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Migration, Trade and Investment

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Contents

BOXES

FIGURES

TABLES

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Abbreviations

ABS	Australian Bureau of Statistics
CES	constant elasticity of substitution
EU	European Union
FDI	foreign direct investment
FE	fixed effects
GDP	gross domestic product
HS6	6-digit Harmonised System
IMF	International Monetary Fund
ln	the natural logarithm
NBER	National Bureau of Economic Research
OECD	Organisation for Economic Co-operation and Development
PC	Productivity Commission
RE	random effects
SITC	Standard International Trade Classification
UN	United Nations
UNCTAD	United Nations Conference on Trade and Development
US	United States

Key points

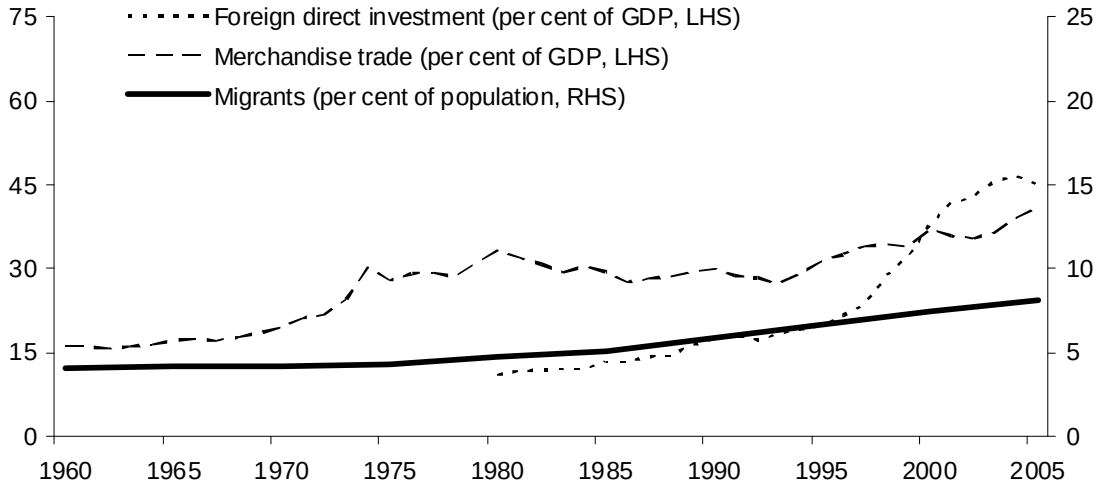
- Migrants can help to build social and business networks that improve the quality of information flowing between countries and lower the costs of international trade and investment. This may particularly benefit Australia, which has a large and growing migrant population.
- The patterns of trade and investment across the OECD suggest that migrant networks are important. Countries tend to trade and invest more with countries from which they have received more migrants and, at least for trade, this relationship appears to be stronger where information barriers like distance and language would otherwise more greatly inhibit trade.
- This does not necessarily mean that countries with more migrants should be expected to trade and invest much more in total. This study finds that, by lowering the cost of trade between a pair of countries, migrants appear to reduce trade with other countries so that the overall effect on aggregate trade seems quite small. By contrast, there was no strong evidence that a reduction in investment with other countries accompanies the positive effect of migrants on bilateral investment.

1 Introduction

Migrants affect many aspects of the community and economy in which they live. Some of the direct economic effects of migrants living within Australia were described in the Productivity Commission's (2006) report on the *Economic Impacts of Migration and Population Growth*. That report showed that migrants tend to raise Australian living standards — measured as GDP per capita — somewhat, because Australia's migrants are more highly skilled than the locally-born population on average and more concentrated in working age groups. This paper focuses on a less direct way in which migrants may affect living standards: by strengthening international social and business networks, thereby facilitating trade and investment flows.

Economies are integrating and becoming more closely interdependent. The past few decades have seen rapid growth in the international movement of goods and factors of production. Trade grew half as fast again as world output during the 1990s and the stock of foreign direct investment (FDI) grew twice as fast as trade. The international movement of people is another important feature of this integrated global economy. The declining cost of travel and communications has lowered information barriers and encouraged migration across national borders (figure 1.1).

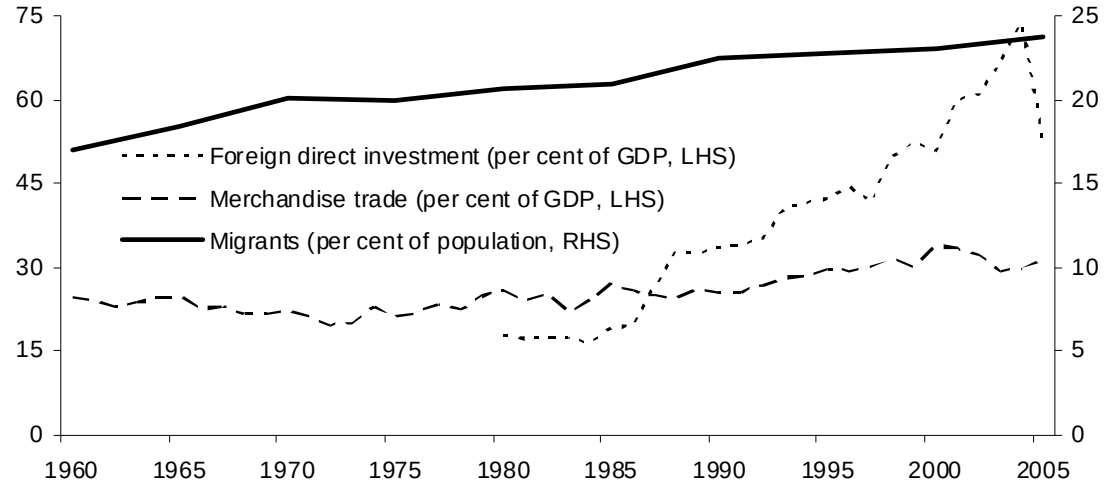
Figure 1.1 **OECD trade, investment and migrant populations, 1960 to 2005**



Data source: Author's calculations based on UNCTAD, World Investment Report, 2006 and World Bank, World Development Indicators, 2006.

Migration has been especially important for Australia. The proportion of migrants in the Australian population has risen since the Second World War through successive waves of migration from Europe and, later, Asia. Today, almost one in four Australians was born overseas, a larger share than in any other OECD country. Australians are also emigrating in larger numbers, and today around 350,000 Australian-born people reside in other OECD countries. Meanwhile, both Australia's trade and foreign investment have increased steadily, as a proportion of GDP, in recent decades (figure 1.2 and appendix A).

Figure 1.2 **Australian trade, investment and migrant population, 1960 to 2005**



Data source: Author's calculations based on UNCTAD, World Investment Report, 2006 and World Bank, World Development Indicators, 2006.

These trends raise the question of whether migrants have, by strengthening business networks between countries, boosted the volume of international trade and investment undertaken by firms in their country of residence and country of birth. It seems plausible that stronger networks would make it faster, simpler and less risky to do business across borders and thereby ease the flow of merchandise across the docks and help to identify investment opportunities abroad. Recent discussion of the untapped potential of Australia's expatriate population, or 'diaspora', has particularly focused on this role:

> Expatriates can contribute to their home country by influencing trade, investment and philanthropic flows, connecting local organisations to international developments and opportunities, and projecting a contemporary national image. … Some of these benefits are already flowing to Australia. A logical approach for our country, which is small in population and physically isolated, is to try to capture more of these benefits … by engaging more comprehensively with our diaspora. (Fullilove and Flutter 2004, p. viii)

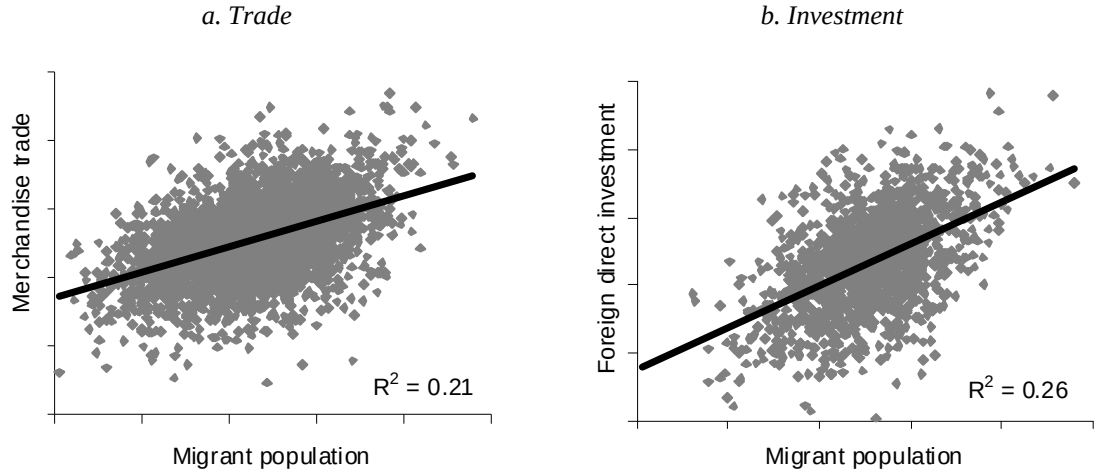
If migrants and expatriates were to strengthen these networks, and this had the effect of boosting the aggregate volume of international trade and investment, then there are clear economic benefits. An expanding literature shows that when countries trade more, their productivity and living standards tend to rise (Frankel and Romer 1999, Alcalá and Ciccone 2004, Redding and Venables 2004, Romalis 2007). This may occur for many reasons. Trade allows countries to specialise in production of those goods to which they are most suited and this specialisation may also permit economies of scale in production. Trade also increases competition between producers which tends to raise productivity by making inefficient production methods both more obvious and costly to managers (Winston 1993), or simply by driving those firms that happen to have low productivity out of business (Syverson 2004). Similarly, foreign investment often brings with it foreign technology, skills and managerial know-how that not only result in high productivity and wages within the foreign-owned firms (for example, Caves 1974), but also spill over to raise the productivity of domestic competitors (Haskel et al. 2002, Keller and Yeaple 2003).

International trade and investment may bring greater benefits to small countries, such as Australia. Small countries face more acute trade-offs between economies of scale and competition. They are also more reliant upon knowledge developed overseas than are larger developed countries. Given the large and growing number of migrants within Australia and the importance of trade and investment for the Australian economy, an understanding of their interconnections is particularly valuable.

1.1 What is already known?

Some evidence that countries trade and invest more with countries from which they have received more migrants is provided by figure 1.3. Panel a plots the level of bilateral merchandise trade between OECD countries and all trading partners for which data are available, against the size of migrant populations living within these OECD countries. Similarly, panel b plots the stock of bilateral foreign direct investment against the size of migrant populations within OECD countries. These data have been normalised by dividing trade flows and foreign investment by the size of each trading partner's GDP and by dividing the number of migrants by the size of each country's population. Both charts show a strong upward trend.

Figure 1.3 **Bilateral trade, investment and migrant populations, 2000**
28 OECD countries and up to 162 partner countries[a]



[a] Trade data are the sum of merchandise imports and merchandise exports, investment data are the sum of inward investment stocks and outward investments stocks while migrant data are the size of migrant populations within OECD countries. Trade and investment data are normalised by dividing by the size of both partner countries' GDP, while migrant populations are normalised by dividing by the size of both countries' populations. The data are expressed as logarithms and zero trade, investment and migrant population data are ignored. Lines of best fit are shown and both slopes are statistically different from zero at conventional significance levels.

Data source: As discussed in chapter 2.

Of course, these rudimentary scatter-plots ignore many factors that affect trade between countries. Important determinants of trade and investment may include transport costs, tariffs and the alternative opportunities that countries have to trade and invest elsewhere in the world. There are growing literatures attempting to identify more carefully the role that migrants play in facilitating trade and investment between their country of residence and country of birth.

The trade literature, in particular, has consistently found that larger numbers of migrants are strongly associated with larger flows of goods between the migrants' country of residence and country of birth. However, estimates of the size of these effects vary widely (table 1.1). At one end of the range, Gould's (1994) results imply that increasing the number of migrants living in the United States from a given country by 1 per cent would increase trade with that country by only 0.01 or 0.02 percentage points. At the other end, Dunlevy's (2006) results imply that this would increase trade by almost 0.4 percentage points.

A problem with some previous studies is that they do not control for characteristics of trading pairs that may affect bilateral trade and migration. The most reliable estimates to date come from a study (Bandyopadhyay et al. 2006) that controls for all important characteristics of trading pairs that are constant over time by looking

at growth in the international exports of US states over the course of the 1990s. That study showed that exports to the migrants' country of birth tend to rise by around 0.13 per cent when the number of migrants in a state rises by 1 per cent. This was shown to be roughly half the effect that would have been estimated from cross-sectional analysis of the level of trade, though the precise reason for this difference was not determined.

The literature linking FDI and migration is scarcer, more recent and its implications are less clear (table 1.2). Both cross-sectional and time-series analyses of foreign investment out of the United States (Javorcik et al. 2006 and Bhattacharya and Groznik 2005) suggest that FDI rises by around 0.3 per cent when the number of migrants increases by 1 per cent. However, it is not yet clear how these results would carry over to other countries because the only previous study of the effects of migrants residing outside the United States, Buch et al. (2003), found widely varying results depending upon how their migrant population data were constructed.

Evidence from foreign case studies is consistent with the empirical finding that migrants are associated with greater bilateral trade and investment. Ethnic Indians working in Silicon Valley, for example, facilitated the development of a large ICT service export industry in India, by improving business networks and establishing a reputation for Indian ICT workers (Saxenian 2002). Similarly, expatriate Chinese business people have facilitated foreign investment into the Chinese manufacturing industry (Weidenbaum and Hughes 1996).

Concrete evidence is hard to find on the effects of Australian migrants on trade and investment, though surveys are consistent with the hypothesis that migration strengthens business ties with the migrants' countries of birth. Those companies in Australia that successfully export to East Asia are more than three times as likely as other businesses to employ staff of East Asian descent (Dawkins et al. 1995). Similarly, follow-up surveys of migrants entering Australia with Business Skills Visas in the 1990s show that companies they established after arrival exported significantly more than other Australian companies of a similar age (Access Economics 1998). Australia's expatriate networks may also play a role. Surveys show that one Australian expatriate in five believes they have established business and trade links during their time abroad (Hugo et al. 2003).

In summary, while the magnitude of the effects that migrants have on trade and investment may be debated, casual inspection of the available data and the results of the literature to date suggest that migrants tend to increase trade and investment flows between their country of residence and country of birth.

1.2 What does this paper say and do?

This paper builds on these previous studies. The main difference is that it examines migration, trade and investment between many countries, whereas previous studies have typically looked at migrants living within a single country, most commonly within the United States. Migrant populations in each of 28 OECD countries, defined as foreign-born populations enumerated in each country's census, are compared with bilateral merchandise trade flows and bilateral stocks of foreign investment around the year 2000.

Looking at migration, trade and investment patterns across many countries has several advantages over studies of a single country.

- The effects of migrants are estimated more robustly than in some previous studies because the larger dataset means it is possible to include dummy variables that control for the unique characteristics of trading partners that affect how much they trade and invest and how many migrants they receive.
- The effects of migrants are estimated more robustly than in some previous studies because the analysis controls for some important characteristics of trading pairs.
- The role played by migrants in overcoming information barriers is explored.
- The effects of migrants on a country's total international trade and investment are estimated.
- Finally, the results average across the idiosyncratic experiences of individual countries and so are likely more widely applicable.

The second point deserves further discussion, though the fourth point is the paper's main innovation. The results of Bandyopadhay et al. (2006) discussed above showed that cross-sectional analysis produces biased estimates of the effects of migrants on trade, presumably because of the omission of variables that are correlated with both migrant populations and trade. The current paper suggests a possible explanation. It shows that an important variable omitted from many previous analyses is the size of expatriate communities. The paper shows that the size of migrant and expatriate communities are positively correlated across the OECD and that ignoring the size of expatriate communities appears to bias upwards estimates of the effects of migrants on both trade and investment.

By taking account of the role of expatriate communities, the paper finds that a 1 per cent increase in the number of migrants increases trade between their country of residence and country of birth by 0.09 per cent, and that this is roughly half the effect that would be estimated if the size of expatriate communities was ignored. Similar analysis of foreign investment suggests that a 1 per cent increase in the

number of migrants increases investment between their country of residence and country of birth by around 0.15 per cent.

The paper's main departure from the previous literature, however, is to consider the effects that migrants have on a country's total trade flows and investment stocks. Migrants have previously been shown to increase trade and investment between their country of residence and country of birth, but this paper makes the first attempt to understand how that additional bilateral trade and investment comes about.

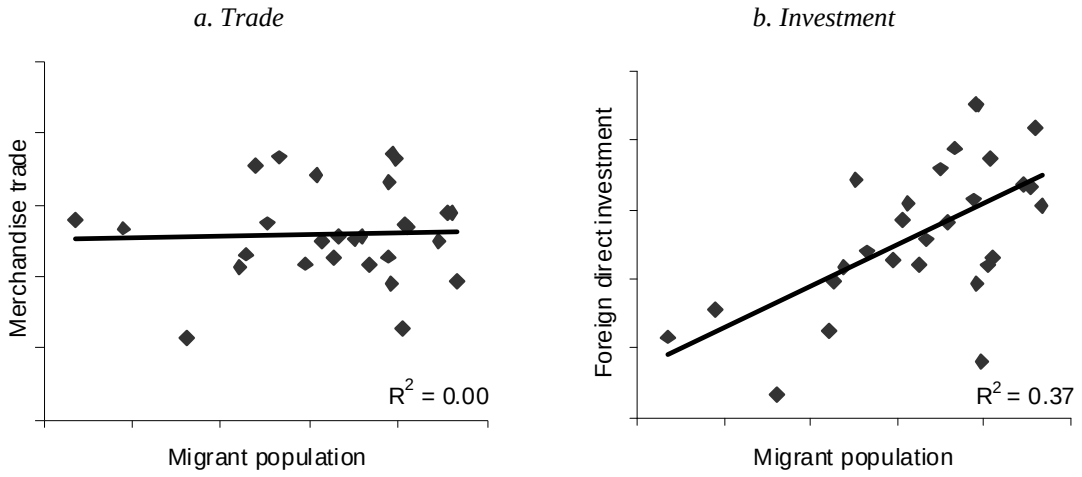
The standard 'gravity model' of trade assumes that the total volume of trade, adding up trade both within and between countries, is determined by the size of the economies involved and by the costs associated with trade between locations. For given levels of output in each country, *relative* trade costs determine the pattern of trade (for example, Anderson and van Wincoop 2003). If migrants are effective in lowering the cost of trade between their country of residence and country of birth, bilateral trade between the two countries will tend to increase with migration. However, as well as a 'trade creation' effect, there will be a kind of 'trade diversion' effect — the additional bilateral trade that migrants create may come at the expense of either internal trade within countries or international trade with other countries. On balance, the total international trade of the migrants' country of residence and country of birth should increase with migration, as should the total international trade of the world as a whole. However, the effects on total trade flows may well be quite small, particularly for countries with many nearby trading partners.

Theories of foreign direct investment are more complex and the overall effects of migrants may depend upon the nature of the investment. On the one hand, if migrants encourage vertical investment as part of a production chain that serves the source country's markets then the choice to locate the plant in one country may mean relocating the plant from another country. On the other hand, if migrants encourage horizontal investment to serve the host country's markets then it does not clearly come at the expense of investment elsewhere.

In practice, it seems likely that most of the effect that migrants have on investment between their country of residence and country of birth does not come at the expense of investment into other countries. Foreign direct investment appears to be mainly horizontal with two-thirds of US affiliate sales going to the host country, while only 10 per cent of sales are back to the source country (Blonigen 2005). Further, the very rapid expansion of foreign direct investment through the 1980s and 1990s suggests that, at least at that time, many profitable investment opportunities were yet to be exploited.

