

Tertiary education, skills and productivity

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KEY FINDINGS

While economic growth was strong from 2002 to 2006, labour productivity growth was weak. New Zealand has had low labour productivity growth compared with our international competitors and in relation to our level of tertiary education.

The proportion of New Zealanders in employment with a bachelors degree or higher doubled from 1992 to 2008. There has also been higher demand for unskilled workers as the economy grew from 2002 to 2006. The average English-based literacy skills of those in employment have not increased, in part due to increased reliance on migration from non-English-speaking countries.

There is evidence that increases in tertiary education have contributed to productivity growth. However, the effect has been dampened by the expansion of the workforce to include more low-skilled workers and greater reliance on migration to fill skill gaps. Firm turnover may also have had some effect on dampening productivity. New Zealand's small size and relative economic isolation also have a significant effect on limiting growth in labour productivity.

Increased skills derived through tertiary education do contribute to increased productivity. How these skills are used and combined with capital, technology and knowledge investments is also important. Raising capital, multifactor and labour productivity need to be addressed together, along with improving industry investment in R&D. An emphasis on building economies of scale and reducing the cost of getting goods and services to market is also essential.

Introduction

This paper updates and extends an article that was first published in *Profile and Trends 2007* (Ministry of Education, 2008). It provides an overview of the information and literature relating to the link between tertiary education, skills and productivity in New Zealand.

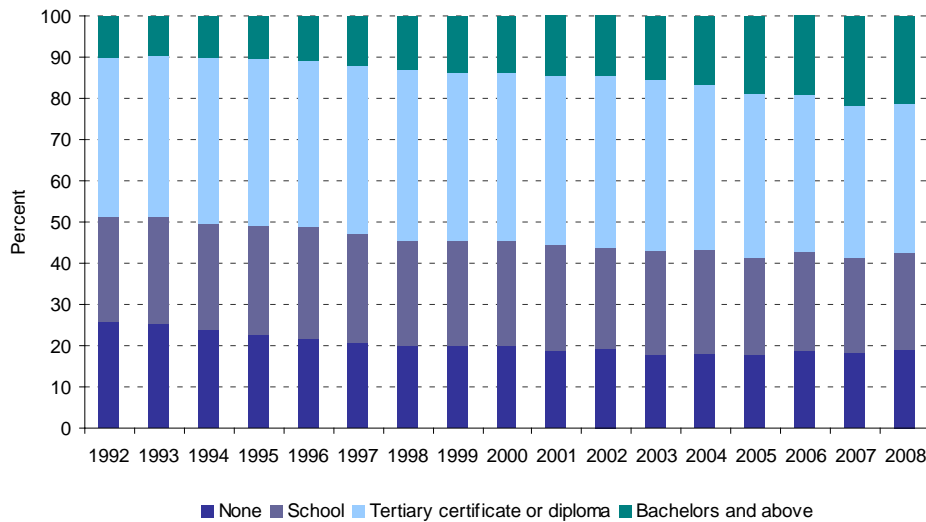
There has been major growth in the proportion of employed New Zealanders with a tertiary education qualification. The proportion with a bachelors degree or higher has doubled since 1992. This has been a result of increased attainment of qualifications by New Zealanders and skilled migration. However, there has been little change in the overall literacy skills of people in employment. During this period, New Zealand's labour productivity has not grown as fast as that of its main competitors. Consecutive governments have identified raising productivity growth as a key economic challenge for the country.

Changes in education and skills

High growth in tertiary education attainment

Over the last 15 years, the proportion of employed New Zealanders with higher-level educational qualifications has increased. From 1992 to 2008, the proportion of employed people with a bachelors degree or higher qualification increased from 10 percent to 21 percent. The total proportion of employed New Zealanders with post-school qualifications increased from 49 percent in 1992 to 57 percent in 2008 and the proportion with no educational qualifications decreased from 26 percent to 19 percent.

