Trade Flows and Migration to New Zealand

David Law and John Bryant

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AUTHORS

David Law
Treasury
PO Box 3724
Wellington 6008
NEW ZEALAND

Email	David.Law@treasury.govt.nz
Telephone	+ 64 4 471 5233
Fax	+ 64 4 473 0982

John Bryant
Treasury
PO Box 3724
Wellington 6008
NEW ZEALAND

Email	John.Bryant@treasury.govt.nz
Telephone	+ 64 4 917 7027
Fax	+ 64 4 473 1151

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NZ TREASURY

New Zealand Treasury
PO Box 3724
Wellington 6008
NEW ZEALAND

Email	information@treasury.govt.nz
Telephone	64-4-472 2733
Website	www.treasury.govt.nz

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Abstract

This paper examines the hypothesis that a greater stock of migrants in New Zealand from a particular country leads to more trade between that country and New Zealand. The literature suggests that migrants can stimulate trade by lowering transaction costs, and by bringing with them preferences for goods produced in their home country. We use panel data techniques within the framework of a standard gravity model of trade. Our sample includes an average of over 170 countries for the years 1981 to 2001. Previous studies of trade and migration have not dealt satisfactorily with problems of unobserved heterogeneity and selection bias. We address these problems using correlated random effects and Heckman selection models. Results suggest that larger migrant stocks are associated with higher trade flows.

JEL CLASSIFICATION F00 – International Economics - General
F10 – Trade - General
F14 – Country and Industry Studies of Trade
F22 – International Migration

KEYWORDS Migration; International Trade; Panel Data; New Zealand

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Trade Flows and Migration to New Zealand

1 Introduction

Migrants often have language skills, local knowledge, and access to international networks that could help overcome barriers to trade. Increasing the number of migrants from a country might be expected to stimulate trade with that country. Econometric analyses in the United States, Canada, Britain, and Spain have confirmed this hypothesis. One study even found a link between migration and trade for internal migration between different *departments* in France (Combes, Lafourcade and Mayer 2003). Such effects are potentially important in explaining New Zealand's recent trade performance, as the country's migrant population has become significantly larger and more diverse over the past 20 years.

This paper presents an econometric analysis of the effects of migration on trade in New Zealand. It tests the hypothesis that, all else equal, a larger stock of migrants from a given country increases New Zealand's imports from and exports to that country. As with previous studies of migration and trade, the starting point is a gravity model of trade. In addition to looking at the overall relationship between migration and trade, the paper also examines whether the relationship between migration and trade differs with the nature of the goods traded, the migrants' origin countries, and the number of migrants. Previous studies have been restricted to merchandise trade. We also look briefly at the effect of migration on international tourism (which in 2001 earned New Zealand an estimated $NZ5.1 billion[1]). The analysis draws on an unusually rich dataset—panel data on more than 170 countries over 21 years—which enhances our ability to deal with the econometric problems of unobserved heterogeneity and selection bias.

Section 2 of the paper gives a brief overview of recent trends in migration and trade in New Zealand. Section 3 summarizes ideas from the international literature on why migration might stimulate trade. Section 4 summarizes the results from previous econometric analyses. Section 5 describes our methodology, and Section 6 our results. The final section summarizes our findings and discusses their implications.

[1] This figure excludes international airfares and applies to the year to June. It was obtained from the International Visitors Survey, on the Tourism New Zealand website www.tourisminfo.govt.nz.

2 Trends in migration and trade

Between 1981 and 2001 the number of people usually resident in New Zealand who stated on their census forms that they were born overseas rose from 450 thousand to 698 thousand, an increase of 55%. As Table 1 shows, the biggest migrant group in New Zealand in 1981 was those born in the United Kingdom. During the 1980s, however, New Zealand's immigration regulations changed, so that preferences for "traditional" sources were ended, and decisions were based entirely on personal characteristics such as qualifications and age. The result was a rapid increase in migration from countries that had formerly supplied few migrants. The largest absolute increase occurred for migration from East Asia and the Pacific.

The data in Table 1 suggest that New Zealand is starting to develop migrant communities from an increasingly wide variety of countries. Detailed examination bears this out. For instance, the number of countries for which New Zealand had at least one thousand migrants increased from 28 in 1981 to 46 in 2001, and the number of countries for which New Zealand had at least 10 thousand migrants increased from 5 to 16[2].

Most analysts trace the dramatic changes in New Zealand's migrant population to changes in immigration policy and, in the case of some East Asian countries, to rapid income growth in the migrants' home countries (Lidgard, Bedford and Goodwin 1998). This provides partial reassurance that migration is not responding to trade, which would bias upwards our estimates of the effect of migration on trade.

Table 1 - Changes in New Zealand's migrant stock, exports, and imports, by region, 1981-2001

	Population by region of birth (thousands)			Exports by region (NZ$1995 millions)			Imports by region (NZ$1995 millions)		
	1981	2001	*Incr.*	1981	2001	*Incr.*	1981	2001	*Incr.*
Australia	44	56	*28%*	1,343	4,844	*261%*	1,529	5,741	*275%*
East Asia & Pacific	76	253	*233%*	2,688	9,066	*237%*	2,611	7,859	*201%*
Europe & Central Asia	47	67	*42%*	1,317	2,612	*98%*	898	4,236	*372%*
Mid East & N Africa	2	12	*679%*	692	800	*16%*	661	1,380	*109%*
North America	12	21	*81%*	1,337	4,300	*222%*	1,721	4,615	*168%*
South America	2	4	*74%*	212	1,192	*462%*	60	327	*445%*
South Asia	7	31	*313%*	126	323	*156%*	62	244	*294%*
Sub-Saharan Africa	8	36	*381%*	57	160	*181%*	28	123	*339%*
United Kingdom	253	217	*-14%*	1,166	1,221	*5%*	770	1,006	*31%*
Unspecified	14	149	*979%*	476	1,087	*128%*	123	681	*454%*
New Zealand	2,679	2,891	*8%*	-	-	-	-	-	-
Total	3,143	3,737	*19%*	9,413	25,605	*172%*	8,463	26,212	*210%*

Source – Population data from Statistics New Zealand unpublished census tabulations. Trade estimates calculated from the United Nations Statistics Division's Comtrade database. The original Comtrade data were denominated in US dollars. See the text for a description of the conversion to NZ dollars.

[2] Bryant and Law (Forthcoming) contains a more detailed analysis of trends in New Zealand's foreign-born population.

New Zealand's imports and exports have also grown substantially over the period 1981-2001. Table 1 presents estimates based on data from the United Nations Commodity Trade Database (Comtrade). Trade values in Comtrade are reported in nominal US dollars; we have converted these into 1995 NZ dollars by multiplying by the NZ-US exchange rate, and then dividing by Statistics New Zealand's aggregate merchandise import and export price deflators[3].

As with migration, there is substantial geographic variation in growth rates. Trade with the United Kingdom, for instance, has increased relatively little, while trade with South America has increased markedly. New Zealand has increased the number of countries with which it conducts substantial international trade. Between 1981 and 2001, the number of countries from which New Zealand imported goods worth at least $100 million (in 1995 NZ dollars) increased from 13 to 31. During the same period, the number of countries to which New Zealand exported goods worth at least $100 million increased from 20 to 29.

3 Mechanisms through which migration could stimulate trade

Following Gould (1994), most authors postulate two mechanisms through which migration could stimulate trade between the host and origin countries: "transaction cost" effects, and "immigrant preference" effects.

3.1.1 Transactions cost effects

Migrants are expected to stimulate trade by lowering transactions costs. There are two related sets of reasons why immigrants might face lower transactions costs for trade with their country of origin. The first is that immigrants have superior knowledge of home country markets, languages, business practices, laws, and other matters related to trade. The second is that migrants may be able to participate in international networks, as exemplified by the networks of ethnic Chinese (Rauch and Trindade 2002). These networks can be conduits of information, and can deter opportunistic behaviour.

Transactions costs effects are generally expected to stimulate both exports and imports. Most authors argue that migrants' informational advantages are more important for differentiated goods than for homogenous goods, because of the greater information problems involved in the trade of differentiated goods. Most authors also argue that the trade-stimulating effect of migration is greatest when the host and origin countries have very different institutions, languages and cultures, and when alternative sources of information and contract enforcement are lacking, so that the advantages of migrants become particularly important.

3.1.2 Immigrant preference effects

Immigrants are assumed to demand certain goods produced in their home countries, or similar to those produced in their home countries. These preferences are expected to boost imports to the host country but not exports from the host country. The effect is

[3] We calculated annual exchange rates by averaging the International Monetary Fund's monthly rates. It would have been preferable to have used country-specific import and export price deflators. However, country-specific deflators are available only for New Zealand's top five trading partners.

assumed to be more marked for differentiated goods than for homogenous goods. Some authors note that there may be a countervailing "immigrant substitution" effect. If there are sufficient immigrants in a country, these immigrants may begin to produce goods themselves rather than importing them (Dunlevey and Hutchison 1999, Girma and Yu 2000).

