of such studies include Passel (1994), Borjas (1994), Ekberg and Andersson (1995), Gustafsson and Larsson (1997), ECON (1996), and Wadensjö (2000).

It is straightforward to conduct a similar exercise here, with the slight modification that τ_e is lowered from 37% to 30%, in line with current Swedish tax code. This yields an annual cost of about 20,000 SEK per immigrant in 1995. Multiplying this figure with the number of immigrants gives 17 billion SEK, or 1.1% of GNP, which is in line with the cash-flow studies for Sweden (Gustafsson and Larsson, 1997, and Ekberg and Andersson, 1995).

One way to compare the net present value measure with the cash flow measure is to compute the annuity value of the net present value and interpret this as the average loss per year per immigrant. If immigrants stay in Sweden for the rest of their lives and have the same mortality rate as Swedes, the average time until death is 54 years. With a discount rate of 3.5% the 54 year annuity value of 175,000 SEK is 7,250 SEK. Thus, the cash flow measure overestimates the annualized cost of immigrants by a factor of 2.8.

What can account for this discrepancy? Since 2/3 of government expenditures are age dependent, the age structure of immigrants largely determines the net cost in a particular year. Hence, the aggregate surplus/deficit for a group in a given year says little about

¹³One alternative explanation for why the gains are so small in Sweden could be that the process of immigrating and obtaining a work permit in Sweden is rather complicated, at least for immigrants from countries outside the European Economic Space. Given the annual flow of net government gain, one could compute the net gain to government of making the prospective immigrant available to the labor market one year earlier. This amounts to an average public gain of 51,000 SEK per immigrant.

the net public benefit over the whole lifetime for a member of this group. Moreover, large costs in distant future, such as pension benefits and health care for retirees, should be discounted, while costs and revenues in the near future should get more weight. Finally, the cash flow method assumes a too low tax rate since the current fiscal policy in Sweden is not sustainable. If instead fiscal policy were made sustainable (by setting $\tau_e = 37\%$), the 1995 average cost per immigrant is reduced to 14,000 SEK.

4.3 Break-even participation rate

An alternative way of presenting my findings is to compute the break-even rate of employment for new immigrants. The break-even rate $k_{i,M}$ is defined as the participation rate such that the expected net present value for a new immigrant is zero:

$$k_{i,M}s_{i,m,1995} + (1 - k_{i,M})s_{i,m',1995} = 0,$$

where M denotes gender and age at immigration, and, with some abuse of notation, m and m' denote type M immigrants who are participating and non-participating, respectively. The results are displayed in Figure 3. The middle graph shows that the break-even rate for 20-30 years old new immigrants is as low as 61%, while immigrants who immigrate after age 50 would be a net fiscal burden even if they had a 100% participation rate. In comparison, the average participation rates for 21-65 years old persons were, in 1995, 66.4% for immigrants and 82.3% for natives.

4.4 Sensitivity analysis

So far, I have assumed that the government consumption expenditures, $g_{i,m}$, increase proportionally when an additional immigrant enter the country. An alternative extreme assumption would be to treat these expenditures as financing pure public goods, in which case these expenditures should be excluded when computing the net public gain of new immigrants. The results are quite sensitive to this assumption. For example, the average net gain on immigrants increases by about 500,000 SEK when the part of government expenditures that cannot easily be attributed to a particular age group is excluded.

The benchmark results assume perfect assimilation of second-generations immigrants.

However, the public press has often claimed the opposite, namely that recent immigrants assimilate quite poorly. In order to evaluate how sensitive the results are to the baseline assumption, I recalculate the net public gain under an alternative extreme assumption, namely that there is no intergenerational assimilation at all, i.e. that immigrant descendants are identical to their parents. This amounts to recalculating equation (5) with $NPV(0, m)$ replacing $NPV(0, N)$ on the right-hand side. The implications are dramatic. First, the present value of a newborn child falls by 700,000 SEK. Second, the NPV profile for immigrants falls significantly for age 1-35, relative to the profile in Figure 2. Consequently, the discounted average cost of an additional immigrant increases by 300,000 SEK, so the net government gain is -480,000 SEK.