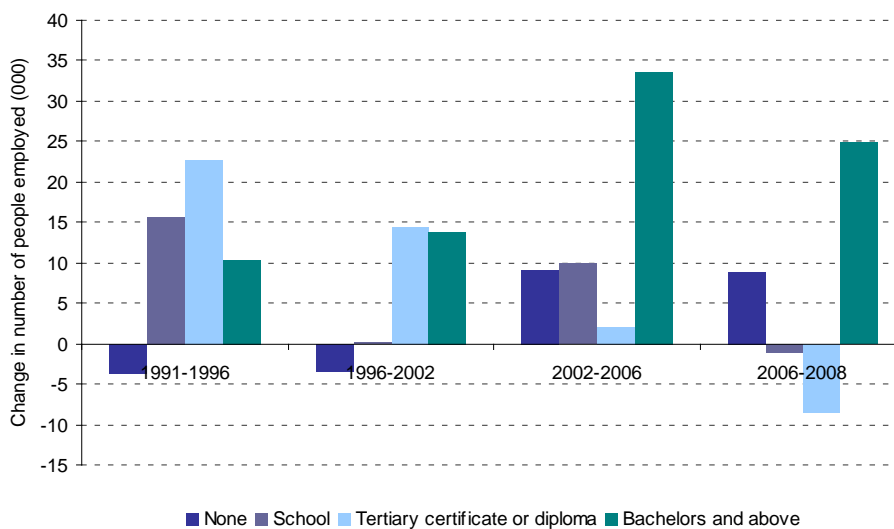
Figure 1
People in employment by highest qualification



Source: Statistics New Zealand, Household Labour Force Survey, June quarters.

As the labour market has gone through various changes, so have the characteristics of the additional employees. From 1992 to 1996, there was high, but decreasing unemployment and high job growth. In this period, the majority of new employees had school qualifications and tertiary certificates and diplomas. From 1996 to 2002, there was a brief return to higher unemployment and decreasing employment. During this period, the net increase in the workforce was in people with tertiary qualifications. From 2002 to 2006, unemployment was low and the number of jobs was increasing steadily. The majority of the increase in employment was in people with bachelors degrees and above. However, there was also increased employment of people with no qualifications or school qualifications only, as more unskilled adults were able to find employment. From 2006 to 2008, job growth decreased and unemployment started to increase. During this most recent period, increased employment was for those with either degrees or no qualifications.

Figure 2
Average annual change in the number of people employed by qualification level



Source: Statistics New Zealand, Household Labour Force Survey (June quarters).

High rate of skilled migration

Inward and outward migration is a significant factor for New Zealand when considering skills in the workforce. New Zealand has one of the highest proportions of tertiary educated¹ people residing overseas. Overall, the number of New Zealanders with a tertiary education living outside the country is more than made up for by the number of people with a tertiary education who have immigrated to New Zealand (Dumont and Lemaître, 2005).²

Over the period from 1996 to 2006, New Zealand had a very high rate of immigration to meet high employment growth in skilled occupations. In 2006, 12 percent of people in employment had first arrived in New Zealand within the previous 10 years. However, 31 percent of people employed with a postgraduate qualification and 21 percent of people with a bachelors degree had arrived since 1996.

