

12th Global Forum on Tourism Statistics

Theme 2 - business registers: the cornerstone of a high quality system of tourism statistics?

New Zealand's Integrated Data Infrastructure - A hotbed for analysis of tourism industries and employment

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1. Introduction

Information about tourism has almost exclusively relied on survey data sources in the past. Different fields within tourism statistics have generated useful insights using modern survey methods and techniques for analysing these data. However as the demand for information continues to grow, we are increasingly looking to administrative data and linked survey and administrative data to generate new information and insights.

Administrative data can have significant advantages over survey data by providing full population coverage, enabling detailed analysis by sector and region for example. Nor do they suffer from non-response, attrition or under-reporting. In addition administrative data have a longitudinal structure which enables individuals and firms to be followed over time and supports the answering of important questions on the effectiveness of policies and programmes.

National statistical offices are increasingly relying on administrative data from the tax system to maintain their core statistical infrastructure, including person and business registers. In New Zealand the business register is now maintained through tax registrations and information on employment from the employers' tax returns of individual employee earnings and tax deducted at source. The Business Frame and the Linked Employer-

Employee Dataset are the central planks of Statistics New Zealand's Integrated Data Infrastructure (IDI), which includes a wide range of person and firm data at unit-record level from administrative and survey sources.

Over the last ten years various administrative and survey data sources on businesses and individuals has been progressively linked together for statistical and research purposes. This data is increasingly being used to generate information on individuals, businesses and industries. Statistics New Zealand's Integrated Data Infrastructure (IDI) was established in 2011 and consolidated the various data linkage projects into a single database.

The IDI is a high quality and comprehensive unit-record level database which provides a rich and multi-dimensional resource for policy makers and researchers, both within government and academia. Since administrative datasets began to be linked together the volume of micro-data research has increased significantly in New Zealand. Examples include detailed industry and regional analysis of employment, turnover, job creation and destruction, analysis of the impact of business assistance programmes on performance, analysis of the impact of gaining different types of qualifications through institutions and workplace-based training on subsequent earnings (including tourism related qualifications). The IDI opens up opportunities for much improved analysis and reporting of the tourism industries, employment and productivity.

2. The Business Frame

The Business Frame is a critical element of the Linked Employer-Employee Dataset (LEED) and the Longitudinal Business Database (LBD) which are brought together in Statistics New Zealand's Integrated Data Infrastructure (IDI).

The Business Frame (BF) is a statistical register of the economic units which make up the New Zealand economy. It includes private businesses ranging from self-employed individuals to large corporations, as well as government departments, local authorities, churches and voluntary groups, and clubs and societies. It records details such as organisation name and addresses, predominant type of activity performed, institutional sector, employment levels, and the degree of overseas ownership. Its primary purpose is to provide an up to date and accurately classified list of all economically significant enterprises for designing, selecting and operating Statistics New Zealand's economic and financial survey program¹. It is also used to produce statistical outputs, including the annual Business Demography statistics.

¹ Statistics NZ has maintained a list of businesses for the purposes of generating survey populations for over 40 years. The list was maintained from a variety of sources including administrative lists of factories, other business lists and enumeration for retailing businesses. For a brief period of time before the Business Directory was set up in 1986 tax records of employers was used as an updating source. From 1986 to 1994 the BD was primarily maintained from: a) the Annual Business Directory Update Survey; b) monthly survey based on new compulsory GST registrations from IRD and; c) survey feed-back. In 1994 the BD coverage was extended to all

The maintained population for the Business Frame is economically significant² enterprises. The coverage of the Business Frame is maintained by continually monitoring business activity and employment levels to determine if the business meets the 'economic significance' requirements for birthing onto the Business Frame.

Over time there have been improvements and extensions to the coverage of the Business Frame, greater use of tax data as a source of industry and employment information, and greater use of tax data for frame maintenance, all resulting in improvements in timeliness and accuracy. There was a move away from a frame population based on contribution to outputs, measured in terms of financial variables such as sales, towards one which covered the all businesses operating in the New Zealand economy and registered for tax.