Labor market conditions for new immigrants to Sweden have been difficult during the last decade, especially for refugees. In 1993 refugees of age 20-64 who had been in Sweden 2-4 years had average employment rates of 25.2% and 22.2% for men and women respectively. As an absolutely worst case, I include a scenario where the employment rate of new immigrants is as low as for recent refugees in Sweden. Also, the employment rate for immigrants is assumed not to improve with spending more time in the country. In this case, the average NPV of each new immigrant is -690,000 SEK. Indeed, the results are very sensitive to the participation rate of immigrants: a 1% point increase in participation rate raises the average NPV by more than 26,500 SEK.

The previous analysis assumes zero return migration. This is a convenient assumption, since little is known about those who return-migrate. To investigate how sensitive the results are to the baseline assumption, I compute the NPV graph when 25% of the new immigrants leave Sweden at age 65. I assume that those who leave do not collect any pension benefits after departure. Under this scenario, the net gain increases by about 200,000 SEK for all ages until retirement, and the weighted average gain of new immigrants increases to +69,000 SEK.

Lowering the growth rate to 0% annually decreases the net benefit of an average immigrant to -191,000 SEK. A real interest rate of 3.5% may be too low. If the interest rate is increased to 5%, the NPV of an average immigrant falls by 14,000 SEK to -189,000 SEK.

5 Conclusion

This paper computes the discounted government “gain” on immigrants by the use of a simple net present value calculation, taking into account the Swedish tax system and detailed government expenditures. The baseline model predicts large possible gains from immigration, over 0.2 million SEK per immigrant if the immigrant is between 20 and 30. For immigrants older than 50, the net cost is substantial, about 1.1 million SEK per immigrant on average. On average, the net government loss per new immigrant is 175,000 SEK, or \$20,500. The net gain is sensitive to conditions in the labor market, in particular to the employment rate of immigrants and the degree of assimilation of second-generation immigrants. The conclusion also hinges on the assumption that government consumption is proportional to the population.

These results suggest that immigrants to a typical welfare state such as Sweden impose, on average, a substantial fiscal burden, and are less beneficial for public coffers than immigrants to the U.S. While these results tend to mitigate the scope for resolving the fiscal strains associated with the ageing of the baby boom in European welfare states, it is important to stress that *young* immigrants still represent a large net gain. Thus, if immigration policy were to be exploited so as to alleviate fiscal problems, such policy should target 20-30 years old immigrants.

While young immigrants represent a positive gain, their net contribution is dwarfed by that of young natives, due to natives outperforming immigrants in the labor market. One natural question to ask, then, is whether increased native fertility could serve as an alternative to immigration and as a remedy for the future fiscal strain associated with an ageing population. I find the answer to be “no”, since newborn children actually represent a net liability, albeit small (see Section 4). This conclusion would change if future generations are to carry the main burden of the ageing population (i.e., if fiscal reform is delayed 20-40 years). However, the net effects on public coffers of increasing fertility are likely to be small.

6 Data Appendix

In addition to standard public data sources, National Social Insurance Board (1995) and Statistics Sweden (1995), I use data from “Arbetskraftsundersökelsen” on labor force participation, unemployment and leave of absence (due to sickness, child care, etc.). The sample consists of 52,000 natives and 6,000 immigrants of age 16-64 for the years 1990-1995. This source contains data on gender and age, but not on national origin or age at the time of immigration.

In order to impute earnings and welfare payments for immigrants of various nationalities, I use the tables underlying Ekberg (1995). All immigrants residing in Sweden in 1991 are included in these data, which identify annual earnings and welfare payments. Earnings are reported conditional on age, gender, national origin and time of immigration. The immigration periods are reported in the following brackets: 1980-91, 1970-79 and before 1969. The areas of origin are Finland, other Nordic countries, other West-European countries, Greece, other South-European countries, Poland, Czechoslovakia, Yugoslavia, other Eastern European countries, Middle East, Asia, Africa and Latin America.

