



Getting under the hood

Insights from Recent Firm-level Productivity Research in New Zealand

About the Productivity Hub

The Productivity Hub is a partnership of agencies which aims to improve how policy can contribute to the productivity performance of the New Zealand economy and the wellbeing of New Zealanders. The Hub will achieve this by:

- developing a joint research work programme;
- helping build capability; and
- translating research into policy.

The Hub agencies are the Productivity Commission, the Ministry of Business, Innovation and Employment (MBIE), Statistics New Zealand, and the Treasury. Several other agencies and non-government groups are active in the partnership.



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Introduction

This note summarises insights from recent research on New Zealand's productivity performance using firm-level data. Coverage is largely limited to research completed since 2013 and that uses the Longitudinal Business Database (LBD), although a small number of older studies or studies that use different data are included where they help illustrate important findings.

The structure is as follows:

- Section 1 explains the focus on productivity.
- Section 2 explains the use of firm-level data and outlines a stylised model of firm-level productivity.
- Sections 3-7 present evidence on reallocation and catch-up, innovation, international connections, skills and management capability, and geography and sectors. As a cross-cutting issue, research on migration can be found in the sections on innovation and on skills and management capability.
- Section 8 discusses the Productivity Hub's forward looking research programme.

The note has three goals. The first is to provide an accessible summary of recent firm-level research. The hope is also that this document will encourage conversations on how this research could help inform policy and, in turn, what the next steps for LBD research should be.

With these goals in mind, the Productivity Hub agencies have developed a joint research work programme. The purpose of this work programme is to better coordinate agencies' (largely LBD-related) research effort. While the Hub agencies retain their independent interests, collaborating in this way helps them make the most of the opportunities the LBD provides to advance understanding of New Zealand's productivity issues and ultimately to improve policy.

Current areas of focus for the Hub are exploring the links between competition and productivity and examining the factors that drive differences in productivity across regions.

This paper attempts to use non-technical language where possible. Where technical terms are used, definitions can be found in the glossary at the end of the paper.

This note discusses both labour productivity and multifactor productivity (MFP, sometimes known as total factor productivity). For ease of reference these two concepts are defined below (Conway and Meehan, 2013).

- Labour productivity estimates reflect the amount of output produced from each unit of labour employed. Labour productivity is a broad measure of productivity that does not account for the role and cost of capital accumulation and other productive inputs in increasing output.
- MFP is usually measured as the output produced from a 'unit bundle' of both capital and labour and thus accounts for changes in the capital stock. Estimating MFP involves aggregating capital services and combining them with hours worked. MFP is sometimes referred to as total factor productivity (TFP).

1. Why focus on productivity?

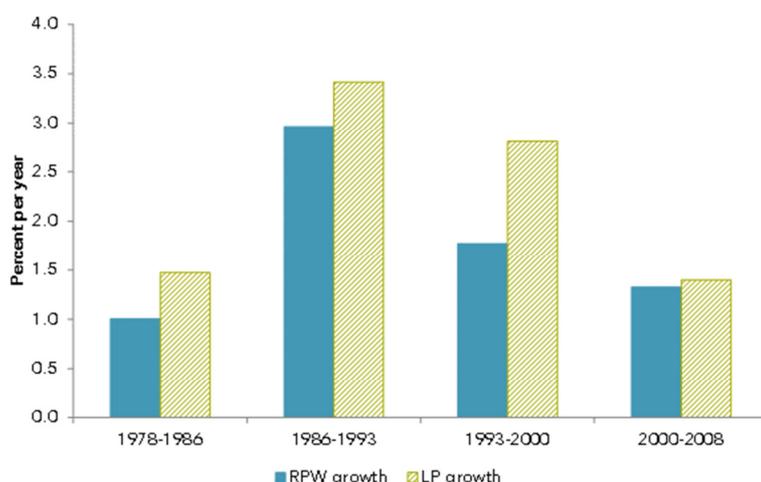
The New Zealand economy is currently performing well compared to other developed countries, with strong GDP growth, high employment, and low unemployment. However, while GDP per capita has improved somewhat since the mid-2000s, our labour productivity (GDP per hour worked) remains relatively low.

Labour productivity is important for a number of reasons.

Labour productivity growth is a major driver of income growth. Between the early 1990s and 2012, increases in labour productivity made a bigger contribution to lifting gross national income (GNI) than any other factor, accounting for over half (around 55%) of all GNI growth (Conway and Meehan 2013). Looking forward, productivity growth is expected to become even more critical to income growth as labour utilisation approaches natural limits.

Productivity growth is a necessary (but not necessarily sufficient) condition for sustained wage growth. There is a strong relationship between labour productivity growth and real wage growth (Conway et al. 2015). Growth in real product wages (RPW) by firms in the measured sector was strongest during New Zealand's period of high labour productivity growth from the mid-1980s to 2000, and was weaker when labour productivity growth was lower.

Figure 1: Real product wages increase more rapidly when productivity growth is strong
Source: Conway, Meehan and Parham (2015)



Improving the productivity performance of lagging firms may also help to reduce wage inequality. International evidence shows there is a link between productivity dispersion *across firms* and wage dispersion (e.g. Berlingieri et al. 2017). There is relatively little New Zealand evidence on the links between productivity dispersion and wage dispersion and this could be a fruitful area of future research.

Productivity is not just good for incomes. For example, more productive use of natural resources allows the same level of output to be achieved at a lower environmental cost. Improved productivity can thus support both growth and environmental aspirations. By delivering 'more for less', higher productivity can also potentially increase the time available for leisure (Conway and Meehan 2013). For these reasons, improving productivity is going to be critical to building a more productive, sustainable and inclusive economy and improving the wellbeing of New Zealanders.