Scatter-plots tell a story consistent with these conjectures. Figure 1.4, panel a, plots the 'openness to trade' of OECD countries, measured as merchandise imports plus exports as a share of GDP, against the share of migrants within their populations, while panel b shows a similar plot of foreign direct investment against migrant populations. There is a clear upward trend in the latter chart, but no discernible trend in the former. That is, those OECD countries that have larger numbers of migrants as a share of their population do not appear to trade more but do appear to engage in more foreign direct investment.

Figure 1.4 **Aggregate trade, investment and migrant populations, 2000[a]**
28 OECD countries



a Trade data are the sum of merchandise imports and merchandise exports divided by that country's GDP, investment data are the sum of inward investment stocks and outward investments stocks divided by that country's GDP, while migrant data are the size of migrant populations divided by the population of their country of residence. The data are expressed as logarithms. Lines of best fit are shown; only the slope in panel b is statistically different from zero at conventional significance levels.

Data source: As discussed in chapter 2

Of course, these charts ignore many important factors that affect aggregate levels of trade and investment. The paper explores the stories suggested by these scatter-plots in a number of ways.

- The analysis of bilateral trade and investment is extended by including in the analysis the effect of the total number of migrants resident in a country. The results suggest that essentially all of the bilateral increase in trade due to migrants comes about by reducing trade with other countries. However, there is not strong evidence that the bilateral increase in investment due to migrants results from reducing investment with other countries.
- The aggregate openness of a country to trade is related to total migrant populations. Estimates suggest that increasing the total migrant population by 1 per cent increases openness to trade by only 0.03 per cent, an effect that is

statistically not different from zero. Compared to the previously-estimated bilateral elasticity of 0.09, this suggests that at least two-thirds of the bilateral increase in trade comes about by reducing trade with other countries.

- The theory underpinning the gravity equation is applied to calculate the effects of increasing the number of migrants on trade between all OECD countries. The results suggest that, depending upon the country of residence considered, between 20 and 80 per cent of the bilateral increase in trade due to migrants results from reducing trade with other countries.

While these different approaches produce quite different results, the overall conclusion is that migrants have a much larger effect on bilateral trade than on aggregate trade volumes. This suggests that the consequences of immigration and emigration for productivity and living standards through their effects on international business and social networks are more nuanced than they may have previously appeared.

A general caveat applies to the results in this paper. The cross-sectional nature of the available data makes it difficult to infer a causal connection and strictly the results only establish correlation. That is, the results do not strictly show that migrants cause an increase in the trade flows and investment between their country of residence and country of birth, but rather they show that where countries have in the past exchanged more migrants they are today engaging in more trade and investment with each other. However, it seems plausible that causality may run from migrants to trade flows, and this is a common assumption in the previous literature. The accumulation of migrants over past decades is likely to be affected more by migration policy, wage differentials and the existing size of migrant communities rather than potential trading and investment opportunities today.[1]

[1] Only one previous study (Javorcik et al. 2006) used an instrumental variable approach, finding that migrant populations caused an increase in the stock of foreign investment to a similar degree as would have been estimated in the absence of instrumentation. In that study, the numbers of migrants residing in the United States were instrumented using the numbers of migrants living in the European Union, population density in the migrant's country of birth, the cost of obtaining a passport and legal restrictions on emigration. This approach could not be used in the current study because country dummy variables are included.

Table 1.1 **Previous literature on trade and migration**

Authors	*Data*	*Export elasticity*	*Import elasticity*	*Comments*	*Indicators of remoteness used*	*Fixed effects*
Bilateral migrants						
Gould (1994)[a]	US trade with 47 countries, 1970-1986	0.02***	0.01***	Larger effects for consumer goods, but little difference due to migrants' education	Relative price indices; population	Country
Helliwell (1997) [b]	Trade between Canadian provinces and US states, 1990	0.03	0.12	Between Canadian provinces	None	None
		0.34***	0.06	Between Canadian provinces and US states		
Head & Ries (1998)[a]	Canadian trade with 136 countries, 1980-92	0.10***	0.31***	Larger effects for independent migrants (mostly professionals) than for family reunions, refugees or entrepreneurs	Relative price indices; openness	Regional
Dunlevy & Hutchinson (1999), Hutchinson & Dunlevy (2001)	US trade with 17 countries, 1870-1910	0.08**	0.29***		Relative price indices; population	None
Girma & Yu (2002)[c]	UK trade with 48 countries, 1981-93	-0.08	0.06	Commonwealth countries	Remoteness (average distance to world GDP); GDP per capita	None
		0.50***	0.19	Non-Commonwealth countries		
Combes et al. (2003)[b]	Trade between 95 French departments, 1978 and 1993	0.22***	0.05	1978	None	None
		0.22***	0.13***	1993		
Wagner et al. (2002)	Trade between 5 Canadian regions and 160 countries, 1992-95	0.08*	0.25***		Remoteness (average reciprocal of the distance to world GDP)	Country (but not province)
Blanes-Cristobal (2004)	Trade between Spain and 40 countries, 1991-98.	0.23***	0.03		None	OECD and EU

Bryant et al. (2004)	Trade between New Zealand and around 170 countries, 1981-2001	0.09***	0.15***	Larger effects excluding agricultural exports and oil imports	Population	None (but correlated random effects by country)
Bardhan & Guhathakurta (2004)	Exports from the United States to 51 countries, 1994-96	0.24***		West coast	Population	Asia-Pacific
		0.06		East coast		
Co, Euzent & Martin (2004)	Exports from 51 US states (and DC) to 28 countries, 1993	0.30***			Trade openness (exports plus imports/GDP); population	None
Herander & Saavedra (2005)	Exports from 51 US states (and DC) to 36 countries, 1993-1996	0.16*** (migrants in that state)		Smaller effects after controlling for ancestry, larger effects for countries with poorer institutions, larger effects for consumer goods than producer goods	Remoteness (average distance to world GDP)	None
		0.07*** (migrants in other states)				
Bandyopadhyay et al. (2006)	Exports from 51 US states (and DC) to 29 countries (1988-92 and 1998-2002)	0.13**		Migrant links to trade appear to be due to a small number of ethnic groups	Population	Trading-pair
Dunlevy (2006)	Exports from 51 US states (and DC) to 87 countries at a single point in time (average 1990-92)	0.39***		Larger effect for exports to countries with corrupt political systems, smaller effect with Spanish or English speaking countries	None	State and country
Ethnic Chinese networks						
Rauch & Trindade (1999)[a]	Trade between 63 countries, 1980 and 1990	0.21	0.21	Bilateral trade in homogeneous goods	Remoteness (average distance to world GDP); GDP per capita	EEC and EFTA
		0.47***	0.47***	Bilateral trade in differentiated goods		

[a] Elasticities are calculated by Wagner, Head and Reis (2002). [b] Immigrant and expatriate populations are both included in regression equations [c] Elasticities are from the regression specification including a lagged dependent variable. ***, ** and * indicate statistical significance at the 1, 5 and 10 per cent levels.

Table 1.2 **Previous literature on FDI and migration**

Authors	*Data*	*Outward FDI*	*Inward FDI*	*Comments*	*Indicators of remoteness used*	*Fixed effects*
Bilateral migrants						
Buch et al. (2003)	FDI stock of 16 German states, 1990-2000	0.01 (net stocks) 0.48*** (gross stocks)	0.06** (net stocks) -0.10 (gross stocks)	Migrant stocks are constructed based on flows since 1974 and the results differ depending on whether gross migration or net migration (including return flows) data are used	Population	None
Bhattacharya & Groznik (2005)[a]	US FDI stock into 33 countries 1970, 1980, 1990, 2000	0.33***		Panel multivariate regression	Openness	Trading-pair
	US FDI stock into 37 countries, 2000	0.42**		Cross-sectional bi-variate regression	None	None
Javorcik et al. (2006)	US FDI stock into 56 countries, 1990 and 2000	0.28*		Higher elasticity to tertiary educated migrants (0.37**)	Population	None[b]
Kugler & Rapoport (2007)[c]	US FDI outflows between 1990 and 2000	0.21*** (primary) -0.56 (secondary) 0.43* (tertiary)		Dependent variable is growth in foreign investment stocks between 1990 and 2000; elasticities are reported for migrants with different educational attainment as indicated	Not applicable	Regional
Ethnic Chinese networks						
Tong (2005)	FDI stocks between 70 countries around 1990	0.21***	0.21***	Higher elasticities for investment from developed countries and to countries with high bureaucratic quality	Population; remoteness (average distance to world GDP)	None

a Regressions are undertaken in levels not logarithms and the elasticities reported here are the current author's estimates based on data for the means of the 37-country sample in 2000. **b** This study does not employ country fixed-effects in the study of aggregate foreign investment stocks, but does in a separate analysis of sectoral investment. **c** These elasticities are for the effect of 1990 migrant numbers on growth in FDI over the following decade. ***, ** and * indicate statistical significance at the 1, 5 and 10 per cent levels.

2 Estimation approach

This chapter sets out: the theory of how migrants may affect trade and investment by overcoming information barriers between countries; the patterns that should be apparent in the data if this occurs; and the modelling approach to be used.

2.1 How may migrants affect trade and investment?

Migrants may facilitate the development of social and business networks that improve the quality of information flowing between countries and encourage trade and investment flows. At a macroeconomic level, two well-known puzzles hint at the important role of social networks in international economic relations.

The first puzzle is that distance appears to matter too much, both for trade and for investment. An expansive literature finds that a 1 per cent increase in the distance separating countries reduces trade between the two countries by around 0.9 per cent (Disdier and Head 2007). In terms of transport costs alone, this seems an unreasonably large effect. If transport costs were typically 5 per cent of the value of traded goods then Grossman (1998) calculates that a 1 per cent increase in the distance separating countries should lower trade volumes by only 0.03 per cent.

For investment patterns, the role of distance is even more surprising. Early theories explained investment in terms of differences in factor endowments that lead to vertical investment (Helpman 1984) or transport cost savings from production close to consumer markets that lead to horizontal investment (Markusen 1984). While distance hampers vertical integration of plants across countries, the larger transport cost savings should encourage horizontal investment and, as mentioned in the introduction, horizontal FDI appears to be the predominant type. This suggests that foreign investment may be expected to *increase* with distance between the source and host countries, yet in practice FDI falls away rapidly.

The second puzzle is commonly called the 'border puzzle'. Trade between countries is a small fraction of trade within countries. Even after accounting for distance and associated transport costs, trade between countries is 20 to 50 per cent lower than trade within countries (Anderson and van Wincoop 2003). In fact, for trade between typical countries, these border effects are more than 3 times as important as actual

transport charges (Anderson and van Wincoop 2004). Similarly, foreign investment is a small fraction of domestic investment.

The most plausible explanation for both puzzles is that information on foreign trading and investment opportunities, and the associated legal and regulatory environments, is both scarce and expensive to gather, and that search costs increase not only with distance, but also with national borders (Rauch 1999, 2001).

Information may be even more important for FDI than it is for international trade. Where traders may interact with foreigners at arms length, investors engage more closely with a wide range of people (suppliers, workers, government officials) and need more detailed knowledge of local labour markets, legal and regulatory environments. At the same time, the risks involved with experimenting to gain information are potentially larger. While trade can involve low fixed costs (establishing distribution networks) but large variable costs (transport), direct investment often requires a large upfront commitment of resources (plant establishment), which is partially sunk.

Migrant communities may offer several ways of improving information flows by strengthening business and social networks between the migrant's country of residence and country of birth. Migrants are well placed to act as middlemen on account of their superior language skills, and their knowledge of consumer preferences, business practices, market structure and laws. Multi-national corporations may use scouting teams to identify potential investments that include foreign-born staff (Bhattacharya and Groznik 2005). Finally, the importance of reputation within these business networks may provide foreign business people with greater certainty of contract delivery in countries in which they have difficulty enforcing contracts through the legal system.

If migrants increase trade flows by overcoming information barriers, then certain patterns of correlations should emerge in the data. First, migrants should be associated with greater trade between their country of residence and their country of birth and the effect should be similar for trade in both directions. If, for example, migrants were associated with only higher imports into their country of residence, but not exports, then this may indicate simply that they are importing goods for personal consumption, because their tastes favour goods produced in their country of birth. Second, migrants should be more strongly associated with trade between pairs of countries for which alternative business and social networks are weaker. For example, migrant networks may play a larger role between countries that do not share common languages or have colonial ties or well-developed business networks or simply between countries that are far apart. Third, migrants should increase trade more strongly in goods for which information is more valuable because quality varies significantly between suppliers. Fourth, migrant networks may play a larger

role where one of the trading partners has poorly developed legal systems so that contract enforcement is difficult. Finally, personal characteristics of migrants, such as their educational attainment, may affect the extent of their market knowledge and connections with local business networks.

Similarly, if these arguments are correct, then migrants should be associated with greater investment flows between their country of residence and their country of birth, and this effect should be larger than for trade because of the larger informational requirements. Further, the effects of migrants should be larger between countries for which alternative networks are weaker or, perhaps, where migrants are better educated.

These are the correlations that the analysis in subsequent chapters will seek to identify. Some of these have been explored within previous studies (table 1.1 and 1.2). Most simply, many studies test whether migrants affect trade by their preferences for consuming goods from their country of birth by comparing elasticities of imports and exports to migrant numbers. Of the 9 previous studies comparing import and export flows, four studies find imports more responsive to migrant numbers, four studies find exports more responsive, while Helliwell (1997) reports different results depending upon whether the trade flows are international or intra-national. That is, there is no consistent evidence that migrants affect imports differently from exports.

The literature has also explored whether migrant networks play a larger role in trade and investment flows where information barriers are larger, with mixed results. The literature provides some evidence that migrants play a larger role where trading partners do not share a common language (Dunlevy 2006) or colonial ties (Girma and Yu 2002). There is also some evidence that migrants have a larger effect on trade in 'differentiated goods' for which information is more valuable because quality may vary significantly between producers (Rauch and Trindade 1999, Gould 1994, Bryant et al. 2004, Herander and Saavedra 2005). Finally, migrants may play a larger role in facilitating both trade and investment between countries with weaker institutions (Herander and Saavedra 2005, Dunlevy 2006, Tong 2006).

2.2 Modelling trade flows

To estimate accurately the roles played by migrants in facilitating trade it is necessary to control for other factors that determine trade flows. For this purpose, this paper employs the so-called 'gravity trade model'. Empirically, this type of model has previously been found to explain much of the variation in bilateral trade flows.

In its simplest form, the gravity model of international trade flows relates the magnitude of trade between economies to the product of their economic 'masses' and to the distance between them, in a similar way to Newton's model of the force between two bodies due to gravity. That is, the value of imports is given by the following equation, where M_{ij} is the total value of imports into country j from country i, Y_i and Y_j are the two countries' respective gross domestic products and T_{ij} captures the cost of moving goods from country i to country j, where originally T_{ij} was assumed to be equal to the distance between the two countries. In practice, it is typical to also include other indicators of trade costs between countries, such as whether they share a common language or common border, and the current paper particularly focuses on the role that migrants play in affecting trade costs. The gravity model is normally estimated in logarithms.[1]

$$M_{ij} = A\frac{Y_j Y_i}{T_{ij}^{\sigma-1}}$$

This simple version of the model is flawed because it omits two variables: the opportunities available for the exporting nation to trade elsewhere in the world and the price of goods available to import from other trading partners. Together these terms are often referred to as the 'multilateral resistance' to bilateral trade or simply the 'remoteness' of the exporter and importer.

The pattern of trade between Australia and New Zealand provides an example of the importance of multilateral resistance. Trade flows between these two countries are very large. In 2000 almost US$ 6 billion in goods moved between the two countries, despite more than 2300 km separating Wellington from Canberra. For comparison, trade between Ireland and the Netherlands — a broadly similarly-sized pair of economies — totalled less than US$ 5 billion in the same year, despite only 760 km separating Dublin from Amsterdam. One difference is that whereas Australia and New Zealand are remote from other potential trading partners, Ireland and the Netherlands are able to trade at low cost with many European neighbours.

Failing to take account of remoteness runs the risk that geography alone may produce a correlation between migration and trade. This may occur if

[1] Estimation in logarithms avoids the problem of strong heteroskedasticity when estimated in levels, with the variance in both trade flows and investment stocks roughly proportional to the square of the expected level of trade flow or investment stock. The downside is that this approach ignores many observations with zero trade and investment flows. Potentially, by discarding observations in a non-random fashion, this may result in biased estimates of the effects of migrants on trade or investment. An important effect of migrant networks may be to establish trade and investment relations where none would have otherwise existed, so the zero trade and investment flows are of interest. An earlier version of this paper used an approach that takes account of these zero observations and produced qualitatively similar results.

geographically remote pairs of countries (such as Australia and New Zealand) also exchange more migrants than pairs of countries with many other neighbours (such as Ireland and the Netherlands). This paper uses different strategies to take account of remoteness in estimating the effects of migrants on bilateral and aggregate trade flows.

Bilateral trade flows

In estimating the effects of migrants on bilateral trade flows between their country of residence and country of birth, the analysis includes dummy variables for both trading partners. This 'origin and destination fixed effects' approach is fairly robust in that it avoids estimation bias that can arise because of *any* mis-specified or omitted factors associated with particular countries, including economic remoteness. It has been previously used, for example, by Wagner et al. (2002) and Dunlevy (2006).

Though this approach solves problems associated with remoteness of trading partners, the regression equation may still be mis-specified. In practice, it is not feasible to include variables that capture the unique historical, cultural, political and business relationships between any *pair* of countries that may both affect trade and have affected historical migrant flows. Further, those variables that can be included, such as distance, provide only a rough proxy to the economic determinants of trade, such as transport costs, and these measurement errors may also bias results. To alleviate these problems, Pakko and Wall (2001) and Bandyopadhyay et al. (2006) advocate panel estimation including 'trading-pair fixed effects' and Bandyopadhyay et al. (2006) show that doing so halves the estimated elasticity of trade to migration compared to cross-sectional analysis.

While data availability means that the current study cannot take a panel approach, an attempt is made to take account of this result. The current study includes, where possible, a number of important trading-pair-specific variables that may affect bilateral trade flows, including the size of expatriate communities and foreign investment stocks. The analysis also includes lagged trade flows in the regression equation, which may capture the effects of slow-moving, unmeasured, trading-pair-specific factors.[2]

[2] The criticism of Bandyopadhyay et al. (2006) cautions against using the resulting regression coefficients to calculate long-run elasticities.

Total trade flows

The paper also seeks to investigate the effects of migration on a country's total trade flows, or equivalently whether increasing the total number of migrants in a country from all countries of birth increase that country's trade. This means focusing on the effects on trade of characteristics of trading partners, specifically aggregates of their immigrant and expatriate populations, so that the origin and destination fixed effects approach is no longer useful. Instead, the analysis includes variables that are likely correlated with each trading partner's remoteness. While this method has been used frequently in the migration literature (for example, Dunlevy and Hutchinson 1999, Hutchinson and Dunlevy 2001, Girma and Yu 2002, Co et al. 2004), this paper is the first to use remoteness indicators with theoretical foundations.[3]

The analysis makes use of a Taylor approximation to Anderson and van Wincoop's (2003) 'multilateral resistance' terms, as suggested by Baier and Bergstrand (2006).[4] The approximation starts by assuming world trade is completely free of transport costs and information barriers and then makes a linear correction to approximate the actual multilateral resistance to trade. This leads to estimation of each country's multilateral resistance to trade with other world economies based on the GDP-weighted average of the indicator of trade barriers with all countries (such as distance, contiguity and migrant shares). For example, the multilateral form of the distance variable is calculated as follows, where the θ_k are GDP shares.

$$multilateral(\ln dist_{ij}) = (\ln dist_{ij} - \frac{1}{2}\sum_k \theta_k \ln dist_{ik} - \frac{1}{2}\sum_k \theta_k \ln dist_{kj})$$

$$-(\frac{1}{2}\sum_k \theta_k \ln dist_{ik} + \frac{1}{2}\sum_k \theta_k \ln dist_{kj} - \sum_l \sum_k \theta_l \theta_k \ln dist_{lk})$$

The first term shows that if two countries are far apart compared to each country's other potential trading partners, the variable will take a larger value. The second term shows that if two countries are far from other potential trading partners compared to the average distance between all countries in the world, then the variable will take a smaller value. Since it is presumed that these variables would take a negative coefficient in the trade equation, this implies that countries that are far apart trade less with each other, that countries that are more geographically

3 This method is less robust than the origin and destination fixed effects approach and may produce biased results if the remoteness indicators do not do a good job of accounting for the important characteristics of the trading partners that affect both trade and migration. Wagner et al. (2002) show that in practice the two methods can produce significantly different results.

