WHAT IMPACT DOES TEMPORARY MIGRATION HAVE ON THE HIRING OF NEW ZEALANDERS?

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Abstract

The early to mid-2000s saw considerable growth in the use of temporary migrants to fill labour market gaps in New Zealand. Temporary migration also grew into an important pathway for prospective permanent migrants. With the onset of the global economic crisis, and consequent rise in unemployment, questions have been raised about potential negative effects of migration on the employment opportunities available to New Zealanders. Temporary migration may present greater risks to those, such as beneficiaries and youth, who are most disadvantaged in the labour market. For many temporary migrants there are few restrictions on the employment they take up, and as a result they may be more likely than permanent migrants to take up low-paid or part-time work, possibly substituting for low-skilled New Zealanders. A number of studies have examined the impact of migration on the New Zealand labour market, but due to data limitations, none has looked at the specific impact of temporary migration. In this paper we estimate the effect of changes in the hiring of temporary migrants on the hiring of New Zealanders using data from the Integrated Data Infrastructure (IDI) prototype. The IDI prototype was created by Statistics New Zealand, and brings together administrative and survey data sources from across a number of government agencies.

Background

The last decade has seen considerable growth in the use of temporary migrants to fill labour market gaps in New Zealand. This growth coincided with a period of strong economic growth and associated skills shortages, and followed a 2001 Department of Labour review of temporary work policy. A key outcome from the review was Cabinet's agreement to "an overarching work policy objective, which was that work policy should complement residence policy by contributing to developing New Zealand's capacity base" (Merwood 2006).

Research has also shown that temporary workers and students who have lived and worked in New Zealand are more likely to integrate well as permanent migrants. One recent report concluded that "encouraging more migrants to make use of temporary permits before applying for permanent residence in New Zealand may be beneficial to both migrants and New Zealand" (Department of Labour 2009). Temporary migration developed into an important pathway for prospective permanent migrants. From 2002 onwards a number of new work-to-residence policies were introduced, while the introduction of other policies, such as the Skilled Migrant Category, provided greater recognition of New Zealand work experience and qualifications (Merwood 2006).

As a result of these policy changes and the growing economy, the number of temporary permits issued rose consistently year on year through most of the decade to 2010. With the onset of the global economic crisis, and consequent reduction in labour demand, the number of temporary migrants being granted permits in New Zealand decreased, but this didn't happen consistently across all immigration categories. While the number of temporary approvals decreased in labour market tested policies such as Essential Skills, the number of working holidaymakers has continued to increase in recent years (Department of Labour 2010). The rise in temporary migration over the decade and the continued growth in some categories raise the question of whether there may be negative side effects on the employment opportunities available to New Zealanders. This study begins to answer this question.

While a number of reports have estimated the impact of immigration generally on the outcomes of New Zealanders, no studies have looked at temporary migration specifically. Data limitations associated with survey data sources mean that temporary migrants are not separately identified. In fact, in many cases, responses from temporary migrants are not sought or captured.

Temporary migration to New Zealand

Temporary migration to New Zealand includes people categorised broadly as workers and students. Temporary work policies are broadly designed to "allow employers to recruit workers from overseas to meet particular or seasonal labour shortages while protecting employment opportunities and conditions for New Zealand workers" (Department of Labour 2011). International student policies have a focus on attracting and developing students who have the skills and talents New Zealand needs. They also aim to increase global connectedness, support sustainable growth of export education capability, earn foreign exchange, and strengthen New Zealand education while managing risk to New Zealand and maintaining social cohesion (ibid.).

While estimates of the number of international students undertaking paid work vary, Ministry of Education (2008) research indicated that 35% of students were in part-time work.

Not surprisingly, most migrants in other temporary categories work while in New Zealand. Examples of work visa categories include:

- Essential Skills - facilitates the entry of people required on a temporary basis to fill job shortages where New Zealand citizens or residents are not available.

- Working Holiday Schemes – bilateral schemes which allow young people to work and study while in New Zealand if the primary intention for their visit is to holiday.

- Horticulture and Viticulture policies such as the Recognised Seasonal Employer scheme - allows horticulture and viticulture businesses to supplement their New Zealand workforce with migrant workers.

- Family – allows partners of New Zealand citizens, residents, and work or student visa holders to work in New Zealand.

The impact of immigration on native employment

Numerous studies have examined the impact of immigration on native employment, particularly focussing on effects on total employment and/or wages (examples include Altonji & Card 1991, Borjas 2003, Dustmann et al. 2005, Longhi et al. 2004, and Card 2001). The overall consensus from a wide range of studies is that the impact of immigration on the labour market outcomes of natives is small at worst. Bauer et al (2011) conclude that "Although simple theoretical models suggest that an increase in labor supply due to immigration may result in lower wages and/or higher unemployment of natives if they are perfect substitutes to immigrants, empirical studies typically conclude that immigration has economically irrelevant or no effects on wages and employment of natives". Recent New Zealand studies have tended to back up this general conclusion (Mare and Stillman 2009, Tse and Maani 2012).

Studies frequently use regional variation in the share of immigrants in the population to estimate the impact of immigration. They either take advantage of natural experiments or use econometric methods such as instrumental variables (IV) and fixed effects estimation to address endogeneity concerns associated with migrants' non-random location choices.

Few studies have looked specifically at temporary migration, however, or at hiring as an outcome of concern, with the odd exception to the latter (e.g. Wagner 2008). Poot and Cochrane (2004) noted that "taking labour market dynamics into account … the impact of immigration on layoff rates or hiring rates can also be investigated" however "the impact of immigration on labour turnover and transitions appears as yet not researched".