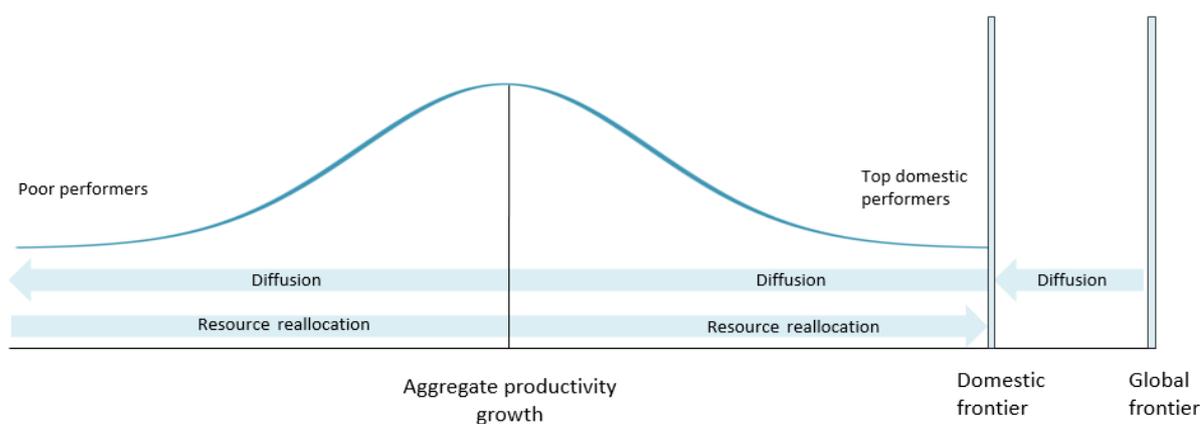
2. Why use firm-level data?

Access to linked administrative and survey data for individual firms (microdata) has the potential to transform our understanding of New Zealand’s productivity performance. Without microdata, researchers are limited to talking about the ‘average’ firm. Looking at averages masks how different firms have different levels of performance. A richer picture comes from understanding the distribution of performance.

This can be shown with a stylised model of the relationship between firm productivity and aggregate productivity. This model sets out to illustrate key concepts and so should not be seen as describing current firm productivity in New Zealand.

Figure 2: A stylised model of firm productivity

Source: Conway (2016) based on OECD (2015)



In this model there are two key ‘technology frontiers’: the domestic one and the global one. The global frontier is made up of the most productive firms in the world and there is a gap between these firms and the most productive domestic firms (the domestic frontier). All the other firms in New Zealand can then be arranged by how close or far away they are to the domestic frontier (giving a distribution of performance).

There are two drivers of aggregate productivity growth in this model: the spread of technology, ideas, and practices between firms (diffusion) and the movement of resources between firms (reallocation). The diffusion of technology and practices from the global frontier to the domestic frontier helps to close the gap between the two frontiers, while diffusion from the domestic frontier to lagging firms helps to close the productivity gap domestically. This raises aggregate productivity by bringing us closer to the global frontier and by improving the performance of lagging firms. Resource reallocation raises aggregate productivity by allowing resources to move from low-productivity to high-productivity firms. Low-productivity firms shrink and exit the market, while high-productivity firms are able to expand.

The LBD is a rich resource for understanding New Zealand firms and can provide a uniquely detailed view of their behaviour and performance across a broad range of topics (Fabling and Sanderson, 2016). Over recent years the Productivity Hub agencies have set out to not only produce new research reports but, more generally, to build broader practitioner capability with these data. A primary objective has been to ensure that more people can work with these data and, as a result, to expand the set of research projects undertaken with them.

A number of ‘foundational’ reports have been completed (Fabling and Sanderson 2016; Fabling and Maré 2015a; and Fabling and Maré 2015b).¹ These reports have helped codify the previously tacit knowledge held by LBD experts. These reports are only discussed in passing in this note but they (and associated datasets) are highly valued by LBD researchers and have the potential to save them time and effort. They are an example of the Productivity Hub’s research partnership providing additionality (as no single agency would have funded them but all benefit) and are likely to have spillover benefits beyond the Productivity Hub.

3. Reallocation and catch-up (convergence)

What is it?

Reallocation is the movement of resources between firms (e.g. people and their skills, capital, land). It takes time for unproductive sectors and firms to reduce input resource use and for more productive firms to take up these resources. Improving this resource allocation boosts productivity by allowing productive firms to expand and make up a larger share of economic activity.

A related principle is convergence. This is the process whereby lagging firms catch up to the productivity frontier, be it lagging domestic firms catching up to the domestic frontier or leading domestic firms catching up to the global frontier. A key driver of this convergence is the diffusion of technology, knowledge, and practices from leading firms to lagging firms.

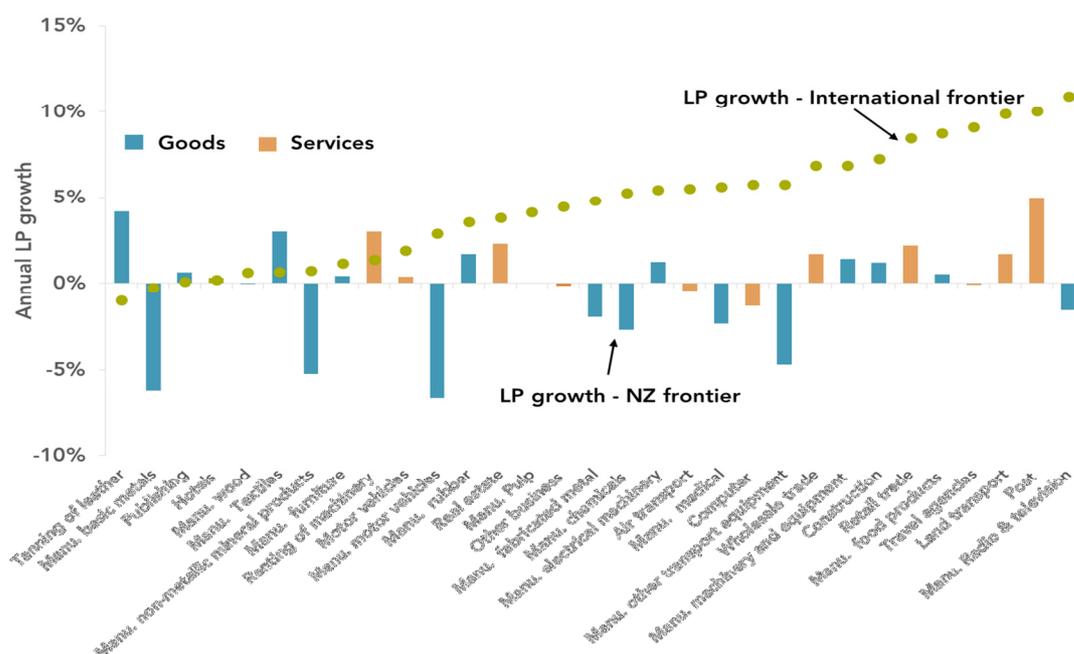
What we’ve learned

- Earlier research has also shown that firm turnover in New Zealand is not unusual when compared with other economies (Law and McLellan 2005; Mills and Timmins 2004). This was reinforced by Meehan and Zheng (2015), who show that firm entry and exit in New Zealand is comparable to other countries. About 30% of firms born in 2001 survived for ten years.
- By making use of the longitudinal element of the LBD, Meehan and Zheng (2015) are also able to show that many surviving firms don’t grow as they age. While surviving firms grow on average, this is driven by a small number of high-growth firms. Most firms don’t grow much at all. New Zealand thus has a relatively high share of old and small firms and an apparent lack of ‘up-or-out’ dynamics.
- One thing that may help improve the reallocation of labour is to increase flexibility for firms in the labour market. Chappell and Sin (2016) examine the impact of the 90-day trial period on firm hiring behaviour. They find that the introduction of the policy had no effect on the number of new hires at the average firm, but firms in the construction and wholesale trade industries (heavy users of trial periods) increased their hiring by around 10%.
- Firm entry and exit contribute to aggregate productivity growth within industries. Maré et al. (2016) find that both entry and exit made a positive contribution to MFP growth over the period 2001-2012.

