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The Impact of Immigration on the Labour Market Outcomes of New Zealanders

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Abstract

This paper examines how the supply of immigrants in particular skill groups affects the wages of the New Zealand-born and older immigrants. We identify the impact of recent immigration on the labour market using the 'area-analysis' approach, which exploits the fact that immigration is spatially concentrated, and thus a change in the local supply of immigrants in a particular skill group should have an impact on the labour market outcomes of similarly skilled non-immigrants in that local labour market. We also extend the simple 'area-analysis' approach by estimating CES and Generalised Leontief production functions using local inputs, thus allowing for different degrees of substitutability between various skill-migrant status groups, and by estimating relationships at various degrees of geographic aggregation.

JEL classifications: J61, R23

Keywords: Immigration, Wage Impacts, New Zealand, Labour Market Areas

1 Introduction

Twenty percent of New Zealand's population is foreign-born and forty percent of immigrants have arrived in the past ten years. Despite the magnitude of these immigrant flows, the impact of immigration on the labour market opportunities of New Zealanders has yet to be investigated using micro-econometric techniques. This paper aims to fill this gap by using data from the 1996 and 2001 Census to examine how the supply of immigrants in particular skill groups affects the employment and wages of the New Zealand-born and of older migrants.

We identify the impact of recent immigration on the labour market using the 'area-analysis' approach, which exploits the fact that immigration is spatially concentrated, and thus a change in the local supply of immigrants in a particular skill group should have an impact on the labour market outcomes of similarly skilled non-immigrants in that local labour market. Direct competition in the labour market is the primary influence that immigrants have on the opportunities of non-immigrants. Economic theory suggests that the entry of immigrants should lower the wages of competing workers and increase the wages of workers whose skills become more valuable because of immigration (Borjas 1999). This increased supply of workers will also lead to reduced employment opportunities for competing workers if wages adjust slowly or institutions, such as minimum wages, make wage adjustment impossible.

However, the majority of international research, as reviewed in Borjas (1994) and Friedberg and Hunt (1995), has found immigration to have a limited impact on the labour market opportunities of non-immigrants. A recent paper by Longhi et. al. (2005) identifies a number of published studies that examine the impact of immigration on the wages of non-immigrants in the United States (Borjas 1987, 2003; Borjas et. al. 1996; Altonji and Card 1991; Card 2001), Australia (Addison and Worswick 2002), Germany (De New and Zimmermann 1994; Winter-Ebmer and Zweimuller 1996), Israel (Friedberg 2001), and France (Hunt 1992), and performs meta-analysis to summarise the results found in these studies. This paper concludes that an increase in the supply of immigrants has a significantly negative, but very small, impact on the wages of non-immigrants.

But, it is difficult to know whether these findings are readily transferable to New Zealand, as most international research focuses on countries, predominantly the United States, which have large

domestic economies and high levels of low-skilled and illegal immigration. New Zealand, on the other hand, has a small open-economy, a large-scale and highly structured immigration system that focuses mainly on higher-skilled migrants, little low-skilled illegal immigration, and a highly mobile population both internally and internationally (Poot and Cochrane 2004; Maré and Timmins 2005; Maré and Choy 2001). These institutional differences may be particularly important in determining the impact that immigration has on host country labour markets (Angrist and Kugler 2003; Borjas 1999).

A number of papers have argued that a spatial comparison of the labour market outcomes of native workers in different localities may not provide valuable information about the economic impact of immigration, because immigration may affect all areas of the country, not just the ones that actually receive immigrants (Borjas et. al. 1996, 1997; Borjas 2003). This will occur if, over time, the supply of new immigrants to local labour markets encourages outward migration of non-immigrants or immigrants, or a reallocation of resources across sectors and an associated adjustment of interregional trade (i.e. a Heckscher-Ohlin effect). We address this concern both by examining, in a companion paper (Stillman and Maré 2006), the impact of recent immigrations on the geographic mobility of non-immigrants (as in Card 2001) and by estimating impacts at different levels of geographic aggregation. As discussed in Borjas (2003), if these endogenous processes follow an immigration shock, the impact of this shock will be larger in more closed labour markets (i.e. larger geographical areas).

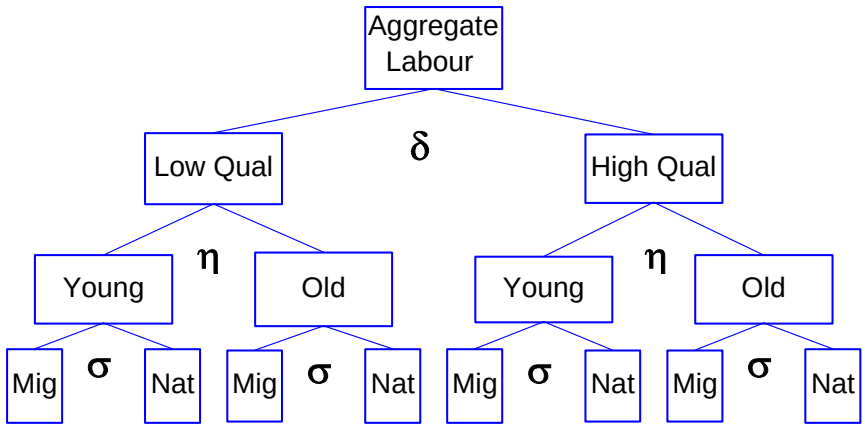
We also extend previous work in this area by estimating both CES and Generalised Leontief production functions using local inputs, thus allowing for different degrees of substitutability between various skill-migrant status groups. This is similar to the approach taken in Ottaviano and Peri (2006) and Manacorda et al. (2006), but we estimate a more flexible function form (Generalised Leontief) and allow for substitution both between and across skill-groups and nativity. Essentially, we combine the approach of Borjas (1987), which estimates within-area labor market competition among immigrants, minorities, and the native population, with the approach taken in more recent papers (e.g. Card 2001; Borjas 2003) where individuals are assumed to compete within particular skill-groups, and extend this to allow for across nativity/skill-group substitution and complementarity.

2 Theory

Migrants and non-migrants compete in a labour market that may be stratified by location and/or skill. We estimate the nature of their interactions by characterising them as imperfectly substitutable inputs (factors) in a local or aggregate production function. The wage impacts of changes in the migrant population will depend on the degree of substitutability between these factors, and the distribution of migrants across different labour market strata. We consider two alternative production function specifications, the 'constant elasticity of substitution' (CES) function, and the Generalised Leontief (GL) production function, which differ in the implied structure of substitutability within and between factors. We consider geographic stratification at various aggregations, and a variety of potential skill-related stratifications, by qualification, age, and occupation.

We start with the empirically convenient CES model of the structure of local labour markets that allows for substitution of workers both between and across skill-groups and nativity groups and allows us to estimate the extent of labor market competition among recent immigrants, older immigrants, and the native population in different skill groups. Ottaviano and Peri (2006) allow for labour market substitutability between immigrants and native-born workers in a labour market that is hierarchically-stratified by education and age. Figure 1 summarises the structure of their approach.

Figure 1: Stratified labour market substitutability– Nested CES



This figure shows a simple case of a labour market where workers belong to one of 8 groups, defined by qualification level, age, and migrant status. The primary stratification of labour input is by qualification – workers with different qualification levels are imperfectly substitutable, with elasticity of substitution of δ. Within each qualification group, young and old workers are substitutable, with

common elasticity of substitution η, where η is expected to be larger than δ, reflecting greater substitutability within than between education cells. Finally, the greatest substitutability occurs for migrants and native within the same education-age cell, with common elasticity of substitution denoted by σ.

Ottaviano and Peri (2006) model these relationships with a nested CES production function, following Borjas (2003) and Card and Lemieux (2001). The parsimonious hierarchical structure of stratification and the constant elasticity of substitution at each level aids identification. Variation across the four age-qualification cells identifies the single parameter σ. Solving this model yields factor demand equations of the form:

$$\ln w_j = \alpha + \gamma \ln\left(L_j \big/ L\right) \tag{1}$$

where j indexes each of the nativity/skill-groups. The parameter γ is the wage elasticity of demand for factor j, indicating the percentage change in wage in response to a percentage change in the factor's share of employment. γ is equal to the negative inverse of the (common) elasticity of substitution between factors. The less substitutable the factors are, the more an increase in employment share will reduce their wages. If factors are infinitely substitutable, the wage is unaffected by how much of total employment is accounted for by any group, and the wage impact will be zero.

The structure imposed by the CES function is uninformative about variation in the substitutability of natives and migrants across skill cells. It does not allow for the possibility of say high skilled migrants substituting for low skilled natives, even though this type of substitutability may be quite important (e.g. the anecdotal stories of immigrant doctors working as taxi drivers). Thus, we complement the CES analysis with an alternative characterization of the production technology, allowing for substitutability both between and across skill-groups and nativity.

Specifically, we utilise a generalized Leontief production function (Diewert 1971), which is a second order approximation to an arbitrary twice-differentiable production function:

$$Q\left(L_1 \cdots L_N\right) = \sum_{i=1}^{N}\sum_{j=1}^{N} \gamma_{ij}\left(L_i / L_j\right)^{1/2} \tag{2}$$

where Q is output and $L_1 \cdots L_N$ are productive inputs and i and j index each of the nativity/skill-groups. The parameters γ_{ij} describe the production technology. Under the assumptions of profit maximisation and constant prices, the factor demand equations implied by this technology take the following convenient form:

$$w_i = \gamma_{ii} + \sum_{j \neq i} \gamma_{ij} \left(L_i / L_j \right)^{1/2} \tag{3}$$

The coefficients from this model can also be used to derive estimates of the Hicks (1970) partial elasticity of complementarity c_{ij}:[1]

$$c_{ij} = \frac{\gamma_{ij}}{2\left(s_i s_j w_i w_j \right)^{1/2}} \tag{4}$$

where s_i is the cost-share of factor i. A positive value of c_{ij} indicates that factors i and j are complements, whereas a negative value indicates substitutability. For example, a finding that $c_{NZ,RM} < 0$ would imply that an increase in the number of recent migrants lead to a lowering of wages for the New Zealand-born. Own- and cross-wage elasticity estimates are conveniently obtained as

$$\eta_{ij} = \frac{d \ln w_i}{d \ln L_j} = s_j c_{ij} \tag{5}$$

This functional form has been used in the immigration literature by Borjas (1987), who estimates the within-area extent of labor market competition among immigrants, minorities, and the native population. The current paper uses a 9-way breakdown of the labour force, based on race, migrant status, and gender Our application of this approach uses various breakdowns of the local labour force, including 3 migration-status ("nativity") groups, 5 qualification groups, 6 age-groups, as well as 90 skill-group/nativity combinations. We also consider a four-way breakdown based on occupational groups. One factor demand equation is estimated for each group, the J equations are estimated simultaneously, with cross-equation symmetry restrictions, and each equation has as many observations as there are area*time combinations.

