SOPEMI

TRENDS
IN
INTERNATIONAL
MIGRATION

Continuous Reporting System on Migration

ANNUAL REPORT 1996

1997 EDITION

ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT

IMMIGRATION AND SOCIAL TRANSFERS:
ANALYTICAL ISSUES AND RECENT RESULTS*

Introduction

One of the most controversial issues in the debate on migration policy concerns the impact of immigrants on social protection systems in OECD countries. Some argue that immigration places a serious burden on social protection systems since the existence of these systems is a factor enticing immigrants to take advantage of them. Others argue, however, that immigrants, far from being a burden on such systems, are indeed net contributors to them, thereby easing the financial burden on national tax payers.

Attempting to calculate the net impact of immigration on social transfers in any country with precision is a very complicated task. This report does not seek to provide a definitive answer on this topic. Instead, it has a more modest aim. On the basis of a review of the existing empirical literature and some elementary modelling, this report will discuss the key analytical issues involved in calculating the impact of immigration on net social transfers. In this regard there is a focus on the methods used in calculations at the national, rather than the local or regional level and also a focus on those studies which take into account the effect of immigration on tax revenue as well as expenditure on social benefits.

The report is divided into four sections: Section I examines the main elements to be considered when evaluating the effects of immigration on social transfers. This is followed by a review of some recent empirical studies carried out on immigration and social transfers for the United States, Canada and Australia. Section III investigates the relationship between immigration and intergenerational transfers of taxes and benefits. The final section provides a brief conclusion and discusses the limitations of current studies with the aim of highlighting some of the avenues that need to be explored in the future.

1. Measuring the impact of immigration on social transfers

The most straightforward method of measuring the impact of immigration on net social transfers is to perform an accounting exercise in which, for a given period of time, tax payments and social transfers are calculated for immigrants. The resulting balance indicates the extent to which those contributions to the transfer system covered by the accounting exercise exceed, or are lower than, the value of government expenditures covered by the calculations. It is common to present similar calculations for non-immigrants to provide a point of comparison.

There are three general criticisms of the accounting approach. First, in practice, the accounting period is often relatively short and this ''snapshot'' of the current stock of immigrants can be misleading. If the characteristics of the immigrant population remain stable over time, then the results will remain valid for other time periods. However if, for example, there is ageing in the population of immigrants, the snapshot is no longer representative for other time periods, hence diluting the significance of the result. An alternative approach is to project the accounts based on known trends in key characteristics of the immigrant population, such as its demographic structure.

Second, an accounting exercise of the sort described above does not include the effects immigrants may have on wages, prices and aggregate output and the consequent effects on the taxes and benefits for both immigrants and nationals. For example, if immigrants are of working age, they can be expected to contribute to

---

the increase of employment and aggregate output. However, the increase in labour supply may also serve to affect real and relative wages and may do so in complex ways depending on the skill mix of the immigrant workers. In order to deal comprehensively with these issues, a general equilibrium approach should be used which takes full account of the effects immigrants have on labour and capital markets in the economy. However, some accounting exercises try to take partial account of market effects by, for example, estimating the fiscal effects of falling wages or by assuming that the arrival of immigrants, to a certain extent, displaces native workers from jobs.

Finally, the straightforward accounting approach does not consider how the benefits, or costs, of immigration may be distributed amongst the native population. For example, under certain assumptions, immigration may allow reduced taxation to the working generation, increased education to the younger generation or increased pensions to the older generation. These, and other intergenerational issues are discussed in Section III.

As the accounting approach forms the basis of the majority of empirical studies reviewed below it is worth discussing some of the issues involved in more detail.

Estimation techniques in the accounting approach

Estimates based on the accounting approach use two methods. The first makes use of available data (whether in the form of surveys, censuses or administrative records) which give direct estimates of taxes paid by immigrants and transfer payments received by them. The second method relies upon inferential techniques. For example, an estimate of the average benefit amount for all recipients may be combined with an estimate of the proportion of immigrants who receive the benefit. If the information can be disaggregated into socio-economic groups or age groups, then more accurate estimates can be made.

One problem of the inferential approach is that the socio-economic variables may not capture some of the special conditions that apply to migrants in terms of benefits or taxes. For example, entitlement to some benefits may be limited due to length of stay in the country. Or, restrictions may relate to the foreigner's status; for example the entitlement and tax position of illegal immigrants is usually quite different from that of legal immigrants or nationals. Immigrants may also have access to certain types of social assistance targeted specifically to them which, if not accounted for, will underestimate the amount of benefits immigrants receive.

In addition, there may be different behaviour between nationals and immigrants with regard to use of the benefit system and the payment of taxes. A body of literature has developed in the United States which tries to explain differences between immigrants and non-immigrants in the use of welfare programmes. This is, in part, a response to observations that welfare participation by immigrants in the United States has increased in absolute terms and relative to non-immigrants (Borjas, 1994). One finding is that, once socio-economic factors are taken into account, migrants use the system less and take smaller amounts from it than nationals (Blau, 1984). There also appears to be a period of assimilation into the use of welfare (Borjas, 1994) which further points to the dangers of using population-wide estimates of participation in welfare programmes in calculating the amount of benefits received by the immigrant population.

Factors influencing the results of the accounting approach

A small number of factors are likely to influence significantly the results of empirical studies based on the accounting approach. One such factor is the demographic structure of the immigrant population. For example, if the migrant population is over-represented in the working-age cohorts, a net positive contribution to the social transfer system will typically result. The presence of a large number of children will attenuate this result to the extent that the social protection system provides for family-related transfers and if the costs incurred by the educational system are taken into account.

A second important factor is the relative position immigrants occupy in the income distribution. The more concentrated the immigrant population is in lower income strata, the more likely they are to be net beneficiaries rather than net contributors to social transfers. This will also relate to the extent of re-distribution in the social transfer system itself. Some systems are, in a general sense, more heavily weighted toward relating an individual's benefits to the amount they have contributed and hence tend to be less re-distributive when compared with social protection systems where there is less of a link between contributions and benefits. In systems where contributions are proportional to wages, a greater burden is placed on unskilled labour, whereas a tax-based scheme tends to penalise those with high incomes – an important point to remember when studying net transfers by country. The existence of progressive contribution schemes also means that to obtain an accurate accounting of transfers, average income data for nationals and foreigners are not sufficient; income distributions are necessary.

Finally, aspects of the redistribution system are related to population structure, as family-related transfers are often means-tested, family policy being, in fact, a common means of vertical redistribution (by income level) as well as horizontal (by size of family).

These preliminary remarks illustrate that the impact of immigrants on the social transfer system is difficult to assess, even using a basic accounting approach. This, combined with the fact that available data are often from a variety of sources and do not cover all of the required inputs to the calculation, has resulted in a wide range of empirical estimates and considerable debate about the methods used.

2. Immigration and social transfers in the United States, Canada and Australia

This section reviews empirical studies on immigration and social transfers in the United States, Canada and Australia which examine the issue of whether immigrants generate a net fiscal surplus, or are a net fiscal burden with regard to social transfers. Hence the focus is placed on studies which evaluate both benefits and taxes.

Immigration and social transfers: United States studies

A survey of the literature by Rothman and Espenshade (1992) provides a useful entry point to the debate on the cost of immigration to social transfer systems in the United States. Table III.1 presents a summary of studies covered in their review. The table illustrates that widespread interest in the United States in this topic began in the mid-1980s. In addition, the following points emerge:

- All of the studies use the accounting approach described above. As discussed later in this text, Simon's (1984) study is unique in that it takes a longitudinal, rather than a cross-sectional approach. Also, all of the studies, in some way, take account of special conditions that apply to immigrants' entitlement to benefits or behaviour towards the benefit system (as discussed above), pointing to the importance of including such elements in the calculation.
- Economic impacts are not generally considered. For example, none of the studies in Table III.1 use a general equilibrium framework to evaluate the impact of immigrants on social transfers. However, some studies do try to take partial account of economic effects, for example, by making assumptions about the degree to which immigrants displace non-immigrant workers from jobs.
- Whilst a wide range of results emerge from the studies (see Table III.1, last column), it is interesting to note that it is only state and local studies which conclude that migrants are net beneficiaries of the social transfer system (however, this conclusion only applies to four of the twelve studies listed). With the exception of Simon (1984), the national studies are far less conclusive as to the overall result of their evidence.
- The majority of studies surveyed in Table III.1 examine benefits only (Blau, 1984; Tienda and Jensen, 1986; Heer, 1990; Borjas and Trejo, 1991), or limit attention to illegal immigrants (North and Houstoun, 1976). Only one study, Simon (1984), generates a national estimate which is based on the whole migrant population and takes into account both taxes and benefits.

In more recent years, interest in generating national results which take full account of both taxes and benefits has increased, with calculations by Huddle (1993), Passel (1994) and Borjas (1994). Detailed discussion of these, as well as Simon's (1984) study, are presented below. In addition, by way of example, a recent study based on local evidence by Clark and Passel (1993) is also discussed.

