International Migration and Income Inequality in Aotearoa New Zealand, 2013–2018

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Abstract

Income inequality and international migration are often interrelated and have both become key concerns in Aotearoa New Zealand over recent decades. The present study aimed to examine the effects of immigration on income inequality in Aotearoa New Zealand by decomposing the within-group and between-group contributions to the level of inequality and to the change in income inequality between 2013 and 2018. Drawing on census and administrative income data, we explored two routes (composition effect and group-specific income-distribution effect) through which international migration influences the aggregate income distribution. Mean log deviation (MLD) decomposition technique was used to decompose the within-group inequality and between-group inequality, and the population subgroup decomposition of Mookherjee and Shorrocks's (1982) approach was used to decompose the change in inequality over the 2013–2018 period. The results show that income inequality was higher among immigrants than among New Zealand-born, and recent immigrants have relatively lower incomes which improve over time. Between 2013 and 2018, increases in the share of the high-skilled immigrant groups had inequality-increasing contributions. The decrease in the population share of low-skilled recent immigrants contributed to decreasing overall income inequality as did the effect of change in group-specific income distribution of low-skilled earlier immigrants. These results highlight the need for more focus on the role of migrant composition in terms of gender, nationality, occupation and migrant

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status in order to gain greater insight into the relationship between immigration and inequality.

Whakarāpopotonga

Ko te tikanga whai pānga ai te kore ōritenga o te moniwhiwhi ki te hekenga i tāwāhi, ka mutu kua piki ake ngā mea e rua hei āwangawanga matua i ngā tekau tau kua pahure ake. Ko te whāinga o tēnei rangahau he ārohi i ngā pānga o te hekenga i tāwāhi ki te kore ōritenga o te moniwhiwhi i Aotearoa mā te wāwāhi i ngā āhuatanga i rō rōpū, i waenga rōpū hoki, ka pā ki te taumata o te kore ōritenga, me ngā panoni i te kore ōritenga o te moniwhiwhi i waenga i te 2013 me te 2018. Nā te whakamahi i ngā raraunga moniwhiwhi ā-tatauranga, ā-whakahaere, i tūhura mātou i ngā ara e rua (te pānga hanganga me te pānga tohatoha moniwhiwhi e whāiti ana ki te rōpū) e kawekawe ai te hekenga i tāwāhi i te tuari moniwhiwhi hiato. I whakamahia te tikanga wāwāhi whakataka pūkōaro toharite (MLD) ki te wāwāhi te kore ōritenga i roto i te rōpū me tō waenga rōpū, ā, i whāia te huarahi wāwāhi rōpū-roto tauori a Mookherjee rāua ko Shorrocks (1982) ki te wāwāhi i te huringa o te kore ōritenga puta noa i te wā 2013–2018. E whakaatu nei ngā kitenga: he nui ake te kore ōritenga o te moniwhiwhi i waenga i ngā manuheke i ngā tāngata i whānau mai i Aotearoa; ā, ka whiwhi ngā manuheke hou i te moniwhiwhi iti iho ka piki ake i roto i te wā, ina whakatauritea ki ētahi atu rōpū. I waenga i te 2013 me te 2018 i piki haere ngā takoha whakanui i te kore ōritenga o ngā rōpū manuheke whai pūkenga nui, engari ki ngā manuheke whai pūkenga iti ake he tauaro kē te pānga. E miramira ana aua kitenga kia nui atu te arotahi ki te tūnga o te hanganga manuheke i runga anō i te ira, te iwi tūturu, te mahi me te tūnga hei manuheke kia mārama ake ai ki te hononga i waenga i te hekenga me te kore ōritenga.

Disclaimer

I n the decade leading up to the COVID-19 global pandemic and associated border closures, Aotearoa New Zealand experienced very high levels of migration, both in comparison to recent history and to similar national contexts such as Australia and Canada. Net international migration between March 2011 and March 2020 was 402,200, constituting as much as 54.5 per cent of the total population growth of 737,200 (Stats NZ, 2020). Temporary migration programmes contributed a substantial proportion of these overall migration flows, with the number of people on temporary work and study visas resident in Aotearoa New Zealand increasing from 156,408 in March 2011 to 302,754 in March 2020 (MBIE, n.d.).

For some time now, researchers have identified a positive impact of contemporary migration on employment and earnings of New Zealanders, particularly in the dairy farming, horticulture, viticulture and hospitality industries (MBIE, 2018; McLeod & Maré, 2013), although qualitative studies of temporary migration in particular highlight evidence of inequality (Collins, 2020) and exploitation (Collins & Stringer, 2019). There is, in that respect, a need to examine whether and to what extent the benefits of economic activity are equitably distributed among immigrant and New Zealand-born employees. This is particularly important given that the period of rapid growth in migrant populations and their participation in the labour market of Aotearoa New Zealand has coincided with a period of economic growth of the country (McLeod & Maré, 2013). Moreover, as the government has now established a programme for normalising the residence status of many temporary migrants (Immigration New Zealand, 2021) and has reset immigration policy (Ardern et al., 2022), it is important to understand the employment situation of migrant populations.

This study aims to address these issues by examining the within-group and between-group inequality contributions of immigrants and New Zealand-born to overall income inequality in Aotearoa New Zealand using the population subgroup decomposition of inequality approach. The distinction between within-group and between-group differences in population subgroup decomposition of inequality allows for a more nuanced understanding of the sources, dynamics and implications of inequality. It enables targeted policy interventions, equity considerations and monitoring progress towards reducing within-group and between-group disparities of immigrants and New Zealand-born.

This study makes three contributions to understanding the levels and changes of income inequality in Aotearoa New Zealand. First, the study investigates the effects of high levels of immigration on income inequality at the national level, focusing on the period between 2013 and 2018 when the number of immigrants to Aotearoa New Zealand increased substantially. Second, while most of the previous studies in New Zealand – for example, Ball and Creedy (2016), Hyslop and Maré (2005), and Pacheco et al. (2017) – used survey data to analyse income inequality, we used two sets of micro-level data on individuals: census data and Inland Revenue's (IR) tax data, available in the Stats NZ's Integrated Data Infrastructure (IDI). Unlike survey data, census data do not suffer from the problems of large sampling error or small sample size. The New Zealand Census of Population and Dwellings offers comprehensive information on the total stock of labour force and composition of population by different demographic characteristics (age, sex, ethnicity) and socio-economic characteristics (qualifications, income, industry). Total personal income is recorded in income bands in censuses; Stats NZ, however, publishes midpoints for each band and we use these income midpoints for analysis. In addition to drawing on census data, this study goes one step further by analysing IR tax data, which record the actual income of individuals. The most obvious difference between the IR tax data and census data sources is that census records personal income in bands, while IR tax data captures the actual dollar amount. Incomes of top earners are reported in an open-ended income band in the census which creates difficulties in the estimation of average income in this income band. Furthermore, we cannot account for inequality within the income bands of census data because it is grouped data. This study overcomes these issues through the analysis of IR tax data.

Third, this study investigates the effects of immigrants' skill composition and length of stay in Aotearoa New Zealand on income distribution. Extant studies suggest that immigrants have different skill compositions than New Zealand-born (New Zealand Productivity Commission, 2021), they may have different returns to their skills (Poot & Stillman, 2016), and that immigrants' incomes depend on their length of stay in receiving countries (Stillman & Maré, 2009). Taking qualifications into consideration, this study divides international immigrants into two groups, high-skilled and low-skilled, and each of these groups is divided into two further groups, recent immigrants and earlier immigrants, based on

length of stay. The study then compares immigrants' income distribution with that of high-skilled and low-skilled New Zealand-born people. The study examines how these groups contributed to levels of and changes in income inequality between 2013 and 2018.

Our analysis shows that income inequality was higher among immigrants than among New Zealand-born populations. There was a substantial gap in average income between recent immigrants and New Zealand-born, while the gap narrowed between earlier immigrants and New Zealand-born. The recent immigrants are the most disadvantaged group in terms of average income, the magnitude of the level of income inequality, and the percentage of increasing income inequality between the 2013 Census and 2018 Census.

The rest of the study proceeds as follows. The next section reviews relevant literature in Aotearoa New Zealand and internationally, and subsequent sections describe the data sources and methodologies, present results from the analyses of the distribution of income among immigrants and New Zealand-born,and discuss these results. The conclusion highlights that high-skilled immigrants had inequality-increasing contributions to the change in income inequality between the 2013 Census and 2018 Census while low-skilled immigrants had inequality-decreasing contributions.