These changes enhance the Business Frame's ability to support longitudinal integration projects such as the Linked Employer-Employee Data (LEED) project, providing a frame that has comprehensive and timely coverage of businesses registered for tax, regardless of size.

The business activity indicator comes from Goods and Services Tax (GST) registrations and payments and information about the level of employment comes from the Employer Monthly Schedule (EMS), which details the wages and salaries paid to each person employed in the business during the calendar month. As at February 2013, there were 473,000 economically significant enterprises and the 508,000 locations (geographic units) at which they operate. About 147,000 enterprises and 176,000 locations had one or more employee.

The BF holds a link between the BF enterprise unit and the administrative tax unit, and is a source of standard classifications (e.g. industry) for other data that can be linked or matched to the frame.

There are three types of statistical unit on the BF: the enterprise; the kind of activity unit (KAU); and the geographic unit. The enterprises generally correspond to legal entities such as companies, statutory bodies, central and local government, sole proprietors, partnerships, trusts and incorporated clubs and societies. The geographic unit represents a business location engaged in one, or predominantly one, kind of economic activity at a single physical site or base (e.g. a factory, farm, office or shop).

GST registrations. The maintained population on the frame includes all non-agricultural units with annual GST activity > \$30,000 and all active agricultural units. In July 2003 a new maintenance strategy was introduced that extended the use of tax data for maintaining the BF and stopped the practice of collecting information directly from businesses directly in the Frame Update Surveys.

² An enterprise is said to be economically significant if it meets one or more of the following criteria; annual expenses or sales (subject to GST) of more than \$30,000; 12 month rolling mean employee count of greater than three; part of a group of enterprises; registered for GST and involved in agriculture or forestry; over \$40,000 of income recorded in the IR10 annual tax return.

Business Frame maintenance procedure have changed considerably over the last ten years, with many fewer businesses included in the Monthly and Annual Frame Update Surveys and greater reliance on administrative data collected through the tax system.

In 2004, all reporting units which reached economic significance were included in the Monthly Fame Update Survey (or Birth Survey), which collected information on geographic-enterprise structure and employment at each geographical location. In 2004 large and complex enterprises (Tier 1, approx. 45,000 enterprises) were surveyed at birth and received an update survey annually. Tier 1 enterprises included all those with multiple geographic units, and members of enterprise groups.) Medium sized enterprises (Tier 2, approx. 120,000 enterprises) were surveyed at birth and received an update survey at least once every three years. Small enterprises (Tier 3, approximately 227,000 enterprises) were surveyed at birth only if they were registered for both Goods & Services Tax (they were above the mandatory threshold or registered voluntarily) and Pay-As-You-Earn (i.e. they had at least one employee). Small firms were not re-surveyed unless they reached the threshold for Tier 2 (GST turnover of \$200,000).

Changes to the maintenance tier boundaries in 2007 lead to a reduction the number of Tier 1 enterprises from 45,000 in 2004 to 22,000 in 2008, and then to about 8,000 enterprises in 2011. The number of Tier 2 enterprises has reduced from 120,000 to 78,000 over the same period. Hence the number of enterprise being included in the Annual Frame Update Survey (AFUS) on an annual or tri-annual basis has declined substantially over 2004-2011 (Sanderson, 2013).

In 2014 further changes to boundaries and further reductions to the sample sizes of MFUS and AFUS are being made. The number of Tier 1 and Tier 2 enterprises has been reduced to about 6,100 and 64,000 respectively. Tier 1 enterprises will continue to be sampled annually, but only Tier 2 enterprises in selected industries³ (which comprise about one-third of all enterprises in Tier 2) will be included in AFUS over a three year period. Smaller firms (Tier 3) will no longer be surveyed at birth (i.e. when they met the 'economic significance' threshold). Small firms will not be surveyed unless they are in one of the specified industries and reach the threshold for Tier 2 (a GST turnover of \$1M or an employment count of 5 or more), or they reach the threshold for Tier 3 (GST turnover of \$65M or an employment count of 20 or more). The Business Frame Structure Update Survey continues to collect information on corporate group structure for groups of enterprises under common ownership and control.⁴ Approximately one-third of the 800 groups are surveyed each year.