National estimates

Using the Survey on Income and Education (Bureau of the Census, 1976), Simon (1984) evaluates government expenditure and taxation for the immigrant households in 1975 for the whole of the US. The immigrant population is defined as being those born overseas and Simon calculates the per household taxes paid and benefits received for a series of migrant cohorts based on their date of arrival. Hence, assuming migrant cohorts to have been reasonably homogenous, a life-cycle interpretation can be placed on the results: progressively earlier dates of arrival representing progressively more advanced stages in the life-cycle. In his analysis, Simon compares the cohorts with estimates for all native-born households in the sample.

A range of government transfer systems are included in the calculations, including those covering schooling, unemployment benefits, social security (pensions), medical services and public welfare. Income tax paid is calculated as a uniform proportion of total family earnings.

The results of this exercise are summed up in Table III.2, which are based on a more comprehensive version of the results presented in Simon (1996). A number of observations can be made: First, the pattern of benefits and

Table III.1. **A summary of US studies**[1]

Author(s)	Geographical coverage	Population studied	Factors included				Source and mode of assessment	Results[2]
			Benefits only or balance	Account for entitlement or behaviour differences with regard to benefits	Longitudinal aspects	Economic impacts		
North and Houstoun (1976)	National	Illegal aliens, 1975	Balance (via participation rate only)	Yes	No	No	Special survey	+/0
Simon (1984)	National	All foreign born, 1976	Balance	Yes	Yes	No	SIE,[3] direct measurement of benefits, estimate of contributions	+
Blau (1984)	National	Immigrant families, 1976	Benefits only	Yes	No	No	SIE[3]	?
Tienda and Jensen (1986)	National	Immigrant households, 1980	Benefits only	Yes	No	No	Census	?
Borjas and Trejo (1991)	National	Native and immigrant households, 1970 and 1980	Benefits only	Yes	No	No	Census	?
Heer (1990)	National	Families of foreign origin, Los Angeles, 1980	Benefits (via participation rate only)	Yes	No	No	Special survey	?
Weintraub and Cardenas (1984)	State	Undocumented aliens, Texas, 1982	Balance	Yes	No	No	Special survey	+
Muller and Espenshade (1985)	State	Households headed by Mexican immigrant, 1980	Balance	Yes	No	No	Census and local sources	–
McCarthy and Valdez (1986)	State	Mexican immigrants in California, 1982	Balance	Yes	No	No	Census and local sources	–/0
Collins (1991)	State	Immigrant households, New Jersey, 1980	Balance	Yes	No	No	Census and local sources	+
Office for Refugees and Immigrants (1990)	State	Foreign residents, Massachusetts, 1987	Balance	Yes	No	No	Census and local sources	?
Community Research Associates (1980)	Local	Undocumented workers and their families, San Diego, 1980	Benefits (estimate of incomplete contributions)	Yes	No	No	Various local sources	–(?)
Muller and Espenshade (1985)	Local	Households headed by Mexican immigrant, 1980	Balance	Yes	No	No	Various local sources	–
South. California Association of Governments (1984)	Local	Immigrants in 6 counties, South California, 1980	Balance	Yes	No	No	Previous studies and local sources	?
Los Angeles County (1991)	Local	Undocumented aliens, Los Angeles, 1990-1991	Balance	Yes	No	No	Previous studies and local sources	–
Bogen (1987)	Local	New York City immigrants, 1980	Contributions relative to expenditures and income	Yes	No	No	Census and local sources	?
Collins (1991)	Local	Foreign-born, New Jersey, 1980	Balance	Yes	No	No	Census and local sources	–

1.   Recent studies are discussed in detail in the text.
2.   ''+'': migrants are net contributors; ''–'': migrants are net beneficiaries; 0: neutral; ?: indeterminate.
3.   ''Survey of Income and Education'', Bureau of the Census, 1976.
Source: Based on Rothman and Espenshade (1992, Table 19).

Table III.2.   **Taxes and transfers per household in the United States in 1975**[1]

	Transfers				Income tax	Taxes less transfers	Excess over native-born	
	Schooling a	Social Security b	Other c	Total $d(= a + b + c)$	e	$f(= e - d)$	Without adjustment for public goods $g(= f - 922)$	With adjustment for public goods[2]
Year of entry of immigrants								
1970-74	831	24	539	1 394	3 048	1 654	732	1 372
1965-69	1 068	152	721	1 941	3 552	1 611	689	1 329
1960-64	1 237	326	684	2 247	4 064	1 817	895	1 535
1950-59	1 237	424	631	2 292	3 927	1 635	713	1 353
1920-49	–	2 229	358	2 587	2 245	–342	–1 264	–624
Before 1920	–	3 090	369	3 459	633	–2 826	–3 748	–3 108
Native-born	859	735	685	2 279	3 201	922	0	0

1.   All data are in 1975 US dollars. Simon (1996) includes data for earlier cohorts which were not included in Simon (1984). Calculations are based on the 1976 Survey of Income and Education. The data for 1970-74 have been calculated by taking a weighted average of annual results in Simon (1996).
2.   Adjustment for public goods is based on the assumption that 20 per cent of taxation is paid towards public goods and that the immigrant's contribution can be considered as surplus above the funding required for the provision of these goods. As a result, the excess over the native born shown in column g is increased by the equivalent of 20 per cent of native-born income tax ($640).
Source: Simon (1984 and 1996).

taxes across cohorts conforms to what one would expect, assuming that they represent increasingly older age-groups as the vintage of the cohorts increases. Benefits more or less rise over time and tax payments first increase for recent cohorts and then begin to decrease for the earliest cohorts, reflecting the usual pattern of benefits and income tax from younger to older age groups.

Second, benefits received by immigrants per household only begin to surpass the average for native-born households for cohorts of immigrants who arrived before 1960 (column *d*). The lower benefits amongst immigrant households in the recent cohorts are almost entirely due to lower social security payments (column *b*). Income tax paid is greater for all cohorts compared with the native-born, except for those who arrived in the 1970s and those who arrived before 1950, once again a reflection of the life-cycle pattern of earnings (column *e*).

Finally, overall, there is a surplus of taxes paid over benefits for all cohorts of immigrants who arrived after 1950 (column *f*), and furthermore, this surplus is always greater than that for the native-born (column *g*). A similar estimate is made in column *h* which includes a crude adjustment for the additional benefit derived from immigrants contributing to the financing of pure public goods. This calculation is based on an estimate that 20 per cent of income tax revenue goes towards the financing of pure public goods. This implies that only 80 per cent of income tax can be ascribed to social transfers for both immigrants and non-immigrants. However, the contribution to pure public goods made by immigrants can be seen as an additional benefit to the native-born as this is surplus to the amount required to fund these goods. The net effect of these adjustments is to increase the excess over the native-born shown in column *g* by an amount equal to 20 per cent of the income tax of the native-born.

A number of minor criticisms have been made of Simons estimates, for instance, the way migrants of different origins are grouped together and the use of a uniform average taxation rate to calculate contributions of foreigners and nationals alike. However, the major criticism is that in his initial presentation of the results, only data for those cohorts who arrived after 1950 were shown, giving a more favourable perspective on the fiscal position of immigrants as a whole. In response, in Simon (1996), he re-emphasises that the older age groups were purposefully omitted from the original analysis. His argument is that the low tax income and large social benefit payments for older cohorts can be viewed as being offset by the net contributions made by the children of these immigrants. As he is unable to include such second-generation effects in his calculations, he considers it reasonable not to place much emphasis on the net cost of the older cohorts of immigrants. However, it can be argued that similar complexities arise for the native-born and the fact remains that Simon bases his conclusion on the comparison of an immigrant population which excludes a large number of pensioners to a native-born population which includes all pensioners.

The study by Simon is unique amongst US studies in its evaluation of the pattern of average household taxes and transfers over the life-cycle of the immigrant population. Other national assessments typically calculate the gross fiscal balance for all immigrants and do not evaluate the fiscal position of different cohorts.

In this regard, Huddle (1993) estimates the fiscal impact of immigrants for the year 1992. His estimates cover legal immigrants who arrived since 1970, illegal immigrants, and immigrants included under the 1986 legalisation programme. In calculating the value of transfers to immigrants, the government costs per beneficiary are taken from a special survey of recent and ''undocumented'' migrants by the Los Angeles County Internal Service Division (the so-called ISD survey). These are then applied to estimated proportions of beneficiaries within the population of immigrants. Account is taken of the more limited access to benefits by illegal immigrants and those included in the legalisation programme. Taxes are based on application of income tax rates to the estimated income of immigrants between 1980 and 1990. In addition, Huddle assumes that immigrants displace 2 million non-immigrants in the labour market, creating additional welfare costs for the native population which are added to the fiscal costs of the immigrant population. Overall, it is estimated that immigrants impose a net cost to social transfers of 43 billion dollars.