4 Previous econometric tests of the effects of migration on trade

Previous econometric tests of the effect of migration on trade have, like ours, been based on a gravity model of trade. The gravity model has been highly successful in describing empirical patterns of international trade (Frankel 1997). It can be derived in a number of different ways. Rauch (1999) and Head and Ries (1999) provide an intuitively appealing derivation, which we summarize here.

The derivation starts from a proposition about the pattern of trade in a frictionless world. Let m_i be the value of New Zealand's imports from country i (the expression for New Zealand's exports to country i is exactly symmetrical). Let y_{NZ}, y_i, and y_w be the GDPs of New Zealand, country i, and the world. In the absence of transport or transactions costs, New Zealand consumes the output of country i in proportion to New Zealand's share of world output y_{NZ}/y_W, so that

$$m_i = \left(\frac{y_{NZ}}{y_W} \right) y_i . \qquad (1)$$

In practice, transport costs, tariffs, and transactions costs induce departures from this pattern. These effects are modelled by applying an adjustment factor $\exp(\mathbf{X}_i'\boldsymbol{\beta})$ to the right hand side of Equation 1, where $\mathbf{X}_i$ is a vector that includes a range of variables attempting to capture transport and transactions costs. Taking logs yields the equation

$$\ln m_i = \ln y_{NZ} + \ln y_i + \mathbf{X}_{ij}'\boldsymbol{\beta} + \text{constant} \qquad (2)$$

One variable that is almost always included is the distance between the two countries. The distance variable tries to measure transport and communication costs, but it is generally believed to pick up cultural and linguistic differences as well. Other frequently used variables include oil prices, real exchange rates, common languages, common borders, membership of trade blocs, and colonial ties. It has become traditional to also include a population or a GDP per capita variable, to allow for effects such as subsistence thresholds or self-sufficiency.

For studies of migration and trade, the key variable in $\mathbf{X}_i$ is one measuring the number of migrants from each potential trading partner living in the country of interest. In principle, a variable measuring the number of migrants from the country of interest living in each potential trade partner country should also be used. The necessary data are, however, difficult to obtain. The only study to include such a variable is one on overseas Chinese (Rauch and Trindade 2002).

Table 2 summarizes results from the nine previous econometric studies of migration and trade that we have located. The studies cover five host countries—the United States,

Canada, the United Kingdom, and France—and various trading partners, though in the case of Combes *et al*. (2003) the trade in question is between different *departments* of France. Dunlevy and Hutchison (1999, 2001) use data from 1870 to 1910; all the other studies use more recent data. Some studies use data from a single period, while others use time series techniques to combine data from several periods. Some studies fit the model in its original multiplicative form using non-linear statistical models, and others take logs of both sides and use linear models.

The export and import elasticities show the extent to which an increase in the size of the immigrant stock increases trade. The elasticities derived by Gould (1994), for instance, imply that, all else equal, a 1% increase in the number of immigrants would increase exports from the host country by 0.02% and increase imports to the host country by 0.01%. In cases where several specifications are presented, elasticities from the main or preferred elasticity are cited. Wherever possible, average elasticities across all goods and all trade partners are shown.

Table 2 – The effect of migration on exports and imports, 9 studies

Study	Sample	Export elasticity	Import elasticity
Gould (1994)	US and 47 trade partners; 1970-1986	0.02	0.01
Head and Ries (1998)	Canada and 136 trade partners; 1980-1992	0.10	0.31
Dunlevy and Hutchinson (1999, 2001)	US and 17 trade partners; 1870-1910	0.08	0.29
Girma and Yu (2000)	UK and 48 trade partners; 1981-1993	0.02	-0.04
Combes et al. (2002)	95 French Departments; 1993	0.25	0.14
Rauch and Trindade (2002)	63 Countries; 1980, 1990	0.21/0.47[a]	0.21/0.47[a]
Wagner, Head, and Ries (2002)	5 Canadian regions and 160 foreign countries; 1992-1995	0.08	0.25
Blanes-Cristobal (No date)	Spain and 40 trade partners, 1991-1998	0.23	0.03
Ching and Chen (Forthcoming)	Canada and Taiwan	-0.06[b]	0.30[b]

[a]The estimate of 0.21 applies to homogenous goods, and 0.47 to differentiated goods; insufficient data were included in the article to allow the calculation of an overall elasticity. No distinction is made between imports and exports.

[b]"Exports" refers to exports from Canada to Taiwan, "imports to imports to Canada from Taiwan.

Notes – Rows 1-6 are based on Table 1 in Wagner, Head, and Ries (2002). The elasticities for Gould (1994) and Rauch and Trindade (2002) were calculated by Wagner et al. The elasticities for Girma and Yu (2000) and Ching and Chen (forthcoming) were calculated by the present authors.

As is apparent from Table 2, most studies find some relationship between migration and trade, in the expected direction, though the magnitudes of the estimated effects vary enormously. All the studies shown in Table 2 also investigate how the relationship between migration and trade varies across goods or across countries. Gould (1994) and Dunlevy and Hutchinson (1999, 2001), for instance, find that the effect of migrants is stronger for consumer goods than producer goods. Rauch and Trindade (2002) and Wagner, Head, and Ries (2002) find that the effect is stronger for differentiated goods than for homogenous goods. Girma and Yu (2000) find that the effect is stronger when there are no colonial ties; Blanes-Cristobal (No date) obtains the opposite result.

Gould (1994: 307) and Wagner, Head, and Ries (2002: 520-22) experiment with alternative specifications in which the elasticity of trade with respect to migration changes as the number of migrants increases. They find that the elasticity decreases with the number of migrants. This is a very strong form of diminishing returns. Diminishing returns

in the ordinary sense of each migrant contributing less than the one before is already possible under the constant-elasticity specification[4].

All the studies summarized in Table 2 looked at trade in goods rather than services. We know of no studies that have looked at the effect of migrant stocks on exports of services, even though migration could plausibly lower transactions costs for trade in services in the same way that it lowers costs for trade in goods.

5 Methodology

5.1 Data

We have assembled data for a large panel of countries for every year from 1981 to 2001. The minimum number of countries included in the panel in our benchmark specifications is 171; the maximum is 179. We include substantially more observations than any previous studies of trade and migration, with the exception of Wagner, Head, and Ries (2002). As discussed below, the reason for assembling a large panel dataset is to address problems of unobserved heterogeneity and selection bias.

Our data on imports and exports come from the United Nations Statistics Division's Comtrade Database. The UN obtains estimates of New Zealand imports and exports from Statistics New Zealand. We treat the data as complete. If no trade is reported between New Zealand and a given country in a given year, we assume that the true value for that year was zero.

Estimates of the foreign-born population in New Zealand come from unpublished tabulations prepared by Statistics New using data from the 1981, 1986, 1991, 1996, and 2001 censuses. To calculate exact values for the inter-censal years it would be necessary to have data on deaths and international movements by place of birth, which are not available. An alternative would be to interpolate. We decided, however, to use the total from the most recent Census for the whole inter-censal period, so that, for instance, migrant stock in years 1981, 1982, 1983, 1984, and 1985 is set equal to the Census estimate in 1981. The advantage of this method, besides its simplicity, is that it gives partial protection against the possibility that migration is responding (in the short term) to trade.

Data on New Zealand's GDP and population come from the World Bank's World Development Indicators database. Data on language come from Grimes (1996), and distance from New Zealand from the website *Great Circle Distances Between Capital Cities*[5].

[4] Let m be trade and x migration. There are diminishing returns when $\frac{d^2m}{dx^2} < 0$. But if $\ln m = \beta \ln x$, then $m = x^{\beta}$, and $\frac{d^2m}{dx^2} = \beta(1-\beta)x^{\beta-2} < 0$, provided $\beta \neq 0$ and $x > 0$.

[5] Available at: http://www.wcrl.ars.usda.gov/cec/java/capitals.htm

5.2 Unobserved heterogeneity[6]

The variables available to us cannot possibly capture all influences on New Zealand's trade. In other words, there is likely to be unobserved heterogeneity across our sample. Applying ordinary cross-sectional techniques in the presence of unobserved heterogeneity can lead to incorrect standard errors and biased coefficient estimates.

Use of panel data, however, permits models of the form

$$\ln m_{it} = \beta_{y_{NZ}} \ln y_{NZ,t} + \beta_y \ln y_{it} + \mathbf{X}'_{it}\boldsymbol{\beta} + \alpha_i + u_{it} \quad (3)$$

where u_{it} is a time-varying idiosyncratic error, and α_i is an unobserved country-specific effect that attempts to represent some of the cross-country heterogeneity. If the α_i are assumed to be uncorrelated with the explanatory variables, then Equation 3 can be estimated using a Random Effects approach. The assumption of zero correlation is, however, difficult to justify in our case. No such assumption is required under a Fixed Effects approach. Under Fixed Effects, however, it is not possible to obtain coefficients for variables that are constant over time, such as Language and Distance.