Data – The IDI Prototype

In 2011, Statistics New Zealand began bringing together a series of its linked datasets into the Integrated Data Infrastructure (IDI) prototype. This followed a successful proposal for Migrant Levy funding, and included linking the then Department of Labour's immigration and international movements data with other linked longitudinal databases (Statistics New Zealand 2012). This paper takes advantage of the new link between immigration data and the Inland Revenue data which sit at the core of the IDI prototype. Access to these data is controlled by Statistics New Zealand, following strict security and confidentiality conditions as set out in Note 1. With these data we are able to identify immigrants on temporary visas, and to link this to information on earnings, industry and location of employment, and receipt of social security benefits for both temporary migrants and New Zealand citizens and residents. Our analysis uses monthly earnings data to construct spells in employment, and hence to identify when people are hired.

Population of interest

While all New Zealand residents and citizens could be considered as being at risk of adverse outcomes due to a migration-related labour supply shock, those most disadvantaged in the labour market may be at greater risk. This is partly due to the lack of attachment these groups have to the labour market, and partly due to an increased likelihood that they may be substitutes for temporary migrants in low-skilled industries, and/or part-time, seasonal or fixed-term work.

Our analysis examines two groups that might be considered as being particularly disadvantaged. Firstly, those who are in receipt of a benefit and have therefore been out of work for long enough to require income support, and young people (aged 16 to 24) not in receipt of a benefit, who may be entering the labour market for

the first time or seeking short-term work. Youth experience high unemployment and have been particularly affected by the recent recession. They tend to have less experience and fewer skills than other people, making them less likely to be hired and more likely to be laid off, and they often lack both labour market information and job search expertise (Department of Labour n.d.).

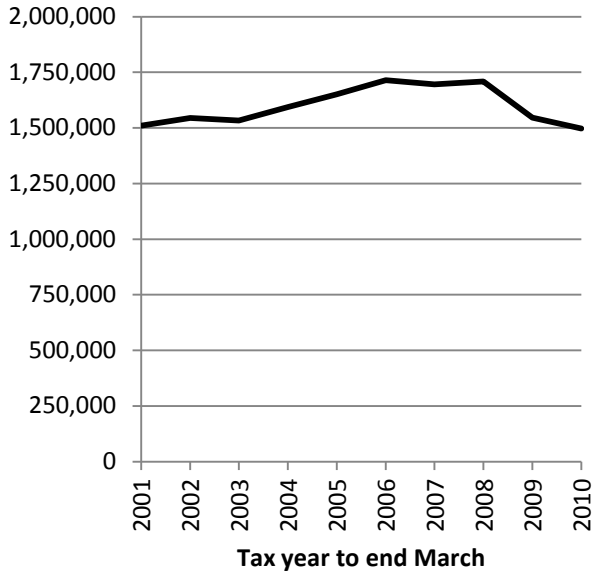
Descriptive analysis of hires

In order to better understand the changes in hiring patterns over recent years, we first present some high level time series broken down by industry, region and migrant visa type. This shows that the number of temporary migrants have grown considerably over the last decade, a period during which overall hiring increased for many years, before falling since 2008.

High level trends in hiring

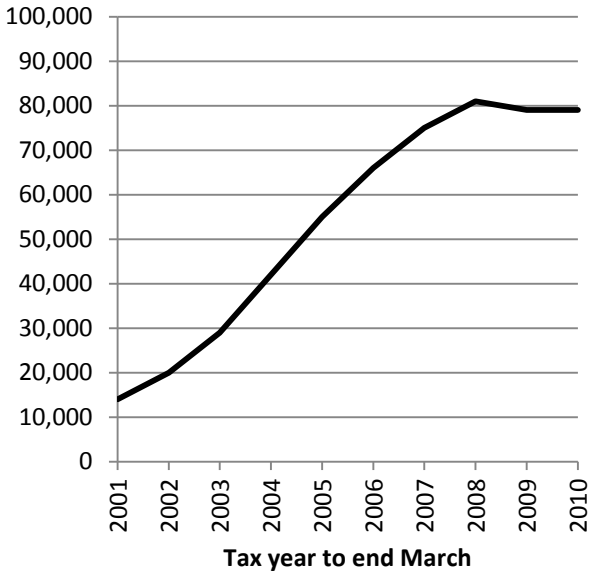
Figure 1 below shows the general trend in hiring over the last ten tax years. The general positive economic conditions were associated with increases in hiring over most of the decade, while hiring dropped considerably in 2009, and continued to drop to a decade-low level in the 2010 tax year. Figure 2 clearly shows the growth in temporary migration over the decade, with increases checked in recent years as the economic crisis took hold. Over the decade, temporary migrant hires rose from 1% to 5% of all hires.

Figure 1 – Total hires by tax year



Source: Figures have been extracted from the IDI prototype managed by Statistics NZ.
Note: All counts behind this graph have been rounded using graduated random rounding to protect confidentiality.

Figure 2 – Temporary migrant hires by tax year



Source: Figures have been extracted from the IDI prototype managed by Statistics NZ.
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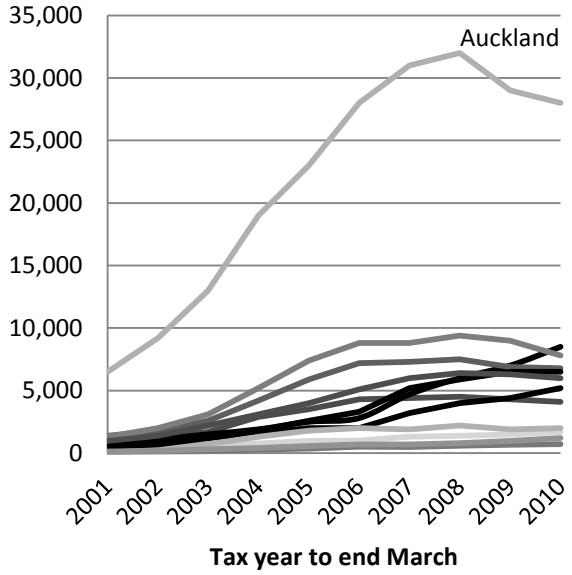
Trends in temporary migrant hiring by industry, region, and category

For the purposes of our analysis, we break down hires according to the industry of the employer and the region of employment. We combine a few small regional council areas such that we end up with 12 regional areas (which match regions used in reporting of the Household Labour Force survey), and break down industry of employment into 21 categories. Industry categories were selected based on a desire to separately represent large industries (e.g. Construction and Manufacturing), while providing extra detail in industries in which temporary migrants tend to be employed (e.g. in Agriculture). Definitions of industries and regions are outlined in the Appendix.