Huddle also makes a number of projections of the future fiscal impact of immigrants. According to one scenario, if immigration flows remain constant at 810 000 for legal entries and 300 000 for illegal entries, the annual net fiscal cost of immigrants could be 50 billion dollars per year between 1993 and 2002.

Huddle's results have been heavily criticised by Passel (1994) for overestimating the fiscal cost of immigrants. First, the estimates of per capita benefits from the ISD survey are considered to be rather high and Huddle's estimate of the proportion of immigrants who receive benefit is also argued to be too high. Second, it is argued that Huddle should have used estimates of immigrant incomes for 1970 to 1990, rather than 1980 to 1990, which would have included a greater proportion of high-income earners due to life-cycle effects. Finally, the estimate of the number of displaced workers is viewed as being high and no account is taken of more positive economic effects such as increased output.

Using data and methods similar to Huddle's, Passel (1994) arrives at a completely different result. He finds that Huddle underestimated taxes by $50 billion and overestimated the cost of social services and displaced workers by $22 billion. As a result, he concludes that immigrants generated a net surplus of about $30 billion

which contrasts sharply with the net deficit of $43 billion estimated by Huddle. Others have also commented on these results. For example, Vernez and McCarthy (1995), in an assessment of the evidence, agree that Huddle underestimated taxes, but argue that he did not overestimate the value of benefits received by immigrants.

The wide gap in estimates between Huddle and Passel prompted Borjas (1994) to present his own calculations based on data for 1990, largely to illustrate the sensitivity of such calculations to key elements in an accounting exercise. The cost of immigrants in terms of welfare benefits is calculated as follows: data indicate that 13 per cent of cash-benefit programmes go to immigrants; applying this proportion to total expenditure ($181 billion) for *all* means-tested entitlement programmes therefore gives an estimated $24 billion welfare cost for immigrants.

Based on an assessment of the income distribution from census data and recent estimates of federal tax rates, Borjas estimates that the average tax burden on immigrants is about 30 per cent. These rates are applied to the total income (excluding welfare) for the immigrant population and the result is an estimated tax contribution by immigrants of $85 billion.

Calculating the difference between taxes and welfare costs therefore results in a surplus of $61 billion. At this stage however, Borjas points out that the additional costs that immigrants may generate for other forms of government expenditure have not been taken into account. He estimates that 91 per cent of all taxes were used to pay for programmes *other than* means-tested entitlement benefits. If it is assumed that immigrants have to make the same percentage contribution in order to remain revenue-neutral with respect to these other forms of expenditure, then only 9 per cent of their taxes can go towards the means-tested welfare benefits. This drastically reduces the tax contributions that can be ascribed to welfare to $8 billion (9 per cent of $81 billion). Using these tax estimates, immigrants are now seen as placing a fiscal burden on the welfare system of $16 billion.

Borjas admits to having omitted some significant areas of government expenditure, such as schooling and pensions from his calculations, however, his calculations illustrate the sensitivity of results to different assumptions about the impact of immigrants on government costs which are not explicitly included in the accounting exercise. As seen above, his particular approach is to assume that, if *x per cent* of nationals' taxes are used to fund non-welfare expenditure (*e.g.* defence, administration), then immigrants must also contribute *x* per cent in order to remain revenue-neutral with regard to non-welfare expenditure. However, in fact, there is no strong case for this approach being appropriate or otherwise.

Local studies for Los Angeles County

One of the local studies that has appeared since Rothman and Espenshade's (1992) review is by Clark and Passel (1993) who quantify the costs and benefits generated by immigrants for the public social welfare system in Los Angeles County. This study was, in part, carried out in response to a study by Los Angeles County Internal Services Division (1992) which, using data from their own survey (the ''ISD'' survey), concluded that immigrants were a fiscal burden to the County.

Clark and Passel criticise the way in which the County study used the ISD survey to calculate benefits: total public health and welfare costs to all legal migrants were used in their calculations whilst the data only cover recent and ''undocumented'' migrants. Clark and Passel attempt to correct for this by making calculations based on three scenarios: *i)* that the average cost of supplying these services to each recent immigrant is the same as the average cost in the case of each long-term immigrant; *ii)* that it is twice as high; and *iii)* that it is three times as high. The total costs obtained are lower in all three cases compared with the ISD-based study by between 23 and 39 per cent.

The ISD data is also considered to underestimate taxes. Clark and Passel make alternative estimates based on a micro-simulation model and income data from the March 1990 Current Population Survey. The results show that immigrants contribute only 28 per cent of total revenue despite representing 33 per cent of the County's population; this result is largely due to their lower income. More importantly, if the calculations are limited to recent immigrants, the total amount paid in tax is found to be significantly higher than the total obtained in the ISD-based study.

Despite estimates of higher tax payments and lower transfer payments, Clark and Passel also find that immigrants cost the County more than they contribute. However, the deficit is much less than that estimated by the ISD-based study. They suggest that three factors need to be developed in subsequent studies on the subject. First, account must be taken of immigrants who have been resident for longer periods as they generally have a higher income, with the result that their situation in terms of their net contribution to the state budget is more favourable. Second, the fact that the ISD-based study shows deficits for recent immigrants but not for the other categories of the population may give the impression that long-term immigrants and persons born in the United States are in credit *vis-à-vis* the County, whereas this is not the case. Lastly, the methods used to calculate the

costs and benefits, particularly in the case of taxes not levied directly on individuals (*e.g.* sales tax), need to be looked at more closely.

Immigration and social transfers: Canadian studies

The benefits of immigration to Canada: evidence on taxes and public services (Akbari, 1989)

Using the 1981 Canadian Census, Akbari (1989) takes a ''pseudo'' longitudinal approach similar to that of Simon (1984). The immigrants are placed in cohorts according to their date of arrival and the vintage of each cohort can be viewed as representing part of the life-cycle of the immigrant population. Data relating to households as well as individuals are used because consumption of social income and tax payments are largely determined by the number of dependent persons, and immigrants tend to either arrive already accompanied by a family or start a family upon their arrival.

Three items of government expenditure are considered: transfer payments, education and healthcare, which together accounted for about half the total government expenditure in Canada in 1980. Actual data for transfer payments are used, whilst estimates for education are based on assuming that education expenditure covers all children between the ages of 6 and 17. Healthcare figures are derived from estimates for the use of medical services according to age and sex. Average expenditure on each cohort is compared with the average value of expenditure on the native-born. Taxes are estimated on the basis of annual income, using a schedule of taxation by income level calculated by Pipes and Walker (1982).

The estimates of government expenditure and taxation show typical life-cycle characteristics. Expenditure per capita for both government transfer payments and healthcare rises with earlier year of entry of immigrants and per capita expenditure on education shows a rising and then falling relationship through the life-cycle. Taxes paid by immigrants generally rise with earlier arrival times, with an abrupt fall for those who arrived before 1946, presumably a reflection of a growing proportion of pensioners in this cohort.

The average per capita tax revenue in 1980 for the whole immigrant population is estimated to be C\$ 9 498 compared with C\$ 8 896 for non-immigrants, a difference of C\$ 602. This difference is attributable to a higher average income in the immigrant population. However, the per capita government expenditure is also greater for the immigrant population, C\$ 4 244 compared with C\$ 3 651, implying a higher expenditure on migrants by C\$ 593. Additional consumption of government transfer and health services by immigrants accounts for most of this difference. One clue to both the higher average income tax and higher expenditure for the immigrant population appears to be due to differences in demographic structure; in Akbari's data, 26 per cent of the heads of immigrant households are aged over 65, compared with only 12 per cent for the non-immigrant population.

On balance, the tax contribution of immigrants, net of government expenditure, marginally exceeds that of the non-immigrant population by C\$ 9 (C\$ 602 less C\$ 593). On the basis of this result, there appears to be no difference between the immigrant and native-born populations in terms of their impact on social transfers. Needless to say, when individual cohorts of immigrants are compared with the average for all non-immigrants, there is considerable variation in this figure. It is interesting to note that there remains a positive net balance of C\$ 1 717 per capita for all migrants who arrived after 1946 compared to all non-immigrants and a negative net balance of \$6 381 per capital for those who arrived before 1946. If nothing else, this reflects the dominant effect of falling tax revenues and increased government expenditures amongst older age groups, a result that is also seen in Simon (1984).

As in Simon's approach, the extent to which the results can be interpreted as indicating life-cycle patterns of benefits and taxes is determined by the extent to which the socio-economic characteristics of immigrant cohorts have remained stable over time. In both the United States and Canada, the immigrant population has changed considerably over time and therefore the life-cycle interpretation should be treated with some caution.

Nevertheless, the study highlights the importance of looking at the whole of the immigrant population and also of taking into account the variation in tax revenue and government expenditure that takes place over the life-cycle. For example, if the study had been restricted to migrants arriving after 1946, a very favourable view of the fiscal impact of immigration would have been found.