Previous econometric studies of migration and trade have used either ordinary cross-sectional techniques or Fixed Effects. There is, however, an alternative approach, referred to as Correlated Random Effects, that avoids the zero correlation assumption and allows the inclusion of variables that are fixed over time. Under Correlated Random Effects, the correlation between the country-specific fixed effect α_i and the explanatory variables is explicitly modelled using the expression

$$\alpha_i = \mathbf{X}'_{i1}\boldsymbol{\lambda}_1 + \mathbf{X}'_{i2}\boldsymbol{\lambda}_2 + \ldots + \mathbf{X}'_{iT}\boldsymbol{\lambda}_T + \eta_i \quad (4)$$

where the $\boldsymbol{\lambda}_t$ are vectors of "projection coefficients" and η_i is a true random effect that is uncorrelated with the explanatory variables. We assign the same weight to all time periods, so that

$$\boldsymbol{\lambda}_1 = \boldsymbol{\lambda}_2 = \ldots = \boldsymbol{\lambda}_T = \boldsymbol{\lambda}, \quad (5)$$

and

$$\alpha_i = T\bar{\mathbf{X}}'_i\boldsymbol{\lambda} + \eta_i. \quad (6)$$

Substituting this expression into Equation 3 (and absorbing T, a constant, into $\boldsymbol{\lambda}$) gives

$$\ln m_{it} = \beta_{y_{NZ}} \ln y_{NZ,t} + \beta_y \ln y_{it} + \mathbf{X}'_{it}\boldsymbol{\beta} + \bar{\mathbf{X}}'_i\boldsymbol{\lambda} + \eta_i + u_{it}, \quad (7)$$

which can be estimated using Random Effects.

Some unobserved heterogeneity also potentially takes the form of shocks affecting New Zealand's trade with all countries more or less equally at the same time. An important example is the trade liberalization that New Zealand began in mid-1980s (Evans, Grimes, Wilkinson and Teece 1996). We allow for such affects by including time dummies ν_t to all equations.

[6] This section draws heavily on unpublished lecture notes by Dean Hyslop.

5.3 Sample selection

Equation 7 does not allow for zero trade. In practice, however, 29% of our observations for imports are zeros, as are 20% of our observations for exports. Following previous studies of migration and trade, we interpret the zeros to mean that observed trade values emerge from a two-step process. Countries in effect decide whether to trade, and then decide how much to trade (Head and Ries 1998; Dunlevy and Hutchinson 1999: fn20; Wagner, Head, and Ries 2002: 518). Our model is

$$z_{it}^{*} = \beta_{y_{NZ}}^{0} \ln y_{NZ,t} + \beta_{y}^{0} \ln y_{it} + \mathbf{X}_{it}'\boldsymbol{\beta}^{0} + \bar{\mathbf{X}}_{i}'\boldsymbol{\lambda}^{0} + \eta_{i}^{0} + \nu_{t}^{0} + u_{it}^{0} \tag{8a}$$

$$z_{it} = \begin{cases} 0, & z_{it}^{*} < 0 \\ 1, & z_{it}^{*} \geq 0 \end{cases} \tag{8b}$$

$$\ln m_{it} = \begin{cases} 0, & z = 0 \\ \beta_{y_{NZ}}^{1} \ln y_{NZ,t} + \beta_{y}^{1} \ln y_{it} + \mathbf{X}_{it}'\boldsymbol{\beta}^{1} + \bar{\mathbf{X}}_{i}'\boldsymbol{\lambda}^{1} + \eta_{i}^{1} + \nu_{it}^{1} + u_{it}^{1}, & z = 1 \end{cases} \tag{9}$$

The u_{it}^{0} and u_{it}^{1} have a joint normal distribution, with means of 0, variances of 1, and a correlation that may be greater than zero. Equations 8a and 8b together make up the "selection equation", while Equation 9 is the "trade equation". If the model of Equations 8a, 8b, and 9 is correct, then simply using Equation 7 on the sub-sample with non-zero trade will, in general, lead to biased estimates. (There are exceptions, but they involve special conditions, such as the u_{it}^{0} and u_{it}^{1} being uncorrelated.)

As demonstrated in Heckman (1979), selection models like that of Equations 8a, 8b, and 9 can be estimated in two steps. Equations 8a and 8b are estimated as a Probit model. The resulting fitted values are then the used to calculate Mill's ratios for each observation,

$$M_{it} = \frac{\phi\left(\hat{z}_{it}^{*}\right)}{\Phi\left(\hat{z}_{it}^{*}\right)} \tag{10}$$

where ϕ is the density function, and Φ is the cumulative density function, for the standard normal distribution. Estimating the equation

$$\ln m_{it} = \beta_{y_{NZ}}^{1} \ln y_{NZ,t} + \beta_{y}^{1} \ln y_{it} + \mathbf{X}_{it}'\boldsymbol{\beta}^{1} + \bar{\mathbf{X}}_{i}'\boldsymbol{\lambda}^{1} + \beta_{M} M_{it} + \eta_{i}^{1} + \nu_{t}^{1} + u_{it}^{1} \tag{11}$$

on the sub-sample with non-zero trade yields unbiased estimates of $\beta_{y_{NZ}}^{1}$, β_{y}^{1}, $\boldsymbol{\beta}^{1}$, $\boldsymbol{\lambda}^{1}$, β_{M}, η_{i}^{1}, and ν_{t}^{1}.

Following previous studies, we use the log of migrant numbers in $\mathbf{X}_{it}$. In some cases, however, the number of migrants equals zero, so that the log is undefined. Simply omitting these cases could potentially create a selection bias. We therefore adopt an approach used by Wagner, Head, and Ries (2002). We introduce a dummy variable called Zero Migrants that takes a value of one when there are no migrants, and zero otherwise. We set our Migrant Stock variable equal to zero when there are no migrants, and the log of the number of migrants otherwise. The Zero Migrants variable shows the change in trade that occurs when New Zealand has exactly one migrant from a country rather than none. In principle, it should be close to zero.

5.4 Differences in the characteristics of goods and countries

Theory suggests, and empirical studies largely confirm, that the effect of migration on trade varies with the goods being traded and the countries involved. We intend to carry out detailed analyses of differences between types of goods in future work. In the present paper, we simply look at the effect of excluding certain goods for which the effect of migrants is likely to be small. We re-estimate our results using exports excluding agriculture. The reason for excluding agriculture is that most of New Zealand's international agricultural exports are channelled through a few large companies, which presumably are large enough to recruit internationally if they cannot draw on local migrants. We also re-estimate our results using imports excluding oil, on the grounds that imports are channelled through a few large companies, and also because petroleum products are homogeneous goods which pose fewer of the transactional difficulties that migrants are expected to alleviate. Our expectation is that the coefficients on the migration variables should be larger in the specifications excluding agriculture and oil than they are in the benchmark specifications.

As with previous studies, we hypothesise that migrants have a stronger effect on trade when they come from a non-English-speaking country, because the migrants' language skills are then needed, and because language proxies for cultural and institutional differences from New Zealand. We test for such effects by interacting the migrant variable with the language variable. We also hypothesize that migrants have a stronger effect when they come from a low-income country (having controlled for the size of the countries' GDPs), since low income proxies for cultural and institutional differences, and for difficulties in obtaining information and enforcing contracts. We test for this by interacting the migrant variable with a low-income variable.

5.5 Changes in elasticity with the size of the migration stock

We examine how the size of the migrant stock affects the elasticity of trade with respect to migration. We do this by adding the square of our migrant variable to the regressions. This is equivalent to assuming that the elasticity of trade with respect to migration declines linearly with the log of the number of migrants. This assumption is somewhat arbitrary and has the unrealistic implication that the elasticity will eventually become negative in many cases. As discussed in Section 4, Gould (1994: 307) and Wagner, Head, and Ries (2002: 520-22) use alternative, more complicated, expressions. Gould's coefficients are, however, difficult to interpret. The coefficients in Wagner *et al*.'s expression have a clear interpretation, but it is not feasible to estimate them as part of a selection model.

5.6 Migrant stocks and tourism

As discussed in Section 4, previous studies of the effect of migration on trade have looked exclusively at merchandise trade. We examine the effect of stocks on an important component of the international services trade: tourism.

Ideally, we would like to use data on expenditure by overseas visitors. Unfortunately, such data are only available for a small subset of origin countries. Comprehensive data are, however, available on the number of visitors arriving from each country. We therefore use visitor numbers to proxy for expenditures. Most visits to New Zealand are

for tourism or similar purposes: in the year to March 2004, 51% of visitors stated that their reason for visiting was "tourism/holiday" and a further 28% stated that it was to "visit friends/relatives"[7].