Temporary migrant hires by region are represented in Figures 3 and 4 below. Auckland dominates the number of temporary migrant hires, reflecting its size and dominance of the New Zealand economy. Other regions are shown more clearly in Figure 4, which excludes Auckland. While the regions that include the other main centres (Wellington, Canterbury, Otago and Waikato) also show large numbers of temporary migrant hires, it is in some of the smaller provincial centres where the most sustained growth in temporary migrant hires can be observed (especially Bay of Plenty, Tasman / Nelson / Marlborough / West Coast, and Gisborne / Hawke's Bay).

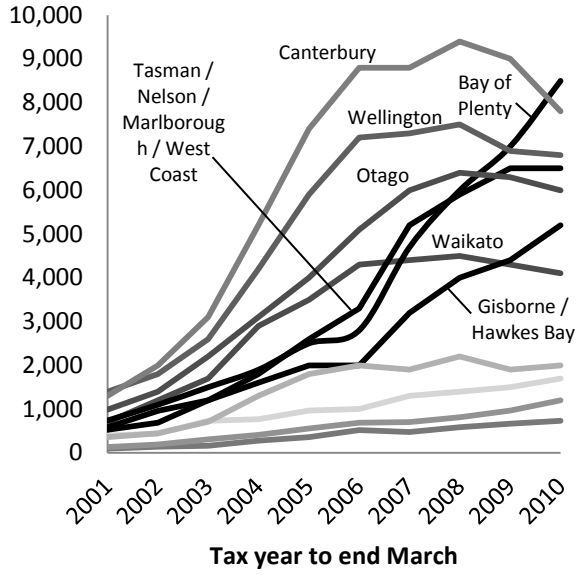
In these latter three regions the number of temporary migrants hired has continued to grow after the onset of the financial crisis, and in contrast to the larger centres. In 2010 temporary migrant hires made up 9% of all hires in Tasman / Nelson / Marlborough / West Coast, and 8% of all hires in Bay of Plenty, higher than in any other region.

Figure 3 – Temporary migrant hires by region and tax year



Source: Figures have been extracted from the IDI prototype managed by Statistics NZ.
Note: All counts behind this graph have been rounded using graduated random rounding to protect confidentiality.

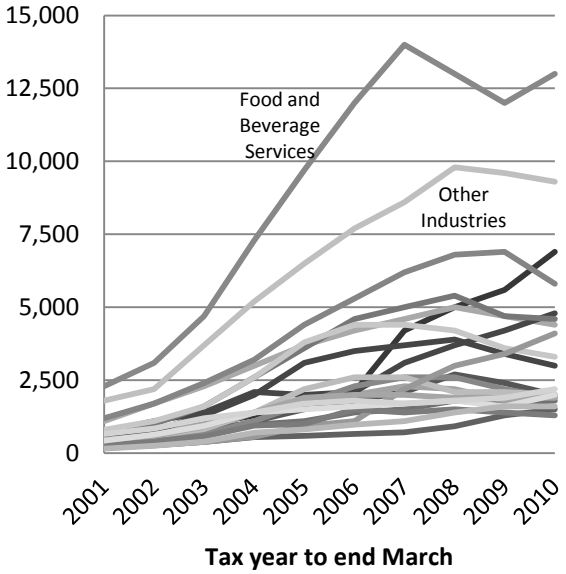
Figure 4 – Temporary migrants hires region and tax year (excluding Auckland)



Source: Figures have been extracted from the IDI prototype managed by Statistics NZ.
Note: All counts behind this graph have been rounded using graduated random rounding to protect confidentiality.

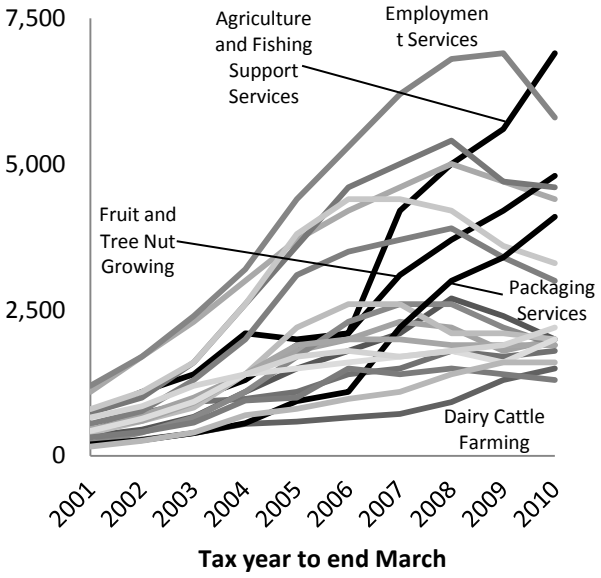
Figure 5 shows temporary migrant hires broken down by industry and tax year. Food and beverage services dominate the temporary migrant hires data. Once these are excluded from Figure 6 (as well as the residual "Other industries" category), some different patterns emerge. The most striking of these is the continued post-recession growth in industries largely associated with the horticultural sector – Fruit and Tree Nut Growing, Agriculture and Fishing Support Services, and Packaging Services. Temporary migrants made up 15%, 18% and 22% of all hires in these three industries respectively in 2010. These are higher than in any other industry, consistent with the growth in hiring in horticulture-based provincial centres highlighted above.

Figure 5 - Temporary migrants hires by industry and tax year



Source: Figures have been extracted from the IDI prototype managed by Statistics NZ.
Note: All counts behind this graph have been rounded using graduated random rounding to protect confidentiality.