Economic and social impact of immigration: a report for the Economic Council of Canada (Swan et al., 1991)

This report examines the economic and social impacts of immigration and includes an analysis of the potential for immigration to reduce the fiscal burden that is forecast due to Canada's ageing population. In doing so, a slightly different approach to estimating the impact of immigration on social transfers is taken.

Three demographic scenarios are considered. From a base-line estimated population of 25 million in 1986, the authors consider a scenario based on no immigration in which the population rises steadily to 28 million in 2015 and then falls gradually in subsequent time periods. The other two scenarios assume ''low'' and ''high'' migration inflows which forecast populations of 35 and 44 million, respectively, by the year 2040. Under all three of the scenarios, the Canadian population continues to age, although less so in the scenarios which assume immigration. The number of dependent persons (young and old) for each member of the population is in fact predicted to remain virtually unchanged in all three scenarios as the increasing number of senior citizens is offset by falling numbers of young people.

Public spending and revenue estimates are made according to sex and age. Covering a wide range of public expenditure including education, health and public pension schemes, the per capita spending pyramid is found to have a fairly wide base (annual per capita spending for young people equals 5 000 dollars), is very narrow in the middle, then broadens beyond the age of 65 with over 20 000 dollars annual per capita spending for the over-85s. Calculations for public revenue show that this is concentrated between those aged 35 and 50, with men accounting for a greater proportion of revenue than women.

These spending and revenue estimates are used to project public finance under each of the demographic scenarios. Some additional costs of immigration, such as welfare payments to refugees and aid to enable them to acquire language skills, are also factored into the calculations. The results show an increase in per capita public expenditure (net of tax) as a result of ageing in the population under all three scenarios, although the increase is less with the introduction of immigration due to the fact that immigrants are assumed to be largely of working age. For example, in 2015 the high-immigration scenario results in reduced per capita public expenditure (net of tax) by C$ 86 compared with the low-immigration scenario. Hence, according to these projections increased immigration could have a positive, but marginal effect on net public expenditure.

Immigration and social transfers: Australian studies

Immigrants and the social security system in Australia (Whiteford, 1991)

This study considers the costs and benefits generated by immigrants, with a focus on the differences that exist between immigrants of various nationalities. Also, the question of whether immigration can be used to ameliorate projected increases in public spending due to ageing is addressed.

Estimates of the ratio of taxes to benefits indicate only a slight difference between nationals and those born overseas, with ratios of 2.3 and 2.2 respectively. However, there are appreciable differences between nationalities within the foreign-born population, *e.g.* in the case of Asians the ratio is 1.7 whilst for immigrants from Oceania (New Zealanders in particular) the ratio is much higher. Whiteford argues that these results may be largely accounted for by differences in demographic structure amongst immigrant groups by national origin.

Interestingly, Whiteford finds that the length of stay in Australia appears to influence the transfer payments received by immigrants. The general trend is for benefits received either to remain stable or to increase with the length of stay. However, it is not possible to know whether the differences between recent immigrants and longer-term immigrants are due to the settlement process *per se* or to differences in the characteristics of the various immigration waves. This confirms results found by Borjas (1994) for the United States.

With regard to the impact of immigration in reducing the projected fiscal costs of Australia's ageing population, Whiteford notes that Tulpulé (1984) simulated several immigration scenarios and found that immigration appeared to reduce the relative costs of social transfers. Whiteford's own calculations only indicate a marginal effect. On the basis of stable fertility and death rates, coupled with an assumed net influx of 100 000 immigrants per year, he predicts that welfare spending could rise from 20 per cent of GDP in 1985 to 22.6 per cent in 2025. If net immigration were to be doubled to 200 000 per year, welfare spending is projected to be 21.6 per cent of GDP in 2025, only 1 percentage point less than in the scenario assuming 100 000 immigrants.

Whiteford points out that other economic factors likely to be far more influential in reducing welfare spending. For example, he estimates that a 1 per cent annual increase in labour productivity would cause welfare to fall as a percentage of GDP to 15.2 per cent in 2025.

Immigration and the Commonwealth budget (Centre for International Economics, 1992)

The main part of this report evaluates the fiscal effects of immigration based on analysing the impact of the wave of immigrants who arrived in the fiscal year 1989-1990. Two approaches are taken: *i)* an accounting exercise is conducted in which the additional government spending in 1989-90 is calculated; and *ii)* an applied general equilibrium model (ORANI) is used to calculate the fiscal effects of the 1989-1990 wave of migration in

the short, medium and longer term. In this respect the study is one of the few which calculates the fiscal effects of immigration while taking full account of economic effects.

The accounting exercise makes an extremely detailed analysis of the government budget and the characteristics of the 121 000 immigrants who entered Australia in 1989-90. The resulting estimate is that an additional A\$ 687 million was spent on these immigrants by government in the year of their arrival, equivalent to 0.7 per cent of federal spending and about A\$ 5 700 per immigrant. This estimate must be qualified by the fact that some of the cost is recovered, due to fees charged for residency applications. However, account must also be taken of illegal immigrants, who have access to some services (at an estimated cost of A\$ 36 million per year) but who also contribute through payment of indirect taxes.

Using the ORANI model, the fiscal effects of the immigrant wave are evaluated, based on various assumptions about immigrants' labour market characteristics (unemployment rates and participation rates). In addition, some account is taken of the eligibility of migrants for certain transfer payments. Three scenarios are considered within the ORANI model:

– a short-term scenario (1 to 2 years), where investment and capital stock remain stable;
– a medium-term scenario (3 to 4 years), where immigration leads to increased investment which can create new jobs; the whole cost of this investment is assumed to be borne by the government;
– a long-term scenario (approximately 10 years), where the capital stock in industry is able to adapt to the arrival of the immigrants and rates of return revert to their previous level without immigration.

Under the short-run scenario, the increase in the federal deficit caused by the wave of immigrants totals A\$ 57 million. On the revenue side, reduced wage levels lead to a fall in income from taxation (reduction in the tax rate and tax base), but this is offset by the growth in indirect taxation and revenue from trade. On the spending side, federal expenditure increases, but at a moderate rate, in order to adjust to the increase in the population. The main costs are generated by the increase in pension payments, followed by sickness and unemployment benefits.

With the assumptions made about investment in the medium-term scenario, the fiscal impact of immigration is more favourable. In the long term, with a reversion of the rates of return to investment to pre-immigration levels, the effect of the 1989-1990 immigrants wave is to reduce the federal deficit by A\$ 317 million over the 10-year period considered.

Further comments on the literature

This literature review has so far looked at a selection of studies evaluating the fiscal impact of immigration, covering a wide range of methods producing a wide range of results. This range is seen most vividly in the literature for the United States where, for example, Huddle (1993), Passel (1994) and Borjas (1994) arrive at very different estimates, even with similar methodology and data sources.

One of the major problems of the estimates reviewed in this chapter is that they typically only cover transfer mechanisms which account for a limited proportion of all government expenditure. As Borjas (1994) points out, a variety of assumptions can be made about the effect of immigrants' presence on those government expenditures which are not covered in the accounting exercise. This is made even more complex by the fact that these other expenditures typically consist of a mixture of pure and quasi-public goods. Unfortunately, if, and how this issue is dealt with appears to strongly influence the results.

The approach taken by Simon (1984) and Akbari (1989) is interesting in that it evaluates the fiscal impact of successive cohorts of immigrants. There are inevitable questions as to what extent these can be viewed as estimates of life-cycle patterns of the fiscal position of immigrants due to the variations in age, nationality, *etc.* of immigrant cohorts thorough time. Nevertheless, both studies highlight the fact that transfers to older immigrants in the form of pensions are a significant issue in any calculus of the overall fiscal impact of immigration. However, as Simon points out, this then raises the issue as to whether the contribution of the offspring of immigrants should be included in the calculations or not. This touches on the issue of intergenerational transfers which are examined in the next section. As a final note, both studies make comparisons between immigrant cohorts and the whole of the non-immigrant population. It would have been preferable if they had generated cohort-based data for the non-immigrant population too and compared these with equivalent immigrant cohorts.

Most of the evaluations of the fiscal impact of immigrants are based on recent or historical data. Implicitly, these studies assume that the main features of their calculations are relatively stable such that the results can be regarded as relevant for both the present and future waves of immigrants. However, previous sections have examined two studies – Swan *et. al.* (1991) for Canada and Whiteford (1991) for Australia – where projections have been made of the fiscal impact of immigration. Both studies were motivated, in part, by an investigation of the fiscal implications of population pressures projected to arise as a result of ageing populations. The studies

both use tax and benefit schedules by age and sex groups and then apply these to various demographic projections for the immigrant population. The value of such scenarios obviously depends, to a large extent, on how stable the tax and benefit schedules are considered to be over time and on the reliability of the demographic projections.