Census respondents are recorded as "usually resident", and hence included in our foreign-born measures, only if they answer yes to a question asking whether they live in New Zealand. Some short-term visitors may, however, misinterpret the question and be inappropriately included. This would bias upwards our estimates of the effect of migration on visitor flows. The help sheets accompanying the 1996 and 2001 Census forms explicitly stated people should not answer yes to the residency question unless they were in New Zealand for more than a year. We re-run our model using data from the 1996-2002 period alone to see whether this affects our results.

5.7 Additional robustness testing

To examine the sensitivity of our results to the sample chosen, we run the model on several different sub-samples of countries. We split the sample into English and non-English speaking countries and high income and low income countries. We also examine the effect of simply omitting countries with no migrants, rather than using the Zero Migrant variable.

We have not included a real exchange rate variable in most of our regressions, as the necessary data are available for only about half of our sample. To assess whether the omission of the exchange rate variable is likely to have affected our results, we apply our benchmark specification to the sub-sample, and then recalculate using the real exchange rate variable.

5.8 Variables

Table 3 summarizes the variables. The sources of our data are discussed in Section 5.1

Table 3 – Variables used in the models

Variable name	Definition
Migrant Stock	Log of the number of migrants at the time of the most recent Census.
Zero Migrants	Dummy variable taking a value of one there are no migrants from the country
GDP	Log of a foreign country's GDP
NZGDP	Log of New Zealand's GDP
Population	Log of a foreign country's population
Distance	Log of the distance between the foreign country's capital and Wellington
Non-English	A dummy variable taking a value of one if English is not widely spoken in the country.
Average Stock	The average value over time of the Migrant Stock variable
Average GDP	The average value over time of the GDP variable
Average Population	The average value over time of the Population variable
Mills Ratio	A variable used to correct for selection bias; see Section 5.3.

[7] Estimates taken from Statistics New Zealand *External Migration (March 2004) - Hot Off The Press*, from the Statistics New Zealand website www.stats.govt.nz.

Square of Migrant Stock	The square of the Migrant Stock variable. Note that the variable is squared after taking logs, not before.
Migrant Stock x Low income	Equal to Migrant Stock if the country is classified as low or middle income by the World Bank, and zero otherwise
Migrant Stock x Non-English	Equal to Migrant Stock if Non-English equals one, and zero otherwise

6 Results

All results presented throughout this section are generated using Correlated Random Effects models. Time dummies for the years 1982 to 2001 and country specific effects are included in all specifications. We do not, however, present the coefficients from these. We use one, two and three stars (*) to denote significance at the 10%, 5% and 1% level respectively. P-values on many of our variables fluctuate between 0.01 and 0.10.

6.1 Benchmark results

In Table 4 we report our benchmark results. As described in Section 5, the variables Average Migrant Stock, Average GDP and Average Population capture correlations between the explanatory variables and country-specific effects. Mills ratios are included to take account of selection effects.

In the selection equation for exports the estimated coefficients on Zero Migrants, GDP and NZGDP are all positive and highly significant, indicating that, all else equal, higher values for these variables imply a higher probability that trade between New Zealand and a given country takes place. The size of the increment in the probability depends on the country's characteristics. As discussed in Section 5.3, we had expected the coefficient on Zero Migrants to be close to zero. However, the fact that is not probably reveals more about the idiosyncracies of the countries with zero reported migrants than it does about the relationship between migration and trade. The estimated coefficients on Population, Distance and Non-English are all negative and highly significant indicating that, all else equal, higher values for these variables would on average result in a lower probability that trade between New Zealand and a given country takes place. The coefficient estimate on Migrant Stock, the variable of most interest to us in this study, is positive and highly significant.

In the trade equation for exports the estimated coefficients on Zero Migrants, GDP and NZGDP are positive while the estimated coefficients on Population, Distance and Non-English are negative. As GDP, NZGDP, Population and Distance are in logs the estimated coefficients associated with these variables are simple elasticities. The coefficient on GDP of 0.9067 for example implies that, all else equal, increasing a country's GDP by 1% would lead to a 0.91% increase in exports to that country. For dummy variables such as Non-English, a coefficient value of β implies that, all else equal, exports to that country will be β % higher when the dummy variable equals one[8]. The coefficient of -0.1162 on Non-English implies that, all else equal, New Zealand will

[8] Let m_1 predicted exports when the dummy variable equals 1, and m_0 exports when the dummy variable equals 0. Then $\ln m_1 - \ln m_0 = \beta$, $m_1/m_0 - 1 = e^{\beta} - 1 \approx (1+\beta) - 1 = \beta$. This approximation ceases to be accurate if the absolute value of β is large.

export approximately 12% less to a country if it is not English-speaking than if it is English-speaking.

Table 4 – Benchmark results

Variable	Exports		Imports	
	Selection	Trade	Selection	Trade
Migrant Stock	0.4268*** (0.0816)	0.0465 (0.0527)	0.1246* (0.0697)	0.1862*** (0.0688)
Zero Migrants	0.6749*** (0.1775)	0.0027 (0.1965)	0.4423*** (0.1659)	0.1414 (0.2611)
GDP	0.5638*** (0.1947)	0.9067*** (0.1569)	-0.2389 (0.209)	1.2827*** (0.2099)
NZGDP	0.3368*** (0.1061)	0.7058*** (0.1103)	0.1437 (0.0926)	-0.0423 (0.1082)
Population	-3.9039*** (0.7137)	-0.2451 (0.3459)	-0.3312 (0.5452)	0.2461 (0.4351)
Distance	-1.9983*** (0.2871)	-2.4838*** (0.32)	-1.812*** (0.2942)	-1.5035*** (0.3227)
Non-English	-0.996*** (0.1459)	-0.1162 (0.2698)	0.3511** (0.1586)	-0.5227* (0.2735)
Average Migrant Stock	-0.0227 (0.081)	0.2839*** (0.0847)	0.2292*** (0.0775)	0.3081*** (0.0974)
Average GDP	0.2173 (0.1997)	0.1998 (0.1857)	0.9206*** (0.2217)	0.0563 (0.2386)
Average Population	3.4443*** (0.7023)	-0.1749 (0.3581)	0.1599 (0.5493)	-0.5405 (0.4458)
Mills Ratio	---	0.0448 (0.1688)	---	0.4873** (0.2251)
R^2 (within)	---	0.136	---	0.1446
R^2 (between)	---	0.7195	---	0.8267
R^2 (overall)	---	0.6535	---	0.7364
Log Likelihood	-746.072	---	-896.793	---
Observations	3385	2721	3385	2406
Countries	179	176	179	171

Notes – For definitions of the variables refer to Table 3. Time dummies and country specific effects are included in all regressions. Dependent variables are in 1995 New Zealand dollars. Three stars (***) indicates that the coefficient is significantly different from zero at the 1% significance level, two stars (**) indicates that it is significant at the 5% level, and one star (*) indicates that it is significant at the 10% level.

The estimated coefficient on Migrant Stock implies that on average a 1% increase in the stock of migrants from a given country would result in an increase in exports to that country of around 0.05%. Migrant Stock is not, however, statistically significant.

In the selection equation for imports the estimated coefficient on Migrant stock suggests that increasing the number of migrants from a given country will, all else equal, increase the probability that New Zealand imports from that country. Migrant Stock is statistically significant at the 10 percent level.

In the trade equation for imports the estimated coefficient on Migrant Stock is highly significant and implies that, on average, a 1% increase in the stock of migrants from a given country would result in an increase in exports to that country of around 0.19%.

In Section 5.4 we hypothesize that the effect of migrants on trade may vary depending on the type of good traded. To investigate this we present in Table 5 our results when excluding agriculture from exports and oil from imports.