¹ Fabling and Sanderson (2016) provide an overview of the LBD. Much of the recent LBD/IDI research has made use of the productivity dataset of Fabling and Maré (2015a) and the labour input dataset of Fabling and Maré (2015b).

- Fabling et al. (2014) look at the impact of the Christchurch earthquakes on firms in the Canterbury region, which provides insights into the drivers of firm exit. They find that firms' prior financial viability heavily influences their chance of survival, showing that firm financial success is an important determinant of the decision to exit a market.
- Fabling and Maré (2017) look at firm and employment dynamics following the GFC. They find that the output and employment declines experienced by firms were accompanied by lower levels of employee turnover, but that firm exit rates did not increase. Firms tend to shrink, but the number of firms doesn't change. Young workers and low wage workers bore the brunt of the employment declines.
- Recent research sought to establish whether there is a gap between New Zealand frontier firms and the global productivity frontier. A gap would suggest potential for improving diffusion into the domestic economy. This research (Conway 2016) shows that the labour productivity levels of New Zealand's leading firms are (on weighted average and irrespective of PPP conversion) about one third lower than the leading international firms (see Figure 3).
- Further, productivity *growth* in leading domestic firms has been weaker than in leading international firms in most industries. Although some New Zealand firms operate at the global productivity frontier, more generally there is scope for New Zealand to benefit more from technologies and ideas developed by leading global firms (Conway 2016).
- A related question is the degree to which productivity gaps within the domestic economy are widening or narrowing. It appears that, like in many economies, these gaps are widening (Zheng 2016). When weighted for employment, MFP growth for the top 5% of firms in the productivity distribution in their industry averaged 11% over the 2000s, while the productivity of lagging firms (the other 95%) grew by 5%.
- However, the story varies throughout the domestic economy. There are pockets of convergence (narrowing gaps) among firms in the primary and goods-producing sectors, and among internationally connected firms. Convergence is slower among services firms (Conway et al. 2015).

Figure 3: Labour productivity growth at the local and global frontier 2001-2012
 Source: Conway (2016)



- Competitive pressures are a key driver of reallocation and convergence. The Ministry of Business, Innovation and Employment (2016) examine competition in New Zealand sectors using a new measure, profit elasticity. This measures the responsiveness of firms' profits to their average costs. In more competitive markets, we would expect to see a larger decline in profits in response to an increase in costs (i.e. larger profit elasticity). The authors find that industries in the manufacturing sector exhibit the highest levels of competition, while industries in the finance and insurance sector exhibit the least. Of the 309 industries in the study, 54 experienced an increase in competition over 2000-2010, while 27 experienced a decrease in competition.

Open questions

- What is driving the divergence between the international and domestic frontier? And between leading and lagging domestic firms?
- What is the role of New Zealand's frontier firms in the New Zealand economy?
- What factors are inhibiting New Zealand's 'up-or-out' (young firms growing rapidly or exiting) firm dynamics?
- Are there any unnecessary barriers to resource reallocation?
- Within industries, would more competition be better for productivity in New Zealand? Can we do anything about it?

4. Innovation, R&D, and Science

What is it? And how does it affect productivity?

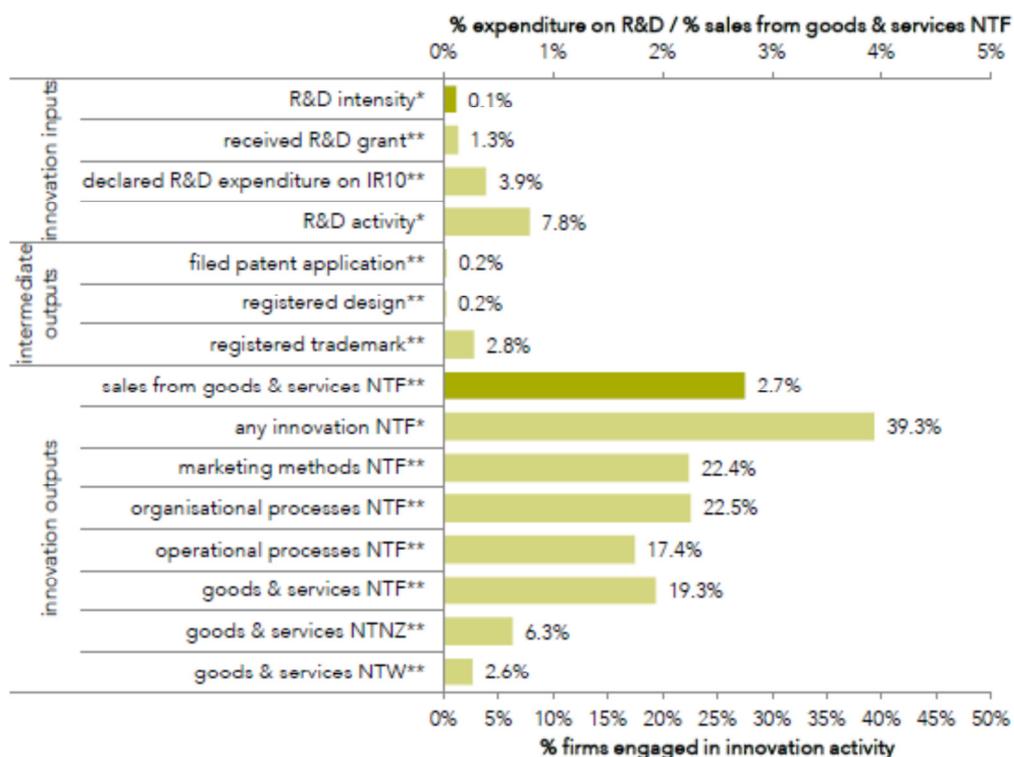
Innovation is the creation and implementation of new ideas. It can involve new ideas on how to structure a business, new ways of producing a firm's existing products, inventing and designing new products or services, and the development of new marketing strategies. Innovation is a key source of competitive advantage for firms and can provide innovating firms with a productivity advantage.