³ The industries included are those likely to have transacting relating to balance of payments or those more likely to be undertaking research and development activities. Tourism industries such as accommodation, food and beverage and retail are not included.

⁴ The *Business Frame Structure Update Survey* collects information on corporate group structure for groups of enterprises and related economic entities under common ownership and control. The target population is the approximately 800 business groups that have more than five subsidiaries, with about 250 groups surveyed each year.

The monitoring of the PAYE data enables groups of employee's moving between firms to be identified which indicates possible changes to structure which are followed up. Enterprises are also contacted if key information is missing or inconsistencies are identified, or if responses to other business surveys indicate potential changes or inconsistencies.

Administrative reporting units may not be consistent with the statistical reporting units, for example, enterprises which have multiple geographic units may report under one tax number. There are also numerous instances of group filing, where more than one enterprise file under a single tax return, referred to as group reporting.

The new statistical unit model being implemented in 2014 will see fewer geographical representations (i.e. multi-geo enterprises) in the Business Frame (soon to be renamed the Business Register). These changes will likely have implications for the data coming through to LEED and IDI (for example information on the geographic location of business and workers). These are discussed further in the next section. There are also potential implications for the level of information held on Business Register about small and medium sized businesses (i.e. those employing fewer than 20 people) in tourism industries, like accommodation, food and beverage and retail as they will not be included in Annual Frame Update Survey, and administrative data will be relied on to maintain the frame.

2 Key components of the Integrated Data Infrastructure (IDI)

Statistics New Zealand's Integrated Data Infrastructure (IDI) was established in 2011 and consolidated the various data linkage projects into a single database. The Linked Employer-Employee Dataset (LEED) and the Longitudinal Business Database are key components of IDI, which includes a wide range of person and firm data at unit-record level from administrative and survey sources. In this section we provide a brief overview of LEED and the LBD, before going on to examine in the IDI in more detail.

2.1 Linked Employer-Employee Dataset (LEED)

The Linked Employer-Employee Dataset (LEED) brings together administrative data from the tax system on individuals and firms with information from the Business Frame, including geographic-enterprise structure of businesses. LEED has been available for statistical and research purposes since 2003. The data is anonymous and all outputs are confidentialised to ensure that no information about an individual person or business is disclosed.

Employers are required to report the wages and salaries paid (and tax deducted) for each person employed in their business in a given calendar month. This data comprises the Employer monthly Schedule (EMS), and contains information on individual's taxable income each month, as well as information on all other sources of taxable income, including welfare benefits, paid parental leave, earning compensation for injury, superannuation, student allowances and annual information on earnings from self-employment. The Inland Revenue

Department (IRD) also has information on individual's date of birth, and sex can be derived from title and first name. Information on location can be obtained from personal address information held by IRD, but it of variable quality due to the fact that many people's tax returns are completed automatically without them needing to contact the tax department. Information on location of their employer can also be used if they are working for a single-location enterprise.

The BF structure of enterprise and geographic unit is embedded in LEED and hence analysis is possible at both levels. However as discussed above the administrative data collection unit may not be consistent with a geographic-enterprise structure recorded in the BF. For example, enterprises which have multiple geographic units may report under a single tax number, and the existence of multiple locations may or may not be recorded on the BF (likely depends on the size of the enterprise). In cases where multiple locations are recorded in the BF and there is only one tax return employees are allocated to geographic units based on whatever location information is available. This can result in individuals moving between different geographical units within the same enterprise over time, although this has been reduced somewhat with improved allocation methods being implemented

The BF identifies legal entities and these can change over time despite the business continuing in the same location, economic activity and even ownership. When LEED was developed attempts were made to reduce this administrative churn through the creation of Permanent Business Numbers (PBN's) and the longitudinal tracking of geographic units over time through tracking flows of employees between geographic units. Seyb (2003) and Bycroft (2003) discuss the various data linkage and methodological issues in countered when integrating LEED with the Business Frame. Administrative churns that exists at the enterprise level can be reduced by using the PBN to identify continuing enterprises, as proposed by Fabling (2011).