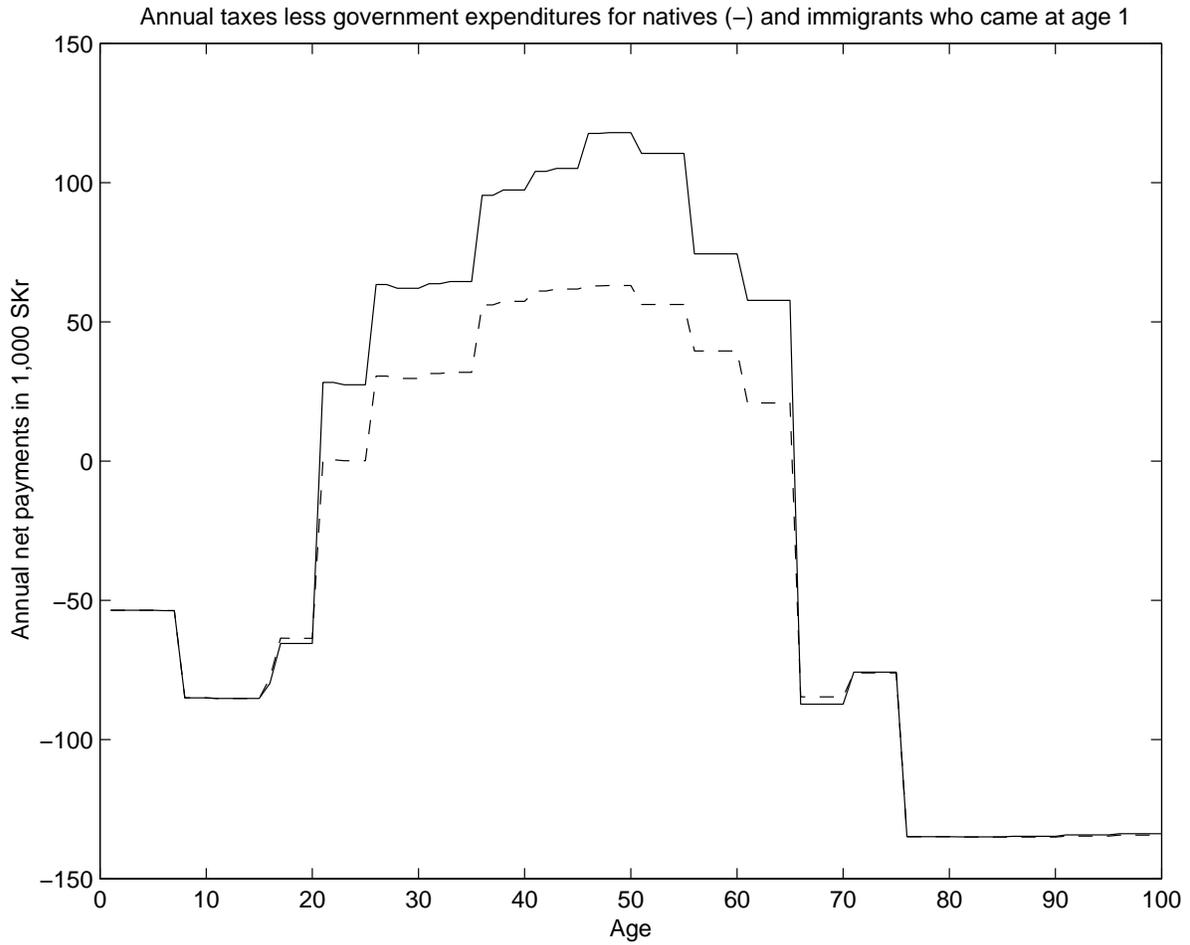
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