[1] The (Hicks-Allen) elasticity of substitution as estimated by the CES approach measures the change in relative quantities in response to a change in relative marginal productivities, holding other factor prices constant. The

3 Data and Sample Characteristics

3.1 Data Sources and Variable Definitions

This paper uses unit record data for the entire New Zealand population from the 1996 and 2001 Census.[2] The Census collects information on an individual's country of birth and their year of first arrival in New Zealand.[3] Individuals are classified as being either New Zealand-born, a recent migrant or an older migrant, where recent migrants are all individuals who first arrived in New Zealand 0-5 years ago and were born in a foreign country and older migrants are all other individuals born in a foreign country. Information is also collected about the current usual residential location of each individual.[4] This location information is coded to the relatively fine census 'area unit' level, allowing us to identify local labour market areas (LMAs).[5] In practice, we utilize the LMAs defined in Newell and Papps (2001) using an algorithm that ensures that most people who live in one LMA work in it, and most people who work in one LMA live in it.[6] Focusing on functional local labour market areas has major advantages over using administratively defined geographic areas, as migration between LMAs is generally associated with a change of job, whereas migration within a LMA is typically motivated by residential factors (Maré and Timmins 2005).

We restrict our analysis throughout to individuals aged 25-54 with non-missing country of birth and years in New Zealand, if foreign-born.[7] We focus on this age group to exclude students and individuals nearing retirement. We also drop a small number of individuals for whom the address

elasticity of complementarity provides an alternative view of the same relationship, and is estimated holding other factor quantities constant.

[2] We also have access to the 1986 and 1991 Census data, but choose to focus on the 1996 and 2001 for three reasons: first, New Zealand underwent a period of comprehensive market-oriented economic reform from 1984-93 which would likely contaminate any results from the early time-period (Evans et al. 1996); second, the occupational classification system was changed between the 1991 and 1996 Census in a way that makes it impossible to create a consistent series over-time even at an aggregated level; and third, the 1991 Census did not ask foreign-born individuals their year of first arrival in New Zealand making it impossible to separate recent from older migrants in this Census.

[3] Country of birth is a write-in question. All responses are coded to a particular country or region, if the answer is incomplete.

[4] Individuals are also asked their usual residential location (including overseas) five years before the census date (i.e. at the time of the previous census).

[5] At the time of the 2001 census, there were 1,860 area units in New Zealand, with an average of 2,010 individuals living in each area unit.

[6] Appendix A contains further information on how LMAs are created and a map of the 140 LMAs in New Zealand. There is an additional 'overseas' LMA.

recorded on the census form is not sufficient for assigning an LMA to the current residence.[8] Out of the total analysis population of 1.45 million individuals in the 1996 Census, 80% are NZ-born, 5% recent migrants and 15% older migrants. For the 2001 Census, out of a total analysis population of 1.51 million, 79% are NZ-born, 6% recent migrants and 16% older migrants.

3.2 Sample Characteristics

Table 1 presents the demographic characteristics of the three sample groups (recent migrants, older migrants, NZ-born) in the 1996 and 2001 Census. As in most countries, recent migrants are younger than the non-immigrant population (for example, 48% are less than thirty-five versus 37% of the NZ-born in 1996 and 45% versus 34% in 2001). But unlike the US where most immigrants are low skilled, in New Zealand, recent migrants are much more qualified than the NZ-born, with 34% of recent migrants in 1996 (32% in 2001) having university degrees versus 9% of the NZ-born (12% in 2001). This is reflected throughout the qualification distribution, with few migrants having no qualifications compared to the NZ-born.[9] This comes as no big surprise given that NZ operates a highly structured immigration system that focuses mainly on higher-skilled migrants.

The source country distribution of recent immigrants is fairly stable over the ten-years examined here, but there is evidence that immigrants from the Pacific and South America, Africa, and the Middle East are becoming more common and those from the British Isles, Western Europe and North America, and North-East Asia are becoming less common.[10] Comparing recent migrants to older migrants, we can see that this reflects an ongoing evolution of migrant source countries (with

[7] 5% and 4% of individuals aged 25-54 are missing country of birth or years in New Zealand in the 1996 and 2001 Census, respectively.

[8] Less than 1% of prime-age individuals have an undefined current address.

[9] A large number of migrants have missing qualifications in 1996 because of the way that foreign qualification were coded in this census. We general treat these individuals as being in their own qualification group, but also test the robustness of our results to this assumption.

[10] The Pacific Islands include Melanesia, Micronesia, and Polynesia (excluding Hawaii); the British Isles include the United Kingdom and Ireland; Western Europe and North America includes all European countries not assigned to the British Isles or Eastern Europe, the US, Canada and Bermuda; the Former Soviet Union and Eastern Europe includes Greece, Cyprus, the countries of the former Yugoslavia, all former Eastern Bloc countries and all former republics of the Soviet Union (including those in the Baltics, Caucasus, and Central Asia); the Americas, Africa and Middle East includes all countries in Central and South America, the Caribbean, North Africa, Sub-Saharan Africa, and the Middle East (including Turkey); South-East Asia includes Myanmar, Cambodia, Laos, Thailand, Viet Nam, Brunei, Indonesia, Malaysia, Philippines, Singapore, and East Timor; North-East Asia includes China, Hong Kong, Macau, Mongolia, Taiwan, Japan and the Koreas; and South Asia includes Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan and Sri Lanka.

the exception of the Pacific Islands, which had large scale immigration to NZ in the 1960s and 1970s and are only now again becoming an important source of migrants to NZ).

Table 2 presents the labour force characteristics of the three sample groups (recent migrants, older migrants, NZ-born) in the 1996 and 2001 Census. Employment rates are much lower among recent migrants compared to both older migrants and the NZ-born, confirming earlier NZ findings by Winkelmann & Winkelmann (1998) and Boyd (2003). For example, only 55% of recent migrants are employed in 1996 compared with 76% of older migrants, and 78% of the NZ-born. This gap has narrowed in 2001, with 62% of recent migrants employed versus 77% of older migrants and 80% of the NZ-born. These differences persist if we focus on full-time employment or full-time wage/salary employment, but are generally smaller in magnitude.[11]

Unfortunately, the Census does not directly collect wage data.[12] However, it does collect total annual income on an individual basis.[13] Recent migrants have much lower levels of average income than older migrants and the NZ-born (who have similar levels). On the other hand, average incomes for full-time employees and full-time wage/salary employees are quite similar across all three nativity groups, suggesting that the overall difference occurs because of differences in labour supply by these groups and not wage rates. In general, average incomes for full-time wage and salary workers are likely to measure something reasonably akin to a wage rate and thus we use mean income for these workers to proxy for the wages of particular migrant/skill-groups throughout the remainder of the paper.

Migrants and non-migrants work in similar occupations and industries (at a highly aggregated level). The only meaningful differences are that migrants are more likely to be in professional occupations and the business and property services industry and are less likely to be in agriculture,

[11] Full-time wage/salary workers are individuals who report working more than 30 hours per week at their main employer (defined as the employer at which they work the most hours) and report being a paid employee (as opposed to being an employer of others in their own business, otherwise self-employed, or an unpaid family worker).

[12] The Income Survey (IS), run each June since 1997 as a supplemental questionnaire to the Household Labour Force Survey (HLFS), directly collects wage data, however, it does not identify local labour markets.

[13] Total income is collected using a bracketed question and covers all income sources. We create a continuous variable by converting the raw data using the mid-point of each bracket and an estimated mid-point for the top bracket.

fishery, or forestry (occupation or industry) and other blue-collar professions (e.g. trades and plant and machine operators) and industries (e.g. construction).

Table 3 presents the distribution of qualifications for recent migrants from different countries of birth in each year (as well as, the distribution for the NZ-born). The countries are ordered from the most to least common source country of recent migrants. There is a large variation in the qualification distribution for recent migrants from different sources countries. For example, 56% of recent migrants from the Pacific Islands have at most school qualifications and only 6% have university degrees in 1996 (60% and 7%, respectively, in 2001), while only 19% of recent migrants from South Asia have at most school qualifications and 63% have university degrees in 1996 (28% and 53%, respectively, in 2001). These differences are largely related to the different immigration categories under which individuals from different countries are migrating (mainly family versus skilled migration). Immigrants from different countries also are more or less likely to settle in different places in New Zealand. As will be discussed in more detail below, this variation allows us to create supply-pull instruments for where immigrants with different skills are most likely to settle.

3.3 Defining Skill-Groups

Throughout this paper, we classify individuals into particular skill-groups and allow for substitutability both across and within (by nativity) these groups. One important question that we need to address is then how to define skill-groups. As in Cohen-Goldner and Paserman (2004), we consider multiple definitions. Our first definition follows the human capital approach taken in Borjas (2003) and creates the following skill-groups: 6 five-year age-groups, 5 qualification groups, and 30 age/qualification group (age and qualification groups are tabulated in Table 1).[14] This approach assumes that the productivity of different individuals is determined solely by their human capital. One potential problem with using age and qualifications to create skill-groups is that human capital acquired in foreign countries may not translate to similar skill levels in NZ.

[14] Borjas (2003) uses education and potential experience to define human capital groups. Because our data only identifies qualifications and not years of education, our groups will be the same whether we use age or potential experience to classify individuals (e.g. all individuals with a certain qualification would have to be coded with the same years of education).

Thus, our second definition follows the methodology used in Card (2001) and creates 4 skill-groups defined as each individual's predicted probability of working in each of the following aggregated occupations: 1) Legislators, Administrators, Managers, and Professionals, 2) Technicians, Associate Professionals, Clerks, and Trades Workers, 3) Agriculture, Fishery and Forestry Workers, 4) Service and Sales Workers, Plant and Machine Operators, and Elementary Occupations.[15] These predicted probabilities are calculated from a multinomial logit occupational choice model estimated at the national level separately by gender for the NZ-born and immigrants as a function of observed characteristics, such as education, age, ethnicity, years in New Zealand and country of origin.[16] Predicted occupations are used to group individuals rather than actual occupations for two reasons. First, an individual's actual occupation is partially determined by the demand for particular occupations in particular locations and we want to produce skill-groups that are not influenced by local demand patterns. Second, it would not be possible to assign a skill-group to individuals that are not currently employed. The main downside in using predicted occupations is that they add noise to our estimates in the sense that some individuals are assigned to the wrong skill-group.