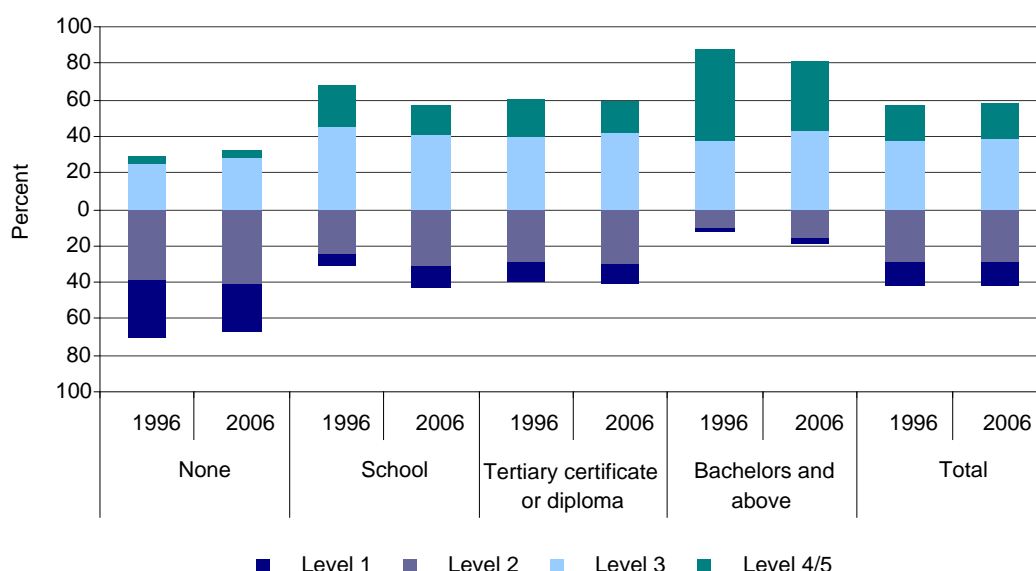
Of those who were employed in 2006 and who had arrived in the previous ten years, 58 percent spoke English as an additional language. The proportions for those with bachelors degrees or higher were over 60 percent. This resulted in 14 percent of all people in employment in 2006 speaking English as an additional language, with the proportions for people with bachelors and postgraduate qualifications being 21 and 31 percent respectively.³

Little overall change in average literacy skills

Despite the growth in the proportion of employed people with tertiary qualifications, the average English-based literacy skills of people in employment have not changed much. International surveys of adult literacy, conducted in 1996 and 2006, show little change in the distribution of English-based skill levels for prose literacy (understanding continuous text). In 1996 and 2006, 60 percent of people in employment had sufficient prose literacy skills to participate in a knowledge society (level 3 and above). For document literacy (understanding tables and charts) there was a small increase in the proportion of people in employment with higher levels of document literacy from 57 to 60 percent (Satherley, Lawes and Sok, 2008).

Figure 3

Distribution of document literacy levels for people in employment by qualification level



Sources: International Adult Literacy Survey (1996) and Adult Literacy and Life Skills Survey (2006)

¹ That is a diploma, degree or postgraduate qualification.

² Figures in this study cover OECD countries only and do not include a number of Asian countries which are significant source countries for migration to New Zealand.

³ Figures are derived from the Adult Literacy and Life Skills Survey 2006.

The overall lack of change in skill levels came from two main sources. While the number and proportion of degree qualified employees increased, the average English-based literacy of employees with degrees decreased. This is due to increased proportion who were recent immigrants with English as an additional language, as discussed above. The other source was been the increased number of people employed with school or no qualifications, who had lower literacy levels. The effect of this can be seen particularly in the decrease in the average skills of employees with school qualifications, as more people with low literacy were employed.

New Zealand’s labour productivity

What is productivity?

Productivity is a measure of how efficiently a firm, or an economy, uses inputs, such as labour and capital, to produce goods and services. Changes in productivity are not the same as changes in levels of production. An increase in productivity can mean that more goods and services have been produced with the same amount of capital and labour, or that the same amount of goods and services has been produced with less capital and labour. Furthermore, the usual measure of productivity is the growth in productivity, that is, the extent to which efficiency is increasing.

There are three standard measures of productivity: **labour productivity** measures the output achieved per worker or per hour worked; **capital productivity** measures the output achieved per unit of capital input; and **multifactor productivity** takes account of both labour and capital inputs and represents the portion of output growth that cannot be attributed directly to growth in labour or capital inputs. As such, it can be taken to represent improvements due to other sources, such as technology change, new knowledge and skills, and improved methods and processes (The Treasury, 2008a and Statistics New Zealand, 2009a).