The link through to the Business Frame provides the information on industry contained in LEED, so that employment, tenure, worker turnover, job creation and destruction can be examined by detailed industry and region. LEED and has been available since 2003 and provides monthly information on employment from April 1999 onwards.

LEED is used to generate official statistics on the number of filled jobs, job flows, worker flows, mean and median earnings for continuing jobs and new hires, and total earnings. This information gives an insight into the operation of the labour market. Other official labour market statistics (survey based) show changes in employment at an aggregate level and are significantly more timely than LEED currently. LEED statistics help explain what causes these aggregate movements and are therefore useful for explaining changes in the labour market at detailed industry level. An example of such an industry level analysis (focusing on tourism industries) is shown in section 4. The timeliness of LEED data available for use in the IDI environment is about to be improved quite substantially from a lag of 15 months to 3 months.

2.2. The Longitudinal Business Database (LBD) and the Longitudinal Business Frame (LBF)

The Longitudinal Business Frame (LBF) is created on a monthly basis from the Business Frame and provides longitudinal links for both enterprises and geographic units included in Business Frame. It has been produced since 2000. Business demography statistics are produced on an annual basis.

Legal entities can change over time despite the firm continuing in the same location, economic activity and even ownership. Hence the issue of repair of the enterprise links over time. Having good longitudinal identifiers is important since researchers often need to be able to observe the same unit over time to make causal inferences. However, firm identifiers in the LBF/LBD can be “broken” by, among other things, changes in the legal status of the firm. Fabling (2011) proposes a simple method for repairing broken firm identifiers, making use of existing plant migration data. Making such repairs materially reduces the apparent rate of business entry and exit, and allows real economic phenomena, such as small business incorporation, to be observed.

The LBF, with its economy-wide coverage and information on employment, location, industrial activity and firm ownership relationships, has many potential uses. These uses include: being an enhanced measure of Business Demographic data; being a source of age information for enterprises; identifying and tracking the components of enterprises involved in structural change; and linking through to various business surveys allowing the use of business survey data longitudinally for productivity and performance measurement. (Fabling 2009)

The Longitudinal Business Database (LBD) brings together data from Statistics NZ’s business surveys with various administrative data sources and allows for policy research and evaluation in a wide range of areas. The Statistics New Zealand website includes many examples: <http://www.stats.govt.nz/methods/research-papers/longitudinal-bus-dbase-research.aspx>. The LBD could be used to evaluate the effectiveness of the Tourism Growth Partnership launched in 2013, which provides government funding to business in develop new initiatives which will help the tourism sector achieve greater commercial and wider returns from high value visitors.

3. Bringing it all together: the Integrated Data Infrastructure

Statistics New Zealand’s Integrated Data Infrastructure (IDI) brings together unit record information on individuals and firms from various administrative and survey data sources for statistical and research purposes. The data are anonymous and all outputs confidentialised to ensure that no information about an individual, business or organisation is disclosed.

Figure 1 illustrates the structure of the IDI. The green boxes represent administrative data sources and the blue boxes survey data sources. The diagram emphasizes the importance of

the Linked Employer-Employee Dataset (LEED), which provides information on employment, income, tenure, worker turnover, job creation and destruction by detailed industry and region.

Various administrative data and surveys of household and individuals have been matched to the Central Linking Concordance (referred to as 'Person Links' in Figure 1), while administrative data for businesses and business surveys are linked to the Business Frame. Figure 2 and 3 provide more detail on the individual and business data available in IDI. Further information on the IDI is available at <http://www.stats.govt.nz>.