Literature review

Immigration and income inequality

There is a growing body of literature that deals with the relationship between income distribution and immigration in New Zealand. Maré and Stillman (2009) have examined how recent immigration affects wages of New Zealand-born people by using data from the 1996, 2001 and 2006 censuses. The Ministry of Business, Innovation and Employment (MBIE) has produced reports on income variation among temporary migrants in the Canterbury construction industry (Searle et al., 2015) and the hospitality industry in New Zealand (Searle et al., 2015). In relation to temporary migration, Collins and Pawar (2021) investigated income inequality among temporary migrants. In contrast, fewer studies have investigated inequality between immigrants and New Zealand-born workers. Gibson et al. (2007), for example, examined wealth inequality between immigrants and New Zealand-born people using the 2001 Household Saving Survey, and Stillman

and Maré (2009) examined and compared wages of immigrants with New Zealand-born people using the Income Survey (1997–2007) data. These studies are dated, however, and migration policies have significantly changed over the last decade. Therefore, this study aims to fill that gap in the literature through investigating the effects of immigration on income inequality in Aotearoa New Zealand by providing updated evidence.

Internationally, there is a wide range of evidence on the relationship between immigration and income inequality; for instance, in the United States (Akee et al., 2020; Hoover & Yaya, 2010; Xu et al., 2016), Australia (Chang Kang & Look, 2020), Spain (Suárez Álvarez & López Menéndez, 2020), Sweden (Joona, 2011) and Italy (D'Agostino et al., 2016; Mussida & Parisi, 2018). These studies suggest that there is a positive effect of immigration on income inequalities in immigrant-receiving countries, notably the United States (Borjas, 2003, 2008). Dustmann et al. (2013) investigated the effects of immigration along different parts of the income distribution and observed that immigration depresses the incomes at the bottom quantile and leads to slight income gains in the upper part of the income distribution in the United Kingdom.

There are three different routes through which international migration may have an impact on the aggregate income distribution in a host country. First, the compositional effects (or the migrant-share effects) that reflect the possibility that migrants may have different characteristics from locals which may create differences in the distribution of income between migrant and local populations (Blau & Kahn, 2015); second, effects of the differences in the income distribution among immigrants themselves (Alimi et al., 2022; Longhi et al., 2005); and third, the general equilibrium effects of immigration on the income distribution of locals (Borjas, 2003; Card & Shleifer, 2009).

Compositional effects

Compositional effects (or the immigrant-share effects) mirror the possibility that immigrants may possess different characteristics from locals which may create differences in the distribution of income between migrant and local populations (Blau & Kahn, 2015). Furthermore, increases in the number of immigrants may create a different composition of skills in a receiving country and create different returns to the immigrants' skills

compared with the returns received by the local population. Both factors may affect the overall income distribution in the receiving country.

There are different factors that allow immigrants to affect the income distribution of a host country. The number of immigrants and their skill composition can both influence the distribution of income. Card and Shleifer (2009) investigated the compositional effects of migration on income distribution and found a strong correlation between immigrant share of population and residual variance of incomes across cities in the United States. Xu et al. (2016) examined the effects of skill composition of immigrants on income inequality across different states in the United States and reported that low-skill migration leads to increases in income inequality in general and high-skill immigration decreases income inequality between the population at the top-income decile and at the median or below. As international migrants tend to be paid lower wages than locals, growth in the number of immigrants may increase the size of the low-income population group, which in turn increases overall income inequality (Blau & Kahn, 2015).

The effects of immigrant-specific income distribution

International migrants belong to heterogeneous groups; that is, there are differences in immigrant demography, education, languages and nationalities. Differences in the income distribution between immigrants themselves (or the effects within the immigrant group) may affect overall income distribution in a host country. Blau and Kahn (2015) found that since international migrants are concentrated at the highest and lowest ends of the distribution of education, increases in the number of immigrants may increase within-group inequality, and in turn, increase overall income dispersion. Taking a meta-analysis approach to provide international evidence, Longhi et al. (2005) investigated the effects of immigration on wages and found that there is a little impact of immigration on the overall wages. They have also shown that immigrants compete more with immigrants themselves than with locals.

It is evident from the extant literature that income inequality within immigrants tends to be higher than within natives. For example, the income gap within immigrant communities is wider than the gap within local communities (Card & Shleifer, 2009). D'Agostino et al. (2016) investigated the issue of economic assimilation among immigrant communities in Italy

and found that the largest share of inequality was within immigrant communities, while the between-group inequalities account for only four per cent of overall inequalities. Lin and Weiss (2019) examined the effects of low-skilled and high-skilled immigrants on the wage distribution of their native counterparts in the Unites States. They found that an increased number of low-skilled immigrants creates a small loss of wages for low-skilled natives, and the competition was most intense among similarly skilled immigrants themselves. In contrast, an increased number of high-skilled immigrants would create little gain for low-skilled natives but a large gain for high-skilled natives.

<u>The general equilibrium effect of immigration on the income distribution of locals</u>

The *general equilibrium channel* refers to the mechanism through which immigration can have an impact on the income of locals. The effects and consequences of immigration on incomes of locals has been debated in many immigrant-receiving countries around the world. Researchers have generally found that an influx of immigrants increases competition in the local labour market and therefore decreases wages of locals (Aydemir & Borjas, 2007; Borjas, 2003; Borjas et al., 2008). In contrast, other researchers argue that immigration increases the income of natives (Card & Shleifer, 2009; Foged & Peri, 2016), while still others have not found any statistically significant effects of immigration on the wage of locals (Card, 2005; Dustmann et al., 2005). In the context of Aotearoa New Zealand, studies suggest that there is small effect or mostly positive effects of immigration on incomes of New Zealand-born individuals (Maré & Stillman, 2009; New Zealand Productivity Commission, 2021). Tse and Maani (2017) also found that immigration had a little impact on the earning of New Zealand-born. Overall, it is likely the effect of immigration on the income distribution of New Zealand-born is quantitatively small. Therefore, the present study focuses on the compositional effect and group-specific income-distribution effect of immigration, without explicitly considering the general equilibrium effect on the distribution of income of locals.

Study context

International migrants possess different characteristics to New Zealand-born people and get different returns for their qualifications relative to

locally born (Poot & Stillman, 2016; Stillman & Maré, 2009). Existing research suggests that new immigrants earned annually $10,000 to $15,000 less than their New Zealand-born counterparts but income differences between immigrants and New Zealand-born becomes halved for males and completely eliminated for females by 15 years after their arrival (Stillman & Maré, 2009).

There is, however, little empirical evidence in the Aotearoa New Zealand literature that investigates how international migration affects income inequality. Alimi et al. (2022) examined compositional effects and migrant-specific distribution effects of immigration on income inequality in metropolitan and non-metropolitan areas. They observed that inequality grew by four per cent in metropolitan areas whereas it decreased by 11 per cent in non-metropolitan areas between 1986 and 2013. They also found that an increasing share of the immigrant population would have inequality-increasing effects, and changes in the migrant-specific income distribution led to decreased inequality in non-metropolitan areas but increased inequality in metropolitan areas. Their analysis used data from between 1986 and 2013, therefore providing an opportunity to extend their insights through analysis of the recent period of high net migration and growing temporary migrant populations. Building on these existing insights, we examine the compositional effects and within-group distribution effects of immigration on income inequality at the national level in Aotearoa New Zealand. We also investigate the effects of immigration in the change in income inequality between 2013 and 2018.

Apart from the channels discussed above, there are other mechanisms – for example, migration policy, work rights and visa regulations – that often link inequality to international migration. We do not provide specific analysis of these mechanisms and their influence on income inequality here, but note them as significant features worthy of further more-detailed analysis. Indeed, temporary migration policy in Aotearoa New Zealand has been shown to create inequalities in society because it establishes and enforces differences between temporary migrants, permanent residents, citizens and NewZealand-born workers in terms of accessing workplace rights and social resources (Collins, 2017, 2020). These then also intersect with discriminatory practices of employers (Collins & Bayliss, 2020) which appear to have effects in wage differences of temporary migrants of different nationalities (Collins & Pawar, 2021). Though we also

note that family income, the gendered composition of the labour market, childcare services, capital investment and technological development affect overall income distribution (Blau & Kahn, 2015; Corts & Pan, 2013), these factors remain beyond the scope covered by our study.

Methods

Data

This study used two sets of micro-level data on individuals available in the IDI: census data and IR tax data. We used the unit record data for the entire usually resident population of New Zealand from the most recent two censuses: 2013 and 2018. These censuses capture a wide range of information on individuals' characteristics. This study used information on age, qualifications, country of birth, place of residence at last census, years since arrival in New Zealand, and current place of residence to define the study populations.