What we've learned

- Innovation comes in many guises, from introducing new products and technologies to organisational and process innovation (see Figure 4). More firms report implementing organisational innovations than introducing new products (Wakeman and Le, 2015). Manufacturing firms are more likely to introduce new products, while service firms are more likely to introduce organisational or marketing innovations.

Figure 4: Innovation rates by different measures

Source: Wakeman and Le (2015)



- There is no evidence of a link between innovation and local workforce characteristics (local skill levels and the presence of newcomers) after controlling for firm characteristics (R&D spending, employee skills etc.) (Maré et al. 2014a). McLeod et al. (2014) finds that firms that hire more high-skilled migrants or returning expats are more likely to introduce new products, marketing methods, organisational, process, and managerial practices. This effect is no different for firms that hire skilled native-born workers. Migrants and returning expats simply increase the supply of highly skilled workers in the labour market.

- Investment in intangible assets (e.g. computer software, employee training, and market research) is expected to generate a return, but the stock of intangible assets is difficult to measure. They do not have a physical form, like plant and machinery. Nonetheless international data suggests that investment in intangible assets is rising and even exceeds investment in machinery and equipment in several OECD countries. In New Zealand, Chappell and Jaffe (2018) find little evidence of a link between investment in intangible assets and average firm productivity in New Zealand. They did find that firms that invested in intangibles expanded employment and output.
- For firms that receive them, R&D subsidies have a positive impact on patenting and introducing new goods and services to the world. Their impact on process innovation and introducing products new to New Zealand or the firm are smaller (Jaffe and Le 2017).
- Receiving a Marsden Grant is associated with an increase in citation-weighted publications, both for research teams and individual researchers (Gush et al. 2015).
- Wakeman and Conway (2017) find the returns from innovation for New Zealand firms may be lower than for comparable countries, although differences in methods make a definitive conclusion difficult. Younger firms, manufacturing firms and firms with international connections (exporting firms and foreign-owned firms) have the highest returns to innovation.
- Wakeman (2017) presents the results from an evaluation of the impact of R&D grants on the performance of New Zealand firms, using information on grants and firm performance from 2004 to 2012. As the available data precedes the creation of Callaghan Innovation in 2013, it does not directly evaluate the performance of Callaghan Innovation's R&D grants programme. Nevertheless it provides guidance on the types of firms for which R&D grants have a more beneficial performance impact. It concludes that the overall impact of receiving a grant on firm performance is mixed – which highlights the importance of being clear about policy objectives when setting up grant programmes.
- Fabling and Grimes (2016) look at the impact of ultra-fast broadband (UFB) adoption on firm performance. They find that adopting UFB, when considered in isolation, has no effect on overall employment, labour productivity, or MFP. This is true even in industries with high uptake and computer capital intensity and in industries where internet speed is important. However, firms that adopted UFB also tended to introduce other organisational changes and there is a positive relationship between introducing complementary organisational changes and productivity among firms that adopt UFB.
- An important determinant of a firm's ability to innovate and improve their productivity is its ability to seek out and use information from external sources (sometimes known as absorptive capacity). Harris and Le (2018) attempt to measure firms' absorptive capacity and to examine the links between a firm's absorptive capacity and firm behaviours that are linked to better productivity outcomes: investing in R&D, innovation, and exporting. Firms with foreign interests (NZ multinationals and foreign-owned NZ firms) had high levels of absorptive capacity, as did firms that undertook R&D. They find that a firm's ability to make use of external knowledge is positively related to its propensity to undertake R&D, innovate, and to export even after controlling for other firm characteristics e.g. foreign ownership, employee skill levels.

Open questions

- What are the financial returns from innovation or R&D investment?
- What are the barriers to R&D investment? What can we do about them?
- How can public research organisations and funding contribute more to firm innovation?
- What is the link between firm churn and innovation in New Zealand and how does it compare internationally?
- How can public policy better support firms' abilities to absorb ideas from overseas?

5. International connectivity

What is it? And how does it affect productivity?

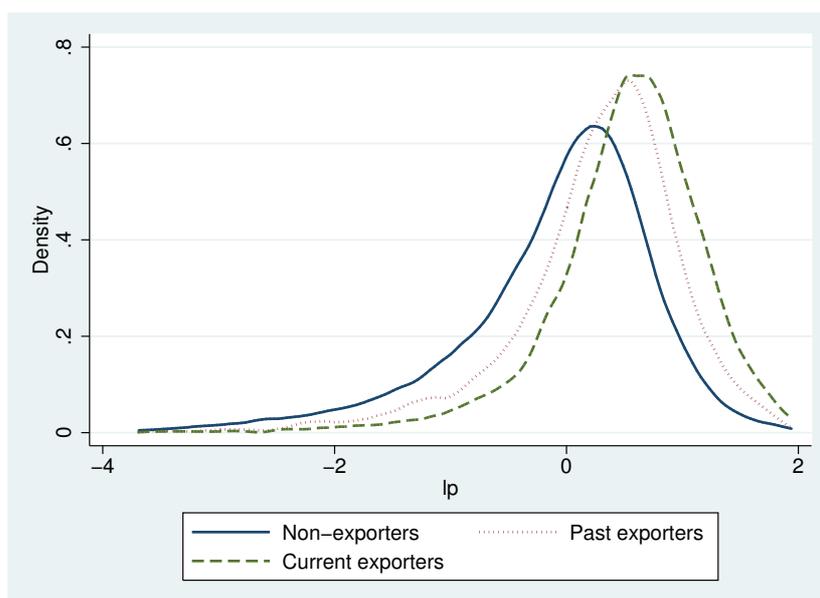
International connections offer firms several pathways for improving their productivity. The competitive pressures faced by exporting firms in international markets means they have to be more nimble and reactive to both domestic and international developments. Access to larger international markets also allows firms to grow and achieve economies of scale. Foreign ownership and investment can facilitate the diffusion of knowledge and technology from leading global firms into New Zealand, and provide firms an alternative mechanism for raising capital.

What we've learned

- Larger, more capital intensive and more productive firms tend to opt into exporting, and this explains most of the productivity difference between exporters and non-exporters (Fabling and Sanderson 2013). The gap in labour productivity widens after firms enter export markets, driven by capital investment and employment growth. This investment and growth continues as current exporters expand into new export markets.