Incorporation of labour, product and capital market effects within an accounting framework is rare. When it does occur it is usually based on limited information and fairly simple and sometimes debatable assumptions about how markets respond to immigration. For example, Huddle's assumption that immigrant workers displace native-born workers in the labour market is not a view held by all researchers in this area. The Australian study by the Centre for International Economics (1992) is the only case where estimates of the fiscal effects of immigration have been made within a general equilibrium framework. The approach is fairly straightforward, consisting of generating different projections of taxes and benefits by making different assumptions about labour supply in an existing model. It is surprising that a similar approach has not been used in other studies.

This literature review has concentrated mainly on national studies. However, some broad lessons can be drawn from the local and state studies. Vernez and McCarthy (1995) suggest that, on balance, the local and state studies tend to imply greater impacts (either positive or negative) by immigrants on the fiscal system compared with national studies. One reason for this is that the studies are usually based on regions with high concentrations of immigrants and therefore the volumes of tax revenue and benefit expenditure are relatively high. Negative results may arise because it is difficult to quantify precisely the contribution to taxation at the state level by immigrants as much of tax revenue is gathered at the federal level. In addition, the re-distribution mechanism to the states is too complex to be fully incorporated in the calculations. For these reasons, the local and state studies are not representative of the national picture, and inferences about the fiscal impact of immigration at a national level should not be drawn from them.

The review by Rothman and Espenshade (1992) points out that differences among immigrants by national origin can explain a certain number of differences between the results of studies at the local level, as the composition of the foreign or foreign-born population varies significantly from one place to another. However, it has been suggested that differences in national origins may simply be serving as a proxy for other unobserved characteristics of the immigrant population.

Overall, the studies reviewed in this chapter do not provide a definitive answer to the question of whether immigrants generate a net fiscal surplus or are a net fiscal burden to the social transfer system. The last column in Table III.1 gives a general impression of the situation in the United States. Literature covered in Rothman and Espenshade's review and the more recent evidence has only served to add to the debate. The relatively small number of studies for Australia and Canada are probably insufficient to permit one to draw a more definitive conclusion for these countries.

3. Generational accounting

One technique for assessing the impact of immigration on social transfers that has not so far been considered in the literature is that of generational accounting. This method is aimed at assessing the total fiscal balance (*i.e.* taxes less benefits, or vice versa) of a typical member of each generation over their lifetime. This is a particularly useful way of examining types of social transfers which have intergenerational features. For example, in most countries, the education of the younger generation and the pensions of the older generation are in fact funded by the tax revenues of the currently working generation. Simon (1984) encountered this issue with regard to the exclusion of older immigrants in his analysis; in one sense he seems to be incorrect in arguing that the older workers should be excluded from the analysis, in another he is correct in that there is effectively an intergenerational transfer between the offspring of the older migrants that funds their parents' pensions. Intergenerational accounting is able to fully incorporate such effects by calculating the lifetime fiscal balance for a series of overlapping generations.

An example of generational accounting

One basic intuition about the fiscal effect of immigrants on social transfers is that, *ceteris paribus*, if immigrants are of working age on arrival they will tend to contribute, over their lifetimes, more to social transfers than the native-born population. The reason for this is that the host country does not incur education costs for immigrants but does so for nationals. Here, results are presented based on an intergenerational accounting model which examines how the benefits of this process may be distributed across generations. Account is also taken of the effects of high fertility amongst immigrants and the dampening of wages due to the increased labour supply created by immigration. Although this is a simulation exercise, there is no reason why similar models should not be applied to real-world data. (A detailed description of the simulation is provided in the Annex.)

The simulation uses as its starting point, a world in which, without immigration, population is constant through time and there is a social transfer system in which the income tax levied on those of working age funds transfer payments to the young (family allowances) and the old (pensions). Annual family allowances are assumed to be equivalent to 25 per cent of the annual wage and pensions to 50 per cent of the annual wage. There are no other forms of social transfer, and those of working age are assumed to all be in employment (*i.e.* there is a 100 per cent participation rate). Taxes and benefits are always such that tax revenue exactly funds government expenditure, *i.e.* a government budget balance of zero is always maintained. Further details of this initial steady-state may be seen in Table III.3.

Table III.3. **Initial assumptions of the simulation**

Age	Survival function	Fertility distribution by age	Migration distribution by age	Wage level	Family allowance and pension	Total contributions
0-9	1.000	0.000	0.000	0.000	0.250	0.000
10-19	1.000	0.000	0.100	0.000	0.250	0.000
20-29	1.000	0.330	0.400	1.000	0.000	0.348
30-39	1.000	0.500	0.400	1.000	0.000	0.348
40-49	1.000	0.170	0.100	1.000	0.000	0.348
50-59	0.833	0.000	0.000	1.000	0.000	0.348
60-69	0.667	0.000	0.000	0.000	0.500	0.000
70-79	0.500	0.000	0.000	0.000	0.500	0.000
80-89	0.333	0.000	0.000	0.000	0.500	0.000
90-99	0.167	0.000	0.000	0.000	0.500	0.000

The effects of a wave of immigration that is assumed to last for 30 years are introduced into this steady-state environment, the immigration flow being constant and equal to 10 per cent of the population in each decade (*i.e.* an inflow equal to about 1 per cent of the population per year). Therefore, immigration alone is assumed to have increased the population by about 30 per cent by the end of the immigration wave. (This is a scenario of very high immigration by world standards.)
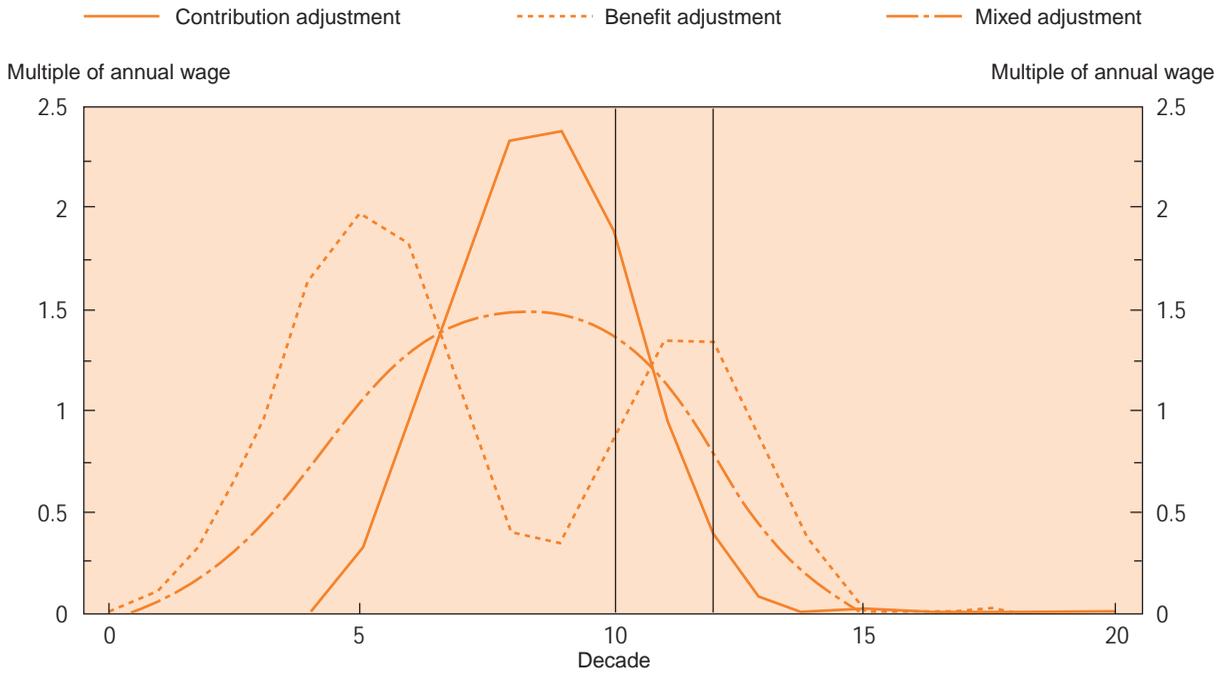
In Chart III.1, it is assumed that, like the native population, immigrant fertility is such that the immigrant population replicates itself, *i.e.* the total population returns to a steady state after the wave of immigration has ended. The horizontal axis in Chart III.1 is marked off in decades, with the wave of immigration assumed to start at the beginning of decade 10 and finish at the end of decade 12. The vertical axis indicates the excess of total transfers less total taxes over the lifetime of an individual born in the decade indicated on the horizontal axis. The units of measurement are multiples of gross annual earnings. The model is such that immigration presents an opportunity for a positive departure from the steady-state as the arrival of the working-age immigrants effectively represents a ''windfall'' gain in human capital. Three scenarios are considered:

– maintenance of taxes at the same level, which allows benefits to rise;
– maintenance of benefits at the same level, so that contributions can be lowered;
– a proportional redistribution between increased benefits and reduced contributions.