The distribution of nativity groups across these four predicted occupational groups is summarised in Table 4. Migrants are more likely to be predicted to be in the Managers/Professionals occupational group and are less likely to be in either the Agricultural or Service/Sales/Blue-Collar occupation group than the NZ-born in both 1996 and 2001. Recent migrants, in particular, are much

[15] This particular aggregation was chosen by estimating multinomial logit occupational choice models at more disaggregated levels and examining the relationship between actual occupation and predicted occupation for each individual, with the goal of finding an aggregation that minimised misclassifications. Agriculture, Fishery and Forestry Workers, while less than 10% of all workers, tend to work in very specific labour markets. The three remaining occupation groups each employ around 30% of workers.

[16] Specifically, separate models are estimated for the NZ-born and non-NZ-born by gender for all individuals employed and reporting a non-missing occupation. The following covariates are included for the NZ-born models: qualifications, a quartic in age, ethnicity, qualifications interacted with ethnicity and a quartic in age, marital status, household type (couple with or w/o children, single parent, or non-couple), census year, and indicator variables for whether an individual lives in Auckland, Wellington, or Christchurch. For immigrants, the following additional covariates are included: a quadratic for years in NZ, a quadratic for years in NZ interacted with qualifications, indicators for whether the individuals moved to NZ earlier than at age 6, than at age 16, or than at age 25, an interaction of these variables with qualifications, and one-digit country of birth. Predicted probabilities of working in each of the four occupations are then generated using the relevant model and each individual's characteristics, but setting the location variables to zero (e.g. treating all individuals as if they live outside the three major cities). These predicted probabilities are then totalled over each LMA and year to generate counts of the number of individuals predicted to be in occupation skill-group i in LMA j in year t.

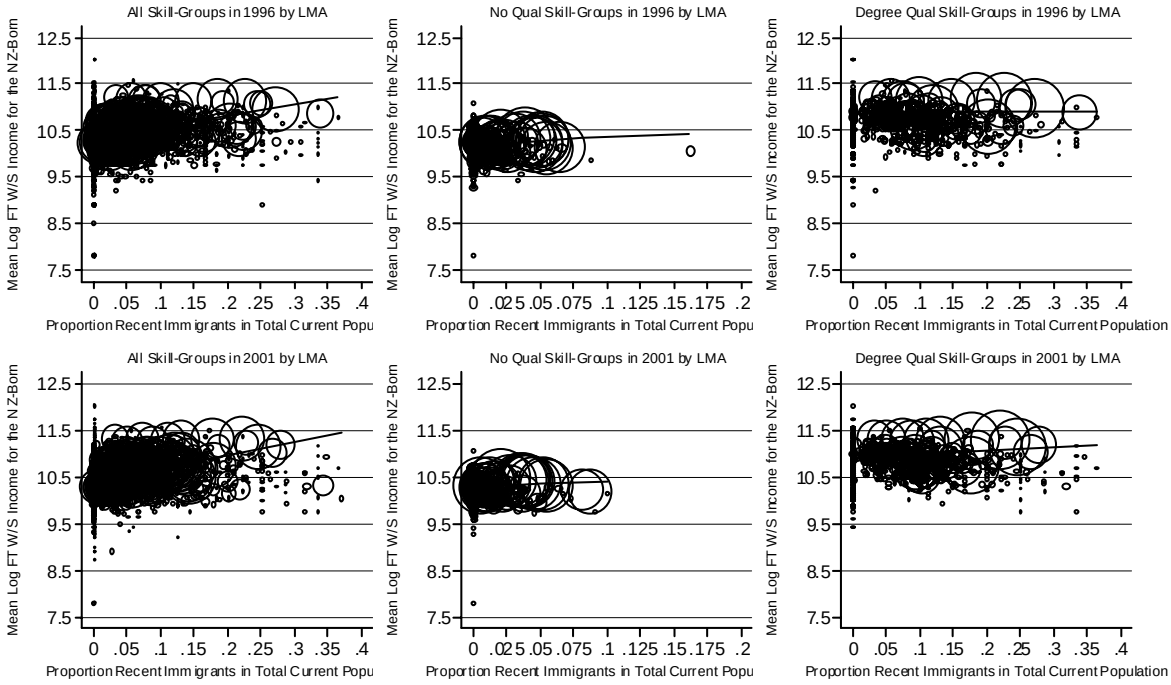
more likely to be predicted to be in the Managers/Professionals occupational group and less likely to be predicted to be in any of the other occupational groups than the NZ-born. This is true in both census years even though relatively more NZ-born individuals are predicted to be in the Managers/ Professionals occupational group in 2001 than in 1996.

4 Impact of Migration on Labour Market Outcomes

4.1 Descriptive Evidence

We begin by examining the relationship between the settlement decisions of recent migrants and labour market outcomes for the NZ-born and older migrants. Before turning to regression analysis, we examine whether there appears to be a relationship between the concentration of immigrants in different skill-groups in particular areas and the average income earned by the NZ-born in those areas.

Figure 2: The Relationship between the Proportion of Recent Migrants and the Mean Income of the NZ-Born in each Skill-Group and LMA



The size of the circles are proportional to the current population of each Skill-Group in each LMA
The solid line is the best linear fit

Figure 2 graphs the mean log income for NZ-born full-time wage and salary employees in each human capital defined skill-group in each LMA versus the proportion of recent migrants in the overall current population in the same skill-group and LMA in 1996 (upper panels) and 2001 (lower panels). The left panels present the results when all skill-groups are pooled together, the centre panels present

the results only for the skill-groups with the lowest education level (e.g. the 6 age-groups with no qualifications), and the right panels present the results only for the skill-groups with the highest education levels (e.g. the 6 age-groups with university qualifications). The size of the plot circles are proportional to the current population of each skill-group/LMA and the solid line in each graph is the best linear fit of the data, with each point weighted by the current population of each skill-group/LMA.[17] If recent immigrants have a negative impact on the labour market outcomes of the NZ-born, we would expect to see lower income for workers living in areas with a larger proportion of recent immigrants in the same skill-group, i.e. we should see a negatively sloping best fit line between the points in each figure.

Pooling all skill-groups, we, in fact, find the opposite, incomes are higher for full-time wage/salary NZ-born workers who live in areas that have a greater concentration of similarly skilled recent immigrants. This is true even for observations where more than 25% of the local population in a particular skill-group are recent migrants. Separately examining low and high education skill-groups, we find a weaker relationship between local migrant concentration and incomes for the NZ-born, but there is still no evidence of a negative relationship within these more uniform groups. While this descriptive evidence is informative, we might expect to find a positive relationship between the local concentration of recent migrants and income for the NZ-born, even if migrants are lowering the wages paid to the NZ-born, if immigrants settle in areas that pay higher wages to NZ-born in the same skill-groups (and presumably to competing recent migrants as well). Thus, we now turn to a regression analysis that allows us to control for fixed characteristics of LMAs and skill-groups to better address this concern.

4.2 CES Regression Estimates

We estimate CES factor demand equations (1) for a range of different definitions of factors (j) and production units (k). Specifically, we define factors of production by nativity, by qualification and

[17] All summary statistics and regressions are variance weighted because the number of individuals in each LMA ranges from less than 500 in eight LMAs to over 100,000 in four LMAs and there is a large variation in the relative size of different skill-groups within LMA/years. If the variances of the estimated wage rates are

age, and by predicted occupation. Substitutability is estimated for production functions defined in aggregate, and for four geographic definitions – 140 Labour Market Areas (LMAs), 58 LMAs, 16 regional councils, and 2 Islands.[18] The regression model for each factor demand equation is written as:

$$\ln w_{jkt} = \gamma \ln\left(L_{jkt} \Big/ L_{kt} \right) + \alpha_{jk} + \alpha_t + e_{jkt} \qquad (6)$$

where α_{jk} is the intercept specific to each factor/production unit combination, α_t is a time fixed effect allowing there to be aggregate differences in wages between 1996 and 2001, and e_{jkt} is a standard white-noise error term. In each regression, w_{jkt} is calculated as the mean income of full-time wage and salary workers in each factor/production unit combination. The intercepts, α_{jk}, remove the influence of heterogeneity of factor shares and wage levels across production units and factors.[19] Factor/production-unit combinations are dropped from a regression when no full-time wage and salary workers are in a particular combination in either census year.

Table 5 summarises the regression specifications (e.g. factor combinations) that are estimated with the CES production function defined for 140 and 58 LMAs (as well as the equivalent GL production function regressions).[20] For each of these models, we highlight the maximum number of observations that could be in the regression, the actual number of observations used (e.g. the cells containing full-time wage and salary workers in both census years), the percentage of total employment covered by these observations, and the number of estimated model parameters. In each

proportional to the sample sizes for each skill-group/LMA group cell, then weighted estimates are more efficient.

[18] New Zealand geographically consists of two main islands separated by a three hour ferry ride or a plane flight, plus a third island that has a very minimal population (Stewart Island). 75% of the working-age population lives on the North Island. Newell and Papps (2001) derive a second set of 58 functional labour market areas also using travel-to-work data, but with a higher containment threshold. New Zealand has 16 regional councils (RC): Northland, Auckland, Waikato, Bay of Plenty, Gisborne, Hawke's Bay, Taranaki, Manawatu/Wanganui, Wellington, Nelson, Tasman, Marlborough, West Coast, Canterbury, Otago, and Southland, which are purely administrative areas and are typically the most disaggregated areas identified in survey data.

[19] An alternative approach would be to assume a common production function across all production units, and restrict α_{jk} to be $\alpha_j + \alpha_k$. Given the lack of information on non-labour inputs in our data, we choose to identify γ solely from changes over time in local factor shares, rather than using cross-unit variation in shares.

[20] We do not present the results from all of these combinations, choosing to focus our discussion around a number of contrasting models. All results (including those at more aggregate geographical areas) are available from the authors.

CES specification, even though a number of cells are dropped, the data used in the regression captures at least 97.8% of all employment. As will be discussed below, coverage does decline in a number of specification using the equivalent GL production function.

Table 6 presents estimates of CES wage and substitution elasticities for various factor/ production unit combinations.[21] We report estimates of γ, and of the implied elasticity of substitution ($-1/\gamma$). The first panel presents the results for 140 LMAs. Examining the first column, OLS estimates of (6) indicate that that a 10 percent increase in a nativity group's (e.g. recent migrants) employment in a LMA is associated with that group having 12.3 percent lower wages, although the relationship is not statistically significant.[22] This relatively large negative own-wage effect suggests a relatively low degree of substitutability between local nativity groups. The estimated elasticity of substitution is 0.8.

As emphasised by Borjas (2003), the area variations approach may fail to pick up negative wage effects of immigration if competition occurs between rather than within areas or if immigration to particular locations causes reallocations of resources across sectors and adjustments in interregional trade (i.e. a Heckscher-Ohlin effect), thus leading to diffuse impacts on all areas of the country. To gauge the strength of between-area competition, the remaining rows of the first column in Table 6 present results for increasingly aggregated production units. The elasticity of substitution is monotonically higher for larger geographic aggregations, with the elasticity rising to 5.5 at the aggregate level, suggesting that the labour market impacts of immigration extend beyond local labour market boundaries. Area variation analyses will understate the impact of immigration, with the bias being larger when the relationship is measured in smaller areas.