Table 5 – Benchmark results, excluding agriculture and oil

Variable	Exports (Excluding Agriculture)		Imports (Excluding Oil)	
	Selection	Trade	Selection	Trade
Migrant Stock	0.291***	0.1009*	0.1769**	0.2264***
	(0.0764)	(0.0553)	(0.0709)	(0.0627)
Zero Migrants	0.3228**	0.4135*	0.6458***	0.3036
	(0.1579)	(0.2279)	(0.1773)	(0.2377)
GDP	0.1572	1.215***	-0.2994	1.3571***
	(0.1892)	(0.1661)	(0.2044)	(0.1936)
NZGDP	0.1656	0.8516***	0.2513***	-0.0624
	(0.1076)	(0.0995)	(0.088)	(0.1037)
Population	-0.7706	0.7673**	-0.4403	-0.0051
	(0.5823)	(0.3712)	(0.5434)	(0.4052)
Distance	-1.224***	-2.8685***	-1.7483***	-1.3007***
	(0.2688)	(0.2892)	(0.2909)	(0.3062)
Non-English	-0.2886**	0.2656	0.5377***	-0.5154**
	(0.1314)	(0.2437)	(0.1294)	(0.2622)
Average Migrant Stock	0.1768**	0.3755***	0.3387***	0.3435***
	(0.0869)	(0.0824)	(0.0743)	(0.0922)
Average GDP	0.4494**	-0.2913	0.7501***	-0.1802
	(0.2015)	(0.1917)	(0.218)	(0.2199)
Average Population	0.3233	-1.0231***	0.3413	-0.1858
	(0.5843)	(0.3849)	(0.5467)	(0.4155)
Mills Ratio	---	0.1859	---	0.4298**
		(0.1875)		(0.2077)
R^2 (within)	---	0.1361	---	0.1844
R^2 (between)	---	0.7897	---	0.826
R^2 (overall)	---	0.7336	---	0.7579
Log Likelihood	-869.06279	---	-917.5939	---
Observations	3385	2574	3385	2388
Countries	179	175	179	171

Notes – For definitions of the variables refer to Table 3. Time dummies and country specific effects are included in all regressions. Dependent variables are in 1995 New Zealand dollars. Three stars (***) indicates that the coefficient is significantly different from zero at the 1% significance level, two stars (**) indicates that it is significant at the 5% level, and one star (*) indicates that it is significant at the 10% level.

As expected the effect of these exclusions is to increase the coefficient estimates on Migrant Stock in the trade equations for both exports (excluding agriculture) and imports (excluding oil). Migrant stock is also now significant at the 10 percent level in the trade equation for exports (excluding agriculture).

6.2 Extensions

We now examine whether the effect of migration varies by type of country, and we test for the effect of migration on tourism receipts.

Table 6 – Allowing the effect of migrants to vary by language

Variable	Exports		Imports	
	Selection	Trade	Selection	Trade
Migrant Stock	0.4575***	0.0593	0.3486***	0.1535*
	(0.175)	(0.0677)	(0.0875)	(0.0892)
Migrant Stock x Non-English	-0.1677	0.0102	-0.3051***	0.0537
	(0.1962)	(0.0636)	(0.11)	(0.0745)
Zero Migrants	0.3055	0.0815	0.4064**	0.2354
	(0.1884)	(0.1721)	(0.2055)	(0.265)
GDP	0.5381***	0.8343***	-0.2188	1.3162***
	(0.1953)	(0.154)	(0.2094)	(0.2107)
NZGDP	0.1331	0.6886***	0.1474	-0.0191
	(0.1243)	(0.1107)	(0.106)	(0.1107)
Population	-3.7956***	-0.4552***	-0.4732	0.2091
	(0.7527)	(0.0843)	(0.5566)	(0.4393)
Distance	-1.2264***	-2.025***	-1.5609***	-1.4298***
	(0.3067)	(0.3265)	(0.2399)	(0.3214)
Non-English	0.224	0.0253	1.6188***	-0.8135*
	(0.4915)	(0.127)	(0.2708)	(0.4581)
Average Migrant Stock	0.1682*	0.1715*	0.3308***	0.2925***
	(0.091)	(0.0895)	(0.0958)	(0.0996)
Average GDP	-0.0562	0.0279	0.7681***	-0.0245
	(0.2297)	(0.1825)	(0.2153)	(0.2373)
Average Population	3.5204***	-0.0581***	0.2451	-0.4889
	(0.7789)	(0.009)	(0.5557)	(0.4493)
Mills Ratio	---	0.0742	---	0.2235
		(0.1229)		(0.2231)
R^2 (within)	---	0.1362	---	0.1453
R^2 (between)	---	0.6798	---	0.8209
R^2 (overall)	---	0.6125	---	0.7364
Log Likelihood	-755.35198	---	-887.55308	---
Observations	3385	2721	3385	2406
Countries	179	176	179	171

Notes – For definitions of the variables refer to Table 3. Time dummies and country specific effects are included in all regressions. Dependent variables are in 1995 New Zealand dollars. Three stars (***) indicates that the coefficient is significantly different from zero at the 1% significance level, two stars (**) indicates that it is significant at the 5% level, and one star (*) indicates that it is significant at the 10% level.

Table 6 presents our results for both export and import equations when we allow interaction between our Migrant Stock and Non-English variables. If migrants from Non-English speaking countries have a greater effect on trade than migrants from English speaking countries then we should see positive coefficient estimates on our interaction variable, Migrant Stock x Non-English. In the selection equations for both exports and imports, migrants from Non-English speaking countries increase the probability that trade will take place between New Zealand and a given country by less than migrants from English speaking countries. The effect of migrants from Non-English speaking countries in both trade equations is greater than that of migrants from English speaking countries. However, our interaction variable is not statistically significant in either the trade equation for exports or imports.

Table 7 – Allowing elasticity to change with the number of migrants

Variable	Exports		Imports	
	Selection	Trade	Selection	Trade
Migrant Stock	0.7422*** (0.1279)	0.1407 (0.1021)	0.4111*** (0.1163)	0.6441*** (0.1385)
Square of Migrant Stock	-0.0645*** (0.0126)	-0.0103 (0.0093)	-0.0506*** (0.012)	-0.0445*** (0.0119)
Zero Migrants	0.817*** (0.2274)	0.1044 (0.2338)	0.743*** (0.2339)	0.8246*** (0.3169)
GDP	0.6963*** (0.197)	0.9406*** (0.1594)	-0.1986 (0.207)	1.3829*** (0.2096)
NZGDP	0.6783*** (0.1446)	0.7021*** (0.1088)	0.2101** (0.0857)	-0.065 (0.109)
Population	-4.0001*** (0.7364)	-0.3121 (0.3514)	-0.1718 (0.5598)	0.0446 (0.4364)
Distance	-2.99*** (0.3573)	-2.5172*** (0.3166)	-1.6445*** (0.2495)	-1.5588*** (0.3222)
Non-English	-0.7043*** (0.1525)	-0.1511 (0.2668)	0.4467*** (0.1303)	-0.6017** (0.2734)
Average Migrant Stock	0.1609* (0.0855)	0.3024*** (0.0851)	0.558*** (0.0868)	0.3667*** (0.1036)
Average GDP	0.2407 (0.2063)	0.1781 (0.1866)	0.6553*** (0.2179)	-0.0526 (0.2357)
Average Population	3.3406*** (0.729)	-0.1168 (0.363)	0.0164 (0.5629)	-0.3376 (0.4479)
Mills Ratio	---	0.1905 (0.1813)	---	0.6043*** (0.2326)
R^2 (within)	---	0.1367	---	0.1483
R^2 (between)	---	0.719	---	0.8269
R^2 (overall)	---	0.6529	---	0.7384
Log Likelihood	-739.23783	---	-895.94338	---
Observations	3385	2721	3385	2406
Countries	179	176	179	171

Notes – For definitions of the variables refer to Table 3. Time dummies and country specific effects are included in all regressions. Dependent variables are in 1995 New Zealand dollars. Three stars (***) indicates that the coefficient is significantly different from zero at the 1% significance level, two stars (**) indicates that it is significant at the 5% level, and one star (*) indicates that it is significant at the 10% level.

We repeat our analysis excluding agriculture exports and oil imports in Appendix Table 2. The effect of excluding these goods is to increase the coefficient estimates on the interaction variable in both the trade equations slightly. In addition the interaction variable in the imports (excluding oil) equation is significant at the 10 percent level. We also allow the effect of migrants to vary with the income of the country from which they were born in. These results are presented in Appendix Table 3 and Appendix Table 4.