4 Appendix B contains a discussion of Anderson and van Wincoop's (2003) analysis and Baier and Bergstrand's (2006) approximation methods.

remote trade more with each other, and that the balance of these two effects can be explicitly calculated.

Similar multilateral forms are constructed for other variables (contiguity, commonality of language, colonial ties).

2.3 Modelling foreign investment stocks

The analysis of bilateral foreign investment stocks is a straight-forward replication of the analysis for bilateral trade flows. The same gravity-model used to model trade flows has been widely and successfully applied to FDI and this is the approach that has been used in the majority of studies to date looking at the effects of migrants on foreign investment (Javorcik et al. 2006, Tong 2005, Buch et al. 2003).

As for the modelling of bilateral trade flows, origin and destination fixed effects are included thereby avoiding the need for strong theoretical underpinnings. Lagged investment stocks are also included in the regression as a broad indicator of historic ties between countries, informed by problems overcome in estimating the trade equation.

However, the paper also seeks to explore the effects of migrants on total investment stocks. At this point in the analysis of trade flows, the theory underpinning the gravity model was employed to identify which additional variables should be included in the model. However, there is no similar empirically estimable theory of investment.[5] The approach taken is to relax minimally the restrictions on the gravity equation by replacing the dummy variables for the migrant's country of residence with a few simple indicators: GDP, GDP per capita and an indicator of economic remoteness (the GDP-weighted distance to other countries, as used for the analysis of trade flows). In this approach, dummy variables for the migrants' countries of birth are retained.

The quality of legal and bureaucratic institutions and the investor's familiarity with the legal environment of the host country are also likely important determinants of investment decisions. Poor legal protection of assets raises the risk of expropriation and poorly functioning markets increase the cost of doing business (Wei 2000, Habib and Zurawicki 2002). Investors may be less uncertain when investing in countries with similar legal systems. The analysis includes an indicator of corruption in the host country and an indicator of whether the legal systems of two countries share British, French, German, Scandinavian or socialist origins.

[5] Preliminary investigation found that the knowledge-capital model of foreign direct investment did not fit this dataset well.

2.4 Main data sources

A bilateral trade, investment and migration cross-section was constructed for 28 OECD countries and up to 162 partner countries (totalling 4508 possible observations) in or around the year 2000.

The OECD *Database of Immigrants and Expatriates* provided data on the number of migrants in each OECD country (except Iceland). Data were generally obtained from the census closest to 2000 undertaken in each country and separately identify migrants by country of birth. Working-age migrants (those aged 15 years or over) were also identified by whether they have low (not completed secondary school), medium (completed secondary school) or high (tertiary) educational attainment. The data collection was close to complete, with more than 99 per cent of the counted population in OECD countries reporting a country of birth and more than 98 per cent of the working-age population reporting education level.

Bilateral merchandise trade flows were sourced from the *NBER-UN Trade Database* as described in Feenstra et al. (2005). While the original database reported trade to or from 72 countries, which account for around 98 per cent of world exports, the analysis focuses on trade to or from 28 OECD countries, which account for around 73 per cent of world exports. Foreign direct investment stocks were obtained from the OECD *International Direct Investment Statistics Yearbook 1992-2003*. The 28 OECD countries studied hosted 71 per cent of global inward FDI and were the source of 87 per cent of global outward FDI in 2000 (UNCTAD 2006).

Full definitions and sources of other data are provided in appendix C. At each stage data sources were chosen and data manipulated to optimise the available coverage of countries.

3 Trade

The two sections of this chapter look at different effects from migration. The first section considers the effect on bilateral trade of an increase in the number of migrants in a particular country of residence from a particular country of birth. The empirical results reproduce the robust positive correlation between bilateral patterns of trade and migrant numbers found in the previous literature. The second section considers the effect on aggregate trade of an increase in the aggregate number of migrants in a particular country of residence. Though this effect is much more difficult to quantify, the results suggest that the increase in bilateral trade associated with migration arises largely at the expense of trade with other countries.

3.1 Effects on bilateral trade flows

This section presents estimates of the effects of migrant numbers on imports and exports between their country of residence and country of birth. The analysis is then extended in an attempt to understand the role played by migrants in providing information regarding profitable trading opportunities.

Some methodological details

Before discussing results a few methodological comments are warranted. As a result of using origin and destination fixed effects, the effect on trade flows of variables that are identified with particular countries, such as GDP and population, cannot be estimated. The variables included are the great-circle distance between countries (*distance*), whether the two countries share a land border (*contiguity*), speak a common language (*language*), or have an historical colonial tie (*colony*), the stock of foreign investment held between the two countries (*FDI in* and *FDI out*), and the average tariff rate levied by the importer on merchandise from the exporter (*tariff*). Appendix C contains a summary of the variable names used in the tables.

The main explanatory variable of interest is the logarithm of the number of migrants born in the trading partner as a share of the local population (for example, *importer's share* is the number of migrants as a share of the importer's population).

This form of the model was chosen in part because it was statistically preferred,[1] and in part because it fits more closely with the underlying theory.[2] However, a problem with this approach is that some countries report no migrants from a particular country and so the logarithm of the migrant share is not always defined. In this case, the share of migrants in the population is taken to be 1 per 1 million population, and an additional dummy variable called *share0* takes the value 1.[3] The coefficient on *share0* can be interpreted as the effect on trade of decreasing the migrant population from 1 person per million to zero. This coefficient would ordinarily be expected to be small, but may be affected by idiosyncrasies related to data collection (since many of the zero observations occur within three countries: Korea, Germany and Austria).

Initial results

The normal practice in previous studies has been to estimate separately the effects that migrants have on imports and exports. Analysed in this way, results from the larger sample of trade between 28 OECD countries and 162 trading partners (table 3.1, columns I and II) suggest an elasticity of bilateral imports to migrant numbers of around 0.15 and an elasticity of bilateral exports to migrant numbers of around 0.18. Analysis of the smaller sample of trade within the 28 OECD countries produces similar estimates (columns III and IV).

1 Statistically preferred in that, after controlling for the logarithm of the migrant share of the total population, other potential migrant indicators were individually not significant (including the log of the number of migrants, the migrant share of the population, and the log of the migrant share of the working-age population).

2 First, the logarithmic form of the relationship assumes a constant elasticity of trade to migrant numbers and hence diminishing returns to additional migrants. This is consistent with the information-based explanation for the relationship between migration and trade, in that each additional migrant from a particular country contributes less additional information on trading opportunities because local firms are better informed when they arrive. Second, including migrants as a share of the population rather than as a total number is consistent with the idea that these information benefits are quite localised. In this form of the model migrants into Australia would have the same effect if considered as a single nation or divided into its States and Territories (so long as the migrants were distributed in proportion to the state populations).

3 A similar approach has previously been taken by Wagner et al. (2002) and Bryant et al. (2004).

Table 3.1 **Bilateral trade and migrants: effects of language, distance, foreign investment and colonial ties[a]**

Dependent variable is log imports or log exports

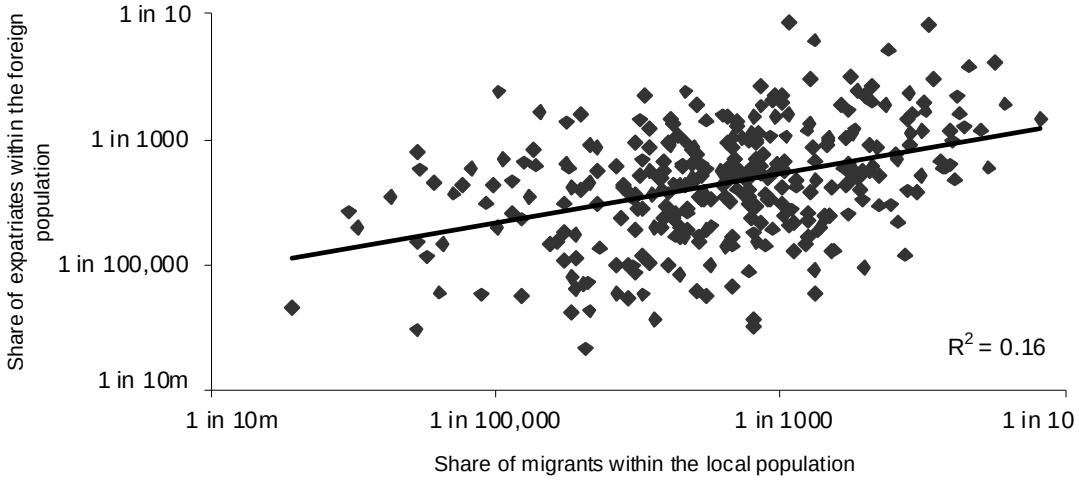
	Large sample		*Imports, OECD sample*				
	Imports	*Exports*	*Immigrants*	*Expatriates*	*Immigrants and expatriates*	*Interactions*	*Education*
	I	*II*	*III*	*IV*	*V*	*VI*	*VII*
ln lagged trade	0.084***	0.100***	0.071***	0.066***	0.064***	0.058**	0.080**
	(0.012)	(0.010)	(0.025)	(0.025)	(0.024)	(0.025)	(0.031)
ln importer's share	0.154***		0.143***		0.088***	0.076***	0.130***
	(0.017)		(0.023)		(0.012)	(0.012)	(0.019)
importer's share0	0.183		0.212		0.117	0.211	
	(0.124)		(0.219)		(0.201)	(0.180)	
ln exporter's share		0.178***		0.160***	0.088***	0.076***	0.130***
		(0.013)		(0.023)	(0.012)	(0.012)	(0.019)
exporter's share0		0.134		0.556**	0.384	0.502**	
		(0.101)		(0.258)	(0.248)	(0.240)	
*ln distance*ln share*						0.038***	
						(0.007)	
*ln FDI1990*ln share*						-0.004***	
						(0.002)	
*colony*ln share*						0.085*	
						(0.050)	
*language*ln share*						-0.039	
						(0.027)	
tertiary educated share							0.007***
							(0.002)
secondary educated share							0.002
							(0.003)
ln distance	-0.714***	-0.983***	-0.781***	-0.780***	-0.770***	-0.519***	-0.767***
	(0.048)	(0.042)	(0.056)	(0.055)	(0.054)	(0.064)	(0.056)
contiguity	0.226*	-0.071	0.068	0.044	0.026	0.398***	0.059
	(0.134)	(0.143)	(0.123)	(0.119)	(0.118)	(0.120)	(0.111)
language	-0.028	0.120*	0.188*	0.199*	0.196*	-0.020	0.097
	(0.090)	(0.070)	(0.105)	(0.106)	(0.107)	(0.147)	(0.106)
colony	0.294***	0.402***	-0.126	-0.149	-0.167	0.077	-0.211
	(0.104)	(0.093)	(0.142)	(0.139)	(0.141)	(0.183)	(0.137)
tariff	-4.722***	-1.580	-3.231*	-3.122*	-3.089*	-2.709	-3.354
	(1.433)	(1.042)	(1.754)	(1.787)	(1.749)	(1.709)	(2.100)
ln FDI in	0.014	-0.018*	0.041***	0.043***	0.040***	0.037***	0.035***
	(0.012)	(0.010)	(0.013)	(0.012)	(0.012)	(0.012)	(0.013)
ln FDI out	0.068***	0.051***	0.013	0.012	0.012	0.012	0.004
	(0.012)	(0.009)	(0.015)	(0.015)	(0.015)	(0.014)	(0.016)
n	3814	4085	755	755	755	755	629
Country of residence FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country of birth FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.933	0.956	0.994	0.923	0.994	0.994	0.994
Standard error	1.234	0.969	0.580	0.576	0.574	0.553	0.559

a Standard errors calculated using the White-robust estimator are reported in parentheses. ***, ** and * indicate statistical significance at the 1, 5 and 10 per cent levels. Results in column VII relate to working-age migrants as a share of the working-age population.

A problem with these estimates of the effects of migrant populations is that they ignore the effects of expatriate populations. It is likely that the size of expatriate populations is generally correlated with the size of migrant populations. Strong cultural similarities between countries may encourage two-way flows of migrants. These may be reinforced through bilateral agreements to provide work permits to each other's citizens, such as currently applies between Australia and New Zealand or within European Union countries. Finally, migrant populations themselves may encourage reverse flows of migration if they return to their country of birth with foreign-born spouses or children. In practice, the number of migrants and expatriates is strongly correlated, at least across the OECD (figure 3.1). Omitting the effects of expatriate populations may bias these estimates of the effects of migrant populations.

Figure 3.1 **Bilateral immigrant and expatriate populations in OECD countries**

Logarithmic scales



Data source: As discussed in section 2.4. A line of best fit is shown; its slope is statistically different from zero at conventional significance levels.

It is possible to take account of both migrant populations and expatriate populations within the smaller sample of trade between OECD countries. Column V of table 3.1 shows the estimated effects on imports of immigrants living in the importing country and expatriates living abroad. The analysis imposes the restriction that migrants and expatriates have the same effect on imports (or equivalently, that migrants have the same effect on imports and exports) because the strong correlation between these variables makes it difficult to estimate their effects separately. The results suggest an elasticity of imports or exports to migrants of around 0.09, which is only a little more than one-half the elasticities to migrant populations that were estimated without controlling for expatriate populations.

Bandyopadhay et al. (2006) found a similar reduction in the estimated elasticity of trade to migrant populations when they add trading-pair dummy variables, and this result suggests a possible explanation for their result. While the estimated elasticity of trade to migrants is somewhat smaller than those in most previous studies, migrants have still have quite important effects on the direction of trade (box 3.1).

The other variables in the equation are generally found to take their expected sign and magnitude. Countries that are far apart trade much less than countries that are close together. The estimated elasticity of trade to distance is between -0.7 and -0.9, which is close to the average found across the gravity-trade literature and, as discussed above, such a large elasticity should be interpreted as evidence of information barriers between countries. Countries that share a common language or that have colonial ties appear to trade somewhat more than countries that do not in at least some specifications of the model. Tariffs reduce the flow of trade between countries.

The role of information barriers

The initial results show that migrants act to increase bilateral trade, but provide little understanding of how migrants have this effect. Chapter 2 argued that migrants likely affect trade flows by providing information about business opportunities. If this were true, their effect should be largest where the information barriers between countries are largest. To test these relationships, the share of migrants was interacted with a range of other variables that proxy for information barriers: distance; foreign investment (lagged a decade to avoid simultaneity bias); colonial ties; and commonality of language.

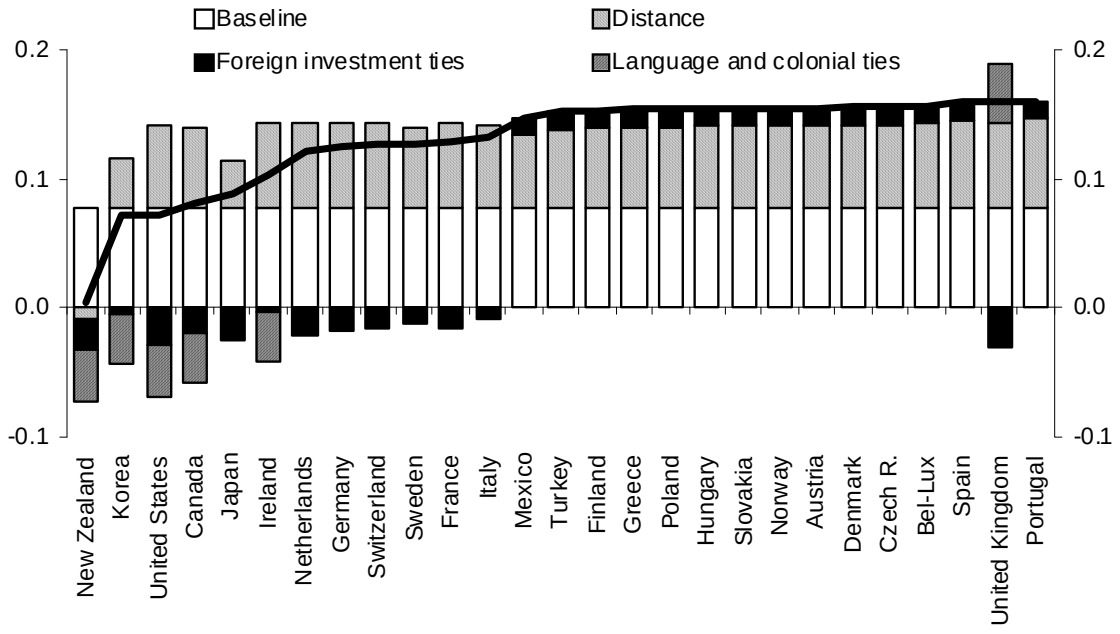
There is some evidence that migrants help to overcome information barriers (table 3.1, column VI). Migrants appear to have a larger effect on trade between countries separated by greater distances, a smaller effect where countries do not also exchange foreign investment,[4] and a smaller effect where countries share a common language. Roughly, doubling the distance between two countries increases the elasticity of trade to migrants by 0.026, doubling the level of foreign direct investment between the two countries reduces the elasticity of trade to migrants by 0.003, while the elasticity of trade to migrants is smaller by 0.039 if two countries

[4] The finding that trade and capital tend to flow together is common in the empirical literature (Collins et al. 1997, Head and Ries 2001, Hejazi and Safarian 2001), against predictions of standard trade models based on differences in resource endowments (Mundell 1957). A possible explanation is that intra-firm trade is increasingly important. For example, around half of US international trade is intra-firm (Blonigen 2005).

share a common language. Surprisingly, there is some evidence that migrants have a larger effect on trade between countries that share colonial ties.

One implication is that migrants may have a stronger influence on Australian trade ties because of Australia's remoteness. Figure 3.2 illustrates the effects that distance, foreign investment, common language and colonial ties have on the estimated elasticities of trade to the number of migrants living in Australia. On average Australia is 15,000 km from other OECD countries, almost three times the average distance between all OECD countries. As a result, the estimated elasticity of Australia's bilateral trade to migrants is as high as 0.16 with many OECD countries. Only for trade with New Zealand is the elasticity of trade to migrant numbers below average, because of its proximity, English-speaking population and the strong foreign investment ties between the two countries.

Figure 3.2 **Contributions to the estimated elasticities of Australian trade to migrants born in OECD countries**



The role of education

Many characteristics of migrants may be important in determining the effect they have on trade flows. From a policy perspective, the most interesting is the skill level of migrants since this has been a target of migration policy in a number of countries. In Australia, qualification for particular occupations and work experience play a role in selection of migrants. Given data limitations, the current analysis looks only at broad attainment of formal education in promoting trade.

The potential effect of migrant skills on trade is ambiguous. On the one hand, more educated and skilled migrants may bring with them more market information and may enter more influential positions within their countries of residence. On the other hand, more educated migrants may be better positioned to pioneer trade-replacing industries within their host countries and may also be less likely to work directly in importing and exporting businesses. Previous studies have found mixed results, with some evidence that more skilled migrants have a larger effect on trade (Head and Ries 1998, Herander and Saavedra 2005), some evidence that they have a smaller effect on trade (Gould 1994) and some evidence that this is different for exports and imports (Mundra 2005).

The current analysis suggests that migrants have a larger effect on trade the more education they have (table 3.1, column VII). The estimates suggest that a 10 percentage point increase in the proportion of migrants with tertiary education, in place of migrants that lack secondary education, increases the volume of trade between countries by 7 per cent (over and above the normal effect of migrant numbers).