Figure 1. Overview of the Integrated Data Infrastructure (IDI)

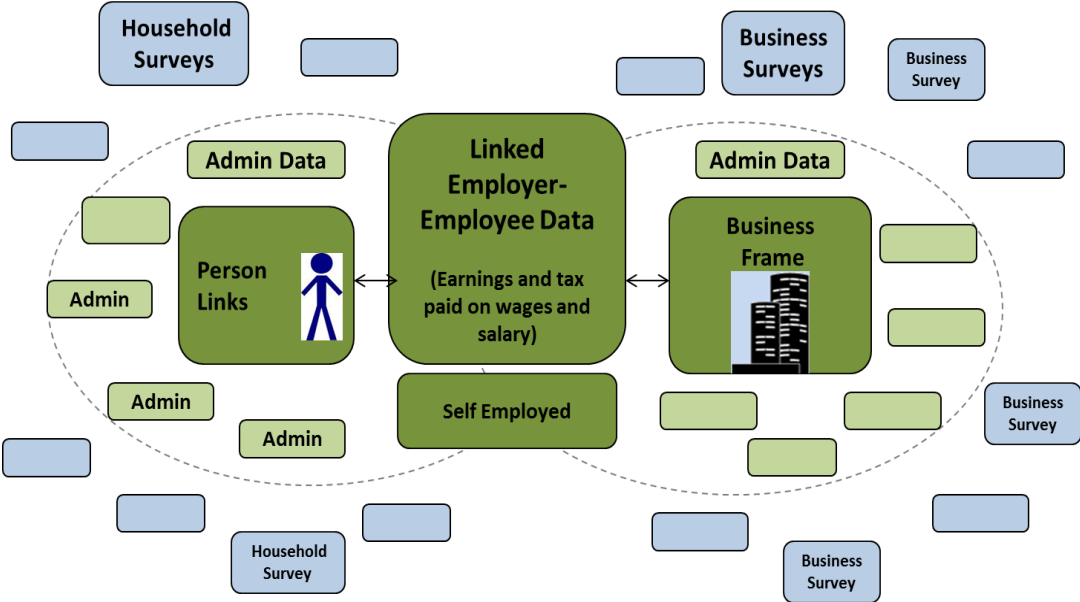


Figure 2 shows the various collections currently included in the IDI which comprises unit record level data on individuals. Each collection has been matched to the Central Linking Concordance (referred to as 'Person Links' in the figure). The addition of further data sources are being investigated, with the inclusion of information on births, deaths and marriages and information from the public health system identified as priority areas for investigation.