These estimates are unbiased if there are not group-specific demand shocks in particular local labour markets in particular time-periods. However, if immigrants are attracted to local labour markets with the strongest wage growth for their group in a particular time-period, OLS estimates of (6) will be biased. Thus, following the approach taken in Card (2001), we instrument the supply of both recent and older migrants in a local labour market area with the concentration of past immigrants

[21] As discussed in footnote 16, all regressions are weighted by L_{jkt}.

from the same country of birth in that area.[23] Immigrants tend to live in areas inhabited by other immigrants from the same source country (Bartel 1989). We use a similar approach to instrument for the supply of the NZ-born in each labour market, using the concentration of NZ-born with the same ethnicity to create the instrument. If social networks are (weakly) stratified by ethnicity, then the ethnic concentration in a particular area should act as a pull-factor that is independent from local demand shocks. If each of these pull-factors is independent from the local demand for individuals with particular skill-levels, instrumental variables will produce consistent estimates of equation (6) even if there are skill-group specific local demand shocks.[24] The IV estimates, shown in the second column, are very similar to the OLS estimates, suggesting that OLS estimates are not significantly biased by endogenous location choice, or that our instruments have failed to remove all demand influences. It may be that labour demand shocks happened to be strongest in local skill cells where supply was predicted to grow most strongly.

In a stratified labour market, substitutability will be greatest within homogeneous strata. Before examining the interaction of nativity groups within skill-groups, we summarise, in the remaining columns of Table 5, the degree of substitutability between groups defined by qualification and age, and predicted occupation. For skill groups defined by qualifications and age or by predicted

[22] Statistical significance here refers to whether the wage elasticity is significantly different from zero. A zero wage elasticity is commensurate with infinite substitutability of factors.

[23] Formally, let RM_{gt} represent the number of recent migrants from source country g in census t, and let λ_{gkt} represent the fraction of older migrants from country g that is observed living in LMA k five-years prior to the current census. Finally, let τ_{gst} represent the fraction of recent migrants from source country g that is in skill-group s in census t. In the absence of demand factors, the number of recent migrants from country g in skill-group s who would be expected to live in LMA k in census t is $\tau_{gst} * \lambda_{gkt} * RM_{gt}$. Summing over all countries, we can calculate the component of the supply of recent migrants in each skill-group and LMA that occurs because of an individual's desire to live near other migrants from their home country. The same formula is used to determine the supply of older migrants in a LMA, except that τ_{gst} is calculated for older migrants and that RM_{gt} is replace by OM_{gt}, the number of older migrants from source country g in census t. In practice, we group individuals into the nine source country groups tabulated in Table 1 for calculating this instrument.

[24] The unreported first-stage regression results from the instrumental variable models show that, overall, the predicted supply of recent migrant, older migrants, and the NZ-born is strongly related to the actual supply. In a CES model that includes year, area and skill (age*qual) dummies the partial R-squared for the location of past immigrants is 8% for recent immigrants and 13% for older immigrants. Using occupation groups as the skill measure, the partial R-squared values are 6% and 16%, respectively. Similarly, the location of different ethnic groups explains 23% of the variation in location of the NZ-born human capital skill groups and 16% when using skill-groups defined by predicted occupation. The F-stats on the predicted supply of recent migrants are between 60 and 2,400 where a F-stat of less than 17 indicates potential problems with weak instruments in our model (Stock and Yogo 2002). Stillman and Maré (2006) provide further evidence on the quality of the instrument for recent migrants.

occupation, all estimated wage elasticities are positive, implying negative elasticities of substitution. This makes little economic sense, implying that production is maximised with a single factor of production rather than with a mix of factors.[25] Our interpretation is that, once we aggregate nativity groups, our instrumental variables strategy may not remove all endogeneity of location choice, and thus there may be a positive bias in our estimated wage elasticities, and therefore a negative bias in the estimated elasticities of substitution. Substitution elasticities are consistently more positive for larger aggregations, suggesting that (allowing for the bias) for these factor definitions as well, there is greater substitutability over larger areas.

Table 7 reports estimated wage and substitution elasticities for nativity groups within skill cells, where skills are defined either by age*qualification or by predicted occupation. Within age*qualification groups, wage elasticities are generally negative but relatively small in magnitude, consistent with a very high degree of within-cell substitutability. The estimated substitutability within occupation cells is also strong, with an elasticity of substitution between 5.8 and 8.7 (final column of Table 7), compared with 0.6 to 5.5 within areas. In general, substitutability of nativity groups is greater within local skill-groups than it is overall within areas.

At the Regional Council level, nativity groups are twice as substitutable within occupation skill cells as they are in areas generally. This contrast suggests that, even though immigrants compete with non-immigrants who have the same predicted occupations, the groups are in sufficiently different occupations that any negative wage effects would be offset by cross-group complementarity.

4.3 Generalised Leontief Regression Estimates

The CES estimates provide an overall summary of the degree of substitutability between different sets of individuals by nativity or skill-group. To allow for variation in the degree of substitutability between different pairs of factors, we extend our analysis by estimating Generalised Leontief

[25] This suggests weakly that different skill groups are complements with each other. Some existing studies have found negative substitution elasticities between nativity groups (Gavosto et al. 1999; Dustmann et al. 2005), which may arise if groups offer sufficiently different and complementary sets of skills. Small negative estimated wage elasticities are more common in studies that look at impacts within relatively homogeneous skill groups (Longhi et al. 2005).

production functions, which are a less constrained specification. We estimate J factor demand equations (3) pooled across local areas:

$$w_{ikt} = \sum_{j \neq i} \gamma_{ij} \left(L_{ikt} / L_{jkt} \right)^{1/2} + \alpha_{ik} + \alpha_{it} + e_{ikt} \tag{7}$$

where i and j index factors (defined by skill and nativity), k indexes production units (local areas), and t indexes time, w_{ikt} is defined as above, L_{ikt} is the number of full-time wage and salary workers, α_{ik} is a local area fixed effect, and α_{it} is a year fixed effect. The inclusion of fixed effects controls for unobservable fixed differences in local labour markets and time-periods, which are allowed to vary across factors.[26] Elasticities of complementarity (c_{ij}) and wage elasticities (η_{ij}) are derived by scaling the estimated parameters (γ), as in equations (4) and (5), where s and w are evaluated at sample means.

There is one factor demand equation for each group, and the J equations are estimated simultaneously as seemingly unrelated regressions, with cross-equation symmetry restrictions imposed. Each equation has as many observations as there are area*year combinations and all regressions are weighted by employment in the area*year. Because of the cross-equation symmetry restrictions, entire areas need to be dropped when data for any factor are missing in any year. Table 5 shows that these exclusions can have a large impact on sample sizes. For nativity*qualification groups observed over local areas, there is no difference in the number of usable observations when using 140 LMAs compared with using only 58. In either case, there are only 7 LMAs that have all non-empty cells in both years.[27] Overall, employment coverage is lower as a result for the GL regressions, compared with the CES analyses.

As in the CES case, endogeneity of factor quantities is a potential source of bias. We again use the supply-pull instruments (properly transformed as square roots of ratios) to estimate models that are consistent even if there are skill-group specific demand shocks in particular local labour markets

[26] Area fixed effects control for local differences in average wages that might be due to compensating differentials for local amenities, or due to unmeasured factors of production, and are allowed to vary over time. Year fixed effects control for aggregate changes in wages over time.

[27] Most, though not all, of the exclusions result from there being no recent migrants in the small 'missing qualifications' category.

in particular time-periods. These regressions are estimated using three-stage least squares with symmetry of technology parameters imposed.[28]

Table 8 presents GL estimates of wage elasticities between nativity groups within local areas and within local skill-groups.[29] IV estimates consistently yield more negative (less positive) estimates of own-wage elasticities, consistent with controlling for the self-selection of nativity groups into areas where their wages are high. The top panel of the table shows elasticities within local LMAs. Focusing on the IV results, the greatest negative wage effect of recent migrants is on recent migrants themselves; a 10 percent increase in the number of recent migrants lowers the wages of recent migrants by 3.3 percent. Own-wage elasticities are smaller for older migrants (1.1 percent) and NZ-born (0.1 percent). In each case, the own-wage elasticity is significant at the 5 percent level. At the area-level, all cross-elasticities are positive, suggesting that nativity groups are complements in local production. The complementarity between older migrants and the NZ-born is statistically significant. This complementarity may be a consequence of the different skill profiles of the nativity groups, as documented in Table 1.

The second panel of Table 8 shows the own- and cross- wage elasticities for nativity groups within the same qualification group[30] (e.g. the relationship between degree qualified recent migrants and degree qualified NZ-born). The negative cross-wage elasticity between recent and older migrants suggests that these groups are substitutes within qualification groups. Older migrants and NZ-born workers with the same qualification level are complements, although the strength of the effect is economically and statistically small. The complementarity between NZ-born workers and older migrants may be due to the different age structure of the two groups. Examining the third panel, we find that within age*qualification skill-groups the NZ-born and older migrants are now substitutes. In

[28] Each equation is exactly identified, using only the instruments associated with the endogenous variables in the particular equation. There is some loss of efficiency in not using all available instruments in each equation. This specification choice is made because, in some specifications, there are not enough degrees of freedom to include all instruments in the first-stage regressions. Where it is possible to include all instruments, the exactly identified and overidentified estimates are very similar.

[29] The underlying structural technology parameters (γ) and estimates of the elasticities of complementarity, are shown in Appendix Tables 1 and 2.

contrast, recent and older migrants in the same age and qualification group are complements, suggesting that the substitutability across qualification groups occurs *across* age boundaries. The fourth panel shows the own- and cross- wage elasticities for nativity groups within the same predicted occupation group. Here, we find pairwise complementarity between the NZ-born and migrants within occupation cells. But, there is no longer significant evidence of complementarity between recent and older migrants.

Overall, there is little evidence that recent migrants reduce the wages of NZ-born workers. The only significant negative impact is found when focusing on competition within age*qualification skill-groups and this impact is economically small in magnitude, with a 10% increase in recent migrants in an age*qualification cell leading to a 0.02% decline in wages for NZ-born in the same skill-group. In fact, when we examine competition within predicted occupation skill-groups, an increase in recent migrants in a particular occupation is found to lead to a small increase in the wages of NZ-born in that same occupation (0.01%). To test the robustness of these findings, we next treat nativity groups with different skill characteristics as separate factors of production, providing estimates of wage elasticities within and between nativity and skill groups.