Trade by type of good

If migrants affect trade through their knowledge and business networks, the effect should be larger for commodities that are differentiated, in the sense that their quality varies significantly between suppliers. For these goods, the buyer has some inherent uncertainty regarding the quality and characteristics of the product purchased from any particular manufacturer and the price alone does not convey all of the information relevant for international trade.

Following Rauch (1999), differentiated goods are identified based on whether it is possible to quote 'reference prices' for the goods, that is prices that do not specify the supplier. Commodities that do not have reference prices are called 'differentiated goods'. The remainder, homogeneous goods, are further split based upon whether reference prices are quoted on organised exchanges ('exchange-quoted homogeneous goods') or quoted only in trade publications ('publication-quoted homogeneous goods'). For the former homogeneous goods it is assumed there are many well-informed, specialised traders so that there is likely little opportunity for migrant networks to improve information flows.

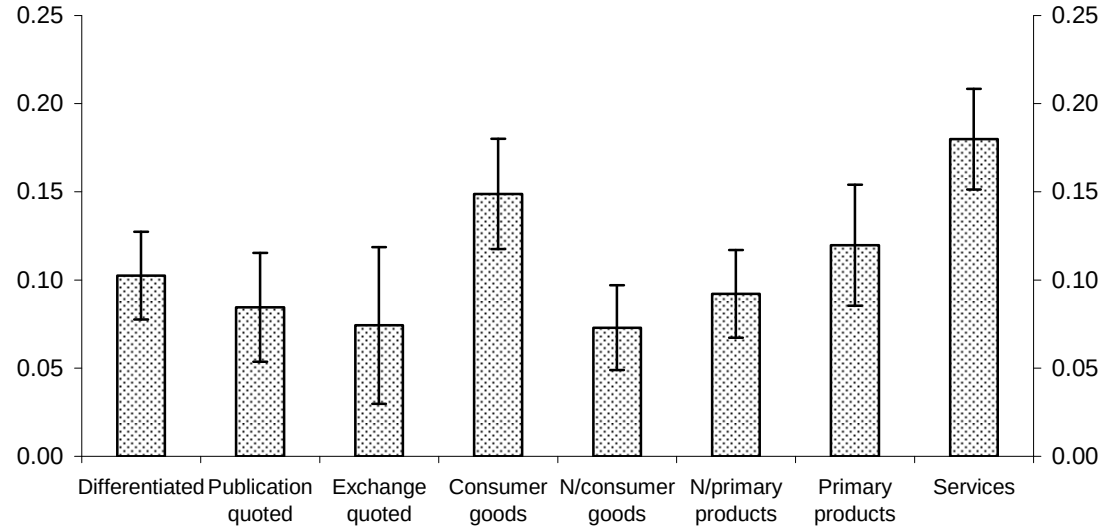
The results show that migrants are associated with greater bilateral trade in all types of goods (figure 3.3). Consistent with expectations, the results suggest that trade in differentiated goods may be more strongly affected by migrants than trade in homogenous goods, but the elasticities are not precisely estimated and the difference in these estimates may be due to chance. Overall, these results are

consistent with the idea that migrants affect trade through their knowledge and business networks, but are not conclusive in their own right.

As a cross-check on these results, two alternative ways of disaggregating merchandise trade were considered. Previous studies have found that the effects of migrants are smaller for crude or primary products (Bryant, Genç and Law 2004, Dunlevy and Hutchinson 2001) and larger for consumer goods (Gould 1994, Herander and Saavedra 2005). The results suggest that migrants affect trade in consumer goods more strongly than trade in other goods, but there is no statistical difference between the estimated elasticity of trade in primary or non-primary goods to the migrant share of the populations.[5]

Finally, migrants may be expected to have a larger effect on trade in services to the extent that they are more closely tailored to the needs of individual clients than are many mass-produced goods. The results suggest that migrants affect trade in services more strongly than for most other goods.

Figure 3.3 **Estimated elasticities of trade by type of good or service[a]**



a Estimated elasticities of bilateral trade to migrant shares of the population based on regression specifications as in column V of table 3.1, except that the 'services trade' regression uses lagged merchandise trade flows in place of the lagged dependent variable. Error bars indicate 95 per cent confidence intervals. The labels 'N/consumer goods' and 'N/primary products' refer to all goods excluding consumer goods and primary products respectively.

5 Primary products are defined to include: food and live animals chiefly for food; crude materials (inedible) except fuel; mineral fuels, lubricants and related materials; and animal and vegetable oils, fats and waxes (SITC rev.2 classes 0, 2, 3 and 4). Consumer goods are defined to include: food and live animals chiefly for food; beverages and tobacco; leather products; furniture; travel goods and handbags; clothing and apparel; and footwear (SITC rev.2 classes 0, 1, 61, 82, 83, 84 and 85).

Box 3.1 **The changing direction of Australian trade**

The origins of Australian migrants and the directions of Australian trade have been changing (appendix A). Over the three decades to 2001, the numbers of Australians born in China increased from 17,000 to 143,000, those born in Korea increased from 379 to around 39,000 and those born in Vietnam, Cambodia or Laos increased from 666 to around 187,000. During the same period, the number of Australians born in the United Kingdom or Ireland was steady, while the number born in Greece or Italy fell by around one-quarter. On the surface, these changes in migrant origins parallel the changes in the direction of Australian trade over the same period. The proportions of Australian trade with the UK and Ireland and Southern Europe have fallen, while the proportions of trade with East Asia and South-East Asia have increased.

The results in this section allow an exploration of the possible connection between these trends. The regression results suggested that a 1 per cent increase in the number of migrants may increase bilateral trade by around 0.09 per cent (see table 3.1, column V). Applying this result to the changes in the number of migrants living in Australia (using a smearing estimate as in Duan (1983)) provides some illustrative estimates of the effects that migrants might have had on the direction of Australian trade.

A good deal of caution is warranted, though. The estimated marginal effects were obtained from comparisons of OECD-country trade at a point in time and may not accurately reflect the effects that migrants have on Australian trade over time. Moreover, some of the changes in migrant numbers over the past three decades have been large, so that applying the estimates of the marginal effect of migrants on trade will not produce accurate predictions.

Table 3.2 **Changing directions of Australian merchandise trade[a]**

	Proportion of Australian trade			*Change attributable to migrants?*
	1970	*2000*	*Change*	
	%	%	% pt	% pt
East Asia	27	36	9	3
South-East Asia	5	14	9	1
New Zealand	4	5	1	0
Southern Europe	4	3	0	-1
North America	23	18	-5	-1
UK and Ireland	18	6	-12	-1
Other	20	18	-2	-1

a These simulations are based on 63 countries and country groups for which data on migrant populations and trade are available in both time periods and are not necessarily the best estimates of trade by region in either year. Migrant populations are sourced from the 1971 and 2001 censuses.

(continued on next page)

Box 3.1 **(continued)**

With these limitations in mind, table 3.2 illustrates the regional distribution of Australia's trade in 2000 that may have resulted had Australia maintained its 1970 migrant populations. Changes in Australia's migrant populations appear to have played a role in the changing directions of Australian trade. Perhaps as much as 3 percentage points of the 9 percentage point increase in the proportion of Australian trade with East Asia and around 1 percentage point of the 9 percentage point increase in the proportion of Australian trade with South-East Asia may be due to the relative strengthening of migrant links with those regions. Nevertheless, this suggests that most of the change in Australia's directions of trade has occurred for other reasons, which presumably include the growth in the relative economic importance and openness of many Asian countries and the effect on UK and Irish trade of closer ties within the European Union.

3.2 Effects on aggregate trade flows

The analysis to this point provides support for the idea that migrant networks increase bilateral imports and exports between their country of residence and country of birth. If so, a possible side-effect is that these migrant networks between some country pairs will draw trade from country pairs *without* migrant networks. A natural question is whether migrants increase *total* international trade or simply change the pattern of trading partners.

The paper takes three approaches to attempt to answer this question. The first approach is to study the effect that the total number of migrants from all countries of birth has on the bilateral trade flows of their country of residence. The second approach is to investigate the effects of aggregate migrant numbers on openness to international trade. Finally, the implications of the theory underpinning the gravity-trade equation are explored.

Do countries with more migrants trade more?

A first attempt to estimate the effects of migration on the total volume of trade is to supplement the analysis in the previous section by estimating the effect that the total migrant share of the population (*total share*) from all countries of birth, has on the international trade of the country of residence. If migrants affected *only* the pattern of trading partners, and not the total volume of trade, the elasticity of trade to the total migrant share of the population would precisely offset the direct effects of migrants born in that partner country. A 1 per cent increase in the number of migrants from all countries of birth would then have no effect on trade.

The analysis is undertaken without origin and destination fixed effects, but by including the GDP-weighted multilateral form of each bilateral variable (*distance*,

contiguity, *colony* and *language*) discussed in chapter 2. Four variables are added: the product of the two countries' GDPs (*mass*); the product of the two countries' GDP per capita (*masspc*); and variables counting the countries in the pair that are landlocked (*landlocked*) or an island (*island*). A random effects estimation approach is taken to control for within-group correlation of error terms that would otherwise tend to bias downwards the estimated standard errors on the *total share* variables (Moulton 1986).

The results (table 3.3, columns I, II and III) suggest that migrants have a much larger effect on the directions of trade than on total trade volumes. As in the previous section, migrants are found to increase bilateral trade between their country of residence and country of birth. However, after controlling for the positive effect that migrants have on bilateral trade with their country of birth, countries that contain more migrants in total appear to trade less. The coefficients on the *total share* variables are not statistically different in magnitude to those on the bilateral migrant share variables. This suggests that if the number of migrants from all countries of birth increased proportionately, the effect on the total trade volumes of their country of birth would be small.

Does migration affect openness?

The analysis of bilateral trade patterns in the previous subsection suggested that, on balance, increasing the total number of migrants in a country from all other countries has only a small effect on the total volume of trade. To supplement that analysis, this subsection explores the relationship between migrants and aggregate openness to trade.

Analysis of aggregate openness (taken here to be the ratio of merchandise imports plus merchandise exports to GDP) has advantages and disadvantages compared to analysis of bilateral trade flows. The main advantage is that aggregate data are available for many more countries and years. The disadvantage is that there is little theory to guide the empirical modelling of aggregate openness.

Table 3.3 **Bilateral trade flows and the total number of migrants[a]**

Regression results; dependent variable is imports or exports measured in million US dollars

	Full sample		*OECD sample*
	Imports	*Exports*	*Imports*
	I	II	III
ln lagged trade	0.063***	0.058***	0.052***
	(0.007)	(0.006)	(0.015)
ln importer's share	0.171***		0.102***
	(0.016)		(0.011)
importer's share0	0.299**		0.168
	(0.133)		(0.171)
ln exporter's share		0.214***	0.102***
		(0.012)	(0.011)
exporter's share0		0.390***	0.029
		(0.097)	(0.174)
ln importer's total share	-0.256**		-0.114*
	(0.103)		(0.061)
ln exporter's total share		-0.349***	-0.114*
		(0.103)	(0.061)
ln mass	0.812***	0.648***	0.770***
	(0.021)	(0.015)	(0.050)
ln masspc	0.180***	0.338***	0.090
	(0.021)	(0.016)	(0.098)
island	0.084	0.064	-0.424***
	(0.077)	(0.058)	(0.161)
landlocked	-0.061	-0.326***	0.146
	(0.067)	(0.050)	(0.150)
multilateral (ln distance)	-0.735***	-0.986***	-0.831***
	(0.048)	(0.036)	(0.043)
multilateral (contig)	0.525***	0.006	0.015
	(0.178)	(0.136)	(0.105)
multilateral (language)	0.133	0.129*	0.273***
	(0.093)	(0.069)	(0.092)
multilateral (colonial ties)	0.131	0.302***	-0.192
	(0.139)	(0.105)	(0.121)
n	3814	4085	755
Country of residence RE	Yes	Yes	Yes
Country of birth RE			Yes
R^2	0.721	0.807	0.837
Standard error	1.484	1.122	0.578

a Standard errors are reported in parentheses. ***, ** and * indicate statistical significance at the 1, 5 and 10 per cent levels.

Guttman and Richards (2004) considered some factors that may affect openness and the analysis here builds on their results. First, the size of a country in terms of land area may matter because large countries tend to have more diverse resource bases, encouraging greater self-sufficiency. Second, the size of a country in terms of population may matter because, with economies of scale and lower intra-national than international transport costs, larger countries will tend to manufacture more to serve their own consumers. Third, remoteness from world economic activity raises the cost of international trade relative to intra-national trade, and so lowers openness. Finally, trade policy plays a role. The current study includes an index of tariffs (with a higher score indicating lower tariffs).

Cross-sections were considered at five-year intervals between 1960 and 2005 covering between 86 and 126 countries. The following equation is estimated in each year with ordinary least squares. The variable of most interest is the total migrant share in the population (*total share*).

$$ln(openness_i) = \beta_0 + \beta_1 ln(total\ share_i) + \beta_2 ln(population_i) + \beta_3 ln(land\ area_i) + \beta_4 ln(remoteness_i) + \beta_5 tariff\ index_i + \varepsilon_i$$

The results suggest that in recent years countries that have a larger share of migrants in their populations do not have noticeably higher openness to trade. In 2000, countries with a 1 per cent larger share of migrants in their populations tended to be 0.03 per cent more open to trade, but this effect was not statistically significant (decennial results are presented in table 3.4).[6] This is consistent with the analysis based on bilateral trade patterns.

However, there is some evidence that in past decades this may not have been the case. In 1960, for example, countries with a 1 per cent larger share of migrants in the population were 0.12 per cent more open to trade and this effect was statistically significant (figure 3.4). Interestingly, the magnitude of this historical elasticity of openness to the migrant share of the population is similar to the simple elasticities of bilateral imports and exports to migrants discussed at the start of this chapter (table 3.1, column V). A better understanding of the historical role of migrants in international trade would require historical data on bilateral migrant numbers.

6 The estimated effects of other variables differ from those of Guttman and Richards (2004) in two ways. First, in the current analysis the remoteness measure generally does not play a significant role in determining openness. Second, the role of population is smaller than in Guttman and Richards (2004), but this is compensated by land area playing a larger role. Both of these differences appear to be mainly due to the use of openness measured by merchandise trade as a share of GDP from the World Bank's *World Development Indicators*, rather than openness from the *Penn World Tables*.

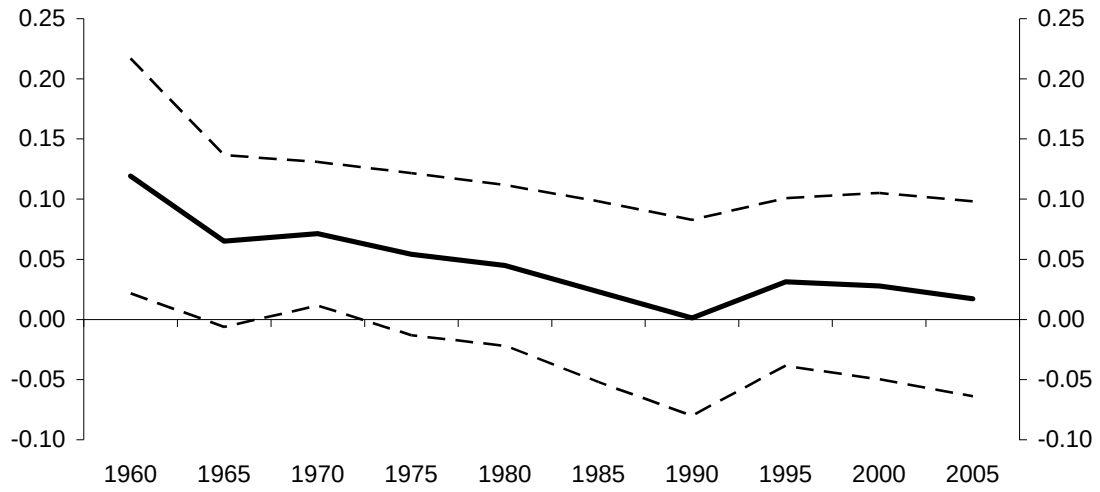
Table 3.4 **Openness[a]**

Dependent variable is the log of merchandise imports plus exports divided by GDP

	1960	*1970*	*1980*	*1990*	*2000*
ln total share	0.118**	0.070**	0.045	0.001	0.028
	(0.049)	(0.030)	(0.034)	(0.041)	(0.039)
ln population	-0.118***	-0.184***	-0.137***	-0.079*	-0.057
	(0.044)	(0.032)	(0.046)	(0.045)	(0.048)
ln land area	-0.109**	-0.098***	-0.103***	-0.106***	-0.075**
	(0.044)	(0.027)	(0.032)	(0.036)	(0.038)
ln remoteness	0.213	0.062	0.038	0.13	-0.108
	(0.186)	(0.118)	(0.125)	(0.123)	(0.150)
tariff index	0.047**	0.078***	0.052**	0.082***	0.054**
	(0.020)	(0.015)	(0.020)	(0.024)	(0.026)
n	86	97	106	111	126
R^2	0.5012	0.7086	0.5600	0.4261	0.2887

a Standard errors calculated using the White-robust estimator are reported in parentheses. ***, ** and * indicate statistical significance at the 1, 5 and 10 per cent levels.

Figure 3.4 **Estimated elasticity of openness to the total migrant share of the population, 1960 to 2005**



Data source: Author's calculations. Dashed lines show 95 per cent confidence intervals.

Should countries with more migrants be expected to trade more?

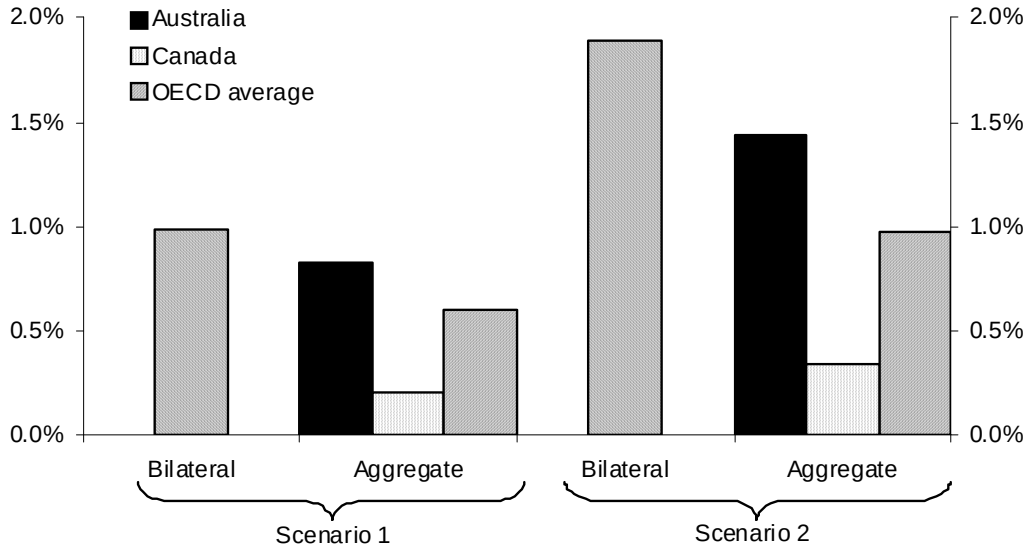
The analysis to this point has described the relationship between migrants and trade in the data set. However, if the theory underpinning the gravity trade model is interpreted literally then it is possible to calculate the extent to which the increase in bilateral trade between migrants' country of residence and country of birth should

be expected to accompany a reduction in trade between other countries. Appendix B contains the detailed analysis and only the results are summarised here.