Figure 2. Integrated Data Infrastructure – information on individuals

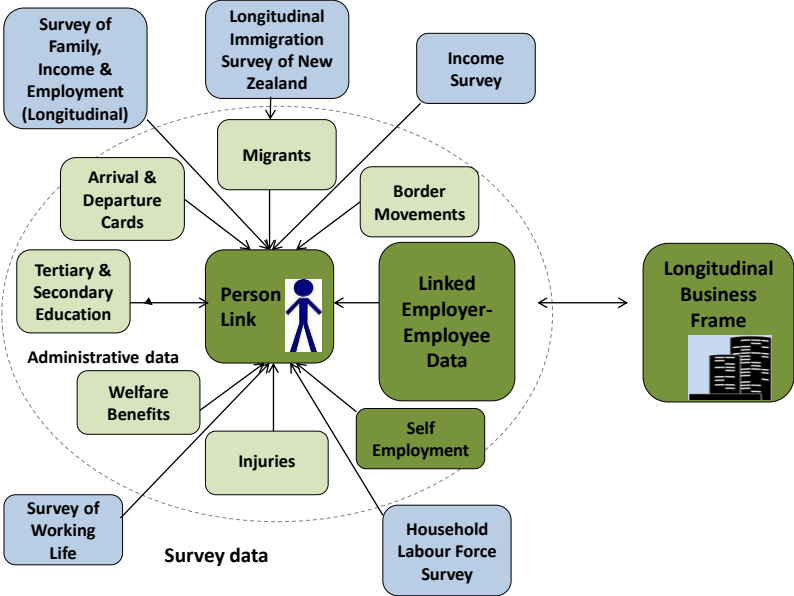
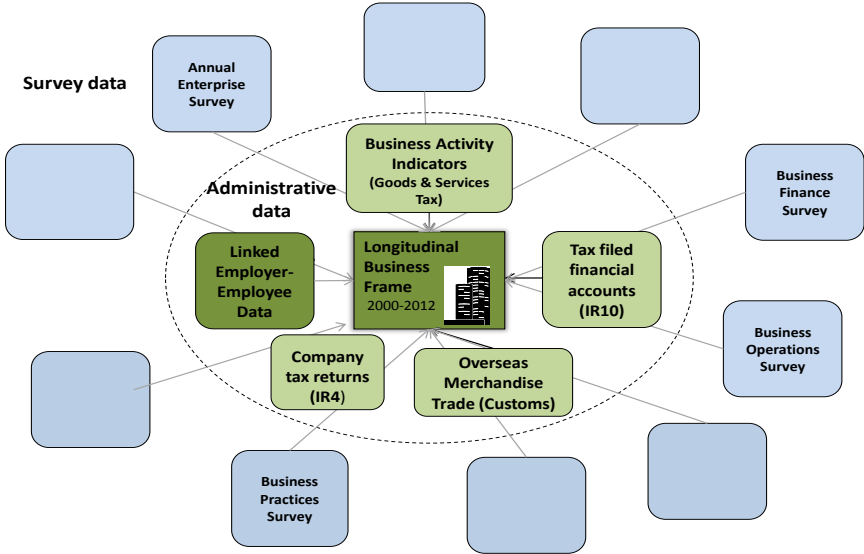


Figure 3 shows the individual data collections which comprise the Longitudinal Business Database. Business surveys undertaken by Statistics NZ link directly through to the Business Frame, while administrative collection are linked to the Business Frame via a tax registration number. Potentially any business survey undertaken by Statistics NZ can be included in LBD. Some government agencies which provide financial assistance to businesses have also included data in the IDI, for example information on business that receive research and development grants or export assistance.

Figure 3. Longitudinal Business Database (LBD)



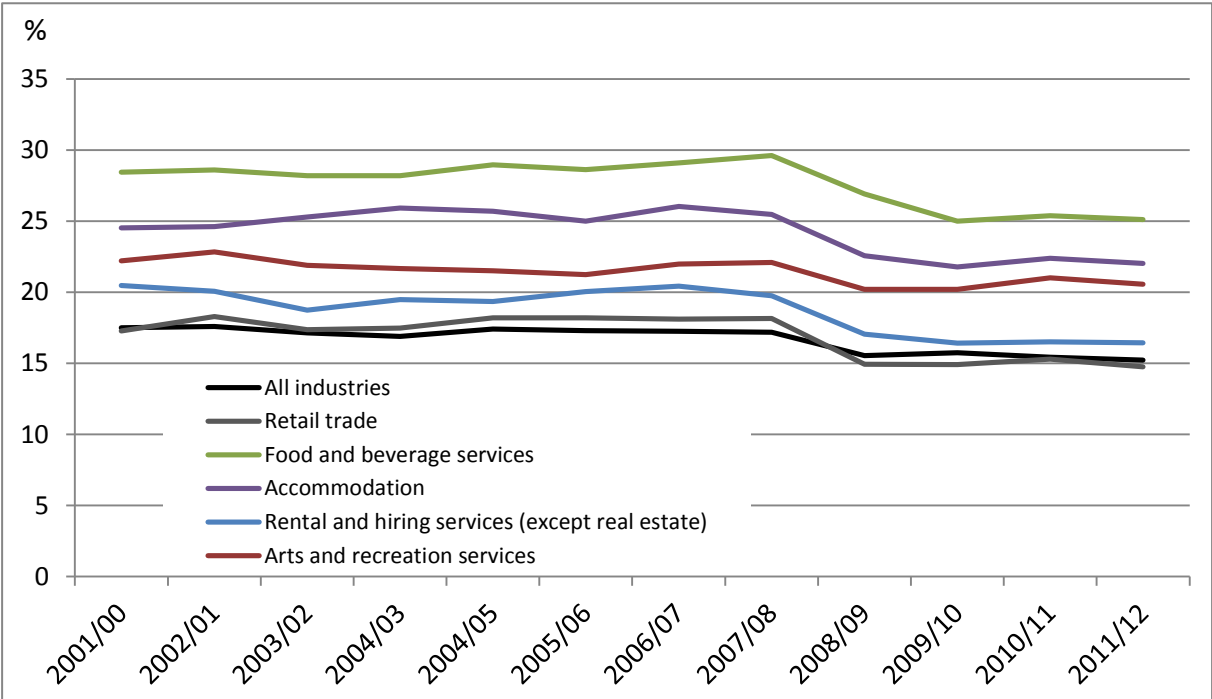
4. Analysing the integrated data to generate new information