Figure 6 - Temporary migrant hires excluding Food and Beverage Services & Other Industries)

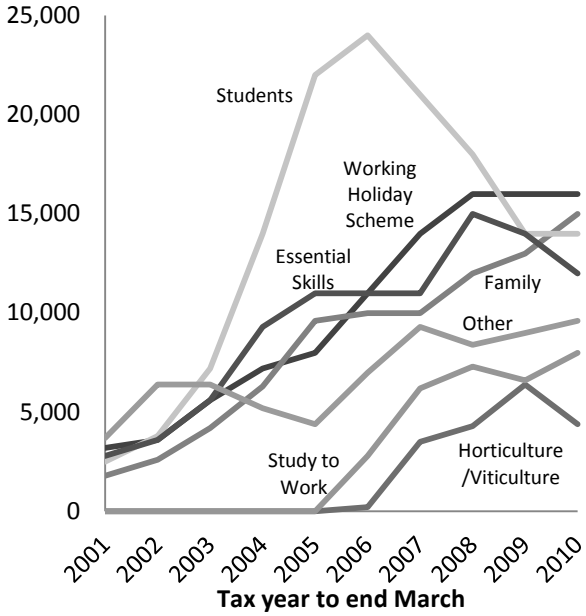


Source: Figures have been extracted from the IDI prototype managed by Statistics NZ.
Note: All counts behind this graph have been rounded using graduated random rounding to protect confidentiality.

Trends for beneficiaries and youth

Figure 7 presents temporary migrant hires according to the type of visa the migrant was most recently issued (migrant category). A drop in hires of international students in recent years is consistent with a drop in the number of student visas issued, while growth in Working Holiday scheme hires is also consistent with growth in this category – although in the case of hires, the number levels off after the global financial crisis. Perhaps the most striking year-on-year growth has been in hires of partners through the family stream. The relatively small number of hires under Horticulture/Viticulture categories highlights the fact that this industry commonly employs temporary migrants who are granted visas under a wide range of categories.

Figure 7 – Temporary migrant hires by migrant category and tax year

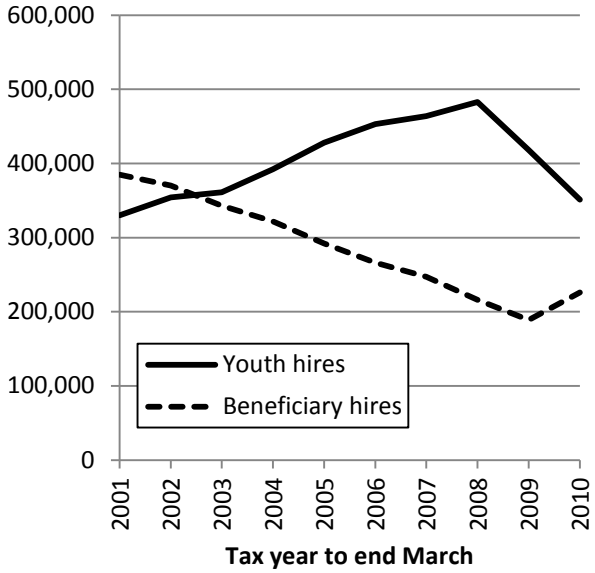


Source: Figures have been extracted from the IDI prototype managed by Statistics NZ.
Note: All counts behind this graph have been rounded using graduated random rounding to protect confidentiality.

Figure 8 shows the contrasting changes in hires amongst beneficiaries and youth. While youth hires generally mimic the economic conditions driving total hiring, beneficiary hires are more responsive to changes in beneficiary numbers, which fell over the decade before rebounding in 2009 and 2010. As the number of beneficiaries dropped over the decade, hires of beneficiaries also dropped. The turning point happened a year later than for other groups, with beneficiary hires showing a lagged response to changes in benefit numbers, increasing in the 2010 tax year.

The key research question for the purpose of this study is whether there is any evidence that the significant growth in temporary migration over the last decade has had a negative impact on hiring of New Zealanders, especially beneficiaries and youth.

Figure 8 – Youth and beneficiary hires by tax year



Analytical approach

Similar to other approaches common in the literature, our approach relates a measure of migrant prevalence (in our case the number of temporary migrant hires) to labour market outcomes of natives (in our case the number of hires of New Zealand citizens or residents). The methods usually include control variables for individual characteristics of natives, and/or regional characteristics. Fixed effects for time and/or region are often included to control for unobservable characteristics, and instrumental variable estimation is usually adopted to account for the fact that migrant share cannot be assumed to be exogenous with respect to labour market outcomes in a region and/or time.

The IDI data allows us to identify people who are working according to certain characteristics (such as their income, location, gender and age) as well as characteristics of the employer they are working for (such as industry and number of employees). It does not allow us to robustly identify those people who are not earning an income, and as such it is difficult to document hiring outcomes at the individual level. As is common in the literature we therefore use outcomes data aggregated over geographic areas and time periods. However we extend such approaches by aggregating at the industry level as well.

Various specifications are outlined in Figure 9, and were estimated first through OLS regression, with and without fixed effects, and then through IV estimation. Specifications (1) and (2) are models aggregated by year and region, and year and industry respectively. Specification (3) provides a more detailed year by industry by region (i.e. local industry) specification, while

specification (4) includes not only direct within-industry effects of migration, but also indirect cross-industry effects. The motivation for this approach is discussed below

Figure 9 – Model specifications

Regional variation:

$$\ln H_{rt}^{NZ} = \alpha + \beta \ln H_{rt}^{M} + \gamma\left(\ln E_{rt} - \ln E_{r(t-1)}\right) + \delta_r + \delta_t + \varepsilon_{rt} \quad (1)$$

Industry variation:

$$\ln H_{it}^{NZ} = \alpha + \beta \ln H_{it}^{M} + \gamma\left(\ln E_{it} - \ln E_{i(t-1)}\right) + \delta_i + \delta_t + \varepsilon_{it} \quad (2)$$

Local industry variation:

$$\ln H_{irt}^{NZ} = \alpha + \beta \ln H_{irt}^{M} + \gamma\left(\ln E_{irt} - \ln E_{ir(t-1)}\right) + \theta \ln U_{rt} + \delta_{ir} + \delta_{it} + \varepsilon_{irt} \quad (3)$$