Table 9 presents estimates for two alternative skill classifications – by qualification and by predicted occupation. As noted above, increasing the number of factors within the GL framework makes econometric identification increasingly challenging. The number of parameters to be estimated rises with the square of the number of factors, and the number of observations may be reduced due to having to drop areas containing any empty cells. In particular, this problem precludes analysis of the 30 age*qualification cells as separate factors. In order to estimate a human capital based skill classification, we collapse qualification groups into three categories, with missing qualifications, no qualifications, and school qualifications grouped together. However, even with this aggregation, the precision of estimates is low and none of the estimated elasticities is statistically significant.

[30] We present patterns treating qualification groups (rather than just age*qualification groups) as background the nativity*qualification breakdown in the following table.

The lower panel, showing the cross-elasticities between nativity*occupation groups reveals some stronger, albeit complex, patterns. The greatest wage impact of recent migrants is on recent migrants, reducing wages of other recent migrants in the same occupational group. In contrast, recent migrants often raise the wages of NZ-born workers in their occupation group. The strongest negative wage impact of recent migrants on NZ-born workers is the effect of an increase in the 'Legislators, Administrators, Managers, and Professionals' occupational category (ProfMgr) on NZ-born 'Technicians, Associate Professionals, Clerks, and Trades Workers' (Clerk/Trade), where a 10 percent increase in recent migrants reduces the wages of the NZ-born by 1.7 percent. For older migrants and the NZ-born, wage impacts are also greatest, and consistently negative, on workers in the same nativity-skill cell, with no strong and consistent pattern of substitutability or complementarity across groups.

5 Conclusions

This paper examines how the supply of immigrants in particular skill groups affects the wages of the New Zealand-born and older immigrants. Migrants and non-migrants in New Zealand have different skill characteristics and we would therefore expect any negative wage impact of migration to be greatest within skill–groups. In particular, both recent and older migrants, on average, have higher levels of qualification than NZ-born workers, and are more likely to be in more highly-paid occupations. Thus, we would expect migrants to be substitutes for NZ-born workers with the same skill attributes, but potentially to be complements with NZ-born workers with different skills sets.

We identify the impact of recent immigration on the labour market using the 'area-analysis' approach, which exploits the fact that immigration is spatially concentrated, and thus a change in the local supply of immigrants in a particular skill group should have an impact on the labour market outcomes of similarly skilled non-immigrants in that local labour market. We estimate both CES and Generalised Leontief (GL) production functions using local inputs, thus allowing for different degrees of substitutability between various skill-migrant status groups, and use an instrumental variables estimation strategy to reduce the bias due to groups locating in areas where wage growth is expected to be high for that group.

Our estimates of CES production functions show that nativity groups (recent migrants, older migrants, and the NZ-born) are moderately substitutable for each other (elasticity of substitution between 0.6 and 5.5) and that the greatest substitutability is between nativity groups with the same predicted occupation (elasticity of substitution between 5.8 and 8.7). We also find consistent evidence that the degree of substitutability is higher for larger geographic aggregations, implying that the wage impacts of migrants extend beyond local labour markets. When we examine the interaction of different nativity groups in more detail by estimating GL production functions, we find that the largest negative wage impact of each nativity group is on their own wage, with a 10 percent increase in own-group numbers reducing the wages of recent migrants by 3.3 percent, of older migrants by 1.1 percent, and of NZ-born workers by 0.1 percent. These negative own-wage effects appear to operate *across* skill-groups and own-wage effects within skill-groups are smaller in magnitude.

Overall, there is little evidence that recent migrants reduce the wages of NZ-born workers. The only significant negative impact is found when focusing on competition within age*qualification skill-groups and this impact is economically small in magnitude, with a 10% increase in recent migrants in an age*qualification cell leading to a 0.02% decline in wages for NZ-born in the same skill-group. In fact, when we examine competition within predicted occupation skill-groups, an increase in recent migrants in a particular occupation is found to lead to a very small increase (0.01%) in the wages of NZ-born in that same occupation.

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Appendix A: Labour Market Areas

Newell and Papps (2001) create labour market areas (LMAs) using travel-to-work data at area unit level drawn from the 1991 census. We use the 140 LMAs defined by the preferred specification in their paper, which enforces a minimum employed population of 2,000 and 75% self-containment of workers (allowing for some trade-off between the two). These LMAs have an average size of approximately 1900 square kilometres. In main urban areas, LMAs generally encompass the urban area and an extensive catchment area. In rural areas, LMAs tend to consist of numerous small areas, each centred on a minor service centre.

The advantage of using functionally defined LMAs over administratively defined areas, such as territorial local authorities, is that migration between LMAs is generally associated with a change of job, whereas migration within a LMA is often motivated by residential factors. By disregarding migration within LMAs, we are able to largely isolate job-related migration. Administratively defined geographic areas are much less able separate these two types of migration.

Table 1: Demographic Characteristics of Migrants and the New Zealand Born in 1996 and 2001

	1996			2001		
	Recent Migrant	Older Migrant	New Zealand Born	Recent Migrant	Older Migrant	New Zealand Born
25-29	22%	12%	18%	21%	9%	16%
30-34	26%	16%	19%	24%	14%	18%
35-39	20%	17%	19%	22%	19%	18%
40-44	16%	18%	17%	16%	19%	18%
45-49	11%	20%	15%	10%	19%	16%
50-54	5%	17%	12%	6%	20%	14%
Missing Qualifications	21%	15%	9%	8%	7%	7%
No Qualifications	11%	25%	31%	6%	15%	23%
School Qualifications	17%	23%	27%	37%	39%	34%
Post-school Qualifications	16%	22%	23%	17%	20%	24%
Degree Qualifications	34%	15%	9%	32%	20%	12%
Australia	7%	7%		5%	7%	
Pacific Islands	6%	23%		12%	22%	
British Isles	19%	42%		17%	35%	
Western Europe & North America	10%	10%		8%	9%	
Former Soviet Union & Eastern Europe	5%	1%		4%	2%	
Americas, Africa & Middle East	10%	4%		16%	5%	
South-East Asia	7%	6%		9%	7%	
North-East Asia	29%	5%		21%	9%	
South Asia	7%	3%		9%	4%	
Percent of Population	5%	15%	80%	6%	16%	79%
Individuals	66,510	219,210	1,161,339	87,447	237,498	1,189,881

Note: Recent migrants first arrived in New Zealand in the five years prior to the census. All other migrants are classified as older migrants. The Pacific Islands include Melanesia, Micronesia, and Polynesia (excluding Hawaii); the British Isles include the United Kingdom and Ireland; Western Europe and North America includes all European countries not assigned to the British Isles or Eastern Europe, the US, Canada and Bermuda; the Former Soviet Union and Eastern Europe includes Greece, Cyprus, the countries of the former Yugoslavia, all former Eastern Bloc countries and all former republics of the Soviet Union (including those in the Baltics, Caucasus, and Central Asia); the Americas, Africa and Middle East includes all countries in Central and South America, the Caribbean, North Africa, Sub-Saharan Africa, and the Middle East (including Turkey); South-East Asia includes Myanmar, Cambodia, Laos, Thailand, Viet Nam, Brunei, Indonesia, Malaysia, Philippines, Singapore, and East Timor; North-East Asia includes China, Hong Kong, Macau, Mongolia, Taiwan, Japan and the Koreas; and South Asia includes Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan and Sri Lanka.

Table 2: Labour Force Characteristics of Migrants and the New Zealand Born in 1996 and 2001

	1996			2001		
	Recent Migrant	Older Migrant	New Zealand Born	Recent Migrant	Older Migrant	New Zealand Born
Employed	55%	76%	78%	62%	77%	80%
Employed Full-Time	45%	63%	63%	51%	63%	65%
Employed Full-Time Wage and Salary	35%	47%	47%	42%	47%	49%
Avg. Income for All Employees	22,291	28,926	28,840	27,103	33,487	34,072
Avg. Income for Full-Time Employees	37,197	38,004	37,492	40,252	43,944	43,591
Avg. Income for FT W/S Employees	38,611	37,306	35,450	41,281	43,661	41,232
Legislators, Administrators and Managers	14%	15%	14%	12%	15%	14%
Professionals	21%	16%	13%	24%	19%	15%
Technicians and Associate Professionals	15%	13%	12%	12%	12%	12%
Clerks	10%	13%	13%	10%	12%	13%
Service and Sales Workers	12%	11%	11%	13%	12%	12%
Agriculture, Fishery and Forestry Workers	4%	4%	10%	3%	4%	8%
Trades Workers	7%	9%	9%	7%	8%	9%
Plant and Machine Operators	5%	9%	9%	6%	8%	9%
Elementary Occupations	5%	6%	6%	5%	5%	5%
Missing Occupation	7%	4%	3%	7%	5%	4%
Agriculture, Fishery and Forestry	4%	4%	10%	3%	4%	9%
Manufacturing, Mining, and Utilities	15%	19%	15%	13%	16%	14%
Construction	4%	5%	7%	4%	5%	7%
Wholesale Trade	7%	6%	6%	6%	6%	6%
Retail Trade	10%	10%	10%	10%	10%	10%
Accommodation, Cafes and Restaurants	6%	4%	3%	6%	4%	3%
Transport, Storage, and Communication	4%	5%	6%	4%	5%	6%
Finance and Insurance	3%	4%	4%	4%	4%	3%
Property and Business Services	14%	12%	10%	14%	13%	12%
Government Administration and Defense	3%	5%	5%	3%	4%	4%
Education	8%	8%	7%	10%	9%	8%
Health and Community Services	9%	8%	7%	11%	10%	9%
Cultural and Recreational Services	2%	2%	2%	2%	2%	2%
Personal and Other Services	3%	4%	4%	3%	4%	4%
Missing Industry	8%	5%	4%	7%	4%	3%
Percent of Population	3%	15%	82%	5%	15%	80%
Individuals	36,255	167,367	906,921	54,051	182,034	949,110

Note: Recent migrants first arrived in New Zealand in the five years prior the census. All other migrants are classified as older migrants. All characteristics besides the employment rate are calculated only for the employed population.