The theory is applied to two scenarios. The first scenario considers what happens to a country if it were to increase the migrant share of its population. The total migrant share of the population can easily be affected by policy choices, such as the Australian Minister for Immigration's choice of the number of permanent visas to be made available each year. To represent this choice, the scenario modelled here assumes a simple 10 per cent increase in the number of migrants from all countries of birth resident in a single country. Of course, in practice the effects on trade will be more complex because the source countries from which migrants arrive are affected by the criteria used to choose between applicants (such as the relative size of the skill, family reunion and humanitarian programs).

With an elasticity of trade to migrant numbers of around 0.1, the effect of increasing by 10 per cent the number of migrants living in Australia from a particular country of birth tends to increase bilateral trade by around 1 per cent. However, if Australia were to increase the number of migrants from all countries then the effect on Australia's aggregate trade would be smaller at around 0.8 per cent (figure 3.5).

Figure 3.5 **Estimated effects of increasing the number of migrants on the country of residence's trade: Australia, Canada and the OECD average**



Data source: See appendix B.

The second scenario models the effects from the ongoing trend towards the circulation of people across the borders of developed countries. It involves increasing by 10 per cent the number of migrants living in *all* countries from *all* countries of birth. Again, with an elasticity of bilateral trade to migrants of 0.1 the effect on bilateral trade of increasing migrant and expatriate populations by 10 per cent would be around 2 per cent. But when all migrant populations increase the effect on aggregate trade is only around 1.4 per cent.

Though only approximate, these scenarios show that a significant portion of the increase in bilateral trade when Australia's migrant population increases is due to 'diversion' of trade from other countries. Migrants living in other countries such as Canada, which trade more heavily with nearby neighbours, appear to reduce trade with other countries to an even greater extent (see appendix B). In an average OECD country, roughly half of the bilateral increase in trade when the number of migrants increases is due to a reduction in trade with other countries.

4 Foreign direct investment

The evidence presented in this chapter suggests that migrants have a very different effect on investment than on trade. Migrants appear to increase bilateral investment between their country of residence and country of birth and this effect is stronger than for trade. However, it is difficult to determine the manner in which migrants affect investment. It is not clear whether migrants have a larger effect on investment where information barriers between countries appear to be larger. Finally, unlike the study of trade in the previous chapter, there is not evidence that the increase in bilateral investment results in a reduction in investment with other countries.

4.1 Effects on bilateral investment

This section begins by analysing the effect of migrants on inward and outward investment stocks and is extended by considering the roles of other information barriers and the role played by the education levels of migrants.

More methodological details

The analysis uses the standard gravity-type variables (*distance*, *contiguity*, *language*, *colony*, *tariff, legal origin*). Since FDI figures were taken for the year closest to 2000 for which data were available (up to 3 years either side), dummy variables for each year were also included. To these was added a variable (*improvement in remoteness*) calculated by summing the reduction in the minimum distance to world markets from two plants (that is, in the source country and in the host country) compared to a single plant in the source country.[1] This is intended to capture a motivation for not just horizontal investment, but also export-platform investment. (Intel's investment in Ireland to supply the large and nearby consumer markets of continental Europe is one example.) Since this measure varies by country-pair it can be included in the regression together with country fixed effects, where the normal indicator of motivations for horizontal investment (host country GDP) could not.

[1] The variable is constructed by adding up, weighted by the GDP in each potential consumer market, the difference in distance from the source country and the host country to each consumer market wherever the host is closer than the source to a consumer market.

Initial results

Migrants appear to increase significantly the amount of investment between their country of residence and country of birth. Analysis that looks only at the effects of migrants on investment without controlling for the effects of expatriate populations suggests an elasticity of between 0.23 and 0.29 (table 4.1, columns III-IV), broadly in line with the results of previous studies (table 1.2).

However, these estimates appear to be biased because the effects of expatriate populations are ignored in much the same way as the estimates for trade flows in the previous chapter. Taking account of the role played by expatriate populations, suggests a better estimate of the elasticity of bilateral investment to migrant numbers is around 0.15 (table 4.1, column V).

Other variables generally had their expected effect on investment. Investment falls away sharply as the distance between countries increases. An elasticity to foreign investment of around -0.64 among OECD countries (column V) means that the volume of investment falls by around 40 per cent as the distance between two countries doubles. For investment out of OECD countries the estimated elasticity is much larger, around -1.45 (column II), indicating that the volume of investment falls by around 60 per cent as the distance between two countries doubles. This difference is consistent with the idea that distance is a proxy for information barriers, since the alternative information sources are probably scarcer regarding investment opportunities in, and characteristics of, less developed countries. In most models, countries appear to invest more with countries that share a common language, and there is some evidence (column II) that OECD countries invest more in countries with which they have colonial ties.

The role of other information barriers

The most plausible explanation for the relationship between migrants and investment is that migrants help to overcome information barriers between countries. The strongest support for this conjecture is that the estimated elasticity of investment to migrants is much larger than the elasticity of trade to migrants found in the previous chapter. This is in line with expectations, given the greater amount of information required by prospective investors compared to traders.

If migrants help to overcome information barriers to investment then their effect should be largest where the information barriers between countries are largest. To test these relationships, the share of migrants was interacted with other variables that proxy for information barriers: distance; colonial ties; and commonality of language. However, there was no evidence that migrants have a different effect on investment between countries separated by larger information barriers (table 4.1, column VI).

The role of education

More educated migrants may be expected to have a larger effect on foreign investment because they are better positioned financially and socially to help entrepreneurs invest abroad. To date, only Javorcik et al. (2006) have investigated this relationship, finding some evidence that that the effect of migrants is larger where migrants held tertiary qualifications. The current results support this finding (table 4.1, column VII). Roughly, a 1 percentage point increase in the share of migrants with tertiary qualifications, at the expense of migrants without complete secondary education, appears to raise investment by 3 per cent. An increase in the share of migrants with complete secondary education, at the expense of migrants without complete secondary education, appears to raise investment to a lesser extent.

Table 4.1 **Bilateral investment and migrants: effects of distance, language and colonial ties**

Dependent variable is inward or outward direct investment stock, measured in million US dollars

	Large sample		*OECD sample, inward stock*				
	Inward	*Outward*	*Migrants*	*Expatriates*	*Migrants and expatriates*	*Interactions*	*Education*
	I	II	III	IV	V	VI	VII
ln lagged investment	0.220***	0.305***	0.175***	0.166***	0.168***	0.165***	0.123***
	(0.026)	(0.023)	(0.030)	(0.031)	(0.030)	(0.030)	(0.032)
ln host's share	0.204***		0.285***		0.151***	0.142***	0.177***
	(0.042)		(0.058)		(0.031)	(0.034)	(0.021)
host's share0	0.444		0.646*		0.393	0.395	
	(0.323)		(0.382)		(0.361)	(0.387)	
ln source's share		0.203***		0.232***	0.151***	0.142***	0.177***
		(0.034)		(0.059)	(0.031)	(0.034)	(0.021)
source's share0		0.896***		1.013***	0.882**	0.886**	
		(0.232)		(0.371)	(0.348)	(0.378)	
*ln distance*ln share*						0.007	
						(0.019)	
*language*ln share*						0.015	
						(0.073)	
*colony*ln share*						-0.152	
						(0.128)	
*legal origin*ln share*						0.034	
						(0.038)	
tertiary educated share							0.028***
							(0.004)
secondary educated share							0.010*
							(0.005)
ln distance	-1.030***	-1.451***	-0.653***	-0.689***	-0.637***	-0.583**	-0.550**
	(0.208)	(0.180)	(0.237)	(0.243)	(0.238)	(0.235)	(0.230)
ln improvement in remoteness	1.896**	3.307***	0.000	-0.003	-0.003	-0.002	-0.006
	(0.812)	(0.685)	(0.018)	(0.018)	(0.018)	(0.019)	(0.019)
contiguity	-0.339	-0.216	0.070	0.143	0.062	0.129	0.068
	(0.214)	(0.195)	(0.246)	(0.243)	(0.241)	(0.258)	(0.228)
language	0.297	0.031	0.427**	0.452**	0.453**	0.451	0.265
	(0.188)	(0.135)	(0.216)	(0.223)	(0.220)	(0.350)	(0.210)
colony	0.286	0.486***	-0.024	0.066	-0.019	-0.491	-0.157
	(0.213)	(0.167)	(0.267)	(0.260)	(0.259)	(0.496)	(0.212)
legal origin	0.305***	0.181*	0.564***	0.581***	0.548***	0.807***	0.376**
	(0.111)	(0.097)	(0.141)	(0.144)	(0.144)	(0.285)	(0.165)
host's tariff	0.099	-1.121	7.959**	7.587*	7.818**	7.737*	7.165*
	(3.377)	(3.109)	(3.931)	(3.964)	(3.948)	(3.966)	(4.055)
n	1108	1494	574	574	574	574	480
Host country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Source country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Reporting year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.853	0.814	0.974	0.973	0.973	0.974	0.977
Standard error	1.281	1.260	1.129	1.143	1.132	1.134	1.080

a Standard errors calculated using the White-robust estimator are reported in parentheses. ***, ** and * indicate statistical significance at the 1, 5 and 10 per cent levels. Results in column VII relate to working-age migrants as a share of the working-age population.

4.2 Effects on aggregate investment

Migrants appear to increase bilateral investment between their country of residence and country of birth. In chapter 1, it was argued that in some cases, particularly where the investment is 'vertical', this additional investment may come at the expense of investment into third countries. That is, the effect of increasing the number of migrants from all countries of birth may be different than the effects of increasing the number of migrants from a particular country.

To investigate this possibility, the analysis within the previous section was extended by estimating the effect that the total migrant share of the population (*total share*) from all countries of birth has on the international investment of the country of residence. In the absence of any theory as a guide, the approach taken is to relax minimally the restrictions on the gravity model. Dummy variables are still included to control for unobserved characteristics of the migrants' country of birth. However, dummy variables are not included for the migrants' country of residence and three other variables are added to control for some of the most important characteristics of each country: GDP; GDP per capita; and a measure of remoteness (*host remoteness* or *source remoteness*), which is the GDP-weighted distance to the rest of the world as constructed in the previous chapter. The analysis also includes a *corruption index* based on data published by Transparency International, with a higher score indicating lower perceptions of corruption.

The results do not provide strong evidence that the increase in bilateral investment attributable to migrants accompanies a reduction in investment into other countries. Patterns of investment between OECD countries and all other countries in the world (table 4.2, columns I and II) suggest that as much as half of the effect of migrants on bilateral investment may be offset by a reduction in investment with other countries, but the estimated reduction is not statistically different from zero.

Table 4.2 **Bilateral investment and the total number of migrants**

Dependent variable is inward or outward direct investment stock, measured in million US dollars

	Large sample		*OECD sample*
	Inward	*Outward*	*Inward*
	I	II	III
ln lagged investment	0.211***	0.302***	0.180***
	(0.023)	(0.020)	(0.026)
ln host's share	0.206***		0.154***
	(0.037)		(0.025)
host share0	0.460*		0.616*
	(0.252)		(0.352)
ln host total migrant share	-0.111		0.053
	(0.161)		(0.111)
ln source's share		0.212***	0.154***
		(0.031)	(0.025)
source share0		0.924***	0.995***
		(0.224)	(0.354)
ln source total migrant share		-0.113	0.053
		(0.152)	(0.111)
ln host gdp	0.661***		0.637***
	(0.141)		(0.125)
ln source gdp		0.527***	0.604***
		(0.116)	(0.129)
ln host gdppc	-0.716		-0.637*
	(0.448)		(0.371)
ln source gdppc		0.888***	1.576***
		(0.246)	(0.242)
ln distance	-0.953***	-1.371***	-0.565***
	(0.212)	(0.170)	(0.127)
ln host remoteness	0.777		-0.166
	(0.698)		(0.404)
ln source remoteness		-0.991**	-0.369
		(0.422)	(0.441)
ln improvement in remoteness	1.586**	2.947***	-0.001
	(0.783)	(0.633)	(0.010)
contiguity	-0.319	-0.218	-0.004
	(0.225)	(0.199)	(0.217)
common language	0.330**	0.028	0.513**
	(0.167)	(0.143)	(0.205)
colonial ties	0.305	0.496***	0.064
	(0.199)	(0.170)	(0.251)
common legal origin	0.319***	0.178*	0.423***
	(0.109)	(0.091)	(0.136)
host's corruption index	0.128		0.152
	(0.147)		(0.123)
n	1108	1494	574
Host country FE		Yes	
Source country FE	Yes		
Host country RE	Yes		Yes
Source country RE		Yes	Yes
Reporting year FE	Yes	Yes	Yes
R^2	0.830	0.789	0.774
Standard error	1.284	1.261	1.097

a Standard errors are reported in parentheses. ***, ** and * indicate statistical significance at the 1, 5 and 10 per cent levels.

5 Conclusions

This paper's main conclusion is that the consequences of immigration and emigration for productivity and living standards through their effects on international business and social networks are more nuanced than they previously appeared.

Previous studies have shown that countries trade more with partner countries from which they have received more migrants. The current results confirm this bilateral correlation. Bilateral trading patterns suggest that migrants increase trade between their country of residence and country of birth, with a 10 per cent increase in the number of migrants from a particular country of birth estimated to raise bilateral trade with that country by 0.9 per cent (table 3.1).

However, countries with larger numbers of migrants do not tend to be much more open to trade. For example, aggregate trade data suggest that a country that increased its migrant population by 10 per cent would only see its aggregate trade increase by 0.3 per cent (and this effect is not statistically different from zero, table 3.4). This suggests that migrants have a larger effect on the direction of trade than on total volumes.

These results do not imply that migrants play insignificant roles in building business ties between countries and in reducing the costs of trade to Australian businesses. It is precisely because migrants appear to lower trade costs between their country of residence and country of birth that they appear to change the direction of trade.

Rather, the results imply that simply increasing the number of migrants from all countries of birth, by say 10 per cent, should be expected to have a much smaller effect on aggregate trade than may have naïvely been expected given previous studies of the effects of migrants on bilateral trade with their country of birth. This suggests caution in applying the results from other papers that have demonstrated the beneficial effects that increasing aggregate international trade can have on a country's productivity and living standards.

The effects of migrants on foreign direct investment appear to be different. Bilateral investment patterns show that migrants increase investment between their country of residence and country of birth, with a 10 per cent increase in the number of migrants from a particular country of birth estimated to raise bilateral investment with that country by 1.7 per cent (table 4.1). There was no strong evidence that this

increase in bilateral investment accompanies a reduction of the stock of investment in other countries.

The paper also explores the roles that migrant networks play in overcoming information barriers between countries. The results show that migrants help to overcome information barriers to trade. Migrants appear to have a smaller effect on trade where countries share a common language or where there are strong business networks already in place (indicated by the historical stock of FDI) and that migrants have a larger effect on trade between countries that are further apart. However, there was no evidence that migrants help to overcome information barriers to foreign investment. These results support the approach taken to model trade flows, but raise some doubt as to whether the approach used to model foreign investment is sound. Taken together with the lack of theoretical underpinning for the gravity model of investment employed and lesser accuracy and completeness of the foreign investment data, this suggests that the results for trade flows should be interpreted as somewhat more reliable than those from the analysis of foreign investment stocks.

A Australia's patterns of migration, trade and foreign investment

This appendix outlines changing volumes of Australia's trade, migration and foreign investment flows over time, how these compare with other OECD countries and the patterns of bilateral relationships. Over the past half-century both the proportion of migrants in the Australian population and the proportion of trade in the Australian economy have been rising, and the directions of both migration and trade have been shifting away from the United Kingdom and Ireland and towards Asia.

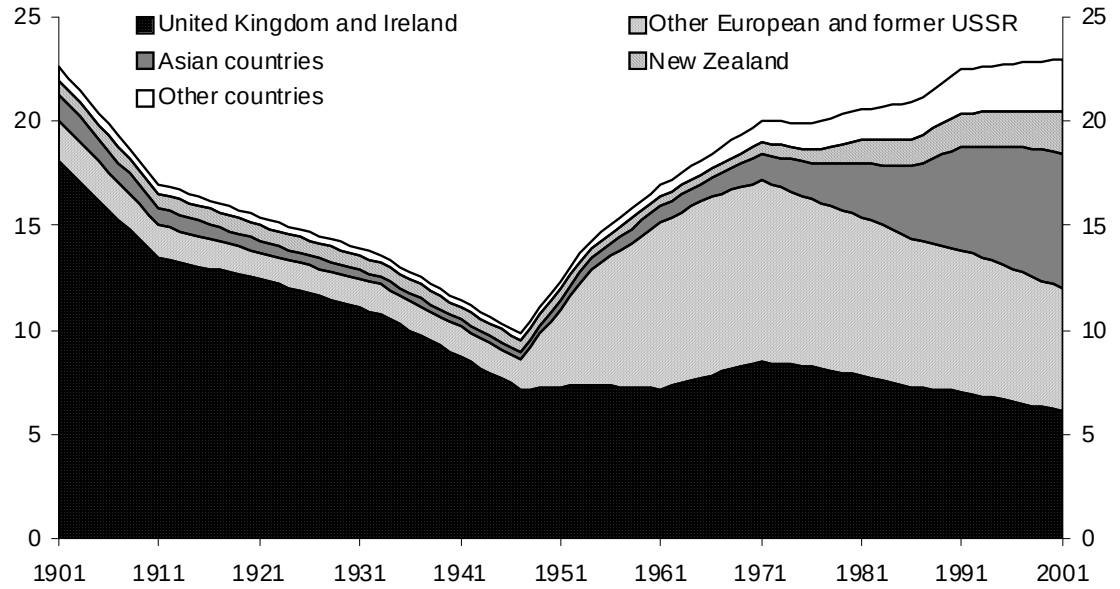
A.1 Migration

Migrants have always played a large role in the Australian economy. At Federation in 1901 around 23 per cent of the population was foreign born (figure A.1). This proportion declined steadily through to the end of the Second World War, at which point less than 10 per cent of the population was foreign born. Since that time, successive waves of migration from Europe and, later, Asia have returned the proportion of the population that was foreign born to around 23 per cent in 2001 (or more than 4 million people), while increasing the cultural diversity of the population.

Elsewhere in the OECD, migrants generally play a smaller role than in Australian society (figure A.2). Migrant populations remain large in historical 'settler' economies — New Zealand, Canada and the United States — and in some small, open European economies such as Switzerland. In most European countries migrants represent a much smaller proportion of the population (10 per cent or less), though this is still large compared to Japan and Korea (where 1 per cent and 0.3 per cent respectively of the populations are migrants). Nevertheless, in the past decade or two these patterns of migrant flows have been changing (Coppel et al. 2001). Migration into EU countries has been growing, peaking in the early 1990s with the increased migration from Eastern European countries and a larger number of asylum seekers. Historically strict migration restrictions in Japan have been eased somewhat as that country confronts economic challenges associated with its changing demographics.

Figure A.1 **Australians born overseas by region of birth**

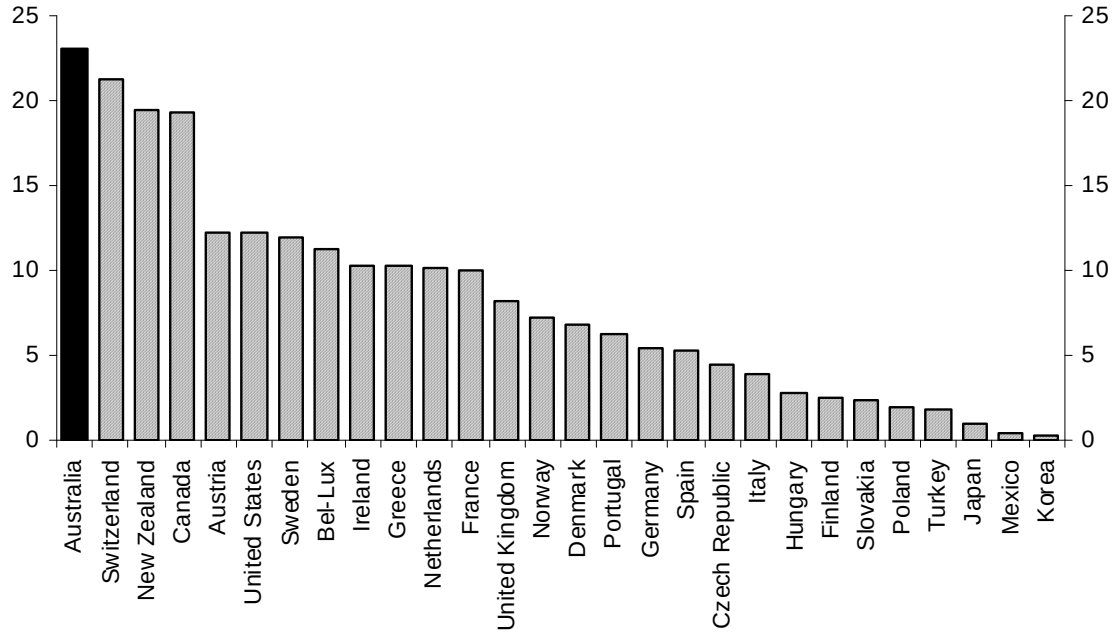
Foreign-born per cent of population identifying country of birth



Data source: ABS, *Australian Historical Population Statistics*, cat. no. 3105.0.65.001.