The present study restricts the population under analysis to those aged between 25 and 64 years in order to focus on the impacts of immigration on income distribution through the labour market and, therefore, sought to exclude those who earn from non-labour-market sources. For example, many of the population below 25 years old earn from parental support, loans and student allowances, while many of the population aged 65 years and above are retired or out of the labour force and earn from superannuation.
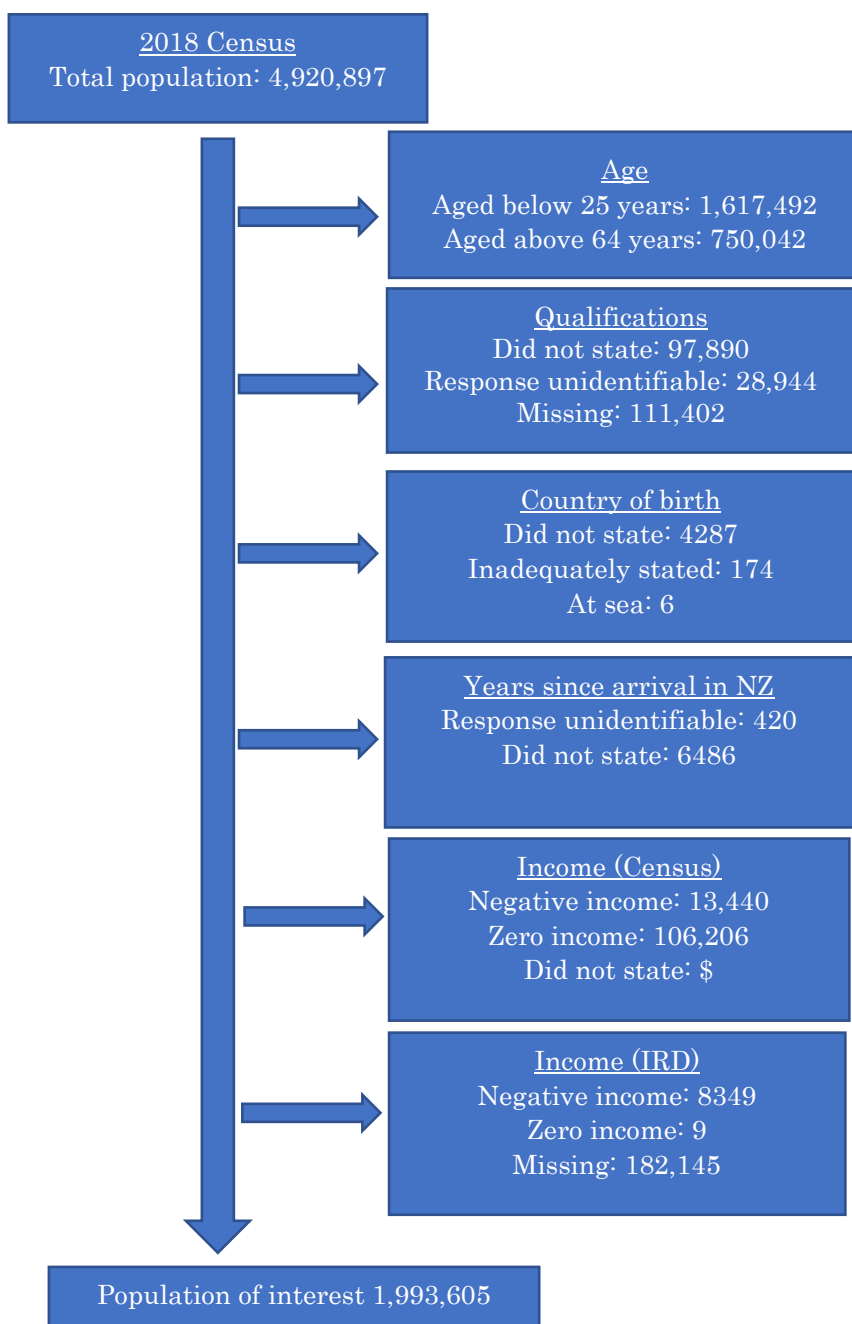
Our focus in this study is gross total personal income as reported in the census. The New Zealand census collects information on total personal income of individuals, which comprises all sources of income such as wages, salaries and earnings from self-employment, superannuation and investments. Wages and salaries are labour income while earnings from self-employment, superannuation and investments are non-labour income. According to a Stats NZ estimate, wages and salaries account for more than two-thirds of overall income (Statistics New Zealand, 1999) and this proportion would even be higher for people aged between 25 and 64 years. It was found from administrative data that wages and salaries of those aged between 25 and 64 years account for 99 per cent of total income (Stats NZ, 2019b). Therefore, we focused on positive income, considering income from wages and salaries, and excluded from this study those individuals who reported zero or negative incomes because these people are likely to be self-

employed and therefore their incomes are not the direct outcome of the labour market. The census does not capture actual income of individuals; rather, it records 'binned' (also known as grouped or bands of) income data. However, Stats NZ publishes midpoints for each band of income, and we used these income midpoints for this research. In addition, we also used IR tax data on incomes. As we discussed earlier, there are several advantages to using IR tax data over census data. IR tax data provides the official records of income of individuals from the tax system of the government, whereas with census records, we need to rely on the respondent's ability to calculate, recall and interpret their total income over the previous year and to choose the correct income band. Furthermore, unlike census data, IR tax data records income as actual dollar values. The IR tax data used in this study summarised total income from all sources (wages and salaries, remuneration of shareholders or directors, rental income, etc.) received by the individual per month in each tax year.

Census data captures information on an individual's country of birth. The study used this information to classify the population as either New Zealand-born or immigrants. In the study, immigrants are those individuals who usually reside in but were not born in Aotearoa New Zealand (i.e., the overseas-born). We divided the immigrants into two groups: 'recent' immigrants (those who had arrived within five years of the census date) and 'earlier' immigrants (those who had arrived more than five years before the census date).

Skill composition effect is one of the routes through which international migration affects income distribution in destination countries. This study examined the effect of skill composition of immigrants and New Zealand-born on income distribution in Aotearoa New Zealand. We divided each immigrant and New Zealand-born group into two different groups – high-skilled and low-skilled – according to their educational qualifications. Individuals who have at least a bachelor's degree are considered to be high-skilled, while those with educational qualifications below bachelor's degree are considered to be low-skilled. Thus, we separated the total usually resident population aged between 25 and 64 years who earned positive income into six groups: high-skilled earlier immigrants, low-skilled earlier immigrants, high-skilled recent immigrants, low-skilled recent immigrants, high-skilled New Zealand-born and low-skilled New Zealand-born. The

Figure 1: Selection of population of interest, 2018 Census and IR tax data

2018 Census
Total population: 4,920,897

Age
Aged below 25 years: 1,617,492
Aged above 64 years: 750,042

Qualifications
Did not state: 97,890
Response unidentifiable: 28,944
Missing: 111,402