Table 3: Qualifications for Recent Migrants by Country of Birth in 1996 and 2001

	Missing Qualifications	No Qualifications	School Qualifications	Post-School Qualifications	Degree Qualifications	% of Recent Immigrants
1996 (# Recent Migrants = 66,510, # NZ Born = 1,161,339)						
NE Asia	25%	13%	19%	10%	32%	29%
British Isles	14%	7%	19%	29%	31%	19%
W Europe & North America	25%	5%	15%	17%	39%	10%
Americas, Africa & Middle East	16%	9%	13%	18%	44%	10%
Australia	20%	11%	21%	23%	25%	7%
SE Asia	23%	23%	14%	11%	29%	7%
S Asia	11%	7%	12%	8%	63%	7%
Pacific Islands	26%	33%	23%	12%	6%	6%
Former Soviet Union & E Europe	32%	2%	13%	13%	40%	5%
New Zealand	9%	31%	27%	23%	9%	
2001 (# Recent Migrants = 87,444, # NZ Born = 1,189,881)						
NE Asia	9%	5%	48%	10%	28%	21%
British Isles	3%	2%	31%	26%	38%	17%
Americas, Africa & Middle East	5%	4%	33%	26%	32%	16%
Pacific Islands	18%	18%	42%	16%	7%	12%
SE Asia	12%	12%	33%	9%	34%	9%
S Asia	7%	4%	24%	11%	53%	9%
W Europe & North America	5%	1%	36%	15%	44%	8%
Australia	3%	4%	41%	21%	32%	5%
Former Soviet Union & E Europe	7%	3%	42%	14%	34%	4%
New Zealand	7%	23%	34%	24%	12%	

Note: Recent migrants first arrived in New Zealand in the five years prior the census. See the note to Table 1 for more information on the countries in each group.

Table 4: Predicted Occupations of Full-Time Wage and Salary Workers - Migrants and the New Zealand Born in 1996 and 2001

	1996			2001		
	Recent Migrant	Older Migrant	New Zealand Born	Recent Migrant	Older Migrant	New Zealand Born
Legislators, Administrators, Managers, and Professionals	40%	32%	28%	41%	35%	30%
Technicians, Assoc. Professionals, Clerks, and Trades Workers	34%	36%	36%	33%	34%	35%
Service and Sales Workers, Plant and Machine Operators, and Elementary Occupations	22%	28%	27%	23%	27%	27%
Agriculture, Fishery and Forestry Workers	4%	4%	9%	3%	4%	8%
Percent of Population	3%	15%	81%	5%	15%	80%
Individuals	23,325	103,536	543,955	36,630	110,174	582,656

Note: Recent migrants first arrived in New Zealand in the five years prior the census. All other migrants are classified as older migrants. Predicted occupations are derived from a multinomial logit occupational choice model estimated at the national level separately by gender for the NZ-born and immigrants as a function of observed characteristics (education, age, ethnicity, years in New Zealand and country of origin).

Table 5: Detailed Description of each Regression Specification

		CES				GL				
Factor (F)	Labour Market Stratum "Cell" (C)	Max # Obs	Obs used	% Emp included	# Parameters (obs/2+1)	Max # Obs	Obs used (in each of F equations)	% Emp included	# System Parameters (F(F-1)/2 + obs/2+1)	
Within 140 Local Labour Market Areas										
Nativity Group (3)	Area (140)	840	522	99.6	262	280	74	90.3	40	
Nativity Group (3)	Area*Qualification (140*5)	4200	1,996	99.0	999	1400	192	80.0	99	
Nativity Group (3)	Area*Occupation (140*4)	3360	3,288	100.0	1645	1120	1,048	99.7	527	
Nativity Group (3)	Area*Age*Qual (140*6*5)	25200	9,034	97.8	4518	8400	656	69.9	331	
Nativity*Qual (3*3)	Area (140)	2520	1,336	99.4	669	280	46	84.8	59	
Nativity*Qual (3*5)	Area (140)	4200	1,996	99.0	999	280	14	63.1	112	#
Nativity*Occ (3*4)	Area (140)	3360	3,288	100.0	1645	280	262	99.7	197	
Qualification Group (5)	Area (140)	1400	1,280	99.8	641	280	188	100.0	104	
Age Group (6)	Area (140)	1680	1,646	99.9	824	280	260	99.9	145	
Occupation Group (4)	Area (140)	1120	1,120	100.0	561	280	280	100.0	146	
Within 58 Local Labour Market Areas										
Nativity Group (3)	Area (58)	348	312	99.9	157	116	80	95.7	43	
Nativity Group (3)	Area*Qualification (58*5)	1740	1,264	99.6	633	580	212	82.5	109	
Nativity Group (3)	Area*Occupation (58*4)	1392	1,392	100.0	697	464	464	100.0	235	
Nativity Group (3)	Area*Age*Qual (58*6*5)	10440	6,130	99.1	3066	3480	708	71.3	357	
Nativity*Qual (3*3)	Area (58)	1044	862	99.9	432	116	54	90.0	63	
Nativity*Qual (3*5)	Area (58)	1740	1,264	99.6	633	116	14	62.2	112	#
Nativity*Occ (3*4)	Area (58)	1392	1,392	100.0	697	116	116	100.0	124	
Qualification Group (5)	Area (58)	580	580	100.0	291	116	116	100.0	68	
Age Group (6)	Area (58)	696	696	100.0	349	116	116	100.0	73	
Occupation Group (4)	Area (58)	464	464	100.0	233	116	116	100.0	64	

Note: # means not estimable

Table 6: CES Wage and Substitution Elasticities for Different Groups of Workers

	3 Nativity Groups				30 Age*Qual Groups				4 Predicted Occ Groups		
	OLS		IV		OLS		IV		OLS	IV	
Within 140 Local Labour Market Areas											
Wage elasticity	-1.229		-1.070		0.034	*	0.065	**	0.066	0.098	**
(s.e)	(1.03)		(1.28)		(0.02)		(0.01)		(0.05)	(0.04)	
Elast of subst	0.8		0.9		-29.7		-15.5		-15.2	-10.2	
Within 58 Local Labour Market Areas											
Wage elasticity	-1.502	**	-1.643	*	0.040	**	0.050	**	0.063	0.097	**
(s.e)	(0.76)		(0.90)		(0.01)		(0.01)		(0.05)	(0.04)	
Elast of subst	0.7		0.6		-25.3		-19.8		-16.0	-10.3	
Within 16 Regional Councils											
Wage elasticity	-0.394	*	-0.380	*	0.086	**	0.079	**	0.070	0.099	**
(s.e)	(0.20)		(0.20)		(0.02)		(0.01)		(0.05)	(0.04)	
Elast of subst	2.5		2.6		-11.6		-12.6		-14.4	-10.1	
Within 2 Islands											
Wage elasticity	-0.201	**	-0.202	**	0.111	**	0.105	**	0.077	0.087	
(s.e)	(0.03)		(0.03)		(0.03)		(0.02)		(0.06)	(0.06)	
Elast of subst	5.0		5.0		-9.0		-9.6		-13.1	-11.5	
Aggregate											
Wage elasticity	-0.182	**	-0.181	**	0.111	**	0.105	**	0.082	0.087	
(s.e)	(0.02)		(0.02)		(0.03)		(0.03)		(0.07)	(0.07)	
Elast of subst	5.5		5.5		-9.0		-9.5		-12.2	-11.4	

Note: Each cell of the table is from a separate regression with the form of equation (6).
Predicted occupation groups are as defined in Table 4.
** 5% Significance, * 10% Significance

Table 7: CES Wage and Substitution Elasticities between Nativity Groups within Different Skill-Groups

Skill-Group	All Workers				Same Age*Qualifications				Same Predicted Occ			
	OLS		IV		OLS		IV		OLS		IV	
Within 140 Local Labour Market Areas												
Wage elasticity	-1.229		-1.070		-0.072	**	-0.073	**	-0.136	**	-0.115	**
(s.e)	(1.03)		(1.28)		(0.02)		(0.03)		(0.03)		(0.04)	
Elast of subst	0.8		0.9		13.9		13.7		7.3		8.7	
Within 58 Local Labour Market Areas												
Wage elasticity	-1.502	**	-1.643	*	-0.066	**	-0.067	**	-0.155	**	-0.117	**
(s.e)	(0.76)		(0.90)		(0.02)		(0.03)		(0.04)		(0.04)	
Elast of subst	0.7		0.6		15.1		15.0		6.5		8.6	
Within 16 Regional Councils												
Wage elasticity	-0.394	*	-0.380	*	-0.058	**	-0.051		-0.178	**	-0.140	**
(s.e)	(0.20)		(0.20)		(0.03)		(0.03)		(0.05)		(0.04)	
Elast of subst	2.5		2.6		17.3		19.7		5.6		7.2	
Within 2 Islands												
Wage elasticity	-0.201	**	-0.202	**	-0.033		-0.031		-0.179	**	-0.171	**
(s.e)	(0.03)		(0.03)		(0.05)		(0.06)		(0.03)		(0.04)	
Elast of subst	5.0		5.0		29.9		32.4		5.6		5.8	
Aggregate												
Wage elasticity	-0.182	**	-0.181	**	-0.025		0.082		0.019		-0.288	
(s.e)	(0.02)		(0.02)		(0.10)		(0.07)		(0.22)		(0.34)	
Elast of subst	5.5		5.5		39.3		12.2		-51.9		3.5	

Note: Each cell of the table is from a separate regression with the form of equation (6).
Predicted occupation groups are as defined in Table 4.
** 5% Significance, * 10% Significance

Table 8: GL Wage Elasticities between Nativity Groups within Different Skill-Groups (OLS and IV-3SLS estimates)

Impact on wages of . . .	Impact of a change in . . .					
	OLS Estimates			IV Estimates		
Nativity Groups - 140 LMAs						
	NZ	OM	RM	NZ	OM	RM
NZ	-0.010	0.012	0.001	-0.012 **	0.013 **	0.004
OM	0.056	-0.086	0.000	0.062 **	-0.109 **	0.016
RM	0.024	-0.002	-0.131	0.065	0.059	-0.330 **
Nativity Groups within Qualification Group - 140 LMAs						
	NZ	OM	RM	NZ	OM	RM
NZ	0.017 **	-0.018 **	-0.002 **	-0.007 **	0.007 *	0.001
OM	-0.085 **	0.136 **	-0.014 **	0.032 *	-0.010	-0.039 **
RM	-0.035 **	-0.058 **	0.285 **	0.017	-0.155 **	0.156 **
Nativity Groups within Age*Qualification Groups - 140 LMAs						
	NZ	OM	RM	NZ	OM	RM
NZ	0.029 **	-0.022 **	-0.009 **	0.003 **	-0.002	-0.002 **
OM	-0.102 **	0.121 **	0.037 **	-0.009	0.005	0.009 **
RM	-0.148 **	0.130 **	0.182 **	-0.027 **	0.031 **	0.007
Nativity Groups within Predicted Occupation Groups - 140 LMAs						
	NZ	OM	RM	NZ	OM	RM
NZ	0.005 **	-0.005 **	-0.003 **	-0.003 **	0.004 **	0.001 **
OM	-0.024 **	0.040 **	0.005	0.022 **	-0.039 **	-0.001
RM	-0.064 **	0.019	0.143 **	0.019 **	-0.003	-0.073 *

Notes: Each row is from a separate factor demand equation with the form of equation (7). Each block reports the results of system estimation of demand equations, with symmetry of production parameters imposed. Wage elasticites are not symmetric due to differing factor shares. IV-3SLS estimates are based on exactly-identified equations. RM=recent migrants, OM = older migrants (as defined in the text), NZ=NZ-born.. Predicted occupation groups are as defined in Table 4.