Local industry variation with indirect effects:

$$\ln H_{irt}^{NZ} = \alpha + \beta_1 \ln H_{irt}^{M} + \beta_2 \ln\left(H_{rt}^{M} - H_{irt}^{M}\right) + \gamma\left(\ln E_{irt} - \ln E_{ir(t-1)}\right) + \theta \ln U_{rt} + \delta_{ir} + \delta_{it} + \varepsilon_{irt} \quad (4)$$

Where:

$H_{\cdot}^{NZ}$ = Hires of New Zealanders (i.e. 'Beneficiaries', 'Youth', or 'Other NZ Citizens or Residents').
$H_{\cdot}^{M}$ = Hires of temporary migrants.
$E_{\cdot}$ = Total employment (in months worked).
U_{rt} = Unemployment in region r, year t.
$\delta_{\cdot}$ = Fixed effects.
i = Industry.
r = Region.
i = Year.
α = Parameter estimate for the intercept.
β = Parameter estimates for temporary migrant hires.
γ = Parameter estimates for change in employment.
θ = Parameter estimates for regional unemployment.
$\varepsilon_{\cdot}$ = Error term.

As in the descriptive analysis above, we break our data into 12 regions. Our model tests the relationship between the number of temporary migrants hired in a particular year, industry and region and the number of New Zealand citizens and residents hired in that year, industry and region (broken down into the three groups described above). Since we are interested specifically in whether the former causes the latter, we need to control for unobserved characteristics, and account for the potential endogeneity of temporary migrant hires.

We do this in three ways. The first is by controlling for changes in regional and/or industry labour demand by including an aggregate employment change figure. We take the difference between the log of the months worked in an industry and/or region in the current year and the months worked in the previous year. In specifications (3) and (4) we also include regional unemployment derived from the Household Labour Force Survey to control for changes in local labour supply (especially of beneficiaries).

Secondly, we include a range of fixed effects to control for un-observables at the region, industry, and year level. These help control for differences in turnover rates, growth rate trends etc. Specifications (3) and (4) include more detailed fixed effects by industry and year, and by industry and region. The indirect migration effect in specification (4) by definition exhibits little variation across regions and years, and as such would be highly collinear with any year by region fixed effects. As such these are not included in the models.

Thirdly and finally, we attempt to instrument for the number of temporary migrants hired. This is potentially endogenous, given that migrants may be attracted to areas where overall hiring rates are unexpectedly high (given the industry, region, time influences controlled for by our fixed effects and control variables). Bauer et al (2011) note that an instrumental variable analysis will only "deliver consistent estimates of the effect of immigration on labor market outcomes if (i) our instrument is correlated with the share of foreigners in the labor force and (ii) if the only channel through which the instrument affects recent labor market outcomes is its effect on the regional distribution of foreigners". As noted by Poot and Cochrane (2004), one of the main challenges facing this type of analysis is finding appropriate instruments.

A common approach, which we adopt, is to use migration (in our case temporary migration hires) in the previous period. While this is clearly going to be highly correlated with current migration, if economic conditions are spatially persistent, there is a risk that the instrument will be highly correlated with current employment growth, and therefore not suitable as an instrument. Although this cannot be easily tested, we test the robustness of our analysis with a two-year lagged temporary migrant hire instrument. While on the one hand this instrument is more believably exogenous, on the other hand it is also weaker, as it is less correlated with current migration.

Results

Region models

The results from specification (1) above based on 12 regions and 10 time periods (2001 to 2010 tax years) are summarised in Table 1. As expected, the change in months employed has a strong positive relationship with the hiring of New Zealanders in each of the three models. The first column excludes fixed effects and instruments. We see a significant positive relationship between hires of temporary migrants and hiring of New Zealanders, consistent with the hypothesis that omitted and unobserved effects have a simultaneous effect on both temporary migrant hires and hires of New Zealanders.

Once we control for unobserved variables by including fixed effects, however, the positive effect disappears, and instead we have a significant negative effect in the case of Beneficiaries, a non-significant coefficient in the case of Youth, and a negative coefficient which becomes significant once IV estimation is adopted in the case of Other New Zealanders.

Industry models

We next ran models based on specification (2) above, using 21 industry groupings and 10 time periods. These results are reported in Table 2, and as before there is a strong positive association between temporary migrant

hires and hires of New Zealanders before fixed effects are included. Curiously, following the addition of fixed effects this specification resulted in a contradictory finding to the earlier one i.e. that temporary migration had a significant positive effect on hires of New Zealanders across all three groups, even once fixed effects were included and IV estimation undertaken.

Local industry models

The apparently contradictory results from the industry and region models could be explained by the failure of either of these specifications to control for local industry effects. Models based on the more detailed industry by region by year breakdown and including more detailed fixed effects were next run, following the model outlined in specification (3), and reported in Table 3. The results are similar to those based on the industry by year model, showing a positive (albeit slightly smaller) impact for all population groups.

Why might different specifications be giving different results?

One possible explanation for the different results is that impacts are occurring that are not captured by our model specification. The most obvious way this could be occurring is if temporary migration has an impact not only within an industry, but also across industries within a region. To explore this possibility further we examined changes in hiring in three industries within three regions with particularly strong growth in temporary migrant hires, as identified earlier.

Table 4 shows the change in temporary migrant hires, beneficiary hires, and youth hires in these regions and industries between 2001 and 2010. It is clear from this analysis that changes in temporary migrant hires, beneficiary hires, and youth hires are not always well correlated by industry within regions. The patterns also seem to differ markedly across regions.

For example:

- In Bay of Plenty – Temporary migration growth has been concentrated in the Packaging Services, and Agriculture and Fishing Support Services industries. Relative falls in beneficiary hires have been greatest in Fruit and Tree Nut Growing and growth in youth hires has been slow in this industry. Growth in hiring in Packaging Services has been strong across all groups.