Country of birth
Did not state: 4287
Inadequately stated: 174
At sea: 6

Years since arrival in NZ
Response unidentifiable: 420
Did not state: 6486

Income (Census)
Negative income: 13,440
Zero income: 106,206
Did not state: $

Income (IRD)
Negative income: 8349
Zero income: 9
Missing: 182,145

Population of interest 1,993,605

Notes: 1. All counts have been rounded using RR3.
2. $ is a notation indicating the confidentiality rules for data suppression.
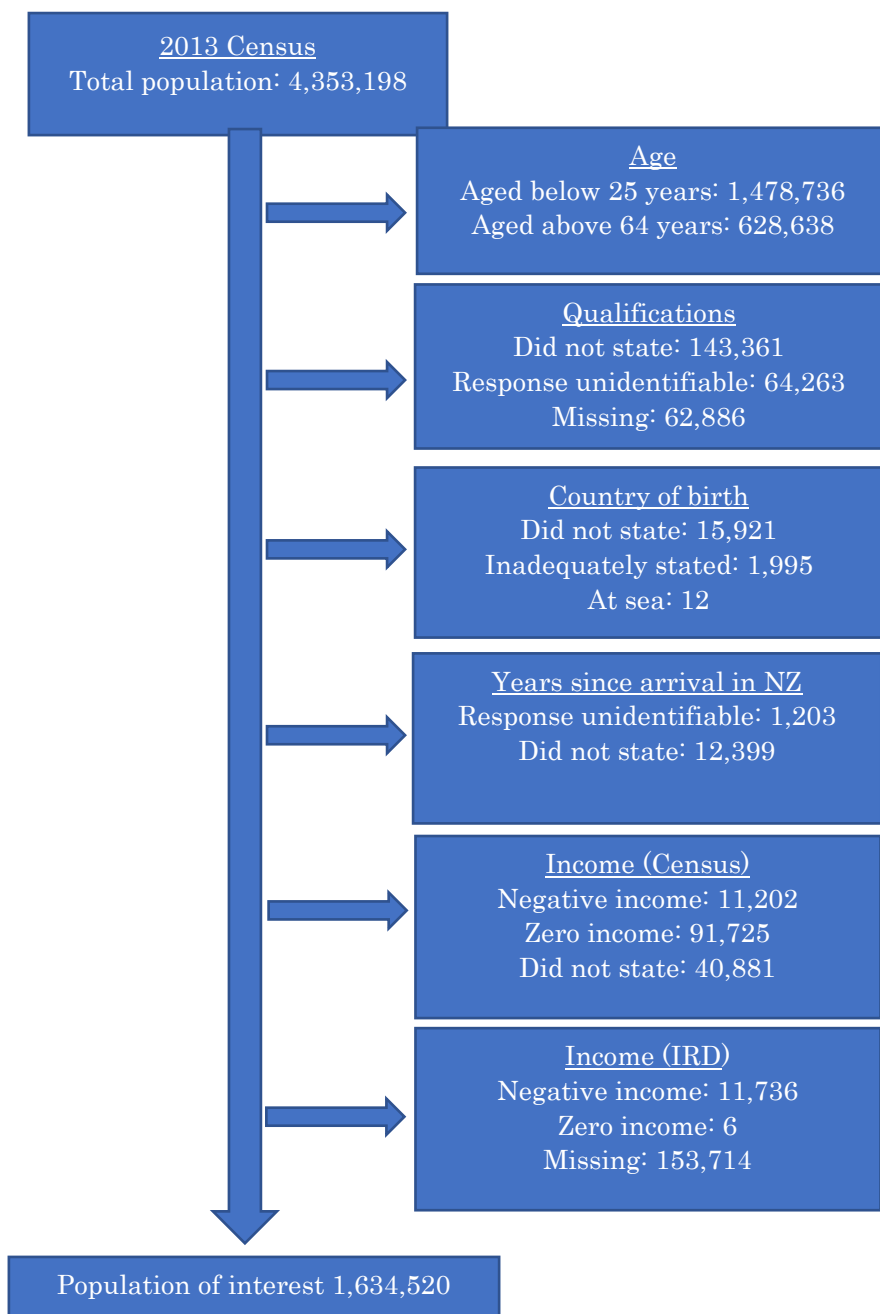
Figure 2: Selection of population of interest, 2013 Census and IR tax data

Note: All counts have been rounded using RR3.

selection procedures of our study populations are given in Figures 1 and 2.

There is some overlap in the data from the 2018 Census and the IR tax data for the same year. Approximately 15 per cent of people either did not participate in the 2018 Census or failed to fully complete the census form (Stats NZ, 2019a). Due to lower-than-anticipated individual responses, Stats NZ applied alternative statistical techniques (i.e., imputation) to enhance the quality of the 2018 Census data, which involved utilising administrative data to address missing information. Consequently, 16.5 per cent of total personal income data in the 2018 Census was imputed from IR tax data (Stats NZ, 2019a). A 2018 Census External Data Quality Panel was established in order to uphold public confidence in the census and strive for the production of high-quality data (Stats NZ, 2018). Nonetheless, this methodological difference in the generation of income data reduces comparability between the 2013 Census and 2018 Census.

Decomposition methods

Mean log deviation (MLD), which is a part of the family of generalised entropy indices (Bourguignon, 1979), is the measure of income inequality used in this study. Though the Theil index is a more popular measure, we used MLD because it is additively decomposable. While the Theil index weights by income share, MLD weights by population share. MLD fits the purpose of this study because we are focusing on the effects of migrant shares in population on income inequality. Though MLD works in a similar way to the Gini index, one of the popular measures of inequality, "unlike the Gini index, MLD is exactly decomposable by population subgroups" (Ravallion, 2014, p. 852). Moreover, MLD is less sensitive to income differences at the top end of the distribution (Cowell & Flachaire, 2007).

This study decomposes the levels and changes of income inequality. The within-group and between-group decomposition of MLD is used to decompose the levels of income inequality. The element of within-group inequality represents the inequality that is due to the variability of income within each group whereas the between-group inequality component expresses the inequality that is due to the variability of income across different groups (Bellù & Liberati, 2006). The subgroup decomposition approach of Mookherjee and Shorrocks (1982) is used to decompose the changes in inequality between 2013 and 2018. The methods used in this

study are detailed elsewhere (Alimi et al., 2018, 2022; Mookherjee & Shorrocks, 1982) but we will describe them briefly now.

MLD decomposition

Let us consider that N_k is the number of migrants in group k.

$$The\ overall\ population, N = \sum_{k=1}^{K} N_k$$

$$Total\ income, Y = \sum_{k=1}^{K} Y_k$$

where: Y_k is the aggregate income of all people of migrant group k.

$$Average\ income, \mu = \frac{Y}{N}$$

$$Average\ income\ of\ migrant\ group\ k, \mu_k = \frac{Y_k}{N_k} \tag{1}$$

$$Relative\ mean\ income\ of\ migrant\ group\ k, \lambda_k = \frac{\mu_k}{\mu} \tag{2}$$

$$The\ proportion\ of\ the\ populaton\ in\ each\ migrant\ group\ k, V_k = \frac{N_k}{N} \tag{3}$$

If there is no intra-group inequality – that is, everyone in each migrant group k has the same level of income (i.e., income of each person is μ_k) – then the overall income inequality can simply be expressed as:

$$MLD = \sum_{k=1}^{K} \frac{N_k}{N} \ln\frac{\frac{Y}{N}}{\frac{Y_k}{N_k}} = \sum_{k=1}^{K} V_k \ln\frac{\mu}{\mu_k} = \sum_{k=1}^{K} V_k \ln\frac{1}{\lambda_k} \tag{4}$$

If there is intra-group inequality – that is, every individual in each migrant group k has different levels of income – then the overall inequality can be decomposed into the weighted sum of within-migrant-group inequality and between-migrant-group inequality:

$$MLD = \underbrace{\sum_{k=1}^{K} V_k\ MLD_k}_{Within-group\ inequality} + \underbrace{\sum_{k=1}^{K} V_k \ln\frac{1}{\lambda_k}}_{Between-group\ inequality} \tag{5}$$

where: $MLD_k = \sum_{k=1}^{K} \frac{1}{N_k} \ln\frac{\mu_k}{y_i}$, and

y_i is the income of i-th individual.

Here, the term 'within-group inequality' reflects the simple weighted sum of the values of subgroup inequality, while the term 'between-

group inequality' is the contribution of inequality due to the differences in subgroup means.

<u>Population sub-group decomposition of inequality change over time: Mookherjee and Shorrocks (1982)</u>

To study the change in inequality over time, we used the population subgroup decomposition of Mookherjee and Shorrocks's (1982) approach. Change in inequality between two periods can be expressed as:

$$\Delta MLD = \underbrace{\sum_{k=1}^{K} \overline{V_k}\, \Delta MLD_k}_{\substack{aggregate\ change\ in\\ within-mgrant\ group\\ inequality\ for\\ given\ migrant\ shares\\ (A)}} + \underbrace{\sum_{k=1}^{K} \overline{MLD_k}\, \Delta V_k}_{\substack{aggregate\ change\ in\\ within-mgrant\ group\\ inequality\ due\ to\\ changing\ migrant\ shares\\ (B)}} +$$

$$\underbrace{\sum_{k=1}^{K} \overline{\ln\frac{1}{\lambda_k}}\, \Delta V_k}_{\substack{aggregate\ change\ in\\ between-mgrant\ group\\ inequality\ due\ to\\ changing\ migrant\ shares\\ (C)}} + \underbrace{\sum_{k=1}^{K} \overline{V_k}\, \Delta \ln\frac{1}{\lambda_k}}_{\substack{aggregate\ growth\ in\\ mgrant\ group\ relative\\ income\ for\\ given\ migrant\ shares\\ (D)}} \qquad (6)$$

where: Δ represents the change in a variable between year t and $t+1$, and a bar over an expression represents arithmetic mean of the variable across two periods; for example, $\overline{V_k} = \frac{1}{2}[V_k(t) + V_k(t+1)]$.

Mookherjee and Shorrocks (1982) suggest an approximation for the computational purposes of ΔMLD decomposition, arguing that it is natural to consider group-specific mean income growth rather than relative income growth. We use this approximation and therefore employ the following decomposition of change in inequality:

$$\Delta MLD \approx \underbrace{\sum_{k=1}^{K} \overline{V_k}\, \Delta MLD_k}_{\substack{aggregate\ change\ in\\ within-mgrant\ group\\ inequality\ for\\ given\ migrant\ shares\\ (A)}} + \underbrace{\sum_{k=1}^{K} \overline{MLD_k}\, \Delta V_k}_{\substack{aggregate\ change\ in\\ within-mgrant\ group\\ inequality\ due\ to\\ changing\ migrant\ shares\\ (B)}}$$

$$+ \underbrace{\sum_{k=1}^{K} (\overline{\lambda_k} - \overline{\ln\lambda_k})\Delta V_k}_{\substack{aggregate\ change\ in\\ between-mgrant\ group\\ inequality\ due\ to\\ changing\ migrant\ shares\\ (C_1)}} + \underbrace{\sum_{k=1}^{K} (\overline{V_k\lambda_k} - \overline{V_k})\, \Delta \ln\mu_k}_{\substack{aggregate\ growth\ in\\ mgrant\ group\ mean\\ income\ for\\ given\ migrant\ shares\\ (D_1)}} \qquad (7)$$

where: the migrant shares or compositional effect = $B + C_1$, and

the migrant group-specific distribution effect = $A + D_1$.