Figure 5: International connection and firm labour productivity

Source: Fabling and Sanderson (2013)



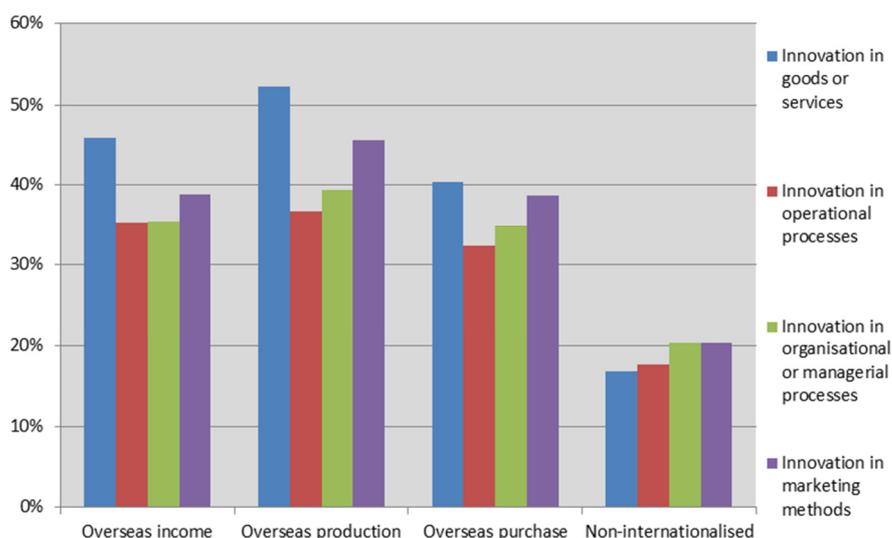
- The positive relationship between productivity and foreign ownership is primarily driven by foreign firms selecting the best Kiwi firms, rather than higher productivity growth after acquisition (Fabling and Sanderson 2014). Recently acquired firms exhibit higher wage and output growth. Doan et al. (2015) find little evidence of substantial productivity spillovers from foreign-owned firms to domestically-owned firms, although this does not rule out such spillovers. There is some evidence of small productivity spillovers among small firms and primary sector firms that have foreign-owned customers.
- Maré et al. (2014b) find a wage premium of 2%-4% in foreign-owned firms, partly due to these firms paying higher wages than domestically-owned firms for workers with similar skills and partly due to higher wage growth. The wage benefits of working in a foreign-

owned firm are highest for younger workers and more highly skilled workers. In general, workers do not keep these higher wages once they leave the firm.

- Country-specific knowledge is an important determinant of export success. Firms that have a higher share of workers from a specific country are more likely to export to that country (Sin et al. 2014).
- Manufacturing and service sector firms that export tend to innovate more, while exporting raw materials is not correlated with innovation (Sin et al. 2014).

Figure 6: Innovation in internationalised and non-internationalised firms

Source: Wang and O'Grady (2013)



- A 10% increase in the bilateral exchange rate reduces average exports to that country by around 3% among committed exporters and reduces the probability that firms began exporting to that country (Fabling and Sanderson 2015). Exchange rate volatility negatively affects export revenues, but has no effect on whether firms enter or exit a particular market.
- Sanderson (2017) looks at the barriers to earning international income as reported by firms and relates these to the probability of future export success. Firms that are not currently exporting are more likely to report a lack of experience, market knowledge, and finance for expansion as the most common barriers, while more experienced exporters are more likely to report exchange rate levels and volatility as the most important barriers to expanding their international income. Perceived barriers do not predict future export success for currently non-exporting firms, while perceived barriers do predict the probability of future market expansion for current exporters.
- Exports of commercial services were \$4 billion in 2011, equal to 30% of services exports (Ministry of Foreign Affairs and Trade 2014). Cross-border supply via the internet, email, or phone was the most common way to export commercial services, with 86% of commercial exports delivered this way. Australia, North America, and the EU were the most important destinations for commercial services exports. Other business services, computer services, and personal, cultural, and recreational services were the most important export categories.

Open questions

- What are the most effective interventions for enabling firms to become exporters?
- What are the barriers to more outward direct investment (ODI)?
- What are the effects of import intensity on New Zealand markets?
- What is the cause for New Zealand being bottom of the rankings for participation in global value chains?
- How can New Zealand derive greater beneficial spillovers from FDI?
- What is the effect of migration on firm productivity?

6. Skills and management capability

What is it? And how does it affect productivity?

The skills of employees and managers within firms are an important determinant of firm productivity. Firms with more skilled employees may be more likely to innovate, more likely to export, and more likely to be able to use and implement the latest ideas or technologies. Similarly, the capability of management in organising the skills at their disposal, in monitoring and improving performance, and in driving organisational change is crucial to firm success.

What we've learned

- Fabling and Maré (2013) find that hiring difficulties are persistent for firms that report them. High-wage firms trying to hire skilled workers are more likely to report hiring difficulties, while firms with longer-tenure workers are less likely to report these difficulties.
- One way a firm can increase the skill level of its employees is through on-the-job training. Mason et al. (2012) study the effect of skill shortages on firm training decisions. They find that firms that report a shortage of skilled workers are more likely to train their staff, controlling for a range of employee and employer factors. For firms that train their staff, there is some evidence that firms are more likely to train existing staff changing roles, rather than training new staff.
- New Zealand experienced strong employment growth in the lead up to the GFC, particularly among lower-skilled individuals. This absorption of lower-skilled individuals into the labour market lowered the average quality of labour (Maré et al. 2016). Almost all of this effect was attributed to changing skill composition within continuing firms. Using quality-adjusted labour to estimate MFP increased the average annual MFP growth between 2001 and 2012 from 0.14% to 0.24%.
- New Zealand ranks 12th among the OECD countries surveyed for management practices among manufacturing firms (Bloom et al. 2016, see Figure 7). New Zealand has relatively few firms with 'best practice' management practices, and a relatively large number of firms with poor management practices. Differences in management practices explain around 50% of the TFP gap between NZ and the US (see Figure 8).
- Management practices are positively related to firm productivity, profitability, and survival. Firms in more competitive industries have better management practices. Older firms also have better management practices and a lower level of dispersion in these practices. Poorly managed firms tend to not survive to become older firms (Bloom et al. 2016).
- Fabling and Grimes (2014) study the impact of human resource management (HRM) practices on firm performance. They find that firms that adopt a suite of HRM practices boost their labour productivity and MFP. These effects extend beyond the manufacturing sector; firms in the high-skilled services sectors also benefit from adopting these practices. Adoption has little effect on profitability, in part because implementation of performance-based pay raises the average wages paid by the firm. This implies the benefits from adopting these practices are shared by firms and workers.
- Career and earnings trajectories for graduates differ more by the level of qualification than the field of study. Maré et al. (2017) look at the career and earnings trajectories of recent