Low growth in productivity

In the period from 1991 to 2002, economic growth averaged 3.5 percent per annum. Over the same period, labour productivity growth was between 2 and 3 percent and multifactor productivity growth around 2 percent. In the period from 2002 to 2006, economic growth increased to an average of over 4 percent per annum. However, labour productivity growth decreased to 1.5 percent and multifactor productivity growth to less than one percent. As economic growth slowed from 2006 to 2008, productivity growth also continued to decline.

Table 1

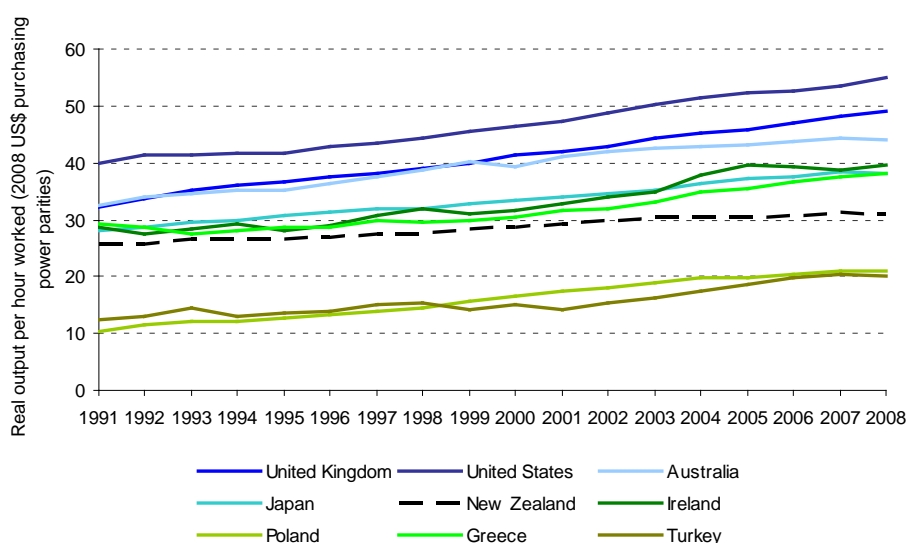
Average annual percentage growth in productivity and gross domestic product

	Average annual productivity growth			Average annual GDP growth
	Labour	Capital	Multifactor	
1991-1996	2.8	1.2	2.2	3.4
1999-2002	2.2	0.5	1.5	3.5
2002-2006	1.5	-0.1	0.8	4.3
2006-2008	1.0	-1.3	0.0	2.6

Source: Statistics New Zealand, Productivity Statistics.

Figure 4 shows that New Zealand’s labour productivity levels have been low in comparison with our main trading partners – including the United Kingdom, United States, Australia and Japan. Growth has also slowed relative to other countries since 2002, such as Ireland, Poland, Greece and Turkey, who are at the periphery of the European Union.

Figure 4
Long-term labour productivity levels



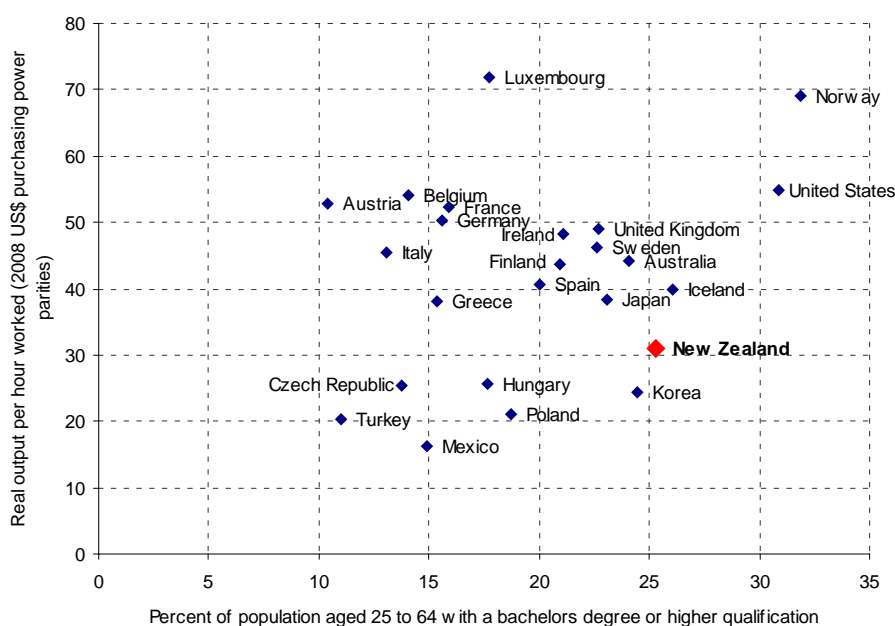
Source: The Conference Board and Groningen Growth and Development Centre (2009).