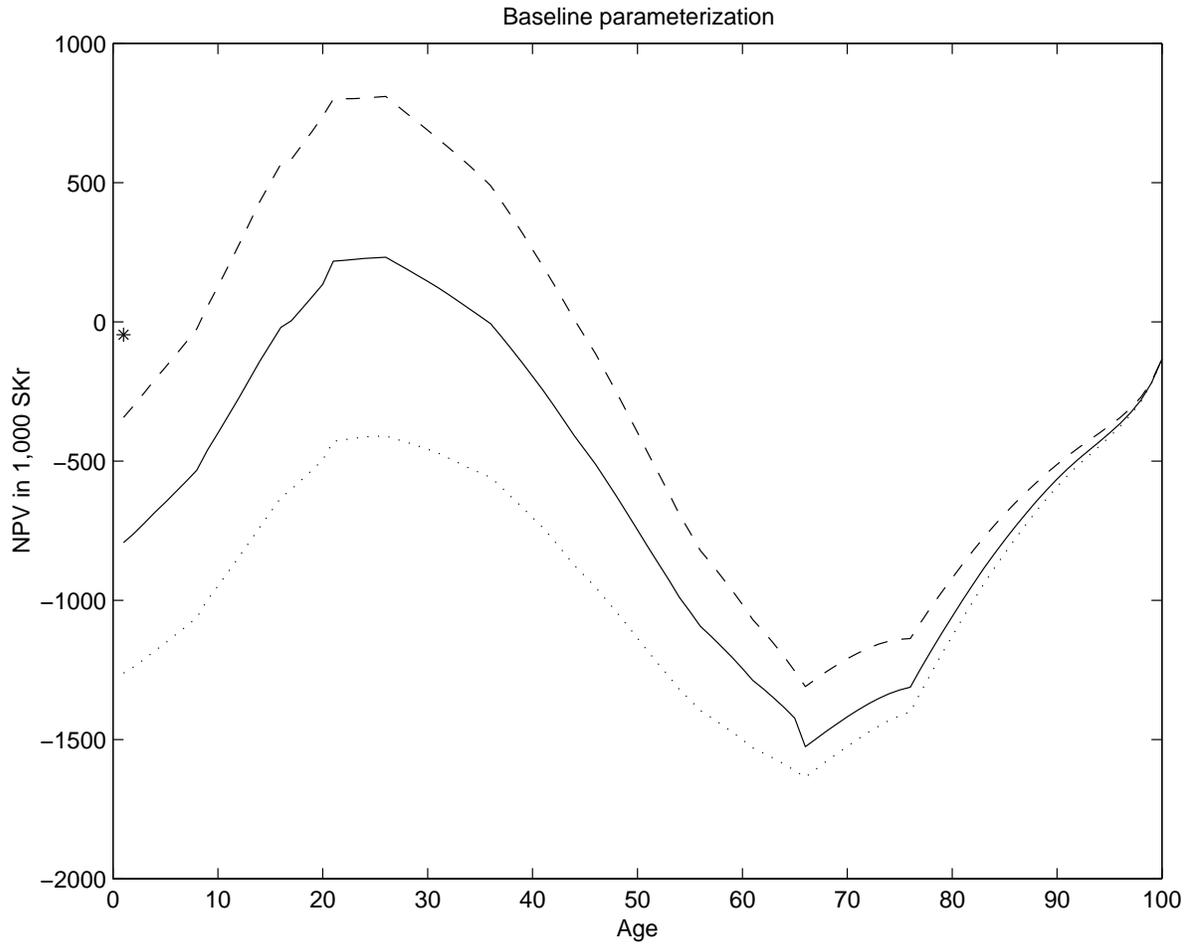
Figure 1