Figure A.2 **Immigrants in OECD countries by country of residence**

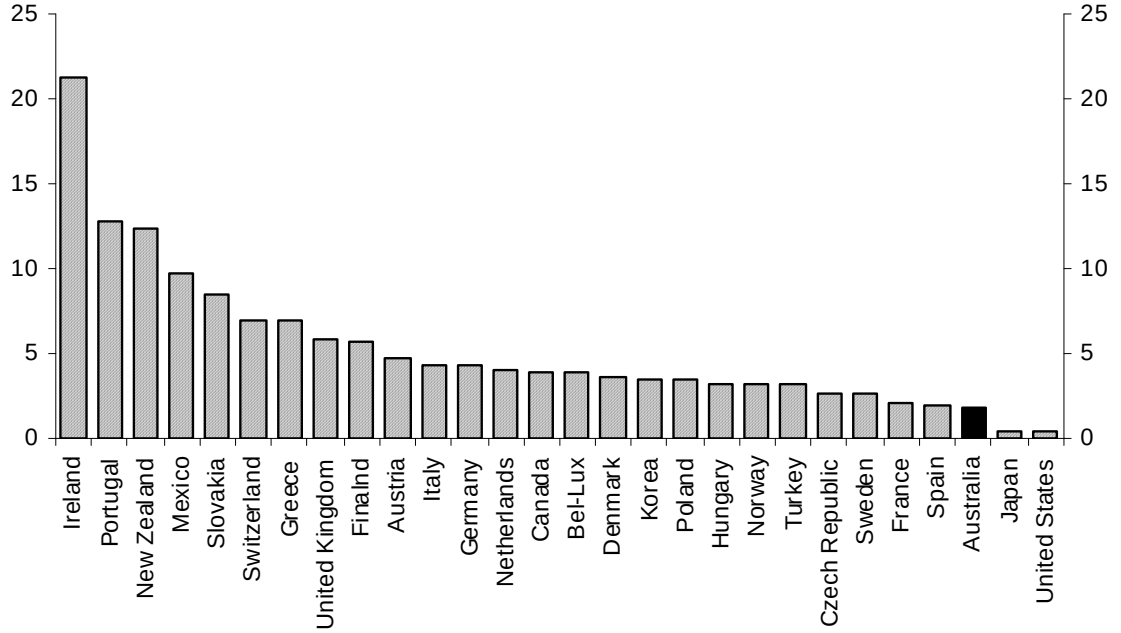
Per cent of country-of-residence population identifying country of birth



Data source: OECD, *Database on Immigrants and Expatriates*.

Though more difficult to measure, the Australian population overseas may also play an important role in Australia's society. Reliable data are hard to pin down. One reason is that the notion of an expatriate community is not precise. The oft-quoted figure is that on any given day as many as one million Australian citizens are overseas, of which around three-quarters are long-term foreign residents and the balance are short-term visitors.[1] More accurate data are available for expatriates defined as those residing outside of their country of birth (figure A.3). Around 346,000 Australian-born people were residing in other OECD countries around the year 2000 (Dumont and Lemaitre 2005).[2]

Figure A.3 **Expatriates living in other OECD countries by country of birth**
Per cent of country-of-birth population



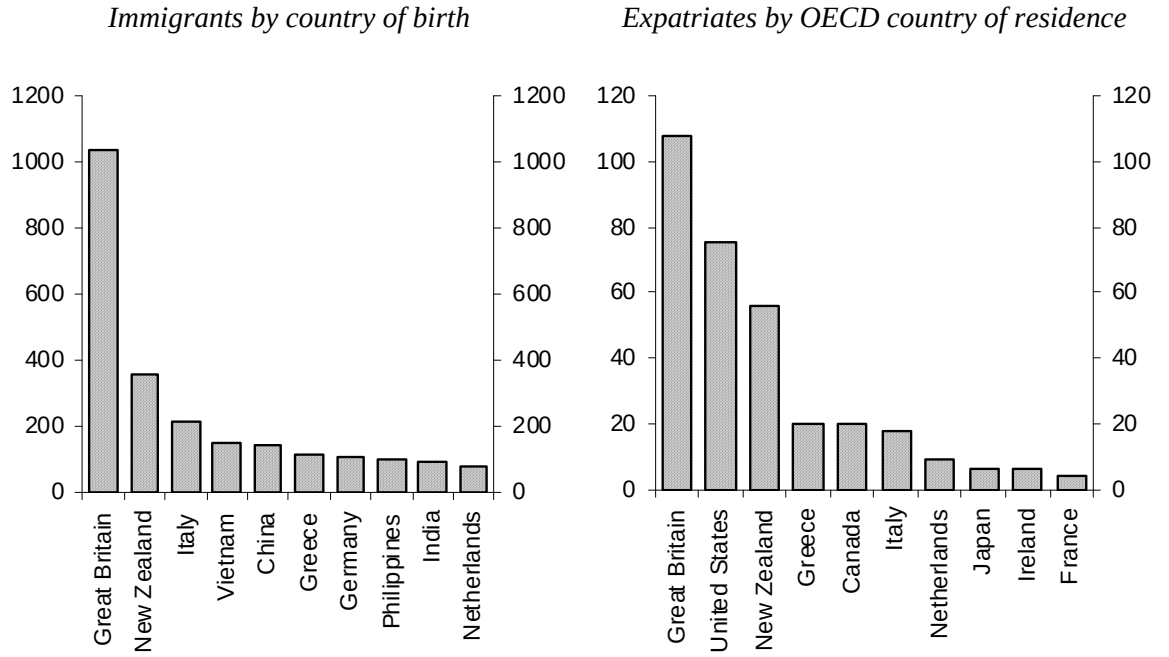
Data source: Author's calculations based on OECD, *Database on Immigrants and Expatriates*.

1 These data reflect Department of Foreign Affairs and Trade consular estimates of the number of Australian citizens abroad (DFAT 2002, 2004).

2 Nevertheless, these two sets of estimates appear to be broadly consistent. Department of Foreign Affairs and Trade estimates suggest around 550,000 Australians are resident in Western Europe, the United Kingdom and Ireland, North America or New Zealand. While census data show 346,000 Australian-born people resident in OECD countries, these data are broadly reconciled by noting that one-quarter of Australians were not born in Australia and among foreign-resident Australian citizens the number born overseas is likely to be larger. For example, just over half of emigrants permanently departing Australia in recent years were born overseas (Hugo et al 2001).

Whereas Australia's migrant population is unusually large, Australia's expatriate population is unusually small. Expressed as a fraction of the Australian population, the number of Australian-born people residing in other OECD countries amounts to less than 2 per cent of the Australian population (figure A.3). By contrast, many European countries have expatriate communities that are two or three times as large and in some cases far larger. Only Japan and the United States have smaller expatriate communities than Australia, relative to their population.

Figure A.4 **Where do Australians come from and where do they go?**
Thousand people



Data source: OECD, *Database on Immigrants and Expatriates*.

While Australia's migrant and expatriate communities differ markedly in size, they share some characteristics. One feature is that migrants' countries of origin are similar to expatriates' countries of destination. The United Kingdom is both the most common source and most common destination, and other European countries such as Italy and Greece are also popular (figure A.4). This two-way migration is not unique; inward and outward migrant populations are positively correlated across the OECD.

Another characteristic that Australia's migrant and expatriate communities share is that they are highly educated (table A.1). In most OECD countries, migrants have lower educational attainment than the locally-born population. Notable exceptions are Canada, New Zealand and Australia, where skill plays a larger role in the migration programme.[3] In most other OECD countries the majority of new arrivals are linked to family reunion. For example, in the United States and France this is the motivation for around three-quarters of new arrivals (Coppel et al. 2001). In Australia, 70 per cent of the annual migrant intake currently comes through the skilled migration programme, and a larger share of the migrant population is tertiary qualified than in any other OECD country.

Table A.1 **Educational attainment of Australian migrants and expatriates**
Per cent of working-age populations

Populations	*Not completed secondary education*	*Completed secondary education*	*Bachelor's degree or higher*
Australian born and resident	46	16	39
Foreign-born Australian residents	39	19	42
Australian-born residents of other OECD countries	18	38	44

Source: OECD, *Database on Immigrants and Expatriates*.

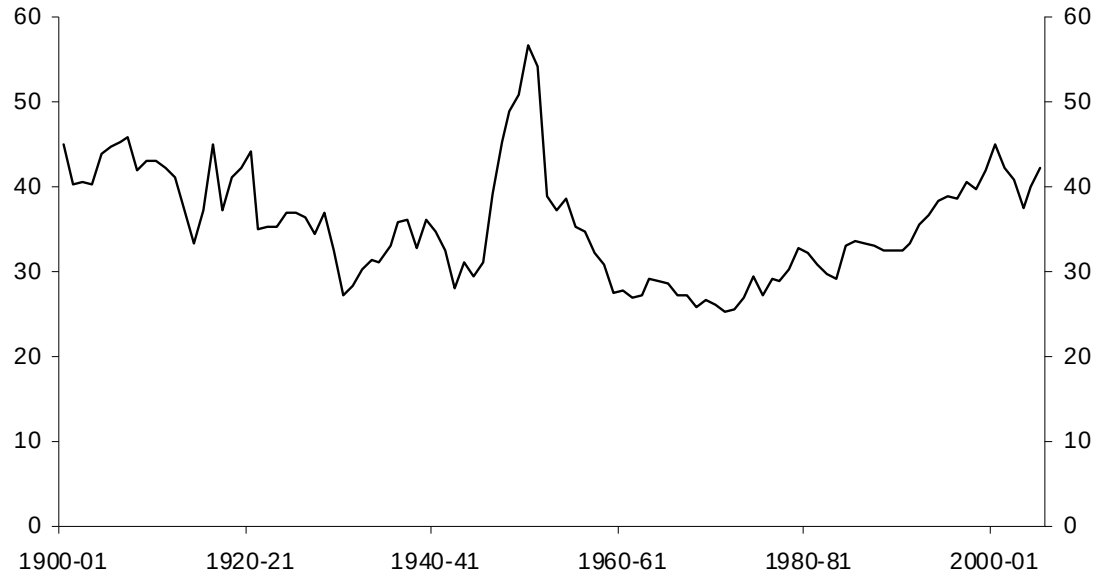
A.2 Trade

Australia's trade has risen rapidly in recent decades accompanying declines in tariffs and shipping costs and the development of trading ties with Asian countries. This has reversed the trend towards smaller trade flows evident in the first half of the 20th century (figure A.5). With the exception of the wool boom in the early 1950s (associated with the Korean war), trade as a proportion of Australia's GDP is at its highest level since the end of the First World War. Australia's patterns of trade have also shifted over the past few decades. The United Kingdom and Ireland accounted for 18 per cent of Australian merchandise trade in 1970 but just 5 per cent in 2000. Over the same period, the proportion of Australia's trade undertaken with Asia increased from 37 per cent to 56 per cent (excluding countries formerly part of the USSR).

[3] Greece and Italy are other examples where immigrants have better educational attainment, but this reflects the lower qualifications of the locally-born labour force.

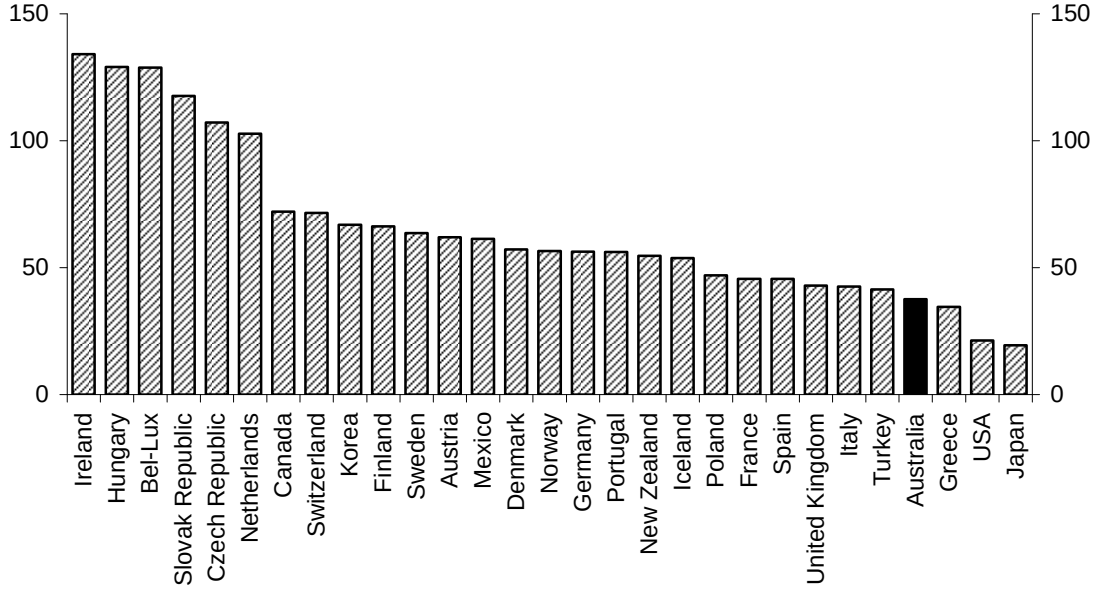
Despite this trend towards greater openness, trade plays a smaller role in the Australian economy than in most other OECD economies. Only the large, diverse and relatively self-sufficient economies of Japan and the United States trade significantly less as a share of GDP than Australia (figure A.6). Geography likely explains why Australia trades so little. Unlike most other developed economies, Australia is a long way from all other developed economies. It is situated half a world away from the large markets in Europe and the United States. The trip from Sydney to Wellington, the capital of Australia's nearest developed neighbour, passes over 2300 km of open water. A similar length trip from Paris to Moscow passes over four other countries and 140 million people. Australia's isolation raises its trade costs. The puzzle, perhaps, is why despite these high trade costs Australia trades so much. Previous studies suggest that Australia's bilateral trade is greater than would be expected after taking account of its remoteness from trading partners (Battersby and Ewing 2005, Guttman and Richards 2005).

Figure A.5 **Australia's international trade, 1900-01 to 2005-06**
Per cent of GDP



Data source: Australian Bureau of Statistics, *Australian System of National Accounts, 2005-06*, Cat. no. 5204.0; Butlin (1977).

Figure A.6 **Merchandise trade in OECD countries, 2000**
Imports plus exports as a per cent of GDP[a]



Data source: NBER-UN World Trade Data; IMF, *World Economic Outlook*, September 2006.

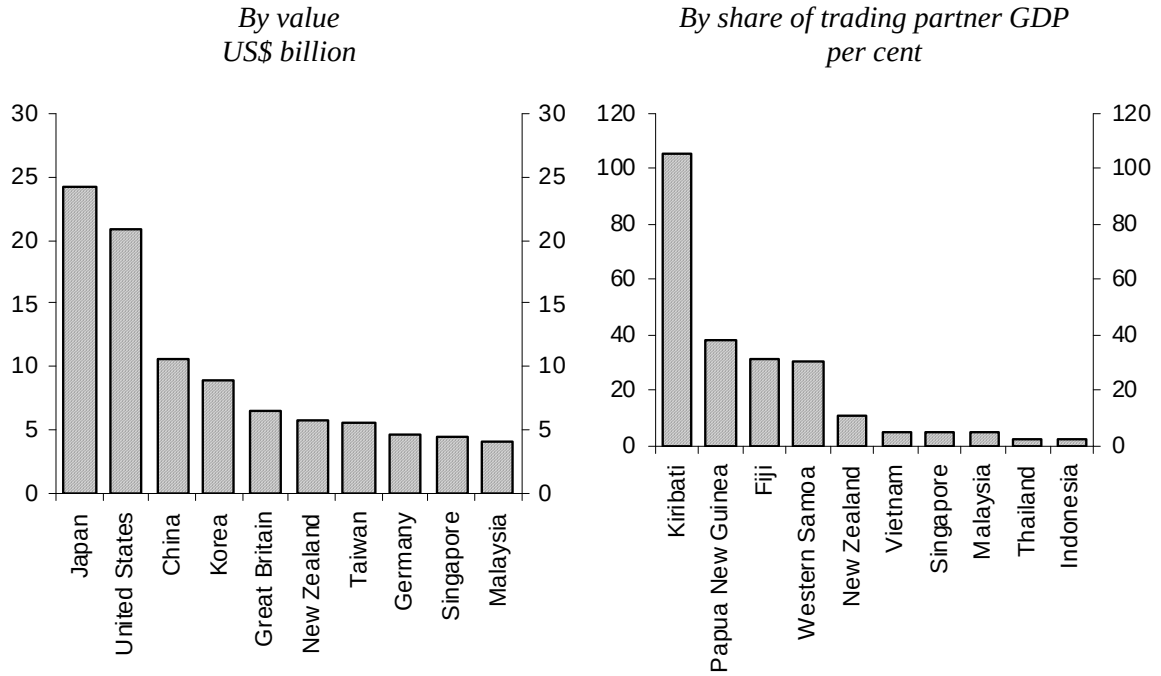
Australia's isolation also affects the direction of its trade. Remoteness from Europe and the United States means that Australia trades more with (relatively) near neighbours. Australia's largest trading partners are Japan, the United States and China, but this is because they are such large economies. The effect of remoteness is more clearly seen if these trade flows are expressed as a percentage of trading-partner GDP. By this metric, Australia's leading trading partners are closer to home: Kiribati, Papua New Guinea, Fiji, Samoa and New Zealand (figure A.7).

A.3 Foreign investment

The stock of foreign direct investment into Australia has risen steadily over recent decades, doubling from 15 per cent of GDP in 1980 to 30 per cent in 2006 (figure A.8). Over the same period, Australian investment abroad grew from 3 per cent to 28 per cent of GDP. This has closely mirrored foreign investment trends elsewhere, with the aggregate stock of foreign investment increasing from 6 per cent of world GDP in 1980 to 24 per cent in 2005.