The contribution of education to productivity

New Zealand and the OECD

New Zealand maintains one of the highest rates of tertiary education in the OECD. Based on the proportion of 25 to 64 year olds with a bachelors degree or higher, New Zealand rate is well above the OECD average (OECD, 2009). However, in terms of labour productivity, New Zealand is in the lower third of the OECD, performing somewhat ahead of the Eastern European countries but well behind Japan, Australia, the United States and Western Europe. This situation raises the question about what contribution increased educational attainment has made to productivity and why the effect appears to be so limited in New Zealand.

Figure 5
Comparison of productivity and tertiary education attainment for selected OECD countries



Sources: OECD (2009) and The Conference Board and Groningen Growth and Development Centre (2009)

Education and labour productivity

Razzak and Timmins (2010) looked at the effect of educational qualifications, as a proxy for human capital and skill levels, on economic output per person. They found that increases in the proportion of employees with bachelors degrees and above and increases in the average gross domestic product per person were highly positively correlated. Thus, there has been a general benefit from increased tertiary education to the economy as a whole.

They also found that the combination of increased *private* investment in research and development, together with an increased proportion of the workforce with bachelors degrees and above, had a strong positive effect on gross domestic product per capita. However, this effect has been limited by New Zealand's low investment in private research and development compared with many of its trading partners (Statistics New Zealand, 2009b).

Razzak and Timmins' models suggest that a 10 percent increase in share of degree-educated workers results in a 0.5 to 1.0 percent increase in gross domestic product per capita. The effect is higher in industries that have a lower percent of degree-qualified employees. A smaller effect on gross domestic product was found for increasing the proportion with tertiary qualifications below degree level.

Skill shortages and skill premiums

Razzak and Timmins (2008) went on to look at skill shortages and skill premiums in New Zealand. The skill premium is the wage paid to skilled workers relative to unskilled workers.

They concluded that the New Zealand economy had been experiencing a strong upward shift in the demand for skilled labour and a significant equal increase in the supply of skilled workers. A major driver has been the adoption of new technology, which drives up the demand for skills and also motivates workers to upskill, increasing the supply of skills.

The increase in premiums paid for higher skills has been small, as the increase in demand has only been slightly higher than the increase in supply of people with those skills. Using qualifications as a measure of labour skill, they estimate that demand has been about 2 percent ahead of supply annually.

They found significant differences in patterns across industries. Demand for skills was relatively higher in service industries (such as finance, insurance, real estate, business services and community, social and personal services) which are more dependent on information technology.

Does quality matter in labour input?

Szeto and McLoughlin (2008) looked at whether the increase in qualifications levels across the workforce, along with increased labour force participation, migration and demographic changes, had resulted in improvement to the quality of labour input. Quality of labour input was examined using qualifications, as a proxy for skills, and age, as a proxy for experience.

They found that increased qualification levels, particularly at degree level and above, as well as a more experienced workforce, had contributed to a large rise in labour quality since 1988. It was stronger in the period 1988 to 1997 and dampened from 1997 to 2005 due to more low-skilled people entering the workforce.

They estimated that around a third of the growth in labour input over this period came from increased labour quality. Around 30 percent of the quality increase could be attributed to demographic changes and the remaining 70 percent to rising qualification levels.

The annual rise in labour quality was similar to that experienced in Australia, the United States and Europe. However, once labour productivity had been adjusted for improvements in quality,

the annual growth in New Zealand was much less than comparable growth rates in Europe, the United States and Australia.

