

Public Policy and Growth in New Zealand

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1. Introduction

This Briefing Note discusses New Zealand's economic performance in the context of the existing academic literature on policies that foster growth and institutions that might dampen it. We summarise some of the key facts about New Zealand's economic performance and compare its performance to Australia, the UK and the US. We discuss what these suggest about policy towards productivity and growth in New Zealand.

In 2009, gross domestic output per capita in New Zealand was US\$ 29,182, while the average for Organisation for Economic Development and Co-operation (OECD) countries was US\$ 33,420, Australia's was US\$ 39,337 and the US was US\$ 46,581.¹

Output growth can come from increased labour inputs, or from the more efficient use of those inputs. Labour productivity – the amount of output produced per hour worked or per worker measures the efficiency of labour inputs. Achieving productivity growth and closing the productivity gap with the major world economies has been a recent policy objective of many governments.

Growth in New Zealand has come largely from increased labour inputs, rather than from labour productivity growth. Labour productivity in New Zealand has grown over the past two decades, however only slowly and there has been a persistent and widening gap with other developed economies. There has been considerable variation across industries in labour productivity growth, and in the factors contributing to labour productivity growth.

It is common to compare levels and growth rates of labour productivity across industries and countries. This can be informative if we think that countries follow a

¹ <http://stats.oecd.org/Index.aspx?DataSetCode=DECOMP>; Luxembourg was the highest at US\$ 83,802 followed by Norway at US\$ 55,650.

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common growth process and produce with common technology. If that is the case then where performance is lower in one country than in other countries this may highlight constraints or barriers to potential growth in that country. However, it is likely that countries differ in important ways, so that the optimal structure of production may differ; it is not necessarily the case that what is optimal in one country will be optimal in another location or circumstance. In this situation we would expect to see differences in the use of factors of production or specialisation (Aghion and Howitt, 2006), and it would not be growth enhancing for a country to implement policies that were not appropriate to its circumstances. Nonetheless, bearing this in mind, it can still be informative to consider how performance differs in order to learn more about what might be constraining growth in New Zealand.

Productivity growth in New Zealand has been strong in many manufacturing and Information and Communication Technology (ICT) producing sectors. Where growth has been slow has been in the services sector. Market services have made a lower contribution to overall labour productivity growth in New Zealand than in the UK or US.

The wholesale and retail sectors in New Zealand performed worse than in the US and UK, although similar to the EU15. New Zealand experienced slow growth in transport and storage, hotel and restaurants and business services compared to other countries. Financial services are the only service sector that performed well compared to other countries, although measurement of output in this industry is very problematic.

A number of papers have emphasised the role of economic geography in dampening labour productivity growth in New Zealand.² It is perhaps surprising therefore that New Zealand exports are not more focused on tradable services, for which transport costs are lower than for most goods. New Zealand has a negative trade balance in a number of important business service sectors, unlike Australia, the UK or the US. Growth in these services has played an important role in driving labour productivity growth in the UK and US; but not in New Zealand. Because they are tradable these services offer stronger potential for growth. It would be interesting to investigate whether imports and increased competition from abroad has promoted productivity, or

² See McCann(2009) and OECD (2009), in particular chapter 2 and Figure 2.6.

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whether it has played a role in dampening the productivity performance of these services.

Several studies point to low capital intensity as an important reason for slow labour productivity growth in New Zealand.³ Investment is low; however, the stock of inward FDI into New Zealand is high, despite the OECD comments that FDI restrictions are high relative to other small OECD countries.⁴

The OECD comments that ICT investment and broadband penetration are low,⁵ although from OECD statistics it appears that ICT as a share of investment is relatively high, and ICT producing sectors showed strong labour productivity growth. However, the ICT using sectors show slow growth; these are the sectors that contributed the most to labour productivity growth in the US and UK, in particular retail in the US and business services in both the UK and the US. The literature emphasises the idea that the benefits from ICT only arise when complementary internal and external reorganisation also occurs. We discuss this literature.

Research and Development (R&D) investment by firms is low and has increased little over the last decade. New Zealand now lies well behind the OECD and EU15 averages, as well as far below China and Australia. A relatively large proportion of the population has tertiary education.

New Zealand undertook widespread market-oriented reforms in the 1980s and 1990s, and it ranks relatively high on most OECD product market regulation,⁶ and trade restrictions are relatively low.⁷

New Zealand's corporate income tax rate is on the high side, and it raises a greater share of tax revenue from corporate tax than the OECD average, the UK or US, but similar to Australia.

The current policy framework for discussing labour productivity growth in New Zealand seems to focus on the "five drivers" of productivity. This does not seem to be the most useful framework, and the UK government, for example, has moved away

³ Figure 2.5, OECD (2009); and Figures 5 and 6 in New Zealand Treasury (2008).

⁴ See Figure 2.7, OECD (2009)

⁵ See page 77, OECD (2009), and ICT indicators OECD (e.g. business with broadband).

⁶ See Figure 2.9, OECD (2009).

⁷ See Table 2.1, OECD (2009).

from this approach. A more direct approach is to focus on the impact that policies and institutions have on the incentives that individuals and firms in the private sector face. The key to policy intervention is to undertake reform where policies or institutions are impeding growth in New Zealand, and to intervene in cases where there are very clear and large ways in which existing institutions fail to give individuals and firms the right incentives, and policy can effectively improve them. Where existing institutions are providing appropriate incentives, or where government is not able to effectively intervene, it is better to do nothing.

The rest of this paper is structured as follows: Section 2 describes some of the main aspects of productivity performance in the New Zealand economy, Section 3 describes other indicators of economic performance and the structure of the economy. Section 4 describes regulation and institutions in New Zealand. A final section summarises and attempts to draw out some implications for policy.