Figure A.7 **With whom does Australia trade?**

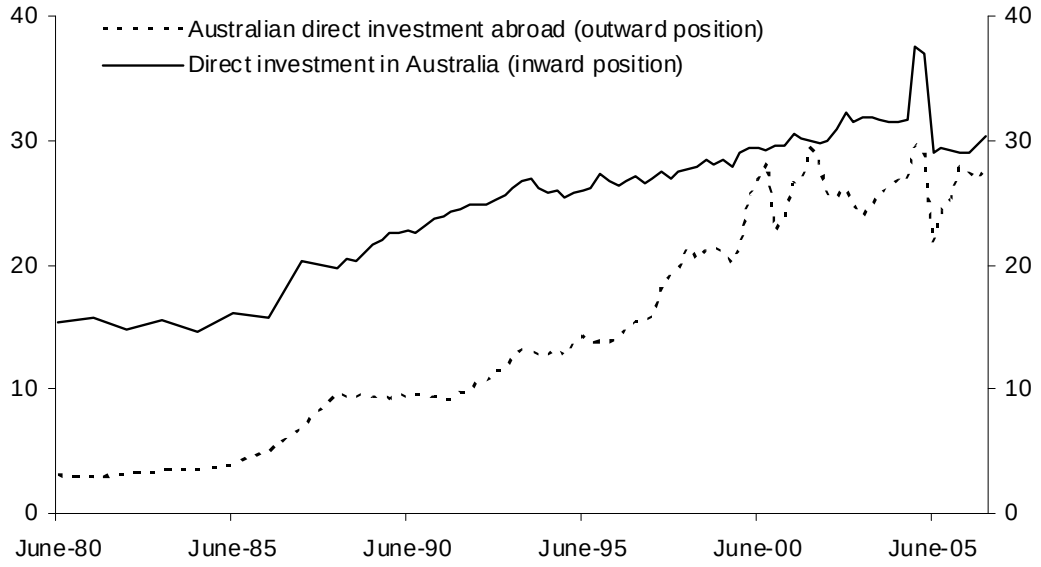
Total merchandise trade (imports plus exports), 2000



Data source: NBER-UN World Trade Data; IMF*, World Economic Outlook*, September 2006.

Figure A.8 **Australia's foreign direct investment, 1980 to 2006**

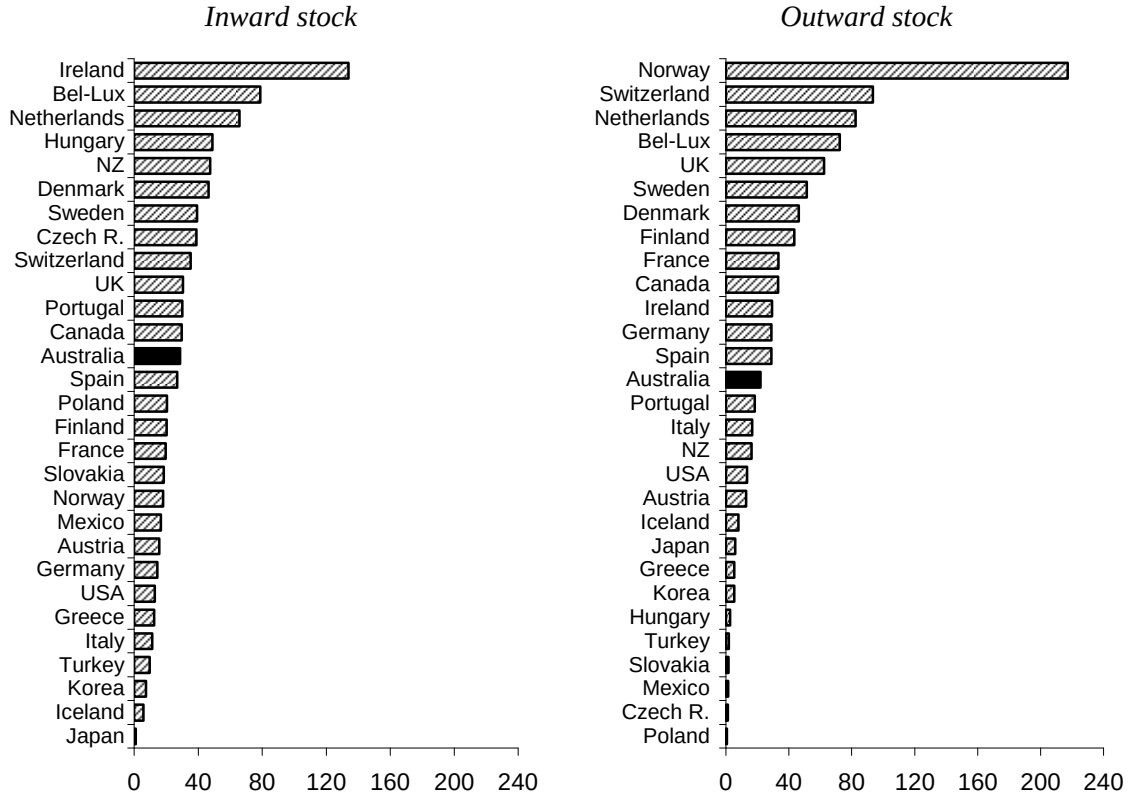
Per cent of GDP



Data source: ABS, *Balance of Payments and International Investment Position*, cat. no. 5302.0, December 2006; ABS, *National Accounts: National Income Expenditure and Product*, cat. no. 5206.0, December 2006.

Whereas Australia trades less than most other OECD countries, its level of foreign investment is similar to many other OECD countries (figure A.9). Many of Australia's largest trading partners are also key investment partners (figure A.10). The United States, United Kingdom, New Zealand and Japan account for 72 per cent of direct investment into Australia and 81 per cent of direct investment out of Australia. There are two significant problems with the investment data. Where foreign investment is directed to companies registered in financially convenient locations, such as Bermuda, it is not possible to identify the countries in which the physical investment occurs. A more fundamental problem is that different countries use different criteria and data sources to record foreign investment. For transactions between OECD countries, each investment stock is reported by both the host and source country. The error bars in figure A.10 show that there are typically very large differences between these reports.

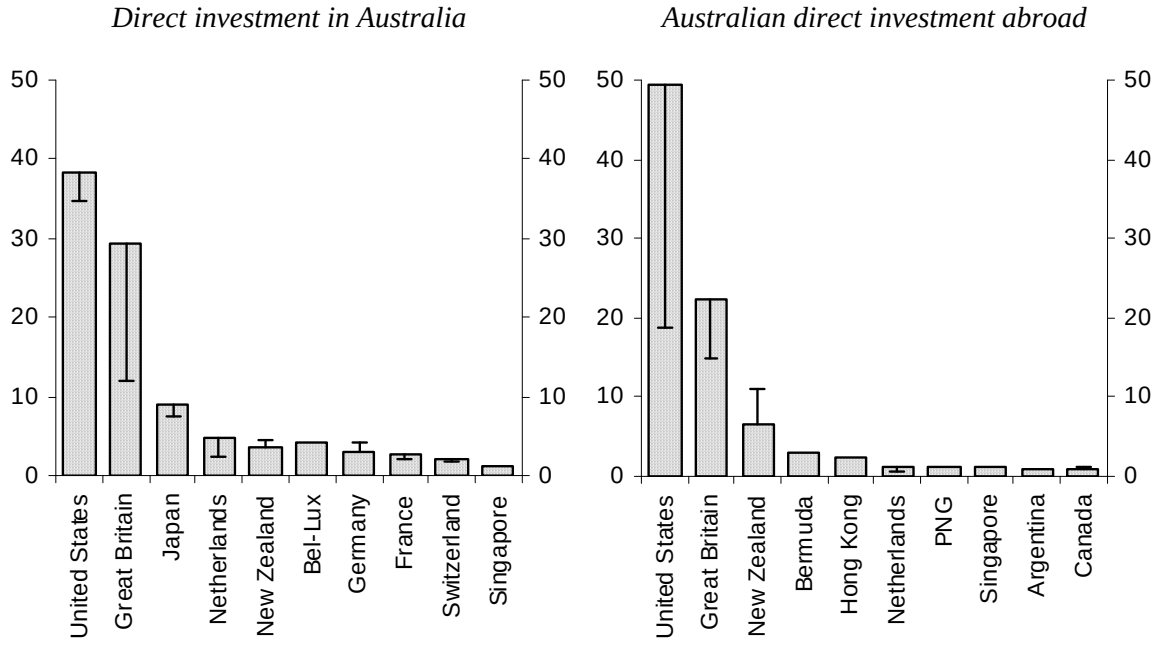
Figure A.9 **Foreign direct investment into and out of OECD countries, 2000**
Per cent of GDP



Data source: UNCTAD, *World Investment Report*, 2006.

Figure A.10 **Where do Australians invest, and who invests in Australia?[a]**

Billion US dollars



a The figure shows investment stocks in the year closest to 2000 for which data are available, originally derived from data reported to the OECD by the Australian Bureau of Statistics. Error bars shows another estimate of the same investment stock, derived from data reported to the OECD by the partner country's statistics bureau where these data are also available.

Data source: OECD, *International Direct Investment Statistics Yearbook*, 1992-2003.

B The gravity equation

This appendix outlines why trade flows between countries should follow a gravity equation pattern. The discussion is technical, but provides strong guidance on how the gravity equation can be implemented to provide consistent estimates of the effects of migration on trade flows and how reliable comparative static analysis can be undertaken.

B.1 Why a gravity equation?

The standard explanation for the gravity equation based on properties of expenditure systems follows the work of Anderson (1979), and is further developed in Anderson and van Wincoop (2003), Feenstra (2004) and Baldwin (2006). The following discussion most closely follows Baldwin (2006).

The goal is to develop a theory of how the trade flows between economies are affected by the size of the economies and the transport costs involved with trading between them. The successful theory should help to explain why there is so much more trade between states within a country than there is between countries, and why there is so much more trade between Australia and New Zealand than between the Netherlands and Ireland (as discussed in chapter 2).

To focus attention on the role of transport costs, it is assumed that people in different countries all have the same tastes and that these tastes are homothetic. A consequence of homothetic preferences is that if all prices are the same in two countries then consumption of each good will be in proportion to these countries' incomes. More specifically, consumers are assumed to have preferences expressed by a constant elasticity of substitution (CES) utility function. An implication of this assumption is that consumers like variety so much that they want to consume at least a little of all goods available regardless of the price.

While consumers in all countries are the same, it is assumed that different countries produce entirely different products so that consumers elsewhere in the world have to import these products. This specialisation of production together with consumers' desire for variety provides the motivation for international trade. However, the price that producers receive for their goods abroad will in part be required to cover transport costs and this curbs international trade. This sort of model is best suited as

an explanation for trade in non-homogenous goods and this raises questions as to what the likely errors are in applying the model to homogenous goods or where there are non-traded goods.

Now for some notation. Suppose that a country *i* produces N_i different varieties of goods. Assuming consumers find each of these varieties equally desirable and the transport costs between the two countries and production costs in country *i* are the same for all varieties, then all of the varieties from country *i* should arrive in country *j* with the same price, p_{ij}, and in the same quantity, c_{ij}. The total value of imports, M_{ij}, into country *j* from country *i* is just the sum of expenditure on all of these varieties $M_{ij} = N_i p_{ij} c_{ij}$. Since each variety is only produced in one country the imports of a variety in country *j* must equal the exports of a variety from country *i*. The remainder of the exercise is to find the prices p_{ij} that result in the export supply equalling the import demand.

Import demand

Import demand depends only upon the relative prices of goods from different countries and the total amount consumers spend, denoted E_j. This observation that relative prices matters seems simple enough but, in fact, ends up being the most difficult part of the estimation of the gravity equation and, as was discussed in the text, has caused trouble with empirical trade modelling in the past. Given the assumption that consumer preferences take the constant elasticity of substitution form, and that the value of a country's consumption is equal to the value of a country's production, it can be shown that demand in country *j* for each good produced in country *i* takes the following form.

$$c_{ij} = E_j \frac{p_{ij}^{-\sigma}}{\Delta_j^{1-\sigma}} \text{ where } \Delta_j = \left(\sum_{k=1}^{C} N_k p_{kj}^{1-\sigma} \right)^{1/1-\sigma} \quad (1)$$

Here the variable Δ_j is an index of the landed prices of all goods that are available for consumption in country *j*. Adding up the value of all goods imported by country *j* from country *i* yields total import demand.

$$M_{ij} = E_j N_i \frac{p_{ij}^{1-\sigma}}{\Delta_j^{1-\sigma}} \quad (2)$$

The number σ is the assumed elasticity of substitution between goods in consumption, which is an indication of how willing consumers are to switch between goods when prices change. For example, if this takes the value 1, consumers choose to spend the same share of their income on all goods. In the

context of global trade it seems reasonable to assume that generally consumers can find close substitutes for most products, so that σ>1.

Transport costs

The simplest way to include transport costs is to assume that that they can be represented as a mark-up over producer prices that is borne by the exporter and fully passed through to the consumer. We assume the relationship between the prices, p_i, the producer receives and the prices the consumer in country j pays is given by $p_{ij} = T_{ij} p_i$, where T_{ij} captures the costs of transporting goods from country i to country j. Here T_{ij} takes the value 1 for trade within countries and is otherwise greater than 1. With transport costs the total import demand equation is given in (3).

$$M_{ij} = E_j N_i p_i^{1-\sigma} \frac{T_{ij}^{1-\sigma}}{\Delta_j^{1-\sigma}} \tag{3}$$

Balanced trade

The equation above contains all of the structure of the model. The problem is that the number of varieties produced in each country and their producer prices are not observable. A way around this is to apply the equilibrium condition that the total value of goods bought from country i, both locally and from abroad, is equal to that country's GDP. The whole system is closed by the assumption that each country's trade is balanced — that is, each country's total imports and exports are equal and total expenditure, E_j, is equal to total production, Y_j.

This means that $\frac{Y_i}{Y} = \sum_{k=1}^{C} M_{ik} = N_i p_i^{1-\sigma} \sum_{k=1}^{C} \frac{T_{ik}^{1-\sigma}}{\Delta_j^{1-\sigma}} \frac{Y_k}{Y}$, where Y is the total of world GDP, and substituting the solution for $N_i p_i^{1-o}$ into the import equation yields the gravity trade equation (4).

$$M_{ij} = \frac{Y_j Y_i}{Y} T_{ij}^{1-\sigma} \frac{1}{\Delta_j^{1-\sigma} \Omega_i^{1-\sigma}} \tag{4}$$

$$\text{where } \Omega_i = \left(\sum_{k=1}^{C} \frac{T_{ik}^{1-\sigma}}{\Delta_k^{1-\sigma}} \frac{Y_k}{Y} \right)^{1/(1-\sigma)} \tag{4a}$$

The derivation of the gravity equation is complete. However, one final result will prove useful below. Substituting the $N_i p_i^{1-o}$ back into the definition of Δ_j reveals the similarity between these terms.

$$\Delta_j = \left(\sum_{k=1}^{C} \frac{T_{kj}^{1-\sigma}}{\Omega_k^{1-\sigma}} \frac{Y_k}{Y} \right)^{1/(1-\sigma)} \tag{5}$$

What does it all mean?

The gravity equation states that imports between any two countries will tend to increase in proportion to the size of each of the partner economies and should decline as a function of transport costs for those imports. But this was already known. What extra information has the theory bought?

The theory shows that trade between two countries is affected by trade costs with other countries. The additional variables Δ_j and Ω_i are composites of world trade costs. Anderson and van Wincoop (2003) call them the 'multilateral resistance' to bilateral trade. The equation shows that if country *j* faces larger transport costs in importing from all countries, then Δ_j will be smaller and that country will tend to import more from any partner country than would be predicted based only on bilateral trade costs. In this sense, Δ_j can be considered to be a measure of the openness of country *j* to imports. Similarly, if country *i* faces larger transport costs in exporting to all countries then Ω_i will be smaller and the country will tend to export more to any partner country than would otherwise be predicted based only on bilateral trade costs. Ω_i can be considered a measure of the access of local firms to foreign markets.

These two terms go some way to solve the puzzle of why Australia trades so much with New Zealand. Both countries are far from the rest of the world so while transport costs between the two countries are high, there are not other markets available for them to trade with more cheaply. Moving down from the national to the regional level, these same two terms explain at least part of the reason that a large country, like the United States, trades so little with the rest of the world: American consumers have such a wide variety of goods available within easy reach that the imperative to look outwards is lessened.

B.2 Multilateral resistance

The theory shows that the relative prices of goods available from other countries (multilateral resistance) affects the level of bilateral imports. Ignoring these prices may bias the estimates of all other terms in the gravity equation because it is likely the omitted multilateral resistance terms are correlated with the transport cost variables.

Four solutions have been proposed to address this problem. The *first* solution comes from observing that the two multilateral resistance terms separately describe characteristics of the exporter and importer. For this reason, the simplest way to avoid the omitted variable bias in estimating the coefficients of the gravity equation is to include two full sets of dummy variables for importer and exporter. A *second* solution is to include in the regression explanatory variables that are likely to be correlated with the omitted multilateral resistance terms. These are commonly termed 'remoteness' indicators and generally involve some form of averaging of distances to trading partners using weights based on the size of each trading partner's economy. A *third* solution is to include estimates of these multilateral price indices directly.

The *fourth* solution is to notice that the gravity model actually provides enough structure to construct these multilateral resistance terms (Anderson and van Wincoop 2003). When trade costs are symmetric a simplifying solution to (4a) and (5) is $\Delta_i=\Omega_i$. The whole system can be estimated by first estimating the coefficients on the trade cost terms in the absence of multilateral resistance, solving for the implied multilateral resistances, then making better guesses at the trade cost terms that are consistent with these resistances, and so forth using a customised optimisation routine.

In practice it is possible to use a Taylor approximation by assuming world trade is close to a simple case, and then making a linear correction to approximate the actual multilateral resistance to trade (Baier and Bergstrand 2006). This section illustrates their approximation technique starting from the simple case where transport costs and information barriers are all zero. In the absence of transport costs the multilateral resistance must be the same in all countries and a solution to the system of equations is $T_{ij}=\Delta_j=\Omega_i=1$. The proposed solution is to estimate the multilateral resistance terms $\Omega_i^{1-\sigma}$ by taking a first-order Taylor approximation with respect to $\ln \Delta_j$, $\ln \Omega_i$ and all $\ln T_{kl}$ about this zero transport cost solution.

$$\Omega_i^{1-\sigma} = \sum_{k=1}^{C} \frac{T_{ik}^{1-\sigma}}{\Omega_k^{1-\sigma}} \theta_k \qquad (6)$$

$$1+(1-\sigma)\ln\Omega_i = 1+\sum_{k=1}^{C}\theta_k(1-\sigma)\ln T_{ik} - \sum_{k=1}^{C}\theta_k(1-\sigma)\ln\Omega_k \quad (7)$$

Subtracting 1 from both sides and dividing by (1-σ) yields the slightly simpler expression.

$$\ln\Omega_i = \sum_{k=1}^{C}\theta_k \ln T_{ik} - \sum_{k=1}^{C}\theta_k \ln\Omega_k \quad (8)$$

Multiplying by θ_i and summing over all *i* and collecting common terms yields:

$$\sum_{k=1}^{C}\theta_k \ln\Omega_k = \frac{1}{2}\sum_{l=1}^{C}\sum_{k=1}^{C}\theta_l\theta_k \ln T_{lk} \quad (9)$$

Substituting this equation into (7) gives:

$$\ln\Omega_i = \ln\Delta_i = \sum_{k=1}^{C}\theta_k \ln T_{ik} - \frac{1}{2}\sum_{l=1}^{C}\sum_{k=1}^{C}\theta_l\theta_k \ln T_{lk} \quad (10)$$

The advantage of the Taylor approximation is that equation (10) can now be substituted into the gravity equation and estimated directly using knowledge of distance, migrants stocks, and a variety of other variables that affect trade costs.

$$\ln M_{ij} = \ln Y_j + \ln Y_i + (1-\sigma)(\ln T_{ij} - \sum_{k=1}^{C}\theta_k \ln T_{ik} - \sum_{k=1}^{C}\theta_k \ln T_{kj} + \sum_{l=1}^{C}\sum_{k=1}^{C}\theta_l\theta_k \ln T_{lk}) \quad (11)$$

A second approximation starts from the simple case where all economies are of equal size and face equal transport costs and information barriers and this leads to estimation of each country's multilateral resistance to trade as a simple average, rather than a GDP-weighted average, of the indicator of trade barriers with all countries.

This first-order approximation technique is easier to implement than the customised optimisation routine proposed by Anderson and van Wincoop (2003). Baier and Bergstrand (2006) show that this approximation produces very similar transport cost estimates because the higher-order terms in the Taylor series are largely uncorrelated with the remaining terms in the gravity equation, so that the estimation bias resulting from omitting these terms is small.