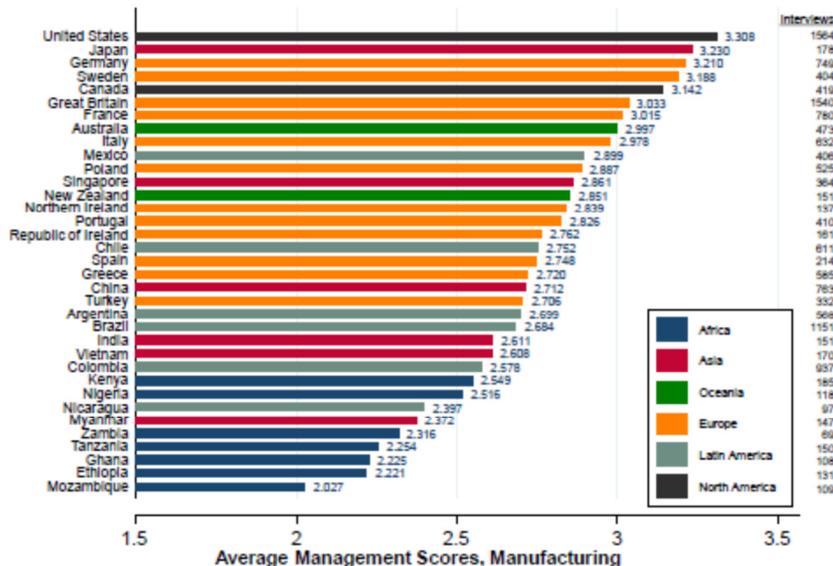
graduates, comparing outcomes for those that studied STEM (science, technology, engineering, and mathematics) subjects to those that studied non-STEM subjects at both the degree and sub-degree levels. They find that graduates who studied at bachelor level or above have both higher median earnings and higher earnings growth in the six years after graduation than those who studied at the sub-degree level. This is partly due to STEM graduates (and graduates with a bachelors or above in general) moving to high wage firms and industries. They also compare the relative contributions to productivity and wages of the different groups. They find those that studied at the degree level had a significantly higher contribution to productivity. STEM graduates had a higher contribution to the wage bill than their contribution to productivity, while the opposite was true for non-STEM graduates.

- The contribution of female workers tends to be systematically undervalued by employers. Sin et al. (2017) find that female workers' contribution to firm output is equal to that of their male counterparts, but are paid 84 cents for every dollar a man is paid. The wage gap increases with age and tenure at a firm, which is inconsistent with employers initially thinking that women are less productive than men. Their results suggest that the gap is largely the result of sexism.

Open questions

- What are the returns, including spillovers, to individual firms and/or groups of firms from increasing the skills of their employees?
- What are the effects of recruitment difficulties and persistent skill shortages on economic growth?
- What is the government's role in addressing management weakness?
- What role do firms, individuals, and the government have in responding to skill-biased technological change?

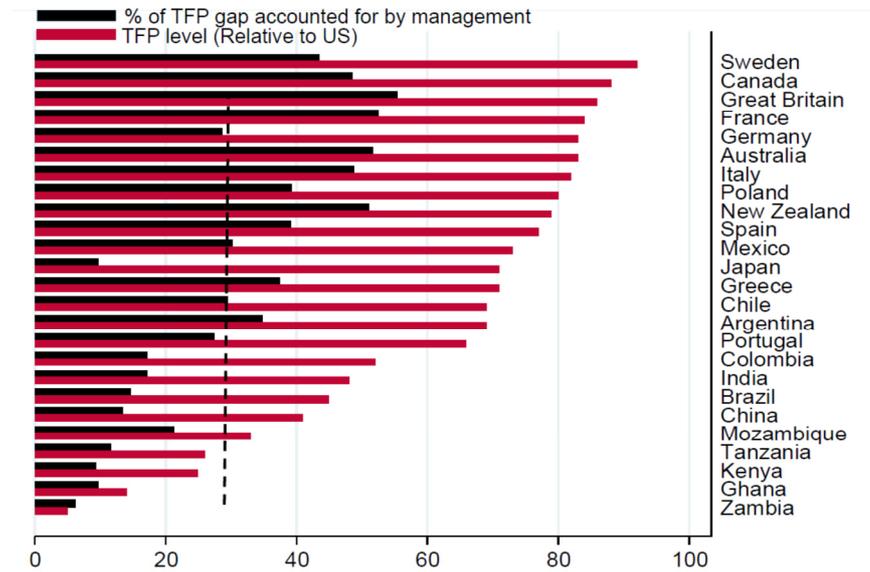
Figure 7: Average management scores by country
Source: Bloom et al. (2016)



Note: Unweighted average management scores; # interviews in right column (total = 15,489); all waves pooled (2004-2014)

Figure 8: Total factor productivity gap accounted for by management

Source: Bloom et al. (2016)



Notes: TFP gaps from Penn World Tables; fraction accounted for by management uses the weighted average management scores and an assumed 10% impact of management on TFP. See Table 7 for details of calculations. Vertical line indicated the mean effect (30%).

Geography and sectors

What is it? And how does it affect productivity?