- In Gisborne / Hawkes Bay – Temporary migration hires have experienced strong growth in Fruit and Tree Nut Growing and Agriculture and Fishing Support Services. Falls in beneficiary hires in these industries have been consistent with falls across the board. Youth hires have fallen by 17% in Fruit and Tree Nut Growing, but grown by 27% in Agriculture and Fishing Support Services.

- In Tasman / Nelson / Marlborough / West Coast - Temporary migrant hires have grown most strongly in Agriculture and Fishing Support Services. Decreases in beneficiary hires have been smaller in relative terms in this industry than across all industries, while youth have experienced a 37% increase in hires in this industry. Both Beneficiaries and Youth have had large decreases in the number of hires in Fruit and Tree Nut Growing in this region.

While this descriptive analysis does not demonstrate that cross-industry impacts of immigration are occurring, it does raise this possibility. The rise of temporary migration may be linked with changes in the way jobs are done in the sectors temporary migrants enter, with employment of migrants (and New Zealanders) potentially now occurring in industries where those jobs were not traditionally based, possibly through intermediaries.

Local industry models allowing for indirect effects

We expand our model as in specification (4) to include explicit allowance for indirect effects. Results are presented in Table 5. Doing this does not change the estimated positive direct effect of migration to any great degree, but it does introduce a compensating negative indirect effect. For Beneficiaries and Other New Zealanders, there is no evidence that this combined effect is different from zero, while for youth there remains a small significant positive impact. Once we test our findings using a second lagged instrument however, the aggregate estimated impact of temporary migration is not significantly different from zero for any population of New Zealanders defined in our study, partly due to lower statistical precision.

Conclusions

Migrants tend to go to areas and industries where a lot of hiring is occurring. Once we control for this in our model, we still see an overall positive relationship between temporary migration and hiring of New Zealanders within an industry and region. Subsequent analysis, however, reveals a negative impact of temporary migration on other industries within the region. These effects seem to cancel each other out, so that overall temporary migration does not appear to impact on the hiring of New Zealanders.

While our analysis does not provide conclusive evidence that temporary migrants do not substitute New Zealand workers and jobseekers in the New Zealand labour market, we have found no evidence that this is the case in aggregate. We were able to draw on robust integrated administrative data, and apply a range of econometric methods to rule out spurious associations. As such, we believe the probability of the existence of large negative impacts which we have failed to identify to be small.

Although the hiring of temporary migrants does not seem to affect the chances of New Zealanders being hired, it does seem to affect the industries of the employers who are hiring them. For example, it may have spurred the emergence of labour market intermediaries (e.g. work brokers and employment agencies) that have aided the hiring of both temporary migrants and other jobseekers in particular industries and regions. This may be associated with other (positive or negative) changes in the conditions of their employment, and temporary migration may have other consequences for New Zealand we haven't yet been able to test for.

While we have not found evidence of substitution effects, temporary migration should not be viewed as either a blanket or permanent solution to labour market skills shortages, nor should policy settings be immune to scrutiny or review. Policy and operational reviews are undertaken on a regular basis by government departments, in consultation with external parties, and our findings will help to inform this work.

Next Steps

Future work will attempt to identify whether there are specific immigration policies, regions, or industries where substitution effects may be occurring, will assess any changes in the impact of migration following the economic downturn of recent years, and will expand the analysis to consider other potential adverse effects for New Zealanders. The most obvious of these effects is wage suppression. While wage data are not currently available in the IDI, monthly earnings are available. Future research will look at whether there is evidence that temporary migration has constrained earnings growth (which could occur either through suppressing wages increases, or affecting hours worked).

Notes

1. This paper was undertaken while the authors were on secondment to Statistics New Zealand. The results in this paper are not official statistics, they have been created for research purposes from the Integrated Data Infrastructure (IDI) prototype managed by Statistics NZ. On-going work within Statistics NZ to develop the IDI means it will not be possible to exactly reproduce the data presented here.

   The opinions, findings, recommendations and conclusions expressed in this paper are those of the authors. Statistics NZ takes no responsibility for any omissions or errors in the information contained here.

   Access to the data used in this study was provided by Statistics NZ in accordance with security and confidentiality provisions of the Statistics Act 1975. Only people authorised by the Statistics Act 1975 are allowed to see data about a particular person, business or organisation. The results in this paper have been confidentialised to protect individual people and businesses from identification.

   Careful consideration has been given to the privacy, security and confidentiality issues associated with using administrative data in the IDI prototype. Further detail can be found in the Privacy impact assessment for the Integrated Data Infrastructure available from www.stats.govt.nz.

   The results are based in part on tax data supplied by Inland Revenue to Statistics NZ under the Tax Administration Act 1994. This tax data must be used only for statistical purposes, and no individual information may be published or disclosed in any other form, or provided to Inland Revenue for administrative or regulatory purposes.

   Any person who has had access to the unit-record data has certified that they have been shown, have read, and have understood section 81 of the Tax Administration Act 1994, which relates to secrecy. Any discussion of data limitations or weaknesses is in the context of using the IDI prototype for statistical purposes, and is not related to the data's ability to support Inland Revenue's core operational requirements.

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Table 1 – Region by year models

* p<0.05, ** p<0.01, *** p<0.001

Source: Figures have been extracted from the IDI prototype managed by Statistics NZ.