Table 8 – The effect of migration on tourism exports

Variable	Visitor Numbers (Model One)		Visitor Numbers (Model Two)	
	Selection	Trade	Selection	Trade
Migrant Stock	0.0383 (0.068)	0.1951*** (0.0237)	0.1521 (0.1301)	0.0094 (0.0466)
Square of Migrant Stock	---	---	-0.0181 (0.0176)	0.0192*** (0.0042)
Zero Migrants	-0.1119 (0.1672)	0.0225 (0.101)	0.0398 (0.2241)	-0.2357** (0.1145)
GDP	-0.1383 (0.1672)	0.6884*** (0.0675)	-0.1313 (0.167)	0.6517*** (0.0677)
NZGDP	0.3399** (0.1686)	0.3635*** (0.0492)	0.3187** (0.1504)	0.3695*** (0.0489)
Population	-1.4966*** (0.5164)	-1.6134*** (0.1552)	-1.4708*** (0.5161)	-1.4345*** (0.1588)
Distance	-1.6701*** (0.4555)	-2.3004*** (0.1438)	-1.6287*** (0.4061)	-2.2257*** (0.1435)
Non-English	-0.7489*** (0.247)	-0.4189*** (0.1198)	-0.7034*** (0.2173)	-0.3401*** (0.1198)
Average Migrant Stock	0.2399*** (0.0795)	0.2358*** (0.0379)	0.2711*** (0.0848)	0.2126*** (0.0381)
Average GDP	0.6928*** (0.191)	0.2689*** (0.0822)	0.6762*** (0.188)	0.2832*** (0.0817)
Average Population	1.2294** (0.5213)	1.1545*** (0.1592)	1.2106** (0.5201)	0.9843*** (0.1624)
Mills Ratio	---	1.1827*** (0.1306)	---	0.9766*** (0.1381)
R^2 (within)	---	0.548	---	0.5532
R^2 (between)	---	0.9258	---	0.9236
R^2 (overall)	---	0.8928	---	0.8912
Log Likelihood	-958.5163	---	-958.0273	---
Observations	3385	2645	3385	2645
Countries	179	178	179	178

Notes – For definitions of the variables refer to Table 3. Time dummies and country specific effects are included in all regressions. Dependent variables are short term visitor flows to New Zealand during any given year. Three stars (***) indicates that the coefficient is significantly different from zero at the 1% significance level, two stars (**) indicates that it is significant at the 5% level, and one star (*) indicates that it is significant at the 10% level.

In Table 7 we allow for the possibility that the effect of migrants on trade varies with the number of migrants from a given country. We do this by including the square of our Migrant Stock variable. The estimated coefficient on this variable is negative in all four equations indicating that there are decreasing returns to migrants. The effects are stronger when we exclude agricultural goods and oil from exports and imports respectively. See Appendix Table 5.

In Table 8 we use short term visitor flows to proxy for tourism receipts. It is evident from the table that migrants have a strong positive effect on short term visitor flows. There is evidence to suggest that this effect increases as the number of migrants from a given country increases.

Because there was a change to the way in which migrants were counted in the 1996 census that may influence these results we repeat our analysis in Appendix Table 6 for the period 1996 to 2001. See section 5.6 for further details. The estimated coefficients on Migrant Stock for this period are somewhat larger.

6.3 Additional robustness testing

To investigate the robustness of our results we have tried splitting up our sample by High and Low income countries and by English and Non English speaking countries. The effect of splitting our sample by language is that the estimated coefficients on Migrant Stock fall considerably as compared to our benchmark results, and vary markedly between English and Non-English speaking countries. When we split our sample by income the estimated coefficients are similar to those we present in Table 4.

We have also tried excluding from our regressions all countries from which New Zealand has no migrants. The effect of this on our estimated coefficients for Migrant Stock is negligible.

We include in Appendix Tables 7 and 8 a comparison of our benchmark results when we include the log of the real exchange rate in our regressions against the same sample when the real exchange rate variable is excluded. The effect of excluding the real exchange rate term on our coefficient estimates on Migrant Stock is negligible. The coefficients are, however, considerably higher than our benchmark results presented in Table 4. This again shows the sensitivity of our results to sample selection and may help account for the variety in the predicted effect migrants on trade in other studies.

7 Discussion

Results from our benchmark specification strongly suggest that the more migrants New Zealand receives from a given country, the more likely it is that New Zealand exports to that country, controlling for plausible confounding factors such as GDP, language, population, and distance. The results hint that if New Zealand does export to a country, then an increase in migrants from that country is associated with a small increase in exports, but this result is far from being statistically significant. Results for imports are slightly different. There is some support for the idea that that more migrants are associated with a greater probability of importing, and strong support for the idea that more migration is associated with higher imports. Taken at face value the results imply that if New Zealand does import from a country, a 1% increase in migrants is associated with a 0.19% increase in imports. Following previous studies, we attribute any relationship between migration and exports to the ability of migrants to reduce transactions costs. We attribute the relationship between migration and imports to some unknown mix of transactions costs effects and preferences by migrants for goods from their country of origin.

Using international visitor numbers as a proxy for earnings, we use the same specification to test for a relationship between migration and tourism “exports”. The relationship appears to be strong. However, some of this apparent strength is probably an artefact of some short-term visitors being recorded as long-term migrants.

Some variants on the benchmark case for merchandise exports and imports give results that are consistent with the hypothesis that migration stimulates trade. We expected that

migration would have less effect on transactions costs and hence trade for agricultural exports and oil imports. It turns out that excluding agriculture and oil do indeed yield stronger relationships. A possible objection to our benchmark specification is that it does not include a real exchange rate variable. We applied our benchmark specification on the sub-sample for which the necessary data were available, and then added in the exchange rate variable. Adding the exchange rate variable made little difference to the results.

However, experiments with interaction terms yielded some results that were inconsistent with the transactions cost interpretation. We had expected that the relationship between migration and trade would be stronger for migrants from non-English speaking countries than from English-speaking countries. When there are language differences and associated cultural and institutional differences, migrants' potential contribution to facilitating trade is presumably greatest. The regression results suggest, however, that the relationship between migration and the probability of trading is actually weaker for non-English speaking countries than for English speaking countries, while the relationship between migration and trade values is essentially the same. We had also expected that the relationship between migration and trade would be stronger for migrants from low income countries than for high income countries (controlling for the independent effect of economic size), on the grounds that low income proxies for differences in culture and institutions. Again, the regression results were contrary to our expectations.

Other results make it difficult to be confident about the magnitude of the association between migration and trade. The experiment with the real exchange rate variable indicates that the results are highly sensitive to the choice of sample. The experiment with the square of the Migrant Stock term suggests that the elasticity of trade with respect to migration varies with the size of the migrant stock. We are not, however, satisfied that the squared term captures this relationship adequately.

It should be possible, in future work, to reduce some of the remaining uncertainties. We aim to disaggregate imports and exports by commodity type. As well as potentially generating further insights into the effects of migration, results from a disaggregated analysis can be used to test the prediction that migrants stimulate trade in differentiated goods more than homogenous goods. We will also experiment with specifications that allow elasticities to vary with the number of migrants.

In the meantime, our judgement is that migration to New Zealand probably does increase New Zealand's trade with the migrants' origin counties. We base this judgement on the fact that positive associations occur in virtually all our specifications, and in all overseas studies, and because the underlying theory is plausible. We are, however, very uncertain about the strength of the relationship.

If migration does boost trade, what are the implications? When imports increase because of immigrant preference effects, standard welfare economics can say very little on whether this is good or bad. The situation is essentially the same as a change in the composition of demand due to a shift in preferences. In contrast, an increase in imports or exports brought about by a reduction in transactions costs must be welfare-enhancing. It is analogous to an increase in imports or exports brought about by a fall in shipping costs. A fall in costs allows New Zealanders to realize more gains from international trade. Any reduction in transactions costs can alternatively be viewed as a reduction in the effective distance between New Zealand and the rest of the world. New Zealand's remoteness, combined with its small size, is often argued to be a serious handicap to the economy, so such effects are potentially important.

It would be easier, and safer, to draw policy implications when results of the analysis by commodity group are available. More satisfactory modelling of the relationship between numbers of migrants and the elasticity of trade with respect to migration would also reduce uncertainty about the strength of the effect. A provisional conclusion, however, is that immigration policies may need to be judged by their implications for trade, in addition to their implications for labour supply and human capital.

Appendix – Supplementary data and estimate results

Appendix Table 1 – Changes in New Zealand's migrant stock, exports excluding agriculture, and imports excluding oil, by region, 1981-2001

	Population by region of birth (thousands)			Exports excluding agriculture by region (NZ$1995 millions)			Imports excluding oil by region (NZ$1995 millions)		
	1981	2001	*Incr.*	1981	2001	*Incr.*	1981	2001	*Incr.*
Australia	44	56	*28%*	1,165	3,990	*242%*	1,253	4,926	*293%*
East Asia & Pacific	76	253	*233%*	1,591	5,060	*218%*	1,942	7,213	*271%*
Europe & Central Asia	47	67	*42%*	782	1,009	*29%*	895	4,227	*372%*
Mid East & N Africa	2	12	*679%*	144	157	*9%*	12	369	*3035 %*
North America	12	21	*81%*	467	2,253	*382%*	1,680	4,504	*168%*
South America	2	4	*74%*	22	224	*915%*	60	327	*448%*
South Asia	7	31	*313%*	110	173	*58%*	62	244	*292%*
Sub-Saharan Africa	8	36	*381%*	22	73	*227%*	28	120	*325%*
United Kingdom	253	217	*-14%*	243	498	*105%*	767	1,003	*31%*
Unspecified	14	149	*979%*	359	451	*26%*	121	675	*460%*
New Zealand	2,679	2,891	*8%*	-	-	-	-	-	-
Total	3,143	3,737	*19%*	4,906	13,888	*183%*	6,819	23,607	*246%*

Source – Population data from Statistics New Zealand unpublished census tabulations. Trade estimates calculated from the United Nations Statistics Division's Comtrade database. The original Comtrade data were denominated in US dollars. For a description of the conversion to NZ dollars, see Section 2.