The results show that, when benefits are adjusted, the gain is mainly for the generations bracketing the migration wave, whether in the form of increased pensions for the preceding generations or (less markedly) of improved family allowances for succeeding ones. For example, those aged 50 when the migration wave begins (*i.e.* those born in decade 5) enjoy two annual incomes worth of additional benefits over the taxes they pay in their lifetimes due to increased pensions. When contributions are changed, those generations whose working life coincides with the migration wave are the ones to benefit. Simultaneous adjustment of both contributions and benefits gives a result intermediate between these two cases. The intuition behind the results is that because social transfers are based on a ''pay as you go'' system, nationals benefit from the arrival of an economically active wave of migrants and are able to distribute these benefits either in the form of increased benefits to the non-economically active, or as reduced contributions by the existing working population. Over time, the migrant population takes on the same characteristics as those of nationals and hence the benefits of the migration wave are not permanent, *i.e.* they do not benefit all future generations.

190

Chart III.1. **The effects of alternative transfer adjustment scenarios**

Migrant's net reproductive rate (NRR) = 1.0, no capital dilution

——— Contribution adjustment   ·········· Benefit adjustment   —·—· Mixed adjustment

Multiple of annual wage   Multiple of annual wage

Decade

Chart III.2. **The effects of higher fertility and capital dilution**

Simultaneous adjustment of benefits and contributions

——— Migrants' NRR = 1.0   ·········· Migrants' NRR = 1.5

—·—· Migrants' NRR = 1.0   – – – Migrants' NRR = 1.5
(with dilution of capital)   (with dilution of capital)

Multiple of annual wage   Multiple of annual wage

Decade
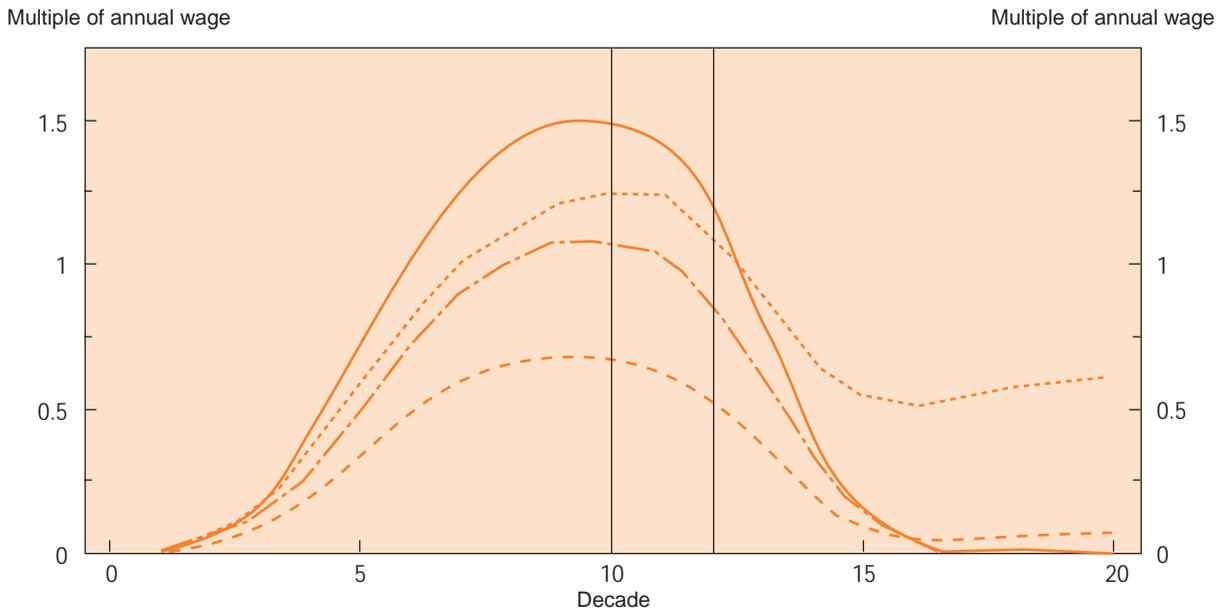
Source: Calculations made by Didier Blanchet.

191

The results of alternative scenarios, which introduce high migrant fertility and lower wages are shown in Chart III.2. The latter is generated by the fact that immigration can be viewed as reducing the marginal product of labour as more labour is combined with the capital stock, a process referred to as ''capital dilution''. The benefits of migration have been distributed such that both contributions and benefits are adjusted as in the third scenario of Chart III.1. Also, as in Chart III.1, the results are based on the migrants arriving in decades 10 to 12. From Chart III.2, the following is shown:

– When migrants are more fertile than nationals (a fertility rate of 1.5 is assumed, rather than 1) and remain so in succeeding generations, the scenario is one of continuing population growth. The higher fertility of the migrants permanently increases the proportion of the population who are economically active and therefore, unlike the case where fertility is the same as nationals, the effects of migration are permanent.

– Assuming migrants' fertility rate to be identical to that of nationals, capital dilution leads to an abatement of some 30 per cent in the advantage derived by the generation most favoured from the presence of immigrants.

– When capital dilution is combined with high fertility, there appears to be only a modest transitory gain, largely during the period of the migration wave. Note that it is merely coincident that the effect of increased fertility is virtually offset by that of lower wages through capital dilution. Simulations using alternative parameter values would not necessarily show this result.

In summary, this simulation exercise shows that, under certain assumptions, immigration can result in a net gain in transfers over individual's lifetimes for at least some generations of nationals. The net gain can be distributed in a variety of ways depending on whether the gain is realised in reduced taxes or increased benefits. The net gain is weakened if wages are lowered through capital dilution and a permanent net gain for all future generations is only possible if immigrants are assumed to have relatively high fertility.

This approach could be pursued further by investigating a wider range of demographic possibilities and configurations of social transfers which conform to the situation existing in a variety of real-world economies. In addition, the model could be expanded in a number of ways, for example by inclusion of transfers to the working population itself. The advantage of this approach is that it attempts an evaluation of the fiscal impact of immigration with full consideration of contributions over the life-cycle and also demonstrates the distribution of the impact across generations of nationals.

Concluding remarks

This report has examined the principle factors that need to be taken into account in calculating the net effect of immigration on social transfers and has also critically reviewed the results of several studies. These studies have used a variety of methods and this has been accompanied by a wide variety of results which, in sum, appear to provide no definitive answer as to whether immigrants are a net burden on the social transfer system or a net cost. Nevertheless, the results of such calculations may be widely publicised and may be influential in policy debate. Therefore, when evaluating the value and usefulness of the information provided, the following should be borne in mind:

– Such calculations are often based on data for recent, and sometimes not so recent, time periods and may not reflect the current state of the immigrant population with regard to social transfers. In addition, any inference that the situation for the current stock of immigrants is a good guide for future immigrants must be made with due consideration to the past and present developments in immigration flows.

– The calculations do not commonly introduce the effects that immigrants may have on labour and product markets. If they do, then they are often based on fairly rudimentary and debatable assumptions. This may also be said of attempts to account for the fiscal position of migrants with regard to government expenditure on items other than social transfers. Accounting for public and quasi-public government expenditure is difficult and a variety of assumptions can be made which may strongly influence the results.

– Use of population-wide estimates of benefits per capita may give misleading results since they fail to take account of differences in entitlement to the benefit system and different behaviour in use of the benefit system between immigrants and nationals.

– Results of local and regional-level studies should not be taken as a reflection of the situation at the national level due to the fact that, at least as far as the United States literature is concerned, these studies are usually conducted in states and localities where immigrant concentration is high.

– Even if some studies suggest, explicitly or implicitly, that the position of immigrants within the system of taxes and social transfers should change, it is not clear how easy this may be to achieve politically, or to what extent savings in government expenditure may be realised as a result of the change. For example,

policies which aim to make budgetary savings by restricting entitlement to benefits for foreign residents may be offset by a rise in naturalisations as immigrants attempt to maintain their entitlement to benefit.

There is obviously no ''correct'' way to evaluate the impact of immigration on social transfers, this depends partly on the precise question being addressed and the available data. However, what does seem appropriate is that researchers should adopt a number of approaches which may help them to evaluate the impact of immigration across various dimensions. Within the accounting approach it seems important to explore a variety of possibilities when allowing for government expenditure on public and quasi-public goods as well as a variety of possible scenarios with regard to the effect immigrants may have on labour and product markets.

One way in which market effects can be fully incorporated is through the use of applied general-equilibrium models. This, in part, depends on whether such models are amenable to addressing the fiscal effects of demographic change. For example, some existing models have fairly simple labour supply structures that may not easily allow the simulation of a wave of immigration specified by age group. The results from such an exercise must inevitably be qualified by the character of the general-equilibrium model itself. For example, some models may assume very rapid labour market adjustment compared to others; thus, in turn, affecting the way in which wages and hence tax revenues change as a result of increased labour supply due to immigration.