B.3 Estimation and comparative static analysis

The theory in the previous two sections provides broad guidance for estimation of a gravity-style equation within chapter 3 of the paper. The key implications are that: (i) consistent estimates of the parameters in the gravity equation can best be obtained by including origin and destination fixed effects; and (ii) where this is not possible, multilateral forms of the variables used to proxy for transport costs (distance, contiguity, colonial ties and common language) do a good job of controlling for each trading partner's remoteness. With this guidance in mind, the first technique is employed in section 3.1 to model bilateral trade flows while the second technique is employed in section 3.2 to also look at the effects on total trade flows. While theory guides that analysis, the approach in those sections is essentially empirical.

In this section the theory is taken literally. A literal interpretation of the theory permits comparative static analysis of the effects of changing the number of migrants in one country on trade flows between all other countries. That is, it is possible to calculate the multilateral resistances to trade and use these to describe how additional migrants would affect trade flows if the theory were correct. The approach taken involves three steps.

1. Estimate trade costs, $(1-\sigma)\ln T_{ij}$, between every pair of countries.
2. Construct a matrix, $B = [B_{ij}]$, whose entries are GDP-weighted trade costs, $\theta_j T_{ij}^{(1-\sigma)}$, and find the unique vector of multilateral resistances $\Omega=[\Omega_i]$ that solves $\Omega=B\Omega^{-}$, where $\Omega^{-}=[1/\Omega_i]$ (based on equation 5 above and the assumption of symmetric trade costs).
3. Use the coefficients estimated in step 1 to recalculate trade costs under different scenarios, and step 2 to recalculate multilateral resistances.

In the first step trade costs are estimated from the gravity equation using ordinary least squares regression. To check the robustness of the results three approaches are used: estimation with origin and destination fixed effects (12a); estimation using the GDP-weighted first-order approximations to multilateral resistance (12b) as described in the previous subsection; and estimation using simply-weighted first-order approximations (12c).

$$\ln\frac{M_{ij}.Y}{Y_iY_j} = \beta_0 + (1-\sigma)(\ln T_{ij}) + u_i + v_j + e_{ij} \qquad (12a)$$

$$\ln\frac{M_{ij}.Y}{Y_iY_j} = \beta_0 + (1-\sigma)(\ln T_{ij} - \sum_{k=1}^{C}\theta_k \ln T_{ik} - \sum_{k=1}^{C}\theta_k \ln T_{kj} + \sum_{l=1}^{C}\sum_{k=1}^{C}\theta_l\theta_k \ln T_{lk}) + e_{ij} \qquad (12b)$$

$$\ln \frac{M_{ij}.Y}{Y_i Y_j} = \beta_0 + (1-\sigma)(\ln T_{ij} - \frac{1}{n}\sum_{k=1}^{C} \ln T_{ik} - \frac{1}{n}\sum_{k=1}^{C} \ln T_{kj} + \frac{1}{n^2}\sum_{l=1}^{C}\sum_{k=1}^{C} \ln T_{lk}) + e_{ij} \quad (12c)$$

where e_{ij} is a stochastic error and trade costs, T_{ij}, are given by:

$$\ln T_{ij} = \alpha_1 \ln \text{distance}_{ij} + \alpha_2(\ln(\text{importer's share}_{ij}) + \ln(\text{exporter's share}_{ij}))$$

The migrant share variable used here differs from that in chapter 3 in three ways. First, the migrant share variables are defined to be the bilateral number of migrants divided by the total resident population ignoring any migrants born outside the OECD. Second, because it is necessary for trade costs to be symmetric in order to apply the theory, the elasticity of imports to migrant and expatriate populations are forced to be equal. Finally, calculations of multilateral resistance are affected by estimates of internal trade costs. Internal distances are calculated based on land area (see appendix C), while the migrant share variables are coded as 100 per cent, to reflect the idea that trade costs within countries are not affected by the country of birth of their residents.

Regression results are shown in table B.1. All three models show that a 10 per cent increase in the number of migrants from a particular country tends to increase bilateral trade with the migrants' country of birth by around 1 per cent. However, the first form of the multilateral migrant share variable, using GDP-weights, explains a much larger share of the variation in trade than does the second form, using simple weights.

Table B.1 **Regression results[a]**

	Model with fixed effects	*Multilateral form 1*	*Multilateral form 2*
	I	II	III
ln distance	-0.891***		
	(0.048)		
ln importer's share + ln exporter's share	0.104***		
	(0.012)		
multilateral (ln distance)		-0.922***	-0.990***
		(0.043)	(0.099)
multilateral (ln importer's share + ln exporter's share)		0.099***	0.097***
		(0.013)	(0.023)
n	755	755	755
Country of residence fixed effects	Yes		
Country of birth fixed effects	Yes		
R^2	0.842	0.649	0.315
Standard error	0.593	0.851	1.188

a Standard errors calculated using the White-robust estimator are reported in parentheses. ***, ** and * indicate statistical significance at the 1, 5 and 10 per cent levels.

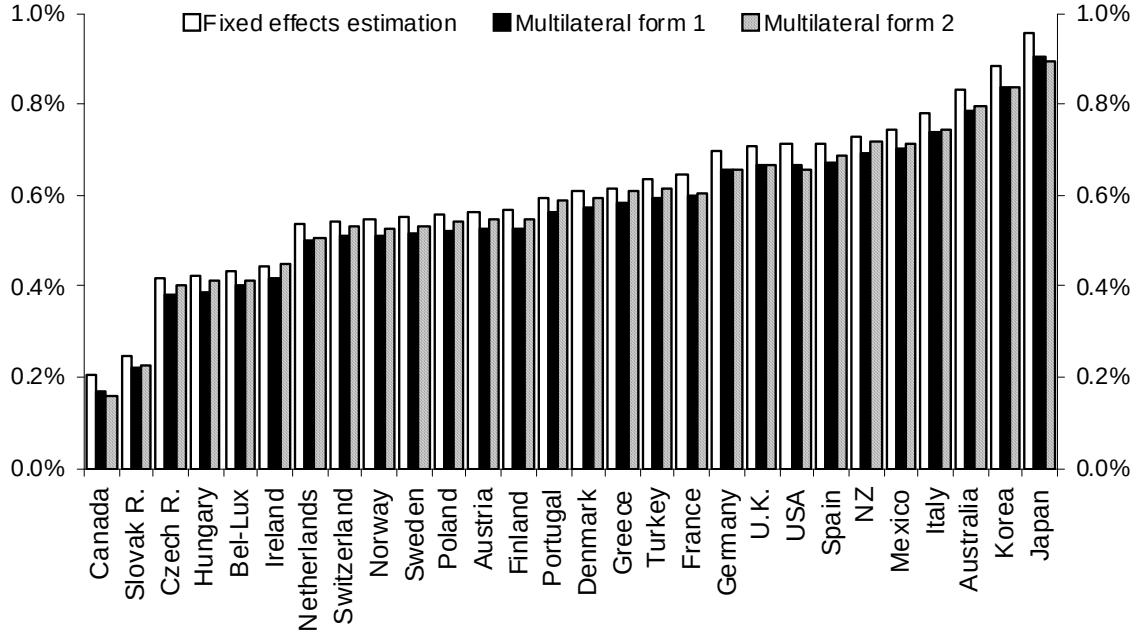
The second step is to calculate the multilateral resistances implied by these trade costs. Baier and Bergstrand (2006) show that these multilateral resistances are the fixed point of the contraction mapping $\Omega \mapsto zB\Omega^{-} + (1-z)\Omega$, where $z \in (0,1)$.

The third and final step is to recalculate transport costs and multilateral resistances for alternative scenarios and then calculate their effects on total international trade volumes. Two scenarios are considered.

The first set of scenarios model the effects of a single country choosing to increase its migrant intake. This involves increasing by 10 per cent the number of migrants living in a particular country from all countries of birth. With a bilateral elasticity of trade to migrant populations of around 0.1 (table B.1) a naïve prediction, ignoring the effects on the multilateral resistance to trade, would be that trade in the migrants' country of residence would increase by around 1 per cent.

In reality, migrants increase trade with their country of birth partly by reducing trade with other countries. Figure B.1 shows estimates of the effects on a country's total trade flows from increasing the number of migrants living in that country after taking into account the changes in multilateral resistance. The effects vary from country to country. For countries like Canada that trade heavily with nearby neighbours, any increase in trade due to an increase in the local migrant population comes about mainly by diverting trade from alternative international destinations. In more remote countries like Japan or Australia that have few nearby neighbours and trade relatively little, most of the increase in trade due to an increase in the local migrant population comes about at the expense of internal trade, so that total international trade volumes increase quite strongly. In an average OECD country, the effect from increasing the local migrant population by 10 per cent is to increase that country's trade volumes by 0.6 per cent. Another way to think about this is that when the local population of migrants increases, a little less than half of the increase in bilateral trade with their country of birth typically comes about at the expense of trade with other countries.

Figure B.1 **First scenario: Migrant populations increase in a single country**
Estimated effect on country-of-residence's international trade volumes

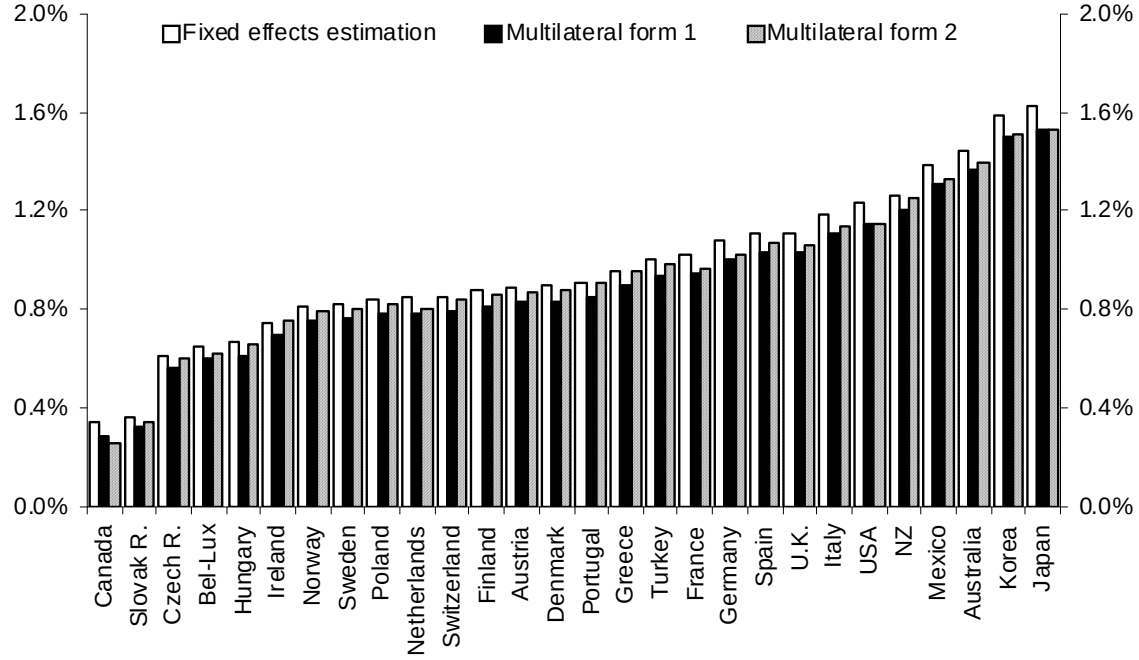


Data source: Author's calculations.

The second scenario models the effects that may result from the ongoing trend towards the circulation of people across the borders of developed countries. It involves increasing by 10 per cent the number of migrants living in all countries from all countries of birth. Since this scenario increases both the number of migrants and the number of expatriates, a naïve prediction based on an elasticity of trade of 0.1 would be that trade in all countries would increase by around 2 per cent.

Again, the naïve prediction overstates the effect that migrants have on each country's trade flows. In this scenario bilateral trade increases because of the increase in the number of migrants living in both the importing and exporting countries, with effects as in figure B.1, but this is partly offset as a result of the number of migrants in other countries also increasing. Figure B.2 shows that the net effect is to increase the total trade in an average OECD country by a little less than 1 per cent. As in figure B.1, the effects vary from country to country.

Figure B.2 **Second scenario: Migrant populations increase in all countries**
Estimated effect on each country's international trade volumes



Data source: Author's calculations.

There are two caveats to these results. First, accurate comparative static analysis would require data on migrants living in all countries in the world, but data limitations mean that the model ignores trade and migration with all countries outside the OECD. Second, other factors besides distance tend to curtail trade between countries by more than trade within countries. The first effect means that the graphs above tend to overstate the effect that migrants have on total trade flows. The bilateral increase that migrants induce in trade between their country of residence and country of birth is also partly at the expense of trade with countries outside the OECD. The second effect means that the graphs above tend to understate the effect that migrants have on total trade flows. In reality, trade within countries is larger than this model assumes, so that more of the bilateral increase in trade between migrants' country of residence and country of birth is at the expense of trade within countries. The balance of these errors in the analysis is unclear.

C Data definition and sources

Bilateral trade, investment and migration cross-section

Corruption: Data were taken from Transparency International's *Corruption Perceptions Index*, 2006. A higher score indicates lower corruption perceptions.

Distance: Great-circle distances in kilometres between the largest cities in each country were obtained from the Centre d'Etudes Prospectives et d'Informations Internationales (http://www.cepii.fr/anglaisgraph/bdd/distances.htm). Internal distances within countries were estimated by $0.67\sqrt{\text{land area}/\pi}$ (Head and Mayer 2002). The same dataset provided indicators of contiguity (two countries sharing a common land border), common language (two countries sharing a language spoken by at least 9 per cent of the population), historical colonial ties, and whether a country is landlocked or an island. Belgium was used to represent Belgium-Luxembourg.

Foreign direct investment stocks: Foreign direct investment stocks (inward and outward) were sourced from the OECD's *International Direct Investment Statistics Yearbook 1992-2003*. In many cases data were missing. Two steps were taken to produce the largest possible data sample. First, inward and outward foreign direct investment stock data are used for the nearest available year to 2000, searching up to 3 years either side. Data are expressed in US dollars in the prevailing exchange rate in that year. Second, for the subset of investment stocks between OECD countries both inward and outward investment should be separately reported for each country pair. For this subset, instead of taking data from the nearest available year, data were averaged across reports of inward and outward investment in 2000 where both were available, and missing data were replaced with reports of the corresponding stock where only one observation was available. This harmonised dataset was used where *only* OECD countries were considered.

Gross domestic product (GDP) and population: Estimates of GDP in current US dollars and population for the cross-section analysis were sourced from the IMF *World Economic Outlook*, September 2006. Where this data was unavailable for particular countries and years, data were sourced from the World Bank *World Development Indicators*. Failing these two sources, population data were sourced

from Maddison (2003), while GDP was estimated based on the GDP per capita of the nearest available year.

Legal origins: Each country's legal system is categorised as of British, French, German, Socialist or Scandinavian origin, as described in La Porta et al. (1999).

Migration: Populations of migrants within OECD countries were obtained from the OECD *Immigrants and Expatriates Database*, as detailed in Dumont and Lemaître (2005). These are drawn from each member country's census closest to the year 2000 and migrants are identified by country of birth (exceptions are Germany where data are based on a household survey, and Korea and Japan where data are based upon nationality rather than country of birth). Where the former Czechoslovakia, former Yugoslavia and former USSR were indicated as countries of birth these were disaggregated in proportion to the average shares across countries for which data were available. Switzerland was aggregated with Liechtenstein and Monaco with France. The education variables used are the number of people with each level of educational attainment (tertiary, upper secondary, less than upper secondary) as a share of the working-age population reporting their educational attainment.

Tariffs: Data on tariffs were obtained from the World Bank's *Bilateral Tariff Data*, as detailed in Bouët et al. (2004). These data are provided at the 6-digit Harmonised System (HS6) level based on simple averages of line-item tariffs and take account of both ad valorem tariffs and the ad valorem equivalent of specific tariffs. The current paper uses a simple average across HS6 classes. Missing data are filled using the average for that importer, and the indicator is used only in models that include importer dummy variables.

Trade flows: International trade flows by commodity were obtained from the NBER-UN *World Trade Data*, as outlined in Feenstra et al. (2004). Missing US export and Indian import data for 2000 were replaced with the corresponding data for 1999. China was aggregated with China Free Trade Zone and China Macau SAR.

Trade flows by differentiation of goods: Trade in goods was aggregated from three and four-digit SITC level into three categories: 'non-homogeneous'; 'exchange-quoted homogeneous'; and 'publication-quoted homogeneous' based on Rauch (1999). Because ambiguity resulted from aggregation of commodities, both 'conservative' and 'liberal' classifications were provided, with the latter using a more liberal definition of non-homogeneous goods. The results in the current paper use the conservative definition; results using the liberal definition are similar and are available from the author on request.

Trade in services: Trade in services was taken from the OECD trade database. Where available, the data used were averages of trade flows reported by the importer and exporter.

Openness analysis

Remoteness: Remoteness was calculated as the GDP-weighted geometric average great-circle distance between each country's main city. Nominal market exchange rate GDP weights were calculated based on the *Penn World Table 6.2*.

Tariff index: A tariff index was obtained from the Institute for Economic Freedom's *Economic Freedom of the World Annual Report 2006* (indicator 4A). Where historical data are missing these are back-cast from the following period's observation using ordinary least squares regression. Data from 2004 were used to represent 2005. A higher score indicates less restrictive tariffs.

Trade openness: Openness data, measured as merchandise imports plus exports as a share of GDP, were sourced from the World Bank *World Development Indicators*, 2006. The same source was used for land area (in square kilometres), population and the total number of migrants as a share of the population.

Table C.1 **Summary of variable names and definitions**

Variable name	*Definition*
Bilateral trade and investment	
lagged trade	Bilateral trade in 1970 in the same class of goods as the dependent variable, except as otherwise noted
lagged investment[a]	Bilateral direct investment stock in 1990
importer's share (exporter's share/ host's share / source's share)	The percentage of the importing (exporting/host/source) country's population that are migrants from a particular country of birth
importer's share0 (exporter's share0 / host's share0 / source's share0)	Dummy variable, takes the value 1 if the importing (exporting/host/source) country contains no migrants from a particular country of birth
ln share	The average of ln(importer's share) and ln(exporter's share), or ln(host's share) and ln(source's share)
importer's total share (exporter's total share)	The percentage of the importing (exporting) country's population that are migrants
tertiary educated share (secondary educated share)	The percentage of working-age migrants that have attained a bachelor's degree (have only completed secondary education), averaged across importing and exporting countries
FDI1990[a]	The sum of the inward and outward direct investment stocks in 1990
FDI in[a]	Inward direct investment stock in 2000
FDI out[a]	Outward direct investment stock in 2000
distance	The distance separating the main cities of two countries
contiguity	Dummy variable, takes the value 1 if countries share a land border
colony	Dummy variable, takes the value 1 if one country colonised the other
language	Dummy variable, takes the value 1 if more than 9 per cent of both countries' populations speak a common language
legal origin	Dummy variable, takes the value 1 if countries share a common legal origin
tariff	Simple average tariff across HS6 classes
corruption index	A higher index indicates lower perceived corruption
mass	The product of two countries' GDPs
masspc	The product of two countries' GDPs per capita
island	The number of countries in a pair that are islands
landlocked	The number of countries in a pair that are landlocked
multilateral(*x*)	As described in chapter 2
host remoteness (source remoteness)	GDP-weighted average distance from the FDI host country (FDI source country) to all other countries
improvement in remoteness	GDP-weighted average difference in distance from the source country and the host country to each consumer market wherever the host is closer than the source to a consumer market
host gdp (source gdp)	GDP of the FDI host country (FDI source country)
host gdppc (source gdppc)	GDP per capita of the FDI host country (source country)
Openness	
total share	Percentage of the population that are migrants
population	Total population
land area	Total land area
remoteness	GDP-weighted average distance to all other countries
tariff index	A higher index indicates less restrictive tariffs

a In some cases, the analysis uses the closest year for which data are available.

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