Dependent variable	Log beneficiary hires				Log youth hires				Log other NZer hires			
Specification	OLS	OLS with FE	IV with FE	2nd lag IV	OLS	OLS with FE	IV with FE	2nd lag IV	OLS	OLS with FE	IV with FE	2nd lag IV
	β / se	β / se	β / se	β / se	β / se	β / se	β / se	β / se	β / se	β / se	β / se	β / se
Independent vars:												
Log temporary migrant hires	0.433***	-0.098***	-0.147***	-0.157**	0.617***	-0.001	-0.05	-0.142*	0.598***	-0.042	-0.098*	-0.171*
	[0.035]	[0.022]	[0.029]	[0.051]	[0.022]	[0.022]	[0.029]	[0.058]	[0.024]	[0.033]	[0.042]	[0.078]
Change log employment	9.402***	0.758*	0.791*	0.604	6.979***	1.976***	2.009***	2.545***	6.144***	3.458***	3.496***	4.260***
	[1.883]	[0.314]	[0.321]	[0.357]	[1.208]	[0.319]	[0.326]	[0.406]	[1.314]	[0.467]	[0.473]	[0.549]
IV tests:												
Anderson CC under-ID (H_0: NOT identified)			66.76	20.61			66.76	20.61			66.76	20.61
Anderson p (ideally 0)			0	0			0	0			0	0
Cragg-Donald Weak ID (H_0:Weak: ideally big)			139.24	20.5			139.24	20.5			139.24	20.5
Stock-Yogo crit val (10%)			16.38	16.38			16.38	16.38			16.38	16.38
Observations	108	108	108	96	108	108	108	96	108	108	108	96
Adj R squared	0.59	1	1	1	0.87	1	1	1	0.84	1	1	1
Adj R squared excl. FE		0.18	0.14	-0.04		0.25	0.22	0.05		0.33	0.31	0.34

* p<0.05, ** p<0.01, *** p<0.001

Source: Figures have been extracted from the IDI prototype managed by Statistics NZ.

Table 2 – Industry variation models

Dependent variable	Log beneficiary hires				Log youth hires				Log other NZer hires			
Specification	OLS	OLS with FE	IV with FE	2nd lag IV	OLS	OLS with FE	IV with FE	2nd lag IV	OLS	OLS with FE	IV with FE	2nd lag IV
	β / se	β / se	β / se	β / se	β / se	β / se	β / se	β / se	β / se	β / se	β / se	β / se
Independent vars:												
Log temporary migrant hires	0.514***	0.212***	0.218***	0.315***	0.819***	0.211***	0.172***	0.211**	0.609***	0.246***	0.196***	0.239*
	[0.060]	[0.040]	[0.049]	[0.085]	[0.049]	[0.039]	[0.048]	[0.078]	[0.059]	[0.043]	[0.053]	[0.094]
Change log employment	3.034*	0.486*	0.483*	0.386	2.951**	1.237***	1.261***	1.245***	2.518	1.099***	1.129***	1.058***
	[1.400]	[0.219]	[0.219]	[0.224]	[1.138]	[0.214]	[0.216]	[0.207]	[1.371]	[0.238]	[0.239]	[0.247]
IV tests:												
Anderson CC under-ID (H_0: NOT identified)			124.69	46.53			124.69	46.53			124.69	46.53
Anderson p (ideally 0)			0	0			0	0			0	0
Cragg-Donald Weak ID (H_0:Weak: ideally big)			306.35	52.86			306.35	52.86			306.35	52.86
Stock-Yogo crit val (10%)			16.38	16.38			16.38	16.38			16.38	16.38
Observations	189	189	189	168	189	189	189	168	189	189	189	168
Adj R squared	0.27	0.99	0.99	0.99	0.59	0.99	0.99	0.99	0.35	0.99	0.99	0.99
Adj R squared excl. FE		0.16	0.16	0.09		0.27	0.26	0.28		0.24	0.23	0.21

* p<0.05, ** p<0.01, *** p<0.001

Source: Figures have been extracted from the IDI prototype managed by Statistics NZ.

Table 3 – Local industry variation models

Dependent variable	Log beneficiary hires				Log youth hires				Log other NZer hires			
Specification	OLS	OLS with FE	IV with FE	2nd lag IV	OLS	OLS with FE	IV with FE	2nd lag IV	OLS	OLS with FE	IV with FE	2nd lag IV
	β / se	β / se	β / se	β / se	β / se	β / se	β / se	β / se	β / se	β / se	β / se	β / se
Independent vars:												
Log temporary migrant hires	0.443***	0.095***	0.186***	0.349***	0.697***	0.107***	0.165***	0.201**	0.539***	0.082***	0.117***	0.301***
	[0.015]	[0.010]	[0.024]	[0.083]	[0.013]	[0.008]	[0.020]	[0.062]	[0.014]	[0.010]	[0.025]	[0.085]
Change log employment	2.011***	0.778***	0.710***	0.615***	1.502***	0.778***	0.735***	0.775***	1.730***	1.111***	1.085***	1.033***
	[0.320]	[0.059]	[0.062]	[0.103]	[0.279]	[0.049]	[0.052]	[0.077]	[0.308]	[0.061]	[0.063]	[0.106]
Log regional unemployment rate	0.234***	0.098***	0.110***	0.135***	0.04	-0.084***	-0.076***	-0.057***	0.224***	-0.087***	-0.082***	-0.059**
	[0.027]	[0.015]	[0.015]	[0.020]	[0.023]	[0.012]	[0.013]	[0.015]	[0.025]	[0.015]	[0.015]	[0.021]
IV tests:												
Anderson CC under-ID (H_0: NOT identified)			374.63	44.51			374.95	44.54			374.79	44.54
Anderson p (ideally 0)			0	0			0	0			0	0
Cragg-Donald Weak ID (H_0:Weak: ideally big)			364.78	36.39			365.17	36.39			364.97	36.39
Stock-Yogo crit val (10%)			16.38	16.38			16.38	16.38			16.38	16.38
Observations	2253	2253	2253	2002	2255	2255	2255	2003	2254	2254	2254	2003
Adj R squared	0.58	0.99	0.99	0.99	0.75	1	1	1	0.67	0.99	0.99	0.99
Adj R squared excl. FE		0.13	0.1	-0.09		0.2	0.18	0.19		0.18	0.18	0.05

* p<0.05, ** p<0.01, *** p<0.001

Source: Figures have been extracted from the IDI prototype managed by Statistics NZ.