** 5% Significance, * 10% Significance

Table 9: GL Wage Elasticities between Nativity Groups * Skill-Groups (IV-3SLS estimates)

Impact of a change in . . .

Impact on wages of . . .

Nativity*Qualification Groups

		NZ Low	NZ Med	NZ High	OM Low	OM Med	OM High	RM Low	RM Med	RM High
NZ	Low	0.155	-0.124	0.009	-0.022	0.037	-0.071	-0.042	0.010	0.030
NZ	Med	-0.229	0.412	-0.132	0.052	-0.106	0.175	0.087	-0.031	-0.081
NZ	High	0.020	-0.164	0.400	0.008	0.061	-0.079	-0.007	0.019	0.071
OM	Low	-0.114	0.150	0.019	0.556	-0.004	0.042	0.069	-0.015	-0.012
OM	Med	0.364	-0.572	0.264	-0.007	0.540	-0.267	-0.099	0.071	0.158
OM	High	-0.544	0.729	-0.264	0.060	-0.207	0.862	0.090	-0.030	-0.294
RM	Low	-1.288	1.425	-0.087	0.396	-0.304	0.355	1.523	0.015	-0.424
RM	Med	0.413	-0.719	0.350	-0.120	0.313	-0.172	0.022	1.241	-0.030
RM	High	0.517	-0.753	0.529	-0.040	0.272	-0.654	-0.239	-0.012	1.244

Nativity*Predicted Occupation Groups

		NZ ProfMgr	NZ Clerk/Trade	NZ Serv&Plant	NZ Ag&Fish	OM ProfMgr	OM Clerk/Trade	OM Serv&Plant	OM Ag&Fish	RM ProfMgr	RM Clerk/Trade	RM Serv&Plant	RM Ag&Fish
NZ	ProfMgr	-0.247 *	0.279 *	-0.112 **	-0.026	0.060	-0.105	0.029	0.063 **	0.153 **	-0.042 *	-0.040	0.016
NZ	Clerk/Trade	0.274 *	-0.674 *	0.154 **	0.025	-0.093 *	0.104	-0.008	-0.051 **	-0.174 **	0.060 **	0.064 *	-0.006
NZ	Serv&Plant	-0.159 **	0.223 **	-0.767 *	-0.003	0.007	0.009	-0.024 *	-0.011	0.002	-0.006	-0.015 *	-0.008 *
NZ	Ag&Fish	-0.102	0.099	-0.007	-0.715 **	0.071 *	-0.044	0.007	0.007	0.108 **	-0.044 *	-0.040	-0.002
OM	ProfMgr	0.261	-0.415 *	0.023	0.080 *	-0.461	-0.032	0.025	-0.053 *	-0.009	0.046	0.009	-0.018
OM	Clerk/Trade	-0.539	0.547	0.031	-0.057	-0.038	-0.584	-0.066	0.015	0.351 *	-0.120	-0.067	-0.024
OM	Serv&Plant	0.230	-0.067	-0.138 *	0.014	0.047	-0.104	-0.728	0.046	-0.141	0.065	0.004	0.035
OM	Ag&Fish	2.919 **	-2.387 **	-0.340	0.081	-0.562 *	0.137	0.264	-0.588	-0.764 **	0.122	0.362	0.147
RM	ProfMgr	2.111 **	-2.440 **	0.014	0.384 **	-0.029	0.943 *	-0.242	-0.228 **	-1.804 **	0.416 *	0.360 *	-0.022
RM	Clerk/Trade	-0.843 *	1.214 **	-0.080	-0.224 *	0.210	-0.466	0.161	0.053	0.603 *	-2.424 **	-0.375 **	0.031
RM	Serv&Plant	-1.473	2.408 *	-0.398 *	-0.380	0.077	-0.481	0.019	0.288	0.959 *	-0.689 **	-3.310 **	-0.039
RM	Ag&Fish	3.083	-1.242	-1.139 *	-0.077	-0.814	-0.921	0.864	0.630	-0.310	0.308	-0.208	-3.025 **

Notes: Each row is from a separate factor demand equation with the form of equation (7). Each block reports the results of system estimation of demand equations, with symmetry of production parameters imposed. Wage elasticites are not symmetric due to differing factor shares. IV-3SLS estimates are based on exactly-identified equations. RM=recent migrants, OM = older migrants (as defined in the text), NZ=NZ-born.. Qualification groupings are: High = degree qualified, Medium = post-school qualified, Low = All other qualification levels. Predicted occupation groups are as defined in Table 4.

** 5% Significance, * 10% Significance

Appendix Table 1A: GL technology parameters (IV-3SLS estimates)

Impact on wages of . . .	Impact of a change in . . .					
	OLS Estimates			IV Estimates		
Nativity Groups - 140 LMAs						
	NZ	OM	RM	NZ	OM	RM
NZ		2.054	0.448		2.267 **	1.233
OM	2.054		-0.070	2.267 **		2.466
RM	0.448	-0.070		1.233	2.466	
Nativity Groups within Qualification group - 140 LMAs						
	NZ	OM	RM	NZ	OM	RM
NZ		-3.213 **	-0.621 **		1.217 *	0.308
OM	-3.213 **		-2.177 **	1.217 *		-5.878 **
RM	-0.621 **	-2.177 **		0.308	-5.878 **	
Nativity Groups within Qualification*Age groups - 140 LMAs						
	NZ	OM	RM	NZ	OM	RM
NZ		-3.939 **	-2.956 **		-0.352	-0.547 **
OM	-3.939 **		5.329 **	-0.352		1.285 **
RM	-2.956 **	5.329 **		-0.547 **	1.285 **	
Nativity Groups within occupation groups - 140 LMAs						
	NZ	OM	RM	NZ	OM	RM
NZ		-0.828 **	-1.122 **		0.749 **	0.336 **
OM	-0.828 **		0.756	0.749 **		-0.125
RM	-1.122 **	0.756		0.336 **	-0.125	

Notes: Each row is from a separate factor demand equation with the form of equation (7). Each block reports the results of system estimation of demand equations, with symmetry of production parameters imposed. Wage elasticites are not symmetric due to differing factor shares. IV-3SLS estimates are based on exactly-identified equations. RM=recent migrants, OM = older migrants (as defined in the text), NZ=NZ-born.

** 5% Significance, * 10% Significance

Appendix Table 1B: GL Technology Parameters (IV estimates)

Impact of a change in . . .

Impact on

Nativity Groups - 140 LMAs

	NZ	OM	RM
NZ		2.3 **	1.2
OM	2.3 **		2.5
RM	1.2	2.5	

Qualification group - 140 LMAs

	Missing	No Qual	School	Post-sch	Degree
Missing		-5.5 *	-1.7	3.5	0.0
No Qual	-5.5 *		-3.7	7.5 **	-3.6
School	-1.7	-3.7		8.7 **	-2.0
Post-sch	3.5	7.5 **	8.7 **		1.2
Degree	0.0	-3.6	-2.0	1.2	

Occupation group - 140 LMAs

	ProfMgr	Clerk/Trade	Serv&Plant	Ag&Fish
ProfMgr		8.4	-8.6 **	0.3
Clerk/Trad	8.4		5.0	1.1
Serv&Plan	-8.6 **	5.0		1.0
Ag&Fish	0.3	1.1	1.0	

Nativity Groups - 58 LMAs

	NZ	OM	RM
NZ		1.4 **	1.0
OM	1.4 **		2.3
RM	1.0	2.3	

Qualification group - 58 LMAs

	Missing	No Qual	School	Post-sch	Degree
Missing		-5.7 **	-3.1	3.4	1.1
No Qual	-5.7 **		-1.2	7.9 *	-5.0
School	-3.1	-1.2		10.3 **	0.6
Post-sch	3.4	7.9 *	10.3 **		0.5
Degree	1.1	-5.0	0.6	0.5	

Occupation group - 58 LMAs

	ProfMgr	Clerk/Trade	Serv&Plant	Ag&Fish
ProfMgr		17.1 *	-10.2 *	0.4
Clerk/Trad	17.1 *		12.2	-1.6
Serv&Plan	-10.2 *	12.2		5.5 **
Ag&Fish	0.4	-1.6	5.5 **	

Notes: Each row is from a separate factor demand equation with the form of equation (7). Each block reports the results of system estimation of demand equations, with symmetry of production parameters imposed. Wage elasticites are not symmetric due to differing factor shares. IV-3SLS estimates are based on exactly-identified equations. RM=recent migrants, OM = older migrants (as defined in the text), NZ=NZ-born.

** 5% Significance, * 10% Significance

Appendix Table 1C: GL Parameter estimates

Impact of a change in . . .

Impact on wages of . . .

Qualification*Nativity groups (IV)

		NZ Low	NZ Med	NZ High	OM Low	OM Med	OM High	RM Low	RM Med	RM High
NZ	Low		-12.8	1.2	-3.3	8.8	-17.7	-15.3	4.5	10.5
NZ	Med	-12.8		-14.3	6.5	-20.6	35.2	25.3	-11.6	-22.8
NZ	High	1.2	-14.3		1.1	12.5	-16.8	-2.0	7.4	20.9
OM	Low	-3.3	6.5	1.1		-0.4	4.4	10.6	-2.9	-1.8
OM	Med	8.8	-20.6	12.5	-0.4		-23.4	-12.6	11.8	19.2
OM	High	-17.7	35.2	-16.8	4.4	-23.4		15.2	-6.7	-47.8
RM	Low	-15.3	25.3	-2.0	10.6	-12.6	15.2		1.2	-25.3
RM	Med	4.5	-11.6	7.4	-2.9	11.8	-6.7	1.2		-1.6
RM	High	10.5	-22.8	20.9	-1.8	19.2	-47.8	-25.3	-1.6	