Results

This section begins with analysis of income distribution of immigrants and New Zealand-born considering immigrants as an homogeneous group. Then according to their educational qualifications and length of stay in New Zealand, we separate them into four groups – high-skilled earlier immigrants, low-skilled earlier immigrants, high-skilled recent immigrants and low-skilled recent immigrants – and compare their income distribution with high-skilled New Zealand-born and low-skilled New Zealand-born. We then examine the contributions of these groups to the level of and change in income inequality by using the MLD decomposition approach and Mookherjee and Shorrocks's (1982) approximate change decomposition approach.

Patterns and trends in the level of income distribution

Table 1 presents average income, relative mean income, subgroup index of inequality measured by the MLD, and population shares of New Zealand-born and immigrants between 2013 and 2018. It is observed that immigrants have become an important component of the composition of population in New Zealand. The proportion of immigrants increased from 28 per cent to 32 per cent between 2013 and 2018. New Zealand-born had higher average income than immigrants in both censuses.

The results from analysis of the census income shows that income inequality (MLD) increased among both immigrants and New Zealand-born between 2013 and 2018. The level of income inequality increased from 0.2992 to 0.3237 among New Zealand-born and from 0.3395 to 0.3524 among immigrants in this time period. Therefore, it is evident that while income inequality grew by 8.2 per cent among New Zealand-born, it rose by only 3.8 per cent among immigrants between 2013 and 2018. Furthermore, income inequality remained higher among immigrants than New Zealand-born in both censuses.

Table 1: Average income, income inequality (MLD) and population shares of immigrants and New Zealand-born, 2013–2018

Place of birth	New Zealand-born	Immigrants	New Zealand-born	Immigrants
	2013 Census		*2018 Census*	
Average income	51895.16	49964.04	57776.65	56303.52
Relative mean income	1.01	0.97	1.01	0.98
Inequality (MLD)	0.2992	0.3395	0.3237	0.3524
Population share	72%	28%	68%	32%
Population	1,172,643	461,874	1,361,946	631,662
	2013 IR tax		*2018 IR tax*	
Average income	51812.25	51176.31	58667.85	58177.23
Relative mean income	1.00	0.99	1.00	0.99
Inequality (MLD)	0.3368	0.3831	0.3358	0.3570
Population share	72%	28%	68%	32%
Population	1,172,643	461,874	1,361,946	631,662

Notes: 1. All frequency counts have been rounded using random rounding – base three (RR3).

2. Percentages and average income are based on RR3 rounded counts.

3. Average income, relative mean income, population share and MLD have been calculated using Equations (1), (2), (3) and (4), respectively.

Source: Calculated by the authors from census and IR tax microdata available in the IDI.

Results from IR tax data shows that the level of inequality was higher among immigrants (0.3570) than among New Zealand-born (0.3358) in 2018. It is evident that there is a small pay gap between immigrants and New Zealand-born.

It is observed from Table 2 that, according to the results from census income, the level of overall inequality increased from 0.3107 to 0.3329 between 2013 and 2018. In other words, income inequality grew by 7 per cent in Aotearoa New Zealand between 2013 and 2018. But while results from census income show that the level of overall income inequality increased between 2013 and 2018, results from IR tax data show that income inequality remained almost constant during this period. However, both census data and IR tax data demonstrate that the within-group contributions to inequality (inequality within New Zealand-born or within immigrants) remained dominant compared with between-group components (disparity between New Zealand-born and immigrants). While within-group contributions to inequality increased in absolute terms (from 0.3106 to 0.3328), between-group components remained the same at 0.0001 between the 2013 Census and 2018 Census. IR tax data also show the same pattern. Therefore, both census income and IR tax data suggest that almost all inequality is due to within-group inequality in Aotearoa New Zealand.

Table 2 also shows that in terms of the magnitude of inequality level, the within-group contribution of New Zealand-born people was higher than that of immigrants in both censuses. However, the growth of within-immigrant-group contributions to overall inequality was slightly higher than that of the within-group contributions of New Zealand-born people.

Up until this point, we compared New Zealand-born with immigrants while treating immigrants as a homogenous group. In fact, the characteristics of immigrants are heterogeneous in terms of educational qualifications, gender, nationality, visa status (temporary, permanent resident and citizen), length of stay in destination countries, etc. In the following sections, we categorised immigrants according to their educational qualifications and length of stay in New Zealand and compare them with New Zealand-born (categorised by educational qualifications) in terms of their skill composition, average income, relative mean income, population share, within-group inequality, and level decomposition and change decomposition of MLD.

Table 2: Within-group and between-group contributions of immigrants and New Zealand-born to the level of inequality (measured by MLD), 2013 and 2018

	Within-group inequality	Between-group inequality	Within-group inequality	Between-group inequality
	2013 Census		*2018 Census*	
New Zealand-born	0.2146	−0.0076	0.2212	−0.0055
Immigrants	0.0959	0.0077	0.1116	0.0056
Sum	**0.3106**	**0.0001**	**0.3328**	**0.0001**
Overall inequality = Within + Between	0.3107		0.3329	
	2013 IR tax 2013		*2018 IR tax*	
New Zealand-born	0.2416	−0.0025	0.2294	−0.0018
Immigrants	0.1083	0.0025	0.1131	0.0018
Sum	**0.3499**	**0.0000**	**0.3425**	**0.0000**
Overall inequality = Within + Between	0.3499		0.3425	

Notes: The within-group and between-group contributions to inequality have been calculated using the MLD decomposition technique; see Equation (5).

Source: Calculated by the authors from census and IR tax microdata available in the IDI.

Skill composition of immigrants and New Zealand-born

Table 3 presents the skill composition of four immigrant groups (high-skilled earlier immigrants, low-skilled earlier immigrants, high-skilled recent immigrants and low-skilled recent immigrants) and two groups of New Zealand-born (high-skilled and low-skilled) between 2013 and 2018. Though the shares of low-skilled workers were higher than the shares of high-skilled workers among each group in the 2013 Census, the proportion of high-skilled workers increased among the groups between 2013 and 2018. While the proportions of low-skilled workers were higher than high-skilled workers among New Zealand-born and among earlier immigrants, the proportion of high-skilled workers was higher than low-skilled workers among recent immigrants in 2018. The highest proportion of high-skilled workers was observed among recent immigrants followed by earlier immigrants in both censuses. The proportion of high-skilled workers increased from 44 per cent to 57 per cent for recent immigrants and from 36 per cent to 42 per cent for earlier immigrants between the two censuses, and therefore the proportions of low-skilled earlier and recent immigrants decreased between 2013 and 2018. This reflects the immigration policy of New Zealand, which has an overall focus on attracting high-skilled immigrants.

It is also observed from Table 3 that the growth in the proportion of high-skilled workers was higher among both earlier and recent immigrants than their high-skilled New Zealand-born counterparts between 2013 and 2018.

Table 3: Percentage distribution of immigrants and New Zealand-born by their qualifications, 2013 and 2018

	New Zealand-born		Earlier immigrants		Recent immigrants		Overall	
	Number	%	Number	%	Number	%	Number	%
2013 Census								
High-skilled	259,245	22	127,173	36	47,160	44	440,733	27
Low-skilled	913,401	78	227,100	64	60,438	56	1,256,622	73
Total	**1,172,643**	**100**	**354,273**	**100**	**107,601**	**100**	**1,634,517**	**100**
2018 Census								
High-skilled	343,542	25	203,511	42	82,371	57	636,219	32
Low-skilled	1,018,401	75	282,678	58	63,099	43	1,390,998	68
Total	1,361,943	100	486,192	100	145,467	100	1,993,605	100

Notes: 1. 'Earlier immigrants' refers to those who arrived in New Zealand more than five years before the census date.

2. 'Recent immigrants' refers to those who arrived in Aotearoa New Zealand within five years preceding the census date.

3. 'High-skilled' refers to individuals who have at least a bachelor's degree education.

4. 'Low-skilled' refers to individuals who have other educational qualifications below bachelor's degree.