Age-profiles of net government contribution



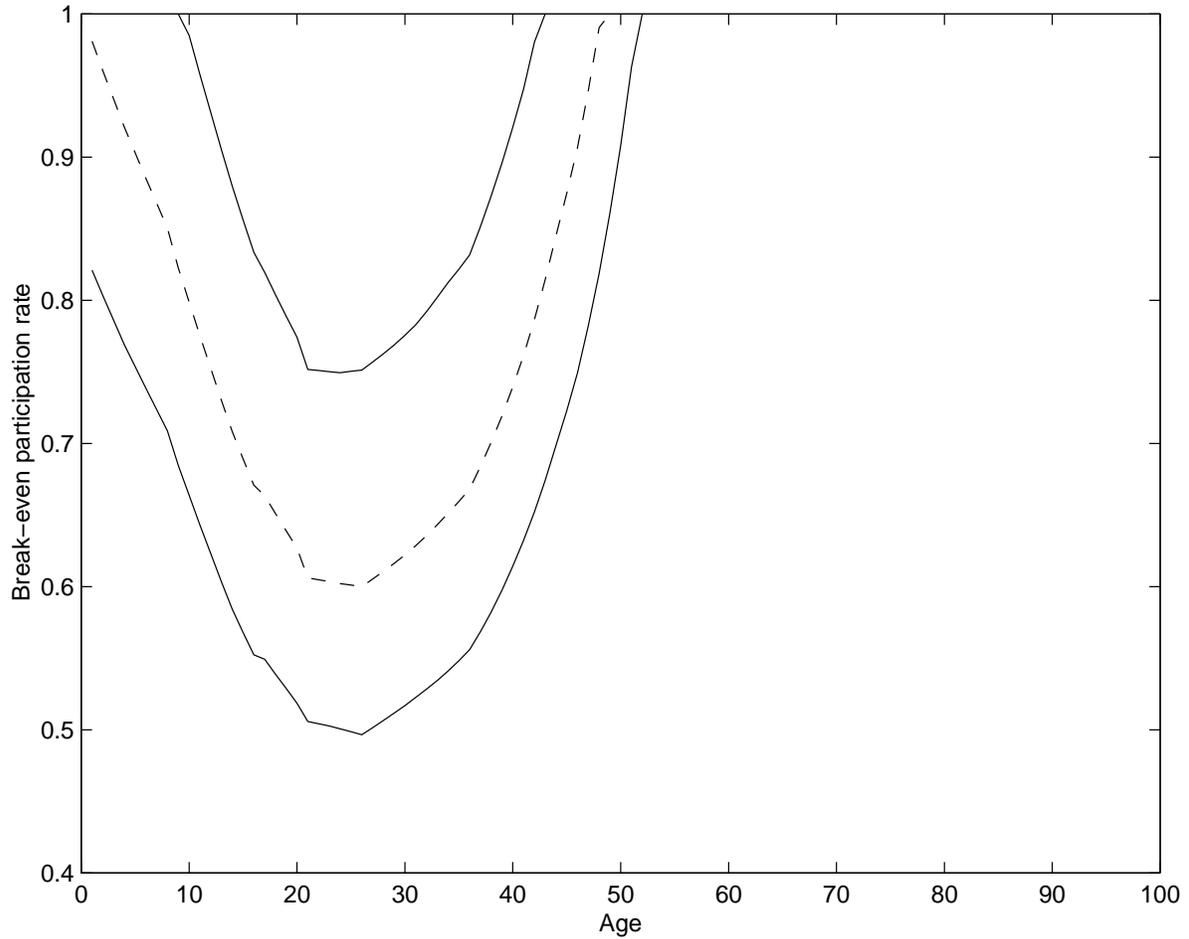
Age-profiles of annual tax payments less government expenditures for a Swedish native (-) and an immigrant who came as a child (- -).

Figure 2
 Net government gain - benchmark case



Middle graph (-) shows the government gain, in net present value terms, of admitting immigrants who come when 1, 2, ..., 100 years old under the baseline parameterization. The upper (dashed) and lower (dotted) graphs represent government gain in NPV terms for immigrant males and females, respectively.

Figure 3
Break even participation rates



The middle graph (- -) represents the break-even rate of participation for immigrants who come when 1, 2, ..., 100 years old. A break-even rate equal to one means that the net present value cannot be zero for any participation rate. The upper and lower graphs are break-even rates for female and male immigrants, respectively.