Finally, as discussed in the third section, generational accounting may provide some new perspectives on the impact of immigration on social transfers, especially if there is a desire to incorporate the effects of immigration in the longer term. The approach requires broad generalisations and inevitable simplifications about the complex structure of the social transfer systems. Despite this, it does take more explicit account of the overall impact of immigrants over the life-cycle. In addition, the generational accounting approach allows consideration of how the net benefits or costs of immigration may be distributed amongst generations of nationals.

AN EXAMPLE OF THE GENERATIONAL ACCOUNTING APPROACH

This model illustrates the effect of introducing a wave of migrants, largely of working age, on the lifetime net transfers of the national population. The model is disaggregated such that the effects on different generations of the national population can be calculated. The social transfer system is such that transfer payments are always exactly funded by current tax revenue, *i.e.* there is no saving or borrowing in the public budget and there is no link between what each individual contributes in taxes over time and what they receive by way of transfer payments. By construction, migration will typically be of net benefit for at least some generations of the national population. This is because the migrants are assumed to be initially of working age and therefore, at least temporarily, there is an increase in the ratio of tax-payers to those living on transfer payments (the young and the old). This allows the national population to benefit from either reduced taxes, increased benefits or a mixture of both. The model also considers the possibility that migrants may lower wages through capital dilution, thus reducing the benefits to nationals. In addition, the possibility of a permanent effect on lifetime transfers is illustrated through assuming that the migrant population has a higher fertility rate compared with the national population.

Without migration, the model is set up such that the national population remains constant and the social transfer system is stable, in other words there is no need for adjustment in either the system of taxes or contributions to maintain the social transfer system. As can be seen in Table III.3 in the main text, it is assumed that there are 10 age groups, each spanning 10 years and four of which are of working age. Those of working age earn wages, *w*, set equal to 1 of which 34.8 per cent is paid in contributions. The other age groups receive social transfers whose total value is equal to the value of the contributions made by the working population at a given point in time. Under these initial stationary conditions each age group, a, has a particular contribution rate *c(a,1)* and amount of benefit *p(a,1)*.

With the introduction of the migrant population, the total amount of contributions and benefits at an arbitrary time *t*, *ex ante* (*i.e.* assuming the tax rates and benefits are those without migration) may be written as:

$$C^0(t) = w(t) \sum_{a=3}^{6} c(a,1)(n(a,t) + m(a,t))$$

$$P^0(t) = \sum_{a=1}^{10} p(a,1)(n(a,t) + m(a,t))$$

In the above, C and P are total contributions and benefits, and *n(a,t)* and *m(a,t)* refer to the population of nationals and immigrants of age group *a* at time *t*, respectively. Note that since contributions are only made by the working population, only age groups 3 to 6 are relevant in the calculation of total contributions. Under this hypothetical scenario, there may not be a balanced budget, therefore the contribution rates and benefits must be adjusted somehow to bring the budget back into balance. Three scenarios are considered:

1. Adjustment of contributions

The contribution rate of each age group is adjusted by the ratio of the *ex ante* benefits to contributions and benefits remain unchanged:

$$c(a,t) = c(a,1) \frac{P^0(t)}{C^0(t)}$$

$$p(a,t) = p(a,1)$$

2. Adjustment of benefits

The benefit to each age group is adjusted by the ratio of the *ex ante* contributions to benefits and benefits remain unchanged:

$$c(a,t) = c(a,1)$$

$$p(a,t) = p(a,1) \frac{C^0(t)}{P^0(t)}$$

3.   Simultaneous adjustment

Both benefits and contributions are adjusted by the ratio of either *ex ante* benefits or contributions to their average:

$$c(a,t) = c(a,1)\frac{2P^0(t)}{C^0(t) + P^0(t)}$$

$$p(a,t) = p(a,1)\frac{2C^0(t)}{C^0(t) + P^0(t)}$$

These three scenarios are considered in Chart III.1 of the text where it is also assumed that the migrant's net reproductive rate equals that of the national population and there is no capital dilution, *i.e.* average wages remain constant. Chart III.1 depicts the effect of introducing migrants over three decades, those indicated by $t = 10$, 11 and 12 and shows the net benefit over the lifetimes of each generation, g, born between decade 0 and decade 20. The benefit for each generation, g, is given by:

$$B(g) = \sum_{a=1}^{10} s(a)\left[p(a,g+a) - c(a, g+a)w(g+a)\right]$$

where $s(a)$ is the survival function. This gives a direct measure of the effect of migration on social transfers for nationals, since the net balance under stationary equilibrium without migration is equal to zero. Note that in this case the wage $w(g+a)$, is constant over time and equal to 1.

Taking the case of the simultaneous adjustment described above, a further four simulations are calculated which combine different assumptions about the fertility of the migrant population and the possibility of capital dilution. A case of increased migrant fertility is considered such that the migrants net reproduction rate is 1.5 compared with that of 1 for the national population.

Capital dilution is modelled by considering the development of wages through time based on the following Cobb-Douglas production function:

$$Y(t) = cK(t)^\alpha L(t)^{1-\alpha}$$

Assuming the labour market to operate such that the market wage rate equals the marginal product of labour then:

$$w(t) = (1 - \alpha)Y(t)/L(t)$$

In order to calculate $w(t)$, values of c, α, $K(t)$ and $L(t)$ are required. $L(t)$ is simply the value ascribed to the size of the working population at time t. The value of α is taken to be 0.25, implying that total income is distributed such that 25 per cent always goes to capital and the rest to labour.

Capital is assumed to last for two time periods. Therefore, the capital stock at any one point in time is the sum of additions to the capital stock (savings) over the previous two time periods. It is assumed that these savings equal a proportion β of total output. Therefore:

$$K(t) = \beta[Y(t-1) + Y(t-2)]$$

In the simulation, β is assumed to take the value of 0.25.

Finally, the value of c and the initial value of K are chosen such that, given the values of α, β and the initial stationary value of L, the wage in the initial stationary state equals 1.

Chart III.2 in the text presents the results of four simulations which combine the two demographic scenarios (the migrant population having the same net reproduction rate as the national population and the migrant population having a higher net reproduction rate) with the two economic scenarios (there being no capital dilution and there being capital dilution as described above). The results in Chart III.2 represent the benefits to generations from three decades of migration as described above.

BIBLIOGRAPHY

AKBARI, A.M. (1989), ''The benefits of immigrants to Canada: evidence on taxes and public services'', *Canadian Public Policy,* Vol. 15, No. 4, pp. 424-435.

ALFANDARI, E. (ed.) (1987), ''Immigration et protection sociale'', No. 2 de la *Revue de droit sanitaire et social*, Sirey, Paris.

ARTHUR, W.B. and McNICOLL, G. (1978), ''Samuelson, population and intergenerational transfers'', *International Economic Review*, No. 19, pp. 241-246.

AUERBACH, A.J., GOKHALE, J. and KOTLIKOFF, L.J. (1991) ''Generational accounting: a meaningful alternative to deficit accounting'', in Bradford, D. (ed.) *Tax Policy and the Economy,* NBER, Vol. 5, pp. 55-110.

BLANCHET, D. (1988*a*), ''Age structure and capital dilution effects in neo-classical growth models'', *Journal of Population Economics*, No. 1, pp. 183-194.

BLANCHET, D. (1988*b*), ''Immigration et régulation de la structure par âge d'une population'', *Population*, Vol. 43, No. 2, pp. 293-309.

BLANCHET, D. and MARCHAND, O. (1991), ''Au-delà de l'an 2000, s'ajuster à une pénurie de main-d'œuvre ?'', *Économie et Statistiques*, No. 243, pp. 61-68.

BLAU, F. (1984), ''The use of transfer payments by immigrants'', *Industrial and Labour Relations Review*, Vol. 37, No. 2, pp. 222-239.

BOGEN, E. (1987), *Immigration in New York*, Praeger, New York.

BORJAS, G.J. (1991), ''Immigrants in the US labor market: 1940-80'', *American Economic Review*, Vol. 81, No. 2, pp. 287-291.

BORJAS, G.J. (1994), ''The economics of immigration'', *Journal of Economic Literature*, No. 32, pp. 1667-1717.

BORJAS, G.J. (1995), ''The economic benefits from immigration'', *The Journal of Economic Perspectives*, Vol. 9, No. 2, pp. 3-22.

BORJAS, G.J. and TIENDA, M. (1987), ''The economic consequences of immigration'', *Science*, No. 235, pp. 645-651.

BORJAS, G.J. and TREJO, S.J. (1991), ''Immigrant participation in the welfare system'', *Industrial and Labor Relations Review*, Vol. 44, No. 2, pp. 195-211.

BORJAS, G.J., FREEMAN, R. and KATZ, L. (1996), ''Searching for the effect of immigration on the labor market'', NBER Working Paper 5454.

BUREAU OF THE CENSUS (1976), *Survey of Income and Education*.

BUTCHER, K.F. and CARD, D. (1991), ''Immigration and wages: evidence from the 1980s'', *American Economy Review*, Vol. 81, No. 2, pp. 892-926.