5. All frequency counts have been rounded using random rounding – base three (RR3).

6. Percentages are based on RR3 rounded counts.

Income distribution of immigrants and New Zealand-born

Table 4 shows average income, relative mean income, subgroup index of inequality measured by MLD and population shares of high-skilled earlier immigrants, low-skilled earlier immigrants, high-skilled recent immigrants, low-skilled recent immigrants, and high-skilled and low-skilled New Zealand-born in the 2013 Census and 2018 Census. Low-skilled New Zealand-born comprised the largest proportion of the population of Aotearoa New Zealand in both censuses. The proportions of low-skilled earlier immigrants were highest among immigrant groups in both censuses. Though the percentage of low-skilled earlier immigrants remained same (14 per cent), the percentage increased from 8 per cent to 10 per cent for high-skilled earlier immigrants between 2013 and 2018.

IR tax data shows that there was a huge gap in average income between high-skilled recent immigrants and high-skilled New Zealand-born while the gap narrowed for high-skilled earlier immigrants. For low-skilled groups, the average income of New Zealand-born and earlier immigrants was almost similar while low-skilled recent immigrants earned lower average income. So, high-skilled recent immigrants and low-skilled recent immigrants are the most disadvantaged groups in terms of average income.

It is observed from the results of analysis of the census data that the MLD level demonstrates that recent immigrants are the most disadvantaged group because the highest level of income inequality was observed among recent immigrants followed by earlier immigrants and then New Zealand-born. Income inequality was higher among immigrant groups than New Zealand-born, regardless of skill levels in the 2013 Census. In the 2018 Census, the level of income inequality was way higher among high-skilled recent immigrants (0.3982) than high-skilled earlier immigrants (0.2915) and high-skilled New Zealand-born (0.2875); similarly, income inequality was higher among low-skilled recent immigrants (0.3927) than low-skilled earlier immigrants (0.3260) and low-skilled New Zealand-born (0.3089). So, high-skilled recent immigrants were the most disadvantaged group from the 2018 Census data. The 2018 IR tax data also confirm that high-skilled recent immigrants were the most disadvantaged group in terms of within-group inequality.

Table 4: Average income, income inequality (MLD) and population shares of immigrants and New Zealand-born by qualifications, 2013–2018

	Population share	Average income	Relative mean income	Inequality (MLD)
		2013 Census		
High-skilled NZ-born	0.16	72766.19	1.42	0.2790
Low-skilled NZ-born	0.56	45971.29	0.90	0.2796
High-skilled earlier immigrants	0.08	66403.94	1.29	0.2931
Low-skilled earlier immigrants	0.14	42695.40	0.83	0.3093
High-skilled recent immigrants	0.03	55385.75	1.08	0.3601
Low-skilled recent immigrants	0.04	38455.68	0.75	0.3607
		2018 Census		
High-skilled NZ-born	0.17	79104.66	1.38	0.2876
Low-skilled NZ-born	0.51	50582.14	0.88	0.3089
High-skilled earlier immigrants	0.10	73112.44	1.28	0.2915
Low-skilled earlier immigrants	0.14	48169.50	0.84	0.3260
High-skilled recent immigrants	0.04	53905.34	0.94	0.3982
Low-skilled recent immigrants	0.03	41663.26	0.73	0.3927

	Population share	Average income	Relative mean income	Inequality (MLD)
2013 IR tax				
High-skilled NZ-born	0.16	73426.58	1.42	0.3634
Low-skilled NZ-born	0.56	45677.42	0.88	0.3021
High-skilled earlier immigrants	0.08	68086.54	1.32	0.3749
Low-skilled earlier immigrants	0.14	44006.96	0.85	0.3349
High-skilled recent immigrants	0.03	54995.63	1.07	0.4476
Low-skilled recent immigrants	0.04	39555.63	0.77	0.3635
2018 IR tax				
High-skilled NZ-born	0.17	80253.71	1.37	0.3495
Low-skilled NZ-born	0.51	51386.36	0.88	0.3043
High-skilled earlier immigrants	0.10	75122.53	1.28	0.3405
Low-skilled earlier immigrants	0.14	50761.39	0.87	0.3103
High-skilled recent immigrants	0.04	52973.87	0.91	0.4224
Low-skilled recent immigrants	0.03	43541.80	0.74	0.3355

Notes: 1. Mean is calculated using RR3 rounded counts.

2. Average income, relative mean income, population share and MLD are calculated using Equations (1), (2), (3) and (4), respectively.

3. NZ-born: New Zealand-born.

4. See notes below Table 3.

Source: Calculated by the authors from Census and IR tax microdata available in the IDI.

The highest percentage of increasing inequality was observed among high-skilled recent immigrants (11 per cent) followed by low-skilled recent immigrants (9 per cent) between the 2013 Census and 2018 Census, while inequality fell among high-skilled earlier immigrants. Therefore, the recent immigrants were the most disadvantaged group in terms of both the magnitude of income inequality and percentage of increasing income inequality between the 2013 Census and 2018 Census.

Decomposition of levels of income inequality

Table 5 presents the decomposition of MLD into within-group and between-group contributions to the overall inequality level in each census. Results show that almost all inequality was due to within-group inequality rather than between-group inequality. Within-group contribution to inequality accounted for 94 per cent and 93 per cent of the overall inequality in the 2018 Census and 2013 Census data, respectively. Within-group contribution to inequality not only remained dominant but also grew (from 0.2900 to 0.3122) over time, whereas between-group inequality remained the same (0.0207) between the 2013 Census and 2018 Census.

This study reveals that the highest aggregate within-group and between-group contributions to inequality were observed among low-skilled New Zealand-born followed by high-skilled New Zealand-born. This is mainly because these groups comprised the highest shares of population in Aotearoa New Zealand given that within-group and between-group contributions of MLD are weighted by shares of population. The magnitude of the within-group contribution of low-skilled New Zealand-born was way higher than that of high-skilled New Zealand-born in both periods. In contrast, a mixed result is observed for immigrant groups. The aggregate within-group contribution to inequality of low-skilled earlier immigrants was higher than that of high-skilled earlier immigrants whereas the aggregate within-group contribution of high-skilled recent immigrants was higher than that of low-skilled recent immigrants.

Table 5: Within-group and between-group contributions of immigrants and New Zealand-born to the level of inequality (measured by MLD) by qualifications, 2013 and 2018

	Within-group inequality	Between-group inequality	Within-group inequality	Between-group inequality
	2013 Census		*2018 Census*	
High-skilled NZ-born	0.0443	−0.0553	0.0496	−0.0555
Low-skilled NZ-born	0.1563	0.0618	0.1578	0.0638
High-skilled earlier immigrants	0.0228	−0.0200	0.0298	−0.0249
Low-skilled earlier immigrants	0.0430	0.0256	0.0462	0.0246
High-skilled recent immigrants	0.0104	−0.0022	0.0165	0.0025
Low-skilled recent immigrants	0.0133	0.0107	0.0124	0.0101
Sum	**0.2900**	**0.0207**	**0.3122**	**0.0207**
	2013 IR tax		*2018 IR tax*	
High-skilled NZ-born	0.0576	−0.0559	0.0602	−0.0544
Low-skilled NZ-born	0.1688	0.0685	0.1554	0.0663
High-skilled earlier immigrants	0.0292	−0.0215	0.0348	−0.0255
Low-skilled earlier immigrants	0.0465	0.0222	0.0440	0.0201
High-skilled recent immigrants	0.0129	−0.0018	0.0175	0.0041
Low-skilled recent immigrants	0.0134	0.0099	0.0106	0.0094
Sum	**0.3285**	**0.0213**	**0.3225**	**0.0200**

Notes: 1. The within-group and between-group contributions to inequality have been calculated using MLD decomposition technique.

2. NZ-born: New Zealand-born.

3. See Equation (5), and also notes below Table 3.

It is evident from both census data and IR tax data that the aggregate within-group contribution to inequality decreased for low-skilled recent immigrants between 2013 and 2018 and the population share of this group also decreased during this period. In contrast, the increasing aggregate within-group contribution to inequality and growing shares of population of high-skilled and low-skilled earlier immigrants and high-skilled recent immigrants led to an increasing contribution of these groups to overall income inequality. We examine the contributions of six groups of populations to the change in income inequality between 2013 and 2018 using Mookherjee and Shorrocks's (1982) decomposition approach in the following subsection.

Decomposition of change in income inequality

This study used Mookherjee and Shorrocks's (1982) approach to investigate the change in inequality in New Zealand between 2013 and 2018. The advantage of this approach is that it splits the total change in inequality into the within-group contributions to inequality change (A+B) and between-group contributions to inequality change (C_1+D_1), or into composition effect (B+C_1) and group-specific distribution effect (A+D_1).