Statistics New Zealand has since developed a composition-adjusted series for labour productivity (Statistics New Zealand, 2009a). This series adjusts for changes in qualifications and experience of the workforce. The adjusted productivity series shows the amount by which productivity has grown over and above changes in the quality of labour. The series shows that adjusted labour input growth has been higher than unadjusted growth. This implies that the average experience and skill levels in the workforce have been increasing. This, in turn, lowers the adjusted productivity growth. The fact that adjusted productivity growth remains greater than zero means that factors other than just improvements to labour quality have also contributed to labour productivity growth.

Table 2

Average annual percentage growth in labour inputs and productivity, unadjusted and adjusted for labour composition

	Labour input growth		Labour productivity growth	
	Unadjusted	Adjusted	Unadjusted	Adjusted
1998-2002	1.1	1.8	2.2	1.4
2002-2006	2.7	2.8	1.5	1.3
2006-2008	1.6	1.8	1.0	0.8

Source: Statistics New Zealand, Productivity Statistics

Variations in earnings and composition of employment

While not looking specifically at the question of qualifications and skills, Maré and Hyslop (2008) examined the impact of the economic expansion from 1999 to 2007 on earnings and the composition of employment. They found that workers entering the workforce during this period had 19 percent lower earnings than the average worker in that period and that more hours were being worked by lower-paid workers. Their analysis confirms the idea that economic expansion has brought an increased number of lower-skilled workers into the workforce, thus lowering average productivity.

They also looked at the effect of changes in firms on wages. They found that firms that started up during this period paid 8 percent lower than average, as did firms that were closing down. The employment shares of entering and exiting firms were roughly equal and accounted for about 20 percent of the workforce in total. Overall, firm turnover accounted for a 1 percent decline in average earnings during this period. From this analysis it is not possible to conclude whether firm turnover had much effect on dampening productivity in this period. A longer time series of data, over several economic cycles, would be needed to form a strong conclusion.

Productivity, capital intensity and labour quality – comparing New Zealand with the United Kingdom

Mason and Osborne (2007) compared productivity, capital intensity and labour quality between New Zealand and the United Kingdom across 21 different ‘market sectors’. Their analysis showed that while New Zealand compares unfavourably with the United Kingdom on average labour productivity, there is considerable sectoral variation.

The paper points out that there is a clear link between the relatively low gross domestic product per capita in New Zealand and weak labour productivity. The authors found that in 2002 the average value added per hour of work in New Zealand was 77 percent of that in the United Kingdom. This was down from 82 percent in 1995. They confirmed that New Zealand had achieved faster growth in labour input through job creation. However, this has been at the cost of average labour productivity.

The paper reports that while New Zealand's productivity is lower than that of the United Kingdom overall, there are some sectors where New Zealand performs better than the United Kingdom. The five areas where there is higher productivity in New Zealand are all in the service industries. The areas where New Zealand does not perform so well are characterised by relatively low physical capital intensity relative to the United Kingdom, such as manufacturing and construction. Part of the difference between the two countries can also be explained by the greater proportion of the New Zealand workforce in lower value-added sectors, such as agriculture.

The Treasury (2008b) explores further the issue of New Zealand's low capital intensity relative to its trading partners. The paper shows that New Zealand firms face a somewhat elevated cost of capital. However, low capital intensity can also be seen in part as a by-product of low multi-factor productivity. Boosting innovation and use of new ideas and technologies is one way of raising multi-factor productivity, which in turn can lower the cost of new capital investment.

Effects of economic geography

McCann (2009) demonstrates that having taken account of New Zealand's economic geography, New Zealand's relative labour productivity performance is much as would be expected. McCann argues that New Zealand's performance needs to be considered in the context of it being a small economy in a very isolated part of the world and is best understood as part of the larger Australasian economic area.