Appendix Table 2 – Allowing the effect of migrants to vary by language, excluding agriculture and oil

Variable	Exports (Excluding Agriculture)		Imports (Excluding Oil)	
	Selection	**Trade**	**Selection**	**Trade**
Migrant Stock	0.494***	0.0845	0.3485***	0.1259
	(0.0891)	(0.0712)	(0.0775)	(0.0827)
Migrant Stock x Non-English	-0.2399***	0.0308	-0.273***	0.1307*
	(0.0588)	(0.0642)	(0.0592)	(0.0702)
Zero Migrants	0.3202**	0.3836*	0.4773***	0.3914
	(0.1637)	(0.2251)	(0.1639)	(0.2423)
GDP	0.2251	1.1937***	-0.2583	1.3529***
	(0.1881)	(0.1664)	(0.2015)	(0.1939)
NZGDP	0.0677	0.857***	0.1364*	-0.0205
	(0.0999)	(0.1015)	(0.0778)	(0.107)
Population	-1.082*	0.8742**	-0.521	0.0749
	(0.5948)	(0.3716)	(0.5422)	(0.409)
Distance	-1.4571***	-2.9383***	-1.4223***	-1.3438***
	(0.2497)	(0.2928)	(0.223)	(0.3098)
Non-English	0.6564***	0.1323	1.5311***	-1.1361***
	(0.2236)	(0.3901)	(0.2377)	(0.4333)
Average Migrant Stock	0.0113	0.3887***	0.344***	0.3653***
	(0.079)	(0.0825)	(0.0739)	(0.0939)
Average GDP	0.8173***	-0.2244	0.7164***	-0.1982
	(0.2016)	(0.193)	(0.2123)	(0.2199)
Average Population	0.2736	-1.1681***	0.3457	-0.2436
	(0.5883)	(0.386)	(0.5446)	(0.4185)
Mills Ratio	---	0.3947**	---	0.3699*
		(0.1623)		(0.2081)
R^2 (within)	---	0.1372	---	0.1885
R^2 (between)	---	0.792	---	0.8178
R^2 (overall)	---	0.7336	---	0.7562
Log Likelihood	-863.20779	---	-911.93412	---
Observations	3385	2574	3385	2388
Countries	179	175	179	171

Notes – For definitions of the variables refer to Table 3. Time dummies and country specific effects are included in all regressions. Dependent variables are in 1995 New Zealand dollars. Three stars (***) indicates that the coefficient is significantly different from zero at the 1% significance level, two stars (**) indicates that it is significant at the 5% level, and one star (*) indicates that it is significant at the 10% level.

Appendix Table 3 – Allowing the effect of migrants to vary by income

Variable	Exports		Imports	
	Selection	Trade	Selection	Trade
Migrant Stock	0.6812***	0.0038	0.1606	0.1779**
	(0.1344)	(0.066)	(0.1006)	(0.0782)
Migrant Stock x Low Income	-0.3974***	0.0531	-0.0179	0.019
	(0.1028)	(0.054)	(0.0639)	(0.0572)
Zero Migrants	0.2294	0.0005	0.521***	0.186
	(0.1581)	(0.2044)	(0.1998)	(0.265)
GDP	0.6738***	0.9225***	-0.2453	1.3062***
	(0.198)	(0.1575)	(0.2078)	(0.2099)
NZGDP	1.2879***	0.6733***	0.3766**	-0.0464
	(0.1458)	(0.114)	(0.1756)	(0.1145)
Population	-3.2335***	-0.262	-0.3688	0.1882
	(0.7053)	(0.3469)	(0.561)	(0.4346)
Distance	-4.0325***	-2.4776***	-2.2532***	-1.4551***
	(0.3749)	(0.317)	(0.5631)	(0.3238)
Non-English	-0.2659*	-0.1369	0.597***	-0.5386*
	(0.1392)	(0.2669)	(0.1446)	(0.2761)
Average Migrant Stock	0.464***	0.2903***	0.3173***	0.2948***
	(0.0983)	(0.086)	(0.0802)	(0.0984)
Average GDP	-0.1452	0.2579	0.8126***	0.0333
	(0.2086)	(0.1946)	(0.2297)	(0.2506)
Average Population	2.8186***	-0.2214	0.2372	-0.499
	(0.7042)	(0.3605)	(0.5697)	(0.4478)
Mills Ratio	---	0.1248	---	0.3641
		(0.17)		(0.2316)
R^2 (within)	---	0.1362	---	0.1443
R^2 (between)	---	0.7198	---	0.8247
R^2 (overall)	---	0.6555	---	0.7367
Log Likelihood	-749.6382	---	-892.53757	---
Observations	3385	2721	3385	2406
Countries	179	176	179	171

Notes – For definitions of the variables refer to Table 3. Time dummies and country specific effects are included in all regressions. Dependent variables are in 1995 New Zealand dollars. Three stars (***) indicates that the coefficient is significantly different from zero at the 1% significance level, two stars (**) indicates that it is significant at the 5% level, and one star (*) indicates that it is significant at the 10% level.

Appendix Table 4 – Allowing the effect of migrants to vary by income, excluding agriculture and oil

Variable	Exports (Excluding Agriculture)		Imports (Excluding Oil)	
	Selection	**Trade**	**Selection**	**Trade**
Migrant Stock	0.5425***	0.1599**	0.2317***	0.2699***
	(0.1201)	(0.0654)	(0.0838)	(0.0715)
Migrant Stock x Low Income	-0.2486***	-0.0902*	-0.1164**	-0.0601
	(0.0894)	(0.0528)	(0.0484)	(0.0533)
Zero Migrants	0.3213**	0.3961*	0.3686**	0.2679
	(0.1617)	(0.2281)	(0.1666)	(0.2457)
GDP	0.1617	1.2091***	-0.2665	1.425***
	(0.1881)	(0.1662)	(0.2253)	(0.1929)
NZGDP	0.208*	0.9114***	0.1372*	-0.0167
	(0.1239)	(0.1053)	(0.082)	(0.11)
Population	-0.8863	0.7495**	-0.5682	-0.1209
	(0.581)	(0.3709)	(0.5748)	(0.4034)
Distance	-1.2911***	-2.8752***	-1.3049***	-1.2019***
	(0.3018)	(0.2897)	(0.2485)	(0.3051)
Non-English	-0.285*	0.3053	-0.0496	-0.581**
	(0.1483)	(0.2448)	(0.1329)	(0.2607)
Average Migrant Stock	0.1464*	0.3749***	0.4352***	0.2951***
	(0.0888)	(0.0824)	(0.0806)	(0.0931)
Average GDP	0.3957*	-0.4212**	0.5095**	-0.3675
	(0.2029)	(0.2043)	(0.2299)	(0.2285)
Average Population	0.4845	-0.8904**	0.7045	0.006
	(0.5861)	(0.3897)	(0.5798)	(0.4141)
Mills Ratio	---	0.0276	---	0.0104
		(0.1971)		(0.2193)
R^2 (within)	---	0.1363	---	0.1842
R^2 (between)	---	0.7917	---	0.8235
R^2 (overall)	---	0.7347	---	0.7582
Log Likelihood	-866.48563	---	-917.88859	---
Observations	3385	2574	3385	2388
Countries	179	175	179	171

Notes – For definitions of the variables refer to Table 3. Time dummies and country specific effects are included in all regressions. Dependent variables are in 1995 New Zealand dollars. Three stars (***) indicates that the coefficient is significantly different from zero at the 1% significance level, two stars (**) indicates that it is significant at the 5% level, and one star (*) indicates that it is significant at the 10% level.