Table 6 presents contributions by group of two groups of New Zealand-born and four groups of immigrants to the change in MLD between 2013 and 2018 in Aotearoa New Zealand. It also shows the composition effects and group-specific distribution effects. We know from Equation 7 that the calculated components of change in inequality (C_1 and D_1) are approximations. The actual change in inequality can be obtained from Table 2. Table 6 reveals that an approximate change in inequality was 0.0222 while the actual change in MLD was also 0.0222 (see Table 2) between the 2013 Census and 2018 Census.

Table 6: Results from Mookherjee and Shorrocks's (1982) decomposition of change in inequality between 2013 and 2018

	Components of change				Composition effect (B+C₁)	Group-specific distribution effect (A+D₁)	Contribution to within-group inequality (A+B)	Contribution to between-group inequality (C₁+D₁)	Total contribution to change (A+B+C₁+D₁)
	A	B	C₁	D₁					
	Census data								
High-skilled NZ-born	0.0014	0.0039	0.0146	0.0055	0.0185	0.0069	0.0053	0.0201	0.0254
Low-skilled NZ-born	0.0157	−0.0141	−0.0483	−0.0057	−0.0624	0.0100	0.0015	−0.0540	−0.0524
High-skilled earlier immigrants	−0.0001	0.0071	0.0251	0.0025	0.0322	0.0023	0.0069	0.0276	0.0345
Low-skilled earlier immigrants	0.0023	0.0009	0.0029	−0.0028	0.0038	−0.0004	0.0033	0.0001	0.0034
High-skilled recent immigrants	0.0013	0.0047	0.0125	0.0000	0.0172	0.0013	0.0061	0.0125	0.0186
Low-skilled recent immigrants	0.0011	−0.0020	−0.0056	−0.0007	−0.0076	0.0004	−0.0009	−0.0063	−0.0072
Sum	**0.0217**	**0.0005**	**0.0012**	**−0.0012**	**0.0017**	**0.0205**	**0.0222**	**0.0000**	**0.0222**
All NZ-born	0.0171	−0.0102	−0.0337	−0.0002	−0.0440	0.0169	0.0069	−0.0339	−0.0270
All immigrants	0.0046	0.0107	0.0349	−0.0010	0.0457	0.0036	0.0154	0.0339	0.0493

(Table continued on next page)

	Components of change				Composition effect (B+C$_1$)	Group-specific distribution effect (A+D$_1$)	Contribution to within-group inequality (A+B)	Contribution to between-group inequality (C$_1$+D$_1$)	Total contribution to change (A+B+C$_1$+D$_1$)
	A	B	C$_1$	D$_1$					
	IR tax data								
High-skilled NZ-born	−0.0023	0.0049	0.0146	0.0058	0.0195	0.0035	0.0026	0.0204	0.0230
Low-skilled NZ-born	0.0012	−0.0146	−0.0484	−0.0075	−0.0629	−0.0063	−0.0134	−0.0558	−0.0692
High-skilled earlier immigrants	−0.0031	0.0087	0.0252	0.0026	0.0339	−0.0004	0.0056	0.0278	0.0334
Low-skilled earlier immigrants	−0.0035	0.0009	0.0029	−0.0028	0.0038	−0.0063	−0.0025	0.0001	−0.0025
High-skilled recent immigrants	−0.0009	0.0054	0.0125	0.0000	0.0179	−0.0008	0.0045	0.0126	0.0171
Low-skilled recent immigrants	−0.0010	−0.0019	−0.0055	−0.0008	−0.0074	−0.0018	−0.0028	−0.0063	−0.0091
Sum	**−0.0095**	**0.0035**	**0.0013**	**−0.0026**	**0.0048**	**−0.0121**	**−0.0060**	**−0.0013**	**−0.0073**
All NZ-born	−0.0011	−0.0097	−0.0338	−0.0016	−0.0434	−0.0028	−0.0108	−0.0354	−0.0462
All immigrants	−0.0084	0.0132	0.0351	−0.0009	0.0482	−0.0093	0.0048	0.0341	0.0389

Notes: 1. A = the aggregate change in within-migrant group inequality for given migrant shares, B = the aggregate change in within-migrant group inequality due to changing migrant-shares, C$_1$ = the aggregate change in between-migrant group inequality due to changing migrant shares, and D$_1$ = aggregate growth in migrant-group mean income for given migrant shares.

2. NZ-born: New Zealand-born.

3. 'All NZ-born' refers to the combination of two groups such as high-skilled New Zealand-born and low-skilled New Zealand-born.

4. 'All immigrants' refers to the combination of four groups such as high-skilled earlier immigrants, low-skilled earlier immigrants, high-skilled recent immigrants, and low-skilled recent immigrants.

5. See Equation (7), and also notes below Table 3.

This study can now answer the two research questions: What roles do these immigrant groups play in the change of income inequality between 2013 and 2018? And what are the effects of the skill-biased immigration policies on income distribution? Census data show that total contribution to the change in inequality of high-skilled groups (high-skilled earlier immigrants, high-skilled recent immigrants and high-skilled New Zealand-born) was inequality increasing. Results also suggest that population shares of these high-skilled groups increased between the 2013 Census and 2018 Census; thus, their inequality-increasing contribution to the change in inequality was driven by the composition effect. High-skilled earlier immigrants had the highest inequality-increasing total contribution to the change in inequality (0.0345) followed by high-skilled New Zealand-born (0.0254) and then high-skilled recent immigrants (0.0186). IR tax data also suggest that the high-skilled groups had inequality-increasing total contribution to the change in inequality and the contribution was driven by the composition effect.

It was observed from the census data that except for low-skilled earlier immigrants, the low-skilled groups (low-skilled recent immigrants and low-skilled New Zealand-born) had inequality-reducing total contributions. The inequality-decreasing total contribution of low-skilled New Zealand-born was higher (−0.0524) than that of low-skilled recent immigrants (−0.0072). The inequality-reducing contributions of low-skilled groups may be because even though mean income of these low-skilled groups increased over time, their relative mean income was low (less than 1) and the population shares of these groups also dropped between the 2013 Census and 2018 Census. Very similar results were observed from the IR tax data, where all low-skilled groups (low-skilled recent immigrants, low-skilled earlier immigrants and low-skilled New Zealand-born) had inequality-reducing total contributions to the change in income inequality.

Census data show that regardless of skill level, when we combine all immigrant groups, their total contributions to the change in inequality is inequality increasing (0.0493). When we combine New Zealand-born groups, their total contributions are inequality decreasing (−0.027). Thus, inequality-increasing contributions of immigrants outstripped the inequality-decreasing contributions of New Zealand-born and led to overall rise in income inequality (0.0222).

It is evident from the results that the composition effect was inequality increasing for high-skilled groups while inequality decreasing for low-skilled groups because there was a growth in population share for high-skilled groups and a fall in population share for low-skilled groups between the 2013 Census and 2018 Census. The inequality-increasing composition effect of high-skilled earlier immigrants was highest (0.0322) followed by high-skilled New Zealand-born (0.0185) and then high-skilled recent immigrants (0.0172). Though the magnitude of the inequality-reducing composition effect of low-skilled New Zealand-born was −0.0624, it was outstripped by the magnitudes of the inequality-increasing composition effect of the high-skilled groups. Thus, the composition effect of all these groups was inequality-increasing to the change in overall inequality between between the 2013 Census and 2018 Census.

Results from IR tax data indicate that both high-skilled earlier immigrants and high-skilled recent immigrants had inequality-increasing within-group and between-group contributions to the change in overall income inequality. This is because both the aggregate change in within-migrant group inequality for given migrant shares (A) and aggregate change in within-migrant group inequality due to changing migrant shares (B) of high-skilled recent immigrants are inequality-increasing. On the other hand, the magnitude of the inequality-increasing aggregate change in within-migrant group inequality due to changing migrant shares (B) outstripped the inequality-decreasing aggregate change in within-migrant group inequality for given migrant shares (A) of high-skilled earlier immigrants and therefore lead to inequality-increasing within-group contributions of high-skilled immigrants. Similarly, since the aggregate change in between-migrant group inequality due to changing migrant shares (C_1) and aggregate growth in migrant-group mean income for given migrant shares (D_1) are inequality increasing, these lead to inequality-increasing between-group contributions of high-skilled immigrants. In contrast, the within-group and between-group contributions to the change in inequality were inequality-reducing for low-skilled earlier immigrants and low-skilled recent immigrants. This is because even though mean income of these low-skilled immigrants increased between 2013 and 2018, their relative mean income was low (less than 1).

In summary, both the census data and IR tax data suggest that income inequality was higher among immigrants than among New Zealand-

born. Recent immigrants, especially high-skilled recent immigrants, were the most disadvantaged group in terms of income inequality. Almost all inequality was due to within-group inequality in Aotearoa New Zealand, while between-group inequality accounted for only a small share. High-skilled immigrants (both earlier and recent) had inequality-increasing contributions to the change in inequality while low-skilled recent immigrants had inequality-decreasing contributions. The fact that both the census data and IR tax data yielded qualitatively similar results makes the results more plausible.