In this section, we highlight some analyses using the IDI. The examples illustrate the richness of the IDI information and are show the scope and range of analysis possible.

4.1 Official statistics on job creation/destruction, worker flows and job turnover

Figure 4 shows worker turnover rates for selected industries. Worker turnover rates are much higher in businesses in food and beverage services and accommodation than in other industries.

Figure 4. Worker turnover rates in selected industries



Source: LEED Quarterly Statistics, Statistics NZ, <http://www.stats.govt.nz>.

4.2. Firm employment dynamics during 2000-2010

Researcher using linked LBD and LEED data examined firms’ employment responses before and after the Global Financial Crisis and variations in job and worker flows.

Fabling & Maré (2012) examine the dynamics of employment adjustment in New Zealand, focusing on the response of firms to the 2008/09 global financial crisis, using data from Statistics NZ’s LBD and LEED to examine firms’ employment responses to output shocks before and after the crisis, and to investigate variations in job and worker flows.

Fabling & Maré (2013) examine the correlates of reported hiring difficulties at the firm level, focusing on the relative influence of firm-level characteristics, persistence, the business cycle, and local labour market liquidity.

Maré & Fabling (2013) examine the extent and composition of employment change between 2000 and 2011, focusing particularly on the 2008–2010 period, when the labour market impacts of the global financial crisis were strongest.

4.3. Transitions from welfare to work

Linking information on individuals' monthly income from earnings and government transfers with information on welfare receipt can be used to investigate transitions from *welfare to work* – including the industry of employment, tenure and wage growth.

Analysis of the linked administrative data showed that during the period 2000-2010 about 7% of new jobs were filled by those leaving welfare. There was considerable variation by industry, with 10% of new jobs in the Manufacturing and Health care & social assistance sector filled by those leaving welfare. This compares to Admin and support services (9%), Retail trade (7%), Accommodation and food services (6%), Arts and recreation (5%), Professional & technical (4%), Finance and insurance (3%).

The proportion of new jobs filled by those leaving welfare declined in Accommodation and Food services, and Arts and recreation, over 2000-2010. This coincided with a large increase in the number of temporary migrants holding working holiday and seasonal employment visas, many of whom were working in tourism industries and in the agricultural sector.

4.4. Characteristics of businesses that sell directly to tourists

The Business Operations Survey collects information from businesses about various aspects of their operations including employment practices, skill shortages, innovation and barriers to growth. Respondents are asked to estimate what proportion of their sales was made directly to tourists. Businesses that said they sold directly to tourists were more likely to report recruitment difficulties hiring lower skilled workers and managers. They were also more likely to say that a lack of appropriate personnel, lack of management resources and lack of marketing expertise were barriers to innovation, compared to business that did not sell directly to tourists. This information can be supplemented by that contained in the LBD, for example information on firm financial position and financial performance contained in the Annual Enterprise Survey.