Occupation*Nativity groups

		NZ ProfMgr	NZ Clerk/Trade	NZ Serv&Plant	NZ Ag&Fish	OM ProfMgr	OM Clerk/Trade	OM Serv&Plant	OM Ag&Fish	RM ProfMgr	RM Clerk/Trade	RM Serv&Plant	RM Ag&Fish
NZ	ProfMgr		22.7 *	-10.4 **	-4.3	11.5	-19.9	6.2	34.9 **	51.7 **	-15.7 *	-18.3	17.6
NZ	Clerk/Trad	22.7 *		13.3 **	3.8	-16.6 *	18.3	-1.6	-25.8 **	-54.1 **	20.5 **	27.1 *	-6.4
NZ	Serv&Plan	-10.4 **	13.3 **		-0.3	1.0	1.2	-3.8 *	-4.2	0.4	-1.5	-5.1 *	-6.8 *
NZ	Ag&Fish	-4.3	3.8	-0.3		6.4 *	-3.9	0.7	1.8	17.1 **	-7.6 *	-8.6	-0.8
OM	ProfMgr	11.5	-16.6 *	1.0	6.4 *		-3.0	2.7	-14.4 *	-1.5	8.4	2.1	-10.0
OM	Clerk/Trad	-19.9	18.3	1.2	-3.9	-3.0		-5.9	3.5	48.8 *	-18.4	-12.6	-11.1
OM	Serv&Plan	6.2	-1.6	-3.8 *	0.7	2.7	-5.9		7.6	-14.2	7.2	0.6	11.9
OM	Ag&Fish	34.9 **	-25.8 **	-4.2	1.8	-14.4 *	3.5	7.6		-34.4 **	6.1	22.1	22.2
RM	ProfMgr	51.7 **	-54.1 **	0.4	17.1 **	-1.5	48.8 *	-14.2	-34.4 **		42.3 *	44.9 *	-6.7
RM	Clerk/Trad	-15.7 *	20.5 **	-1.5	-7.6 *	8.4	-18.4	7.2	6.1	42.3 *		-35.7 **	7.3
RM	Serv&Plan	-18.3	27.1 *	-5.1 *	-8.6	2.1	-12.6	0.6	22.1	44.9 *	-35.7 **		-6.1
RM	Ag&Fish	17.6	-6.4	-6.8 *	-0.8	-10.0	-11.1	11.9	22.2	-6.7	7.3	-6.1	

Notes: Each row is from a separate factor demand equation with the form of equation (7). Each block reports the results of system estimation of demand equations, with symmetry of production parameters imposed. Wage elasticites are not symmetric due to differing factor shares. IV-3SLS estimates are based on exactly-identified equations. RM=recent migrants, OM = older migrants (as defined in the text), NZ=NZ-born.

Appendix Table 2A: GL Elasticity of Complemntarity (IV-3SLS estimates)

Impact on wages of . . .	Impact of a change in . . .					
	OLS Estimates			IV Estimates		
Nativity Groups - 140 LMAs						
	NZ	OM	RM	NZ	OM	RM
NZ	-0.012	0.071	0.030	-0.016 **	0.079 **	0.082
OM	0.071	-0.525	-0.010	0.079 **	-0.667 **	0.360
RM	0.030	-0.010	-3.026	0.082	0.360	-7.616 **
Nativity Groups within Qualification group - 140 LMAs						
	NZ	OM	RM	NZ	OM	RM
NZ	0.022 **	-0.107 **	-0.044 **	-0.009 **	0.041 *	0.022
OM	-0.107 **	0.800 **	-0.339 **	0.041 *	-0.060	-0.915 **
RM	-0.044 **	-0.339 **	6.696 **	0.022	-0.915 **	3.671 **
Nativity Groups within Qualification*Age groups - 140 LMAs						
	NZ	OM	RM	NZ	OM	RM
NZ	0.037 **	-0.131 **	-0.190 **	0.004 **	-0.012	-0.035 **
OM	-0.131 **	0.705 **	0.759 **	-0.012	0.031	0.183 **
RM	-0.190 **	0.759 **	3.757 **	-0.035 **	0.183 **	0.153
Nativity Groups within occupation groups - 140 LMAs						
	NZ	OM	RM	NZ	OM	RM
NZ	0.006 **	-0.030 **	-0.079 **	-0.004 **	0.027 **	0.024 **
OM	-0.030 **	0.263 **	0.121	0.027 **	-0.253 **	-0.020
RM	-0.079 **	0.121	3.481 **	0.024 **	-0.020	-1.778 *

Notes: Each row is from a separate factor demand equation with the form of equation (7). Each block reports the results of system estimation of demand equations, with symmetry of production parameters imposed. Wage elasticites are not symmetric due to differing factor shares. IV-3SLS estimates are based on exactly-identified equations. RM=recent migrants, OM = older migrants (as defined in the text), NZ=NZ-born.

** 5% Significance, * 10% Significance

Appendix Table 2B: GL Elasticities of Complementarity (IV Estimates)

Impact of a change in . . .

Impact on wages of . . .

Nativity Groups - 140 LMAs

	NZ	OM	RM
NZ	-0.02 **	0.08 **	0.08
OM	0.08 **	-0.67 **	0.36
RM	0.08	0.36	-7.62 **

Qualification group - 140 LMAs

	Missing	No Qual	School	Post-sch	Degree
Missing	2.33 **	-0.99 *	-0.20	0.41	0.00
No Qual	-0.99 *	1.01	-0.26	0.53 **	-0.24
School	-0.20	-0.26	0.31	0.41 **	-0.09
Post-sch	0.41	0.53 **	0.41 **	-0.61	0.05
Degree	0.00	-0.24	-0.09	0.05	-0.15

Occupation group - 140 LMAs

	ProfMgr	Clerk/Trade	Serv&Plant	Ag&Fish
ProfMgr	0.01	0.29	-0.39 **	0.02
Clerk/Trad	0.29	-0.51	0.25	0.09
Serv&Plan	-0.39 **	0.25	-0.73	0.11
Ag&Fish	0.02	0.09	0.11	-2.55

Nativity Groups - 58 LMAs

	NZ	OM	RM
NZ	-0.01 **	0.05 **	0.07
OM	0.05 **	-0.48 **	0.35
RM	0.07	0.35	-6.28 **

Qualification group - 58 LMAs

	Missing	No Qual	School	Post-sch	Degree
Missing	2.83 **	-1.02 **	-0.36	0.39	0.12
No Qual	-1.02 **	1.00	-0.08	0.56 *	-0.33
School	-0.36	-0.08	0.09	0.48 **	0.03
Post-sch	0.39	0.56 *	0.48 **	-0.89	0.02
Degree	0.12	-0.33	0.03	0.02	-0.53

Occupation group - 58 LMAs

	ProfMgr	Clerk/Trade	Serv&Plant	Ag&Fish
ProfMgr	-0.26	0.60 *	-0.46 *	0.03
Clerk/Trad	0.60 *	-1.35	0.62	-0.13
Serv&Plan	-0.46 *	0.62	-2.69	0.59 **
Ag&Fish	0.03	-0.13	0.59 **	-8.34 *

Notes: Each row is from a separate factor demand equation with the form of equation (7). Each block reports the results of system estimation of demand equations, with symmetry of production parameters imposed. Wage elasticites are not symmetric due to differing factor shares. IV-3SLS estimates are based on exactly-identified equations. RM=recent migrants, OM = older migrants (as defined in the text), NZ=NZ-born.

Appendix Table 2C: GL Elasticities of Complementarity

Qualification*Nativity groups

Impact on wages of . . .		Impact of a change in . . . NZ Low	NZ Med	NZ High	OM Low	OM Med	OM High	RM Low	RM Med	RM High
NZ	Low	0.39	-0.58	0.05	-0.29	0.91	-1.36	-3.23	1.04	1.30
NZ	Med	-0.58	1.91	-0.76	0.70	-2.65	3.38	6.61	-3.34	-3.49
NZ	High	0.05	-0.76	2.31	0.11	1.53	-1.53	-0.50	2.02	3.06
OM	Low	-0.29	0.70	0.11	7.38	-0.10	0.80	5.26	-1.59	-0.53
OM	Med	0.91	-2.65	1.53	-0.10	13.46	-5.16	-7.58	7.80	6.78
OM	High	-1.36	3.38	-1.53	0.80	-5.16	16.63	6.86	-3.31	-12.63
RM	Low	-3.23	6.61	-0.50	5.26	-7.58	6.86	116.27	1.65	-18.23
RM	Med	1.04	-3.34	2.02	-1.59	7.80	-3.31	1.65	135.91	-1.30
RM	High	1.30	-3.49	3.06	-0.53	6.78	-12.63	-18.23	-1.30	53.46

Occupation*Nativity groups

		NZ ProfMgr	NZ Clerk/Trade	NZ Serv&Plant	NZ Ag&Fish	OM ProfMgr	OM Clerk/Trade	OM Serv&Plant	OM Ag&Fish	RM ProfMgr	RM Clerk/Trade	RM Serv&Plant	RM Ag&Fish
NZ	ProfMgr	-0.91 *	1.01 *	-0.59 **	-0.38	0.96	-2.00	0.85	10.81 **	7.82 **	-3.12 *	-5.45	11.41
NZ	Clerk/Trade	1.01 *	-2.45 *	0.81 **	0.36	-1.51 *	1.99	-0.24	-8.68 **	-8.87 **	4.41 **	8.75 *	-4.52
NZ	Serv&Plant	-0.59 **	0.81 **	-4.03 *	-0.04	0.12	0.16	-0.73 *	-1.79	0.07	-0.42	-2.09 *	-5.99 *
NZ	Ag&Fish	-0.38	0.36	-0.04	-10.33 **	1.15 *	-0.83	0.20	1.16	5.54 **	-3.23 *	-5.49	-1.11
OM	ProfMgr	0.96	-1.51 *	0.12	1.15 *	-7.47	-0.62	0.75	-9.10 *	-0.47	3.40	1.25	-13.19
OM	Clerk/Trade	-2.00	1.99	0.16	-0.83	-0.62	-11.12	-1.97	2.62	17.95 *	-8.88	-9.15	-17.54
OM	Serv&Plant	0.85	-0.24	-0.73 *	0.20	0.75	-1.97	-21.69	7.88	-7.20	4.79	0.56	25.76
OM	Ag&Fish	10.81 **	-8.68 **	-1.79	1.16	-9.10 *	2.62	7.88	-100.59	-39.04 **	9.03	49.32	107.77
RM	ProfMgr	7.82 **	-8.87 **	0.07	5.54 **	-0.47	17.95 *	-7.20	-39.04 **	-92.20 **	30.81 *	49.01 *	-15.83
RM	Clerk/Trade	-3.12 *	4.41 **	-0.42	-3.23 *	3.40	-8.88	4.79	9.03	30.81 *	-179.73 **	-51.10 **	22.85
RM	Serv&Plant	-5.45	8.75 *	-2.09 *	-5.49	1.25	-9.15	0.56	49.32	49.01 *	-51.10 **	-450.84 **	-28.36
RM	Ag&Fish	11.41	-4.52	-5.99 *	-1.11	-13.19	-17.54	25.76	107.77	-15.83	22.85	-28.36	-2223.29 **

Notes: Each row is from a separate factor demand equation with the form of equation (7). Each block reports the results of system estimation of demand equations, with symmetry of production parameters imposed. Wage elasticites are not symmetric due to differing factor shares. IV-3SLS estimates are based on exactly-identified equations. RM=recent migrants, OM = older migrants (as defined in the text), NZ=NZ-born.