Appendix Table 5 – Allowing elasticity to change with the number of migrants, excluding agriculture and oil

Variable	Exports (Excluding Agriculture)		Imports (Excluding Oil)	
	Selection	Trade	Selection	Trade
Migrant Stock	0.6629***	0.2631**	0.2753***	0.7443***
	(0.1219)	(0.113)	(0.1045)	(0.1251)
Square of Migrant Stock	-0.0551***	-0.0168*	-0.0198*	-0.051***
	(0.0133)	(0.0101)	(0.0108)	(0.0106)
Zero Migrants	0.85***	0.6191**	0.7109***	1.1179***
	(0.2235)	(0.2592)	(0.2143)	(0.294)
GDP	0.2271	1.2612***	-0.3085	1.3837***
	(0.1844)	(0.1678)	(0.2052)	(0.1931)
NZGDP	0.0072	0.843***	0.3109***	-0.077
	(0.1141)	(0.1001)	(0.0892)	(0.1035)
Population	-0.6368	0.687*	-0.3574	-0.1252
	(0.5852)	(0.3705)	(0.5442)	(0.4041)
Distance	-0.86***	-2.9048***	-1.9763***	-1.5936***
	(0.2962)	(0.291)	(0.3029)	(0.3113)
Non-English	-0.1148	0.2329	0.5759***	-0.4778*
	(0.1314)	(0.2454)	(0.1451)	(0.2621)
Average Migrant Stock	0.351***	0.4017***	0.3094***	0.4216***
	(0.0807)	(0.0842)	(0.0742)	(0.0926)
Average GDP	0.3353*	-0.3313*	0.7973***	-0.152
	(0.1964)	(0.1915)	(0.2247)	(0.2198)
Average Population	0.231	-0.9448**	0.2498	-0.0581
	(0.5851)	(0.3823)	(0.548)	(0.4146)
Mills Ratio	---	0.3626	---	1.0184***
		(0.2224)		(0.2308)
R^2 (within)	---	0.137	---	0.1928
R^2 (between)	---	0.7898	---	0.8287
R^2 (overall)	---	0.7346	---	0.7601
Log Likelihood	-865.83144	---	-920.39214	---
Observations	3385	2574	3385	2388
Countries	179	175	179	171

Notes – For definitions of the variables refer to Table 3. Time dummies and country specific effects are included in all regressions. Dependent variables are in 1995 New Zealand dollars. Three stars (***) indicates that the coefficient is significantly different from zero at the 1% significance level, two stars (**) indicates that it is significant at the 5% level, and one star (*) indicates that it is significant at the 10% level.

Appendix Table 6 – The effect of migration on tourism exports for the period 1996 to 2001

Variable	Visitor Numbers (Model One)		Visitor Numbers (Model Two)	
	Selection	Trade	Selection	Trade
Migrant Stock	0.3332***	0.3938***	0.3608	0.3205***
	(0.1158)	(0.0627)	(0.2296)	(0.101)
Square of Migrant Stock	---	---	-0.0048	0.0075
			(0.0345)	(0.0083)
Zero Migrants	0.0301	-0.2473	0.0707	-0.3089
	(0.2987)	(0.2686)	(0.4174)	(0.279)
GDP	0.4993	1.0666***	0.5025	1.0354***
	(0.331)	(0.1837)	(0.3317)	(0.1867)
NZGDP	0.7012***	0.3568***	0.6968***	0.3545***
	(0.1968)	(0.0504)	(0.1989)	(0.0508)
Population	0.5401	-0.4272	0.5483	-0.435
	(1.0493)	(0.5083)	(1.0504)	(0.5088)
Distance	-2.6102***	-2.2741***	-2.6033***	-2.2255***
	(0.5333)	(0.15)	(0.5346)	(0.159)
Non-English	0.2155	-0.0131	0.2191	-0.0046
	(0.2096)	(0.1197)	(0.2111)	(0.1204)
Average Stock	0.1004	0.1528**	0.1064	0.1355**
	(0.1171)	(0.0635)	(0.1251)	(0.0665)
Average GDP	-0.0497	-0.1251	-0.0539	-0.1038
	(0.3494)	(0.1886)	(0.3507)	(0.1902)
Average Population	-0.7401	-0.0203	-0.7471	-0.0109
	(1.0884)	(0.5214)	(1.0892)	(0.522)
Mills Ratio	---	1.869***	---	1.7163***
		(0.2008)		(0.2544)
R^2 (within)	---	0.1027	---	0.1038
R^2 (between)	---	0.9341	---	0.9339
R^2 (overall)	---	0.9111	---	0.911
Log Likelihood	-266.55057	---	-266.54096	---
Observations	1052	851	1052	851
Countries	178	172	178	172

Notes – For definitions of the variables refer to Table 3. Time dummies and country specific effects are included in all regressions. Dependent variables are short term visitor flows to New Zealand during any given year. Three stars (***) indicates that the coefficient is significantly different from zero at the 1% significance level, two stars (**) indicates that it is significant at the 5% level, and one star (*) indicates that it is significant at the 10% level.

Appendix Table 7 – The effect of including a real exchange rate variable in our benchmark export equation

Variable	Exports (Model One)		Exports (Model Two)	
	Selection	Trade	Selection	Trade
Migrant Stock	0.4868***	0.0615	0.4791**	0.0626
	(0.1795)	(0.0703)	(0.2009)	(0.0706)
Zero Migrants	1.6231***	-0.39	1.6987***	-0.4026
	(0.4045)	(0.2526)	(0.4451)	(0.2472)
GDP	1.75***	0.9984***	1.779***	1.0188***
	(0.4268)	(0.2089)	(0.4329)	(0.206)
NZGDP	0.2317	0.7245***	1.3705***	0.6671***
	(0.2454)	(0.1291)	(0.2984)	(0.1262)
Population	-0.3822	-0.7029*	-1.0356	-0.8425**
	(1.1056)	(0.409)	(1.4015)	(0.4254)
Distance	-0.8811	-2.5163***	-4.4077***	-2.4131***
	(0.577)	(0.3874)	(0.8041)	(0.3708)
Non-English	-1.2807***	-0.6664**	-0.0651	-0.7344**
	(0.2635)	(0.334)	(0.236)	(0.3194)
Real Exchange Rate	---	---	-0.3825*	0.1572
			(0.2239)	(0.1322)
Average Stock	0.1248	0.1792*	-0.4859**	0.1926*
	(0.1545)	(0.1054)	(0.1977)	(0.1023)
Average GDP	-1.6327***	0.1322	-0.6544	0.0717
	(0.4428)	(0.2456)	(0.4131)	(0.2403)
Average Population	0.4348	0.2988	0.2101	0.4769
	(1.1154)	(0.4249)	(1.3762)	(0.4429)
Mills Ratio	---	-0.4833	---	-1.0259***
		(0.3199)		(0.3192)
R^2 (within)	---	0.1351	---	0.1391
R^2 (between)	---	0.7987	---	0.8014
R^2 (overall)	---	0.7092	---	0.7124
Log Likelihood	-254.53068	---	-249.85193	---
Observations	1726	1540	1726	1540
Countries	90	90	90	90

Notes – For definitions of the variables refer to Table 3. Time dummies and country specific effects are included in all regressions. Dependent variables are in 1995 New Zealand dollars. Three stars (***) indicates that the coefficient is significantly different from zero at the 1% significance level, two stars (**) indicates that it is significant at the 5% level, and one star (*) indicates that it is significant at the 10% level.

Appendix Table 8 – The effect of including a real exchange rate variable in our benchmark import equation

Variable	Imports (Model One)		Imports (Model Two)	
	Selection	Trade	Selection	Trade
Stock	-0.2224* (0.1213)	0.5934*** (0.1051)	-0.1855 (0.1255)	0.5879*** (0.1048)
Zero Stock	-0.6142*** (0.2323)	0.0398 (0.3678)	-0.5936** (0.2442)	-0.0299 (0.3693)
GDP	0.8633** (0.4121)	1.2929*** (0.2683)	0.7943** (0.3981)	1.3057*** (0.2673)
NZGDP	0.1262 (0.1177)	0.1773 (0.1407)	0.2619* (0.1533)	0.1439 (0.1449)
Population	0.2575 (0.9085)	-1.5799*** (0.5249)	-0.2653 (0.9222)	-1.3944*** (0.5395)
Distance	-0.8017** (0.3672)	-1.7587*** (0.4258)	-1.5456*** (0.5228)	-1.7937*** (0.4343)
Language	0.9779*** (0.2281)	-0.7009* (0.3861)	0.6859** (0.341)	-0.6186 (0.3864)
Real Exchange Rate	---	---	-0.0814 (0.2459)	0.1654 (0.1354)
Average Stock	0.5805*** (0.1336)	-0.1865 (0.1432)	0.502*** (0.1564)	-0.161 (0.1419)
Average GDP	-0.6084 (0.4212)	-0.0297 (0.3043)	-0.2452 (0.3989)	-0.0346 (0.3035)
Average Population	-0.3357 (0.9142)	1.2535** (0.5376)	0.0291 (0.9279)	1.0663* (0.5556)
Mills Ratio	---	-0.4918 (0.5408)	---	-0.1267 (0.447)
R^2 (within)	---	0.1855	---	0.1862
R^2 (between)	---	0.842	---	0.8414
R^2 (overall)	---	0.7577	---	0.7579
Log Likelihood	-365.6764	---	-366.07735	---
Observations	1726	1378	1726	1378
Countries	90	89	90	89

Notes – For definitions of the variables refer to Table 3. Time dummies and country specific effects are included in all regressions. Dependent variables are in 1995 New Zealand dollars. Three stars (***) indicates that the coefficient is significantly different from zero at the 1% significance level, two stars (**) indicates that it is significant at the 5% level, and one star (*) indicates that it is significant at the 10% level.

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