5. Using the integrated data for policy evaluation

The IDI enables a wide variety of aspects of the New Zealand economy to be described in a highly detailed manner. However, the possibilities of linked data go beyond “descriptive”

analyses. The IDI can be used for policy evaluation and to quantify the impact of government policy and programmes.

The standard problem of policy evaluation is that while the impact of a policy or a programme (independent of other factors) can truly be assessed only by comparing actual and counterfactual outcomes, the counterfactual cannot be observed. In light of this 'missing data', one approach to measuring program outcomes or policy impact is to create a convincing and reasonable comparison group.

At the heart of an evaluation is the following: In seeking to know the impact of a programme/policy on a firm/person, the evaluator wishes to compare what happens if they are subject to the government policy (in the language of the literature: receive the treatment) to what would happen otherwise. If we call the first Y^1 and the second Y^0 , then the treatment effect for each firm/person i at any time t is defined as the difference between its potential outcomes:

$$d_{it} = Y_{it}^1 - Y_{it}^0$$

Depending on the time, the outcomes of interest might be intermediate outcomes, such as an increase in sales to tourists, or a final outcome such as improvements in productivity or return on capital. The fundamental evaluation problem arises because we cannot observe both what would happen if the firm/person was "treated" (Y^1) and what would happen if it was not (Y^0). The outcome that we do not observe is called the "counterfactual".

The measurement of impact compared with what would have happened otherwise is sometimes called 'additionality'. Evaluation of government policies or programmes should try to test for attributable impacts including the additionality of these impacts over what would otherwise have occurred without the assistance (Bartle and Morris 2010).

The IDI can be used for impact evaluation because the data contained in the IDI allows the construction a control group. The methodology involves matching firms/persons that are affected by a programme/policy to comparable "untreated" firms/persons based on similar characteristics. The evaluator then compares changes in performances of the assisted group with the group of matched "untreated" firms/persons.

In the econometric evaluation literature there are a number of techniques available that can be used, e.g. propensity score matching and difference-in-difference estimation. The matching method matches assisted firms/persons with similar, "untreated" firms/persons from the rest of the population on the basis of observable characteristics. The difference-in-differences approach allows evaluators to take some account of unobservable aspects of firms/persons that are constant over time – such as its management capability or innate capabilities.

Such an approach could be used (in combination with information contained in the LBD) to evaluate the effectiveness of the Tourism Growth Partnership launched in 2013, which provides government funding for business to invest in initiatives that will help the tourism sector achieve greater commercial and wider returns from tourism.

5.1. The impact of further education and training on future employment and earnings

Linked employment and education data in IDI has been used to estimate the impact of gaining different types of qualifications through institutions and workplace-based training on subsequent earnings (including qualifications in tourism, hospitality and retail).

Crichton & Dixon (2011) found that the benefits of gaining further qualification varied considerably depending on the level and field study. Many qualifications at lower levels (i.e. the equivalent of school level qualifications and certificates and diplomas below degree level) did not result in greater earnings three after completion. Completing qualifications through work-based industry training resulted in some earning benefits, although there was considerable variable by industry of employment (Crichton, 2012).

6. Conclusion

Over the last 10 years a large amount of administrative and survey data on businesses and individuals has been linked together for statistical and research purposes in New Zealand. Central to this has been the development of Linked Employee-Employer Dataset and the Longitudinal Business Database, which have recently been brought together in the Integrated Data Infrastructure. These data are increasingly being relied upon to provide information on industries, businesses and employment. Administrative data can provide unique information on labour market and firm dynamics at detailed industry and regional level. There are also many other applications, for example identifying the extent to which particular groups of individuals (former welfare recipients, students or migrants) are employed in particular industries, and the impacts of workplace training on participants future employment and earnings, and the effectiveness of government programmes and policies. Linked administrative and survey data opens up opportunities for improved analysis and reporting of tourism industries, business and employment. The need to reduce costs while maintaining or increasing statistical outputs means that use of administrative data sources will continue to increase.

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