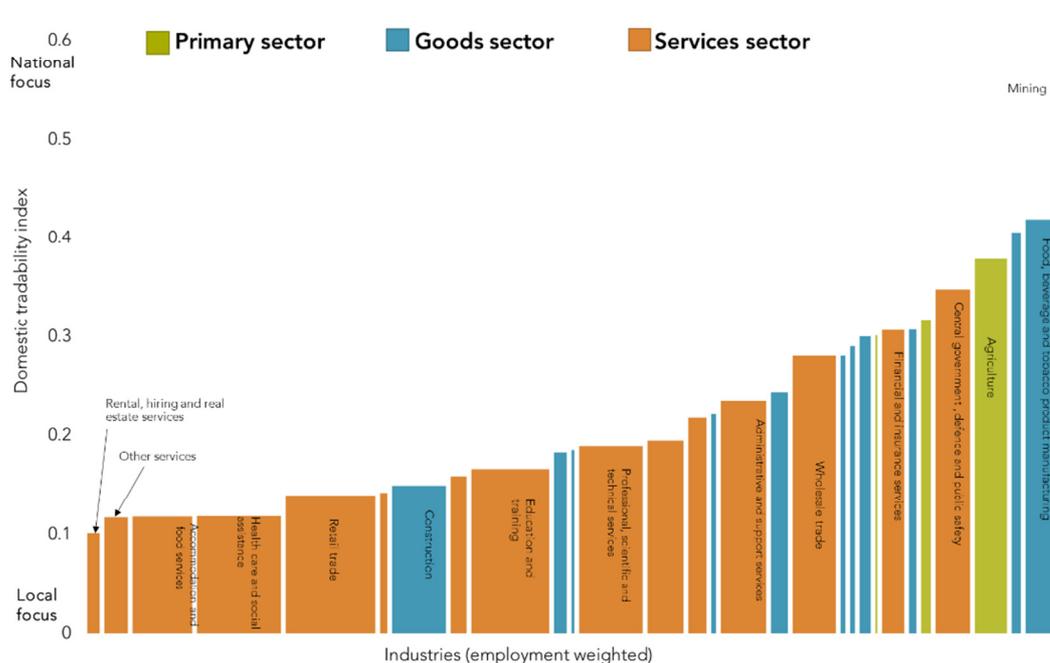
The regional and spatial study of productivity seeks to understand the drivers of variation in firm productivity across space. Firms in different regions may face different degrees of competition, have access to different labour pools, face different input prices, transport costs, market sizes, and have more/fewer opportunities to learn from other firms.

Regions also differ in their industry composition. There may be industry-specific drivers of productivity that are masked when considering overall drivers of productivity, such as innovation or international connections.

What we've learned

- Industries differ in terms of the geographic scope of their market. Output from the primary sectors is the most traded over distance, followed by other goods-producing sectors then services, although there is significant variation within each broad sector (Conway and Zheng 2014, see Figure 9). Firms in sub-industries whose output is more tradable over distance have higher average labour productivity.

Figure 9: Domestic tradability index by sector
Source: Conway and Zheng (2014)



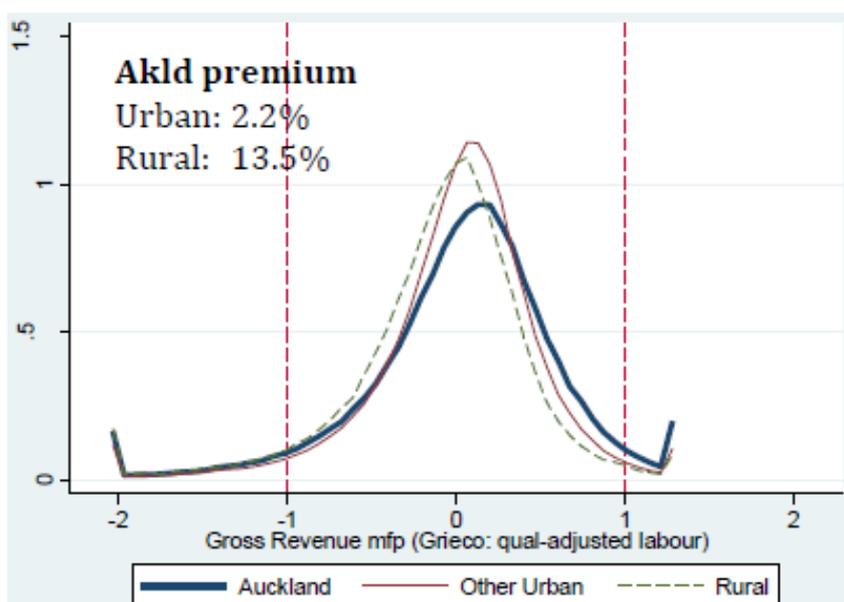
- Firms in Auckland do tend to benefit from agglomeration, such as the attraction of skilled workers to large cities and the concentration of more productive industries in Auckland. Firms in Auckland have labour productivity that is 17.9% higher than firms in other cities, on average (Maré 2016). Part of this is driven by firms in high productivity industries tending to locate in Auckland. After controlling for industry structure, Auckland firms still enjoy a productivity premium of 13.5% over other urban areas. Much of this remaining premium is explained by Auckland firms being more capital intensive and having access to

more highly skilled labour. Even after controlling for these things, Auckland firms still enjoy a 2.2% productivity premium.

- Increasing stocking rates (the number of animals per hectare) is positively associated with output for both dairy and sheep/beef farms, although land quality is more important for dairy farms than for sheep/beef farms (Apatov et al. 2015). Dairy farms do not benefit from having secondary activities on their land (such as forestry), while sheep/beef farms with other activities have higher output than those that report no such activities.

Figure 10: Multifactor productivity distributions for Auckland, other urban, and rural areas, with skill-adjusted labour

Source: Maré (2016)



- There is significant regional variation in the productivity of dairy and sheep/beef farms. Taranaki and Hawkes Bay are home to the most productive dairy farms, while Southland has the most productive sheep/beef farms (Apatov et al. 2015, see Figure 11).
- Average productivity in the construction sector is low compared to other sectors, but productivity dispersion in this sector is similar to other industries (Jaffe et al. 2016, see Figure 12). The lower average productivity is related to a lack of star performers, rather than the presence of lots of small, low productivity firms. High-productivity firms tend to be younger, to belong to a business group, and to locate in Auckland.
- In the building construction and heavy civil engineering sectors, new entrants tended to be more productive than existing firms and these firms continued to be more productive as they aged; a somewhat surprising result. In the construction services sector, entry, exit and the growth of continuers all contributed positively to average productivity growth.
- Jaffe and Chappell (2018) explore the reasons why new entrants in the construction sector are more productive than their continuing counterparts. They find the result is partly driven by 'transitory' firms, firms that appear in the data between one and four years. These firms are substantially more productive in the first year, but this advantage erodes over time prior to exit. New entrants that continue for at least four years aren't quite as

productive as these transitory firms but have stronger productivity growth than existing firms.

- Job churn is high in the construction industry. Of those employed in construction firms, less than 40% were at the same firm four years prior and around 40% were at the same firm four years later. Construction firms that hire new workers from other highly productive construction firms have higher productivity. They find that about 75% of this effect is selection; that highly productive workers tend to work for good firms, while the other 25% is explained by workers transferring knowledge between firms. Employee churn within the construction sector appears to be contributing to improved productivity performance.