Over half of the gap in labour productivity between New Zealand and the OECD average can be attributed to geography alone. The small size of New Zealand's economy further increases this gap. The global trend is towards concentration of capital and skilled labour in major cities. The effect of this for New Zealand is an outflow of both towards the large Australian cities. These outflows are also highly correlated with the productivity gap between the two countries.

The consequence of this analysis is that New Zealand is faced with the dual challenges of reducing the cost of getting goods and services to market and maximising the opportunities for economies of scale.

Impact of migration on productivity

There is limited information on the effect of New Zealand's high reliance on skilled migration on productivity. Studies of labour-market outcomes show that immigrants start out with lower income and are underemployed, and then take time to adjust to similar outcomes as New Zealand-born workers. For immigrants from English-speaking backgrounds, the adjustment period has been estimated to be 10 to 15 years for employment rates and 15 or more years for income. For immigrants from non-English speaking background, the periods are estimated to be much longer and some studies suggest they may not attain parity within the first generation (Moody, 2006 and Earle, 2009). The Longitudinal Immigration Survey (Department of Labour, 2009) found that of migrants who were employed within six months of attaining permanent residence, around 30 percent were working in jobs that were at a lower skill level than the job they did in their previous country of residence.

This evidence suggests that migration has a delayed contribution to increasing productivity, in terms of raising the skills of employees, as migrants take time to reach their full potential in the workforce. In this regard, it is not an immediate substitute for loss of skills through emigration. In recent years, the high reliance on skilled migrants may have dampened labour productivity growth.

Immigration can also improve capital investment, if migrants bring capital with them. There is little evidence of on which to judge the extent of this in the New Zealand context. Migrants can also help extend international connections of firms. There are undoubtedly cases of this

happening in New Zealand. However, there is limited evidence of the extent to which it has added value across the economy (Moody, 2006).

Modelling of the economic impacts of immigration shows that increased immigration inflows result in a larger economy. The added benefits from immigration can result in a more externally focussed economy and increased gross domestic product per capita. The modelling suggests that the benefits of immigration are greatest when immigrants bring a range of skill levels which enable the economy to grow. It also shows that the additional benefits from immigration only increase significantly when there are accompanying improvements to productivity (Nana, Sanderson and Hodgson, 2009).

How qualifications and skills influence firm productivity

The link between qualifications and national productivity is not straightforward. International literature points to a number of channels of influence (Mason, 2008). Increases in skills and qualifications may have greater effect when combined with physical capital investment and/or the introduction or more effective use of new technologies. The latter is noted above in Razzak and Timmins (2008). There is also evidence that combining investment in higher skills and in employer-funded research and technology has a greater impact on productivity. This combination can enable both greater innovation and greater take up of innovation within the workforce. This combination effect is noted in Razzak and Timmins (2010) above. Hall and Scobie (2006) found that in the agricultural sector, having domestic capability within in the industry to make use of international knowledge is essential to productivity growth.

Durbin (2004) identified three categories of skill that seem to be important for firm productivity. In addition to technical skills, firms need good entrepreneurial skills to identify and respond to market opportunities and managerial capability to lead and organise effective production. Raising the overall skills of workers is only one mechanism by which skills influence productivity. Durbin also points to the interaction of skills with other inputs such as capital, R&D, technology and sharing of knowledge within and across firms.

Linking qualifications, skills and productivity

The information and research reviewed above confirms that the increased levels of qualifications in the workforce have fed through to improved quality of labour and contributed to labour productivity growth. However, this contribution has been dampened by the expansion of the workforce to include more low-skilled workers and greater reliance on migration to fill skill gaps. Firm turnover may also have had some effect in dampening productivity. New Zealand's small size and relative isolation pose additional challenges to achieving high rates of labour productivity.

Increased skills derived through tertiary education do contribute to increased productivity. How skills are utilised within firms and combined with capital, technology and knowledge investment is also critical to raising productivity. Raising capital, multifactor and labour productivity need to be addressed together, along with improving industry investment in R&D. This needs to be considered in the wider context of improving economies of scale and reducing the cost of getting goods and services to market.

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