Table 4 – Changes in the number of hires from 2001 to 2010 tax years in selected regions, selected industries, and across all industries

Region	Temporary migrants	Beneficiaries		Youth	
Industry	Change hires 2001-2010	Change hires 2001-2010	% change 2001-2010	Change hires 2001-2010	% change 2001-2010
Bay of Plenty					
Fruit and Tree Nut Growing	540	-1,300	-54%	130	15%
Agriculture and Fishing Support Services	2,110	-700	-37%	400	57%
Packaging Services	2,925	1,300	54%	1,410	178%
Total all industries	7,760	-10,000	-32%	4,000	24%
Gisborne / Hawkes Bay					
Fruit and Tree Nut Growing	1,530	-2,800	-53%	-400	-17%
Agriculture and Fishing Support Services	1,310	-1,700	-50%	300	27%
Packaging Services	570	-760	-54%	20	6%
Total all industries	4,610	-20,000	-51%	2,000	11%
Tasman/Nelson/Marlborough/West Coast					
Fruit and Tree Nut Growing	1,130	-2,800	-74%	-700	-30%
Agriculture and Fishing Support Services	2,465	-330	-30%	190	37%
Packaging Services	154	-230	-64%	-40	-21%
Total all industries	5,970	-12,200	-55%	1,000	7%

Source: Figures have been extracted from the IDI prototype managed by Statistics NZ.
Note: All counts behind this table have been rounded using graduated random rounding to protect confidentiality.

Table 5 – Local industry variation models with indirect effects across industries

Dependent variable	Log beneficiary hires				Log youth hires				Log other NZer hires			
Specification	OLS β / se	OLS with FE β / se	IV with FE β / se	2nd lag IV β / se	OLS β / se	OLS with FE β / se	IV with FE β / se	2nd lag IV β / se	OLS β / se	OLS with FE β / se	IV with FE β / se	2nd lag IV β / se
Independent vars:												
Log temporary migrant hires (direct effect)	0.717*** [0.015]	0.132*** [0.010]	0.266*** [0.027]	0.387*** [0.086]	0.873*** [0.014]	0.119*** [0.009]	0.209*** [0.023]	0.224*** [0.068]	0.669*** [0.016]	0.104*** [0.010]	0.169*** [0.028]	0.328*** [0.088]
Log temporary migrant hires (indirect effect)	-0.709*** [0.022]	-0.160*** [0.013]	-0.265*** [0.020]	-0.388*** [0.049]	-0.456*** [0.021]	-0.054*** [0.011]	-0.148*** [0.017]	-0.238*** [0.038]	-0.338*** [0.024]	-0.097*** [0.013]	-0.171*** [0.020]	-0.272*** [0.050]
Change log employment	1.449*** [0.264]	0.736*** [0.057]	0.626*** [0.063]	0.563*** [0.107]	1.141*** [0.253]	0.763*** [0.049]	0.688*** [0.053]	0.744*** [0.084]	1.462*** [0.296]	1.085*** [0.060]	1.030*** [0.064]	0.997*** [0.109]
Log regional unemployment rate	0.679*** [0.026]	0.062*** [0.014]	0.054*** [0.015]	0.042* [0.019]	0.321*** [0.025]	-0.095*** [0.012]	-0.107*** [0.013]	-0.114*** [0.015]	0.436*** [0.029]	-0.108*** [0.015]	-0.118*** [0.016]	-0.124*** [0.020]
H_0: Combined effects=0												
F statistic	0.20	4.49	0.00	0.00	588.84	31.22	9.69	0.09	272.48	0.21	0.01	0.86
P value	0.65	0.03	0.98	0.99	0.00	0.00	0.00	0.76	0.00	0.65	0.93	0.35
IV tests:												
Anderson CC under-ID (H_0: NOT identified)			330.35	44.88			330.64	44.88			330.5	44.88
Anderson p (ideally 0)			0	0			0	0			0	0
Cragg-Donald Weak ID (H_0:Weak: ideally big)			157.05	18.33			157.22	18.33			157.13	18.33
Stock-Yogo crit val (10%)			7.03	7.03			7.03	7.03			7.03	7.03
Observations	2253	2253	2253	2002	2255	2255	2255	2002	2254	2254	2254	2002
Adj R squared	0.72	0.99	0.99	0.99	0.8	1	1	1	0.69	0.99	0.99	0.99
Adj R squared excl. FE		0.19	0.11	-0.09		0.21	0.16	0.11		0.2	0.18	0.07

* p<0.05, ** p<0.01, *** p<0.001

Source: Figures have been extracted from the IDI prototype managed by Statistics NZ.

Appendix – Industry and region groupings

Table A1 - Industry groupings presented in the analysis

Industry	Industry description	ANZSIC 2006 codes included
A013	Fruit and Tree Nut Growing	Group A013
A016	Dairy Cattle Farming	Group A016
A052	Agriculture and Fishing Support Services	Group A052
A999	Other Agriculture, Forestry and Fishing	Groups A011, A012, A014, A015, A017, A018, A019, A020, A030, A041, A042, A051
C999	Manufacturing	Division C
E999	Construction	Division E
F999	Wholesale Trade	Division F
G411	Food Retailing	Group G411
G999	Other Retail Trade	Groups G391, G392, G400, G412, G421-G427, G431, G432
H440	Accommodation	Group H440
H999	Food and Beverage Services	Groups H451-H453
M999	Professional, Scientific and Technical Services	Division M
N721	Employment Services	Group N721
N731	Building Cleaning, Pest Control and Gardening Services	Group N731
N732	Packaging Services	Group N732
N999	Other Administrative and Support Services	Groups N722, N729
P810	Tertiary Education	Group P810
P999	Other Education and Training	Groups P801, P802, P821, P822
Q860	Residential Care Services	Group Q860
Q999	Other Health Care and Social Assistance	Groups Q840, Q851-Q859, Q871, Q879
Z999	Other Industries	Divisions B, D, I, J, K, L, O, R, S

Table A2 – Region groupings

#	Region grouping
1	Northland
2	Auckland
3	Waikato
4	Bay of Plenty
5	Gisborne / Hawkes Bay
6	Taranaki
7	Manawatu - Wanganui
8	Wellington
9	Tasman / Nelson / Marlborough / West Coast
10	Canterbury
11	Otago
12	Southland