Figure 11: Regional differences in multifactor productivity in the dairy and sheep/beef industries

Source: Apatov et al. (2015)

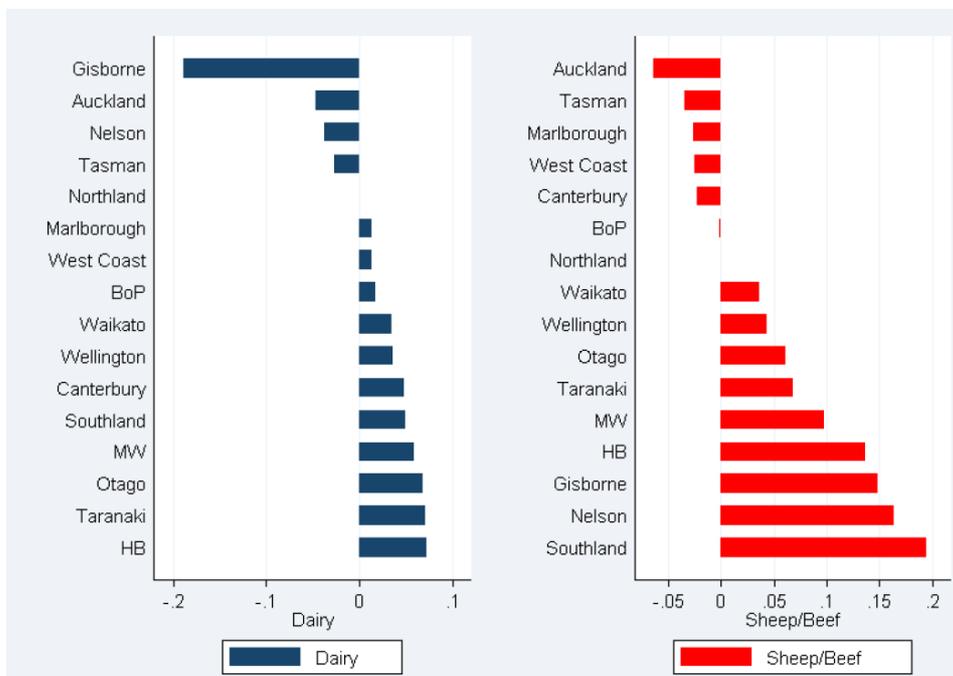
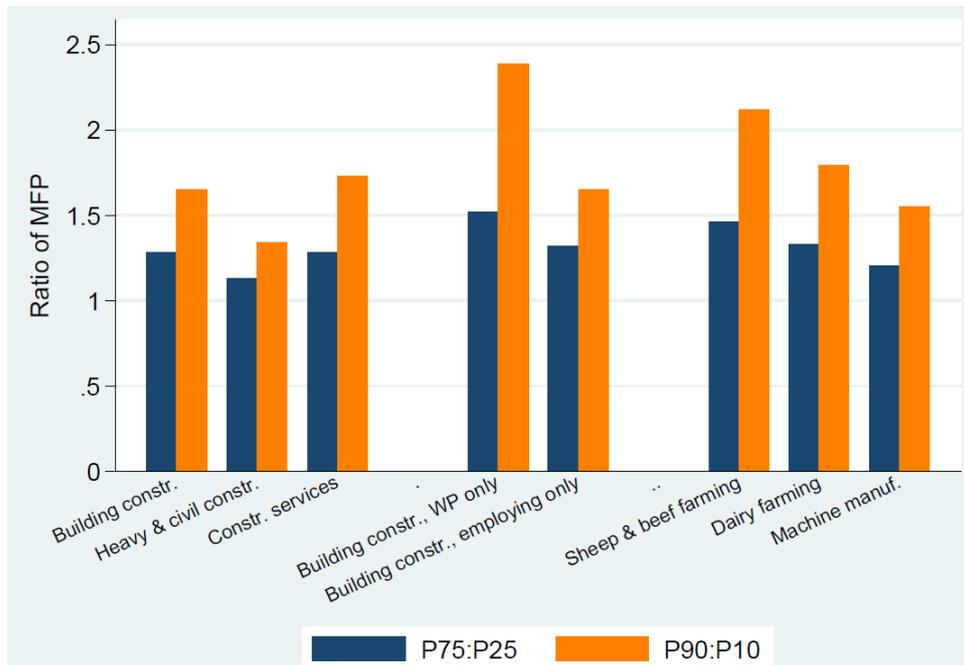


Figure 12: Productivity dispersion in different industries

Source: Jaffe et al. (2016)



Open questions

- Are there sector-specific productivity drivers that can be influenced by policy?
- How economically connected are our cities and regions?
- How significant are differences in competition across regions?
- What drives spatial productivity differences within sectors?

The Forward Looking Research Programme

Between 2014 and 2016, the Productivity Hub partnered with Motu Economic and Public Policy Research (Motu) to undertake research using the LBD. The topics chosen reflected the Hub's earlier Forward Looking Agenda for Research (FLARE), which identified key research questions that the LBD could be used to inform (Nolan, 2014).

Recently the Productivity Hub has shifted to a new approach, which builds on the partnership with Motu and aims to increase flexibility and to broaden the pool of expertise. The two priority areas for the Productivity Hub for the 2017/18 year are:

- Competition
- Spatial productivity

The purpose of the work programme is to co-ordinate (largely) productivity-related research effort (particularly using the LBD) across the Productivity Hub agencies. While the Hub agencies retain their independent interests, they felt that collaborating in this way would help them make the most of the opportunities the LBD provides to advance understanding of New Zealand's productivity issues and to ultimately improve policy.

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Glossary

LBD – Longitudinal Business Database. A collection of microdata maintained by Statistics New Zealand that contains information on over 400,000 active, private-for-profit business in New Zealand. The information comes from a range of administrative and survey sources. See Fabling and Sanderson (2016) for details.

IDI – Integrated Data Infrastructure. A collection of microdata maintained by Statistics New Zealand that contains information on individuals from sources such as Inland Revenue, the Ministry of Health, the Ministry of Education, the Department of Corrections, and the Ministry of Justice, among others. Individuals are linked to firms via tax records.

Diffusion – the movement of technology, knowledge, ideas, and practices across people and firms.

Reallocation – the movement of resources, such as capital and labour, from one firm to another.

Technology frontier – the most up-to-date, state of the art technology available to firms.

Firm productivity – how good a firm is at turning its inputs into outputs.

Aggregate productivity – how good the economy (or an industry) as a whole is at turning inputs into outputs.

Intangible assets – assets that do not have a physical form. They are assets in the sense that investment in them is expected to generate a return. Intangible assets can include intellectual property, market intelligence, employee skills, computer software etc.

R&D intensity – defined as the amount spent on research and development as a fraction of total expenditure.

NTF – new to the firm.

NTNZ – new to New Zealand.

NTW – New to the world.

RPW – real product wage, or the wages a firm has to pay relative to the price of output