Discussion

This study examined the effects of immigration on income inequality in Aotearoa New Zealand by using Census data and IR tax data available in the IDI of Stats NZ. The present study decomposed the within-group and between-group contributions of different immigrant groups to the overall level of income inequality and examined the effects of immigration in the change of income inequality between 2013 and 2018 in Aotearoa New Zealand.

The levels of overall income inequality were 0.3107 and 0.3329 in between the 2013 Census and 2018 Census, respectively, an inter-censal growth of 7 per cent (see Table 2). This result supports findings from previous studies that reported that income inequality has increased in the last decades (Alimi et al., 2016, 2018). Other studies suggest that income inequality grew between the late 1980s and early 1990s but remained either constant or slightly fell between 1994 and 2014 (Ball & Creedy, 2016; Creedy et al., 2018). We also observed from the analysis of IR tax data that income inequality had started falling slightly between 2013 and 2018 but there was a small pay gap in terms of average income between immigrants and New Zealand-born. While the census data show that there was an increasing trend in income inequality between 2013 and 2018, the IR tax data report a slight fall. One possible explanation for this apparent inconsistency is that census data are self-reported whereas IR tax data capture formal interactions with the tax system. Differences in the collection methodologies may also lead to the differences in the estimates of total personal income. Moreover, census data record personal income in bands, while IR tax data capture the actual dollar amount. Census data do not account for the

inequality within income bands because the data are grouped data, whereas IR tax data overcome this caveat.

The present study clearly indicates that income inequality was higher among immigrants than among New Zealand-born between 2013 and 2018. This finding is consistent with those of other studies carried out in Aotearoa New Zealand that have also reported that income inequality is higher among immigrants than locals in urban areas of the country (Alimi et al., 2018a). A similar result was observed in a study in the United States (Reed, 2001). Studies have suggested a wide range of reasons why immigrants have poorer economic outcomes compared with their native-born counterparts, such as lower returns to human capital acquired in origin countries (Friedberg, 2000), job networks (Frijters et al., 2005), language skills (Chiswick & Miller, 2001) and length of stay in the receiving countries (Stillman & Maré, 2009).

We then focused on two observable characteristics of immigrants: human capital (educational qualifications) and length of stay. According to these characteristics, we separated immigrants into four different categories: high-skilled earlier immigrants, low-skilled earlier immigrants, high-skilled recent immigrants and low-skilled recent immigrants; New Zealand-born were separated into two categories (high-skilled and low-skilled). Through analysing these six groups' contributions relative to the overall level of income inequality, this study has revealed that recent immigrants had the highest level of income inequality followed by earlier immigrants and then New Zealand-born (see Table 4). Similarly, the results from the IR tax data suggest that there was a huge gap in average income between high-skilled recent immigrants and high-skilled New Zealand-born while the gap narrowed between high-skilled earlier immigrants and high-skilled New Zealand-born. The study also found that low-skilled recent immigrants earned the lowest average income among the three low-skilled groups, high-skilled recent immigrants earned the lowest average income among the three high-skilled groups, and that recent immigrants are the most disadvantaged group in terms of average income, the magnitude of the income inequality and the percentage of increasing income inequality between between the 2013 Census and 2018 Census. This last finding suggests that there is a need for further research on whether there is an impact of immigration policies, especially those related to temporary

migration, on the earnings of recent immigrants or more in-depth research on what determines the poor earnings of recent immigrants.

The study has revealed that almost all income inequality between 2013 and 20018 was due to within-group inequality rather than between-group inequality (see Table 5). Within-group contribution accounted for more than ninety per cent of the overall income inequality, a finding that is in line with other studies in the UK (Hills et al., 2010), Italy (D'Agostino et al., 2016) and Vietnam (Bui & Imai, 2019). The present study found that the aggregate within-group contribution to overall income inequality of low-skilled immigrants (both earlier and recent) decreased between 2013 and 2018 while it increased for high-skilled immigrants (both earlier and recent). This is expected since there is a wide range of income distribution of immigrants due to the selectivity in immigration policy in Aotearoa New Zealand. While we have used a bachelor's degree as a measure of skill level, immigration of those with tertiary qualifications varies considerably, with some such immigrants working in very highly paid occupations while others struggle to find work commensurate with their education and experience. Occupations such as medical doctors have substantial numbers of overseas-born workers for example (Medical Council of New Zealand, 2021), but research on graduated international students suggests considerable variability in employment outcomes (Universities New Zealand, 2021), including, in some cases, exposure to workplace exploitation (Collins & Stringer, 2019). Some immigrants attain employment that matches their qualifications and thus earn a higher income. Others, however, may be limited to lower-paid jobs that do not recognise their qualifications – for example, doctors or engineers working in occupations with no qualification requirements – which has de-skilling effects (Poot & Roskruge, 2013). Caused by a range of factors including labour market discrimination, limited professional networks and skill transferability, these patterns establish a pay gap at the outset of migrant arrival that influences levels of inequality (Bauder, 2006).

The present study also highlights that high-skilled immigrants (both earlier and recent) had inequality-increasing contributions to the change in overall income inequality. These inequality-increasing contributions were mainly driven by composition effect because the population shares of these groups also increased between 2013 and 2018. There are several factors that influence income inequality among high-skilled immigrants. For example,

Collins and Pawar (2021) showed that nationality played a vital to role in widening income gap among immigrants in Aotearoa New Zealand. The authors found that there is a notable gap in income between registered nurses who were from Great Britain and Ireland and those from the Philippines and India. In contrast, low-skilled immigrants (both earlier and recent) had inequality-decreasing contributions to the change in income inequality. We found that the decrease in the population share of low-skilled recent immigrants contributed to decreasing overall income inequality as did the effect of change in group-specific income distribution of low-skilled earlier immigrants. Even though the mean income of these low-skilled groups increased over time, their relative mean income was low. A United States-based study found that low-skilled immigrants significantly contributed to overall income inequality while high-skilled immigrants affected income distribution only between those at the top decile and at the median or below (Xu et al., 2016). The study presented here argues that people who are at the top of the income distribution experience higher within-group inequality and increased relative average income, and eventually these changes widen the gap at the top of the income distribution. Therefore, the study suggests that future research could analyse income gap across the distribution of income to understand the variability in income along the quantiles of the distribution.

Conclusions

This study concludes that income inequality between 2013 and 2018 was higher among immigrants than among New Zealand-born. There was a substantial gap in average income between recent immigrants and New Zealand-born, while the gap narrowed between earlier immigrants and New Zealand-born. Recent immigrants are the most disadvantaged group in terms of the magnitude of the level of income inequality. Future research could investigate whether there is an impact of immigration policies on the earnings of recent immigrants or what are the other factors that determine the poor earnings of recent immigrants.

This study highlights that the largest share of overall income inequality was due to within-group inequality, with the between-group inequality accounting for only 6 per cent. The aggregate within-group contribution of low-skilled immigrants to inequality has declined between 2013 and 2018 while it has grown for high-skilled immigrants. Policy efforts

should focus on reducing inequalities within immigrant groups especially high-skilled immigrants.

The high-skilled immigrants (both earlier and recent) had inequality-increasing contributions to the change in overall income inequality. These inequality-increasing contributions were mainly driven by composition effect because the population shares of these groups also increased between 2013 and 2018. In contrast, low-skilled immigrants (both earlier and recent) had inequality-decreasing contributions to the change in overall income inequality. The decrease in the population share of low-skilled recent immigrants contributed to decreasing overall income inequality as did the effect of change in the group-specific income distribution of low-skilled earlier immigrants.

There are some limitations of this study. First, unlike the 2013 Census data, the 2018 Census data was imputed from IR tax data due to low response rates to the census questionnaire. As a result, for the 2018 data, we are not dealing with two entirely separate data sets; instead, there is an overlap between them. This difference in methodology reduces the comparability between the 2013 Census and 2018 Census data. Second, we focused on the effects of length of stay in Aotearoa New Zealand and educational qualifications of immigrants on income inequality in this study, but do not provide specific analysis of the influence of other characteristics such as gender, nationality and visa status (temporary migrants or permanent residents) on income inequality here – although we note them as significant features worthy of more detailed future research. Third, we examined income inequality by decomposing within-group and between-group contributions of immigrants but did not focus on the variations across the income distribution. Therefore, this study suggests more in-depth research to understand if inequality varies across the distribution of income of immigrants.

Abbreviations

GE	generalised entropy
IDI	Integrated Data Infrastructure
IR	Inland Revenue
MLD	mean log deviation
RR3	random rounding – base 3

Acknowledgement

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