CENTER FOR IMMIGRATION STUDIES (1994), *The Costs of Immigration: Assessing a Conflicted Issue*, Backgrounder, No. 2-94, September.

CENTRE FOR INTERNATIONAL ECONOMICS (1988), ''The relationship between immigration and economic performance'' in *Immigration: a Commitment to Australia*, Report to the Committee to advise on Australia's immigration policies, Vol. 2, Australian Government Publishing Office, Canberra.

CENTRE FOR INTERNATIONAL ECONOMICS (1992), *Immigration and the Commonwealth Budget*, Australian Government Publishing Office, Canberra.

CLARK, R.L. and PASSEL, J.S. (1993), *How Much do Immigrants Pay in Taxes? Evidence From Los Angeles County,* Washington DC, The Urban Institute, PRIP-UI-26, August.

CLARK, R.L., *et al.* (1994), *Fiscal Impacts of Undocumented Aliens: Selected Estimates in Seven States*, Washington DC, The Urban Institute, September.

COLLINS, N. (1991)*, ''*Do immigrants place a tax burden on New Jersey residents?'', Unpublished senior thesis, Department of Economics, Princeton University.

COMMUNITY RESEARCH ASSOCIATES (1980), *Undocumented Immigrants: Their Impact on the County of San Diego*, CRA, San Diego, California.

CORDEIRO, A. and VERHAEREN, R. (1976), *Les travailleurs immigrés et la Sécurité sociale*, Presses universitaires de Grenoble.

CURRIE, J. (1995), ''Do children of immigrants make differential use of public health insurance?'', NBER Working Paper 5388.

FRIEDBERG, R.M. and HUNT, J. (1995), ''The impact of immigrants on host country wages, employment and growth'', *Journal of Economic Perspectives*, Vol. 9, No. 2, pp. 23-44.

GREENWOOD, M.J. (1994), ''Potential channels of immigrant influence on the economy of the receiving country'', *Papers in Regional Science*, Vol. 73, No. 3, pp. 211-240.

HEER, D.M. (1990), *Undocumented Mexicans in the United States*, Cambridge, England, Cambridge University Press.

HUDDLE, D. (1993), *The Costs of Immigration*, Washington, DC, Carrying Capacity Network.

JENSEN, L. (1989), *The New Immigration: Implications for Poverty and Public Assistance Utilization*, Greenwood Press, New York.

KING, V.E. (1994), ''An investigation of the fiscal impacts of immigrants in New Jersey'', in Espenshade, T.J. (ed.), *A Stone's Throw from Ellis Island: Economic Implications of Immigration to New Jersey*, University Press of America.

KOTLIKOFF, L.J. (1992), *Generational Accounting: Knowing Who Pays And When For What We Spend*, The Free Press, MacMillan.

LALONDE, R.J. and TOPEL, R.H. (1991), ''Immigrants in the American labor market: quality, assimilation and distributional effects'', *American Economic Review*, Vol. 81, No. 2, pp. 297-302.

LEE, R.D. (1980), ''Age structure, intergenerational transfers and economic growth: an overview'', *Revue économique*, No. 6, pp. 1129-1156.

LEIBFRITZ, W., ROSEVEARE, D., FORE, D. and WURZEL, E. (1995), ''Ageing populations, pension systems and government budgets: do they affect saving?'', *Economic Department Working Paper No. 156*, OECD.

LOS ANGELES COUNTY (1982), *Costs of Undocumented Aliens*, Chief Administrative Office, Los Angeles, California.

LOS ANGELES COUNTY (1991), *Updated Revenues and Costs Attributable to Undocumented Aliens,* Chief Administrative Office, Los Angeles, California.

LOS ANGELES COUNTY INTERNAL SERVICES DIVISION (ISD) (1992), *Impact of Undocumented Persons and Other Immigrants on Costs, Revenues and Services in Los Angeles County*, Los Angeles County, 6 November.

McCARTHY, K.F. and VALDEZ, R.B. (1986), *Current and Future Effects of Mexican Immigration in California*, RAND Corporation, Santa Monica, California.

MULLER, T. and ESPENSHADE, T.J. (1985), *The Fourth Wave: California's Newest Immigrants*, Urban Institute Press, Washington DC.

NORTH, D. and HOUSTOUN, M. (1976), *The Characteristics and Role of Illegal Aliens in the US Labor Market: An Exploratory Study*, Linton and Company, Washington DC.

OECD (1991), *Migration: The Demographic Aspects*, Paris.

OFFICE FOR REFUGEES AND IMMIGRANTS (1990), *Through the Golden Door: Impacts of Non-Citizen Residents on the Commonwealth*, Commonwealth of Massachusetts, 16 May.

PARKER, R.A. and REA, L.M. (1993), *Illegal Immigration in San Diego County: An Analysis of Costs and Revenues*, Report to the California State Senate Special Committee on Border Issues, California Legislature, September.

PASSEL, J.S. (1994), *Immigrants and Taxes: A Reappraisal of Huddle's ''The Costs of Immigrants'',* Washington DC, The Urban Institute, PRIP-UI-29, January.

PIPES, S. and WALKER, M. (1982), *Tax Facts 3*, Vancouver, the Fraser Institute.

RIMMER, S.J. (1991), *The cost of multiculturalism*, Belconnen, ACT.

ROMERO, P.J., CHANG, A.J. and PARKER, T. (1994), *Shifting the Costs of a Failed Federal Policy: The Net Fiscal Impact of Illegal Immigrants in California*, Sacramento, Governor's Office of Planning and Research, State of California, September.

ROTHMAN, E. and ESPENSHADE, T.J. (1992), ''Fiscal impacts of immigration to the United States'', *Population Index*, Vol. 58, No. 3, pp. 381-415.

SAMUELSON, P.A. (1975), ''The optimum growth rate of a population'', *International Economic Review*, No. 16, pp. 531-538.

SIMMONS, A.B. and BUTTRICK, J. (1987), ''The impact of immigration on government expenditures: conceptual and methodological considerations'', prepared for the Research Division Immigration Group, Employment and Immigration, Canada, August.

SIMON, J. (1981), ''What immigrants take from and give to the public coffers''. *US Immigration Policy and the National Interest: Appendix D* to Staff Report of the Select Commission on Immigration and Refugee Policy.

SIMON, J. (1984), ''Immigrants, taxes, and welfare in the United States'', *Population and Development Review*, Vol. 10, No. 1, pp. 55-70.

SIMON, J. (1989), *The Economic Consequences of Immigration*, Basil Blackwell.

SIMON, J. (1996), ''Public Expenditures on Immigrants to the United States, Past and Present'', *Population and Development Review*, Vol. 22(1), pp. 99-109.

SOUTHERN CALIFORNIA ASSOCIATION OF GOVERNMENTS (1984), *Southern California: A Region in Transition*, *Volume Two: Impacts and Future Immigration.* Los Angeles, California, SCAG.

SPARKES, L. and GODDARD, R. (1988), ''Population and Immigration: trends and implications'', Unpublished paper.

STECK, Ph., RAUBER, E., ALFANDARI, E. and CHASTAND, A. (1987), ''L'immigré et sa famille : les prestations familiales des immigrés'', in Alfandari E. (ed.), *Immigration et protection sociale*, Sirey, Paris.

SWAN, N. *et al.* (1991), *Economic and Social Impact of Immigration*, Economic Council of Canada.

TAPINOS, G. and de RUGY, A. (1994), ''The macroeconomic impact of immigration, review of the literature published since the mid-1970'', in OECD, *Trends in International Migration*, SOPEMI, Annual Report 1993, Paris.

TIENDA, M. and JENSEN, L. (1986), ''Immigration and public assistance participation: dispelling the myth of dependency'', *Social Science Research*, Vol. 15, No. 4, pp. 372-400.

TULPULÉ, A (1984), ''Effects of alternative migration strategies on government expenditure'', *Information Paper 12*, Committee for the Economic Development of Australia, Melbourne.

VERNEZ, G. and McCARTHY, K.F. (1995), *The Fiscal Costs of Immigration: Analytical and Policy Issues*, Center for Research on Immigration Policy, Rand, Santa Monica.

VERNEZ, G. and McCARTHY, K.F. (1996), *The Costs of Immigration to Taxpayers: Analytical and Policy Issues*, Center for Research on Immigration Policy, Rand, Santa Monica.

WEINTRAUB, S. and CARDENAS, G. (1984), ''The use of public services by undocumented aliens in Texas: a study of state costs and revenues'', *Policy Research Report*, No. 60, Lyndon B. Johnson School of Public Affairs, Austin, Texas.

WHITEFORD, P. (1991), ''Immigrants and the social security system'', University of New South Wales, Austrialian Bureau of Immigration Research.

YOUNG, C.M. (1988), ''Towards a population policy: myths and misconceptions concerning the demographic effects of immigration'', *Australian Quarterly*, Winter, pp. 220-230.