2. Labour productivity

2.1 Labour productivity levels in the whole economy

Labour productivity, as measured by gross domestic product (GDP) per hour worked, is at the low end in New Zealand when compared to other OECD economies. In 2009, it ranked 25th and was lower than the OECD average (see Figure 1).

Labour productivity in New Zealand has grown over the last two decades, from US\$36 in 1990 to US\$43 in 2009. However, that growth has been slower than in other developed countries. New Zealand now has lower labour productivity per hour worked than many other developed economies. For example, in 2009, in one hour, New Zealand workers produced 87% of the output per hour produced by Australian workers, 89% of the output produced by UK workers and 76% of that of US workers (as shown in Figure 2). Slower labour productivity growth in New Zealand has been the result of faster growth in hours worked than in output, particularly between 1990 and 2005.

2.2 Labour productivity growth in the whole economy

Output can increase either if hours increase or if productivity increases, i.e. more goods and services are produced each hour. Table 1 decomposes output growth in

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Australia, New Zealand, the UK and the US into that part that has arisen from growth in labour productivity and that part by growth in hours worked. More of New Zealand's growth in output has come from growth in hours worked, relative to growth in labour productivity, than in Australia, the UK and US; although over the most recent period 2005-2009 employment growth has slowed. Over this period New Zealand has seen rising labour market participation and falling unemployment (New Zealand Treasury, 2008).

Increased employment or hours is often associated with weaker labour productivity growth, because the marginal workers or additional hours worked are likely to be less productive than already active workers (see for example Figures 3 and 4 in Warmke et al (2010)). This could happen due to a range of reasons; for example if new entrants tend to have lower skill levels than the average worker or take time to learn skills on the job or assets complementary to workers get congested.

However, there is not necessarily a trade off between employment and productivity (see McMarrow et al (2005)). The US and UK have recently experience output growth and labour productivity growth in Business Services.

Note that the figures in Table 1 refer to the whole economy. US productivity performance, particularly up to 2000, is slightly lower than the UK or Australia in the whole economy; this contrasts to the market economy where US growth was stronger. New Zealand contrasts to the other three countries which have seen labour productivity make a greater contribution to growth relative to hours worked.

2.3 Labour productivity growth over the recession

How did labour productivity across the whole economy evolve over the recession? By definition output falls in a recession. In most countries hours worked also fell. The path of labour productivity depends on the relative size of the fall in output and total hours worked. A fall in total hours worked will have a negative effect on output, but the effect on productivity is less clear. If a reduction in hours means that the lowest productivity workers are no longer working, or if workers are more productive when working fewer hours, then reduced hours would lead to an increase in productivity.

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New Zealand experienced a fall in productivity during the recession; output fell by more than hours worked. This is similar to the UK but in contrast to the US and Australia, where productivity growth was positive throughout 2007-2009.

The growth rates of output and hours worked in recent years are shown in Figures 3 for each of Australia, New Zealand, UK and US. In New Zealand output fell by around 1% in both 2008 and 2009. The number of hours worked showed little change in 2007; grew slightly in the year to 2008 and then saw a 1.3% fall in the year to 2009.

As can be seen from the other figures, New Zealand had a similar experience to the UK in that output fell by more than hours worked. In contrast, in both Australia and the US, the growth in hours slowed more quickly than the growth in output. Notably, Australia's output remained positive across the years 2006-2009; Australia escaped recession, while the slowed growth in hours worked ensured productivity remained positive. The fall in output and hours was greater in the UK and especially in the US than in New Zealand. Despite the large fall in US output - in the first quarter of 2009 it was 8.7% lower than it had been in the same quarter in 2008 – hours fell further, producing positive US productivity growth through the recession.

New Zealand productivity fell by 2.5% in 2008 relative to 2007; this is the result of the larger fall in output than in hours worked seen in Figure 3. By 2009 productivity was slightly higher than in 2008; the yearly change was 0.5%. However, productivity remained lower in 2009 than it had been in 2007. This was a similar experience to the UK where productivity fell throughout the recession.

Australian productivity growth remained positive throughout 2007-2009. A similar pattern was seen in the US where productivity continued to grow throughout the recession. The large fall in hours worked in the US compared with output, seen in Figure 3, acted to keep US productivity high.

Australia's output growth was positive throughout this period. In 2008 this was the result of strong growth in hours worked. In 2009 hours worked fell, as they did in each of the four countries, resulting in strong labour productivity growth.

In 2008 New Zealand's hours growth was matched by a fall in productivity. Hours worked fell in 2009 resulting in productivity growth.

2.4 *Labour productivity growth in the market economy*

In this section we focus in the market economy, which excludes non-market services and accounts for around 70% of New Zealand's economy. We document the relative importance of changes in factor intensity (the amount of capital used for each hour worked) and multifactor productivity (which captures all other factors such as innovation and how efficiently labour and capital are used) in accounting for labour productivity growth in the period 1995-2004. This is the most recent period for which we have comparable data across countries at the industry level. This coincides with the period during which the US market economy experienced strong productivity growth. Growth in this period was largely attributed to the adoption of Information and Communication Technologies (ICT) and complementary internal and external restructuring.⁸ We compare New Zealand to the US, the UK and an EU average. Australia is not included in this part of the analysis due to a lack of readily accessible comparable data.

Table 2 decomposes annual output growth in the market economy into growth in hours worked (col 2) and growth in labour productivity (col 3). Output growth in the market economy in New Zealand was faster relative to the EU, UK, and similar to the US. Growth in hours worked in New Zealand is almost three times higher than in the other countries, resulting in lower labour productivity.

Labour productivity growth in New Zealand averaged 2% per annum, lower than the UK and US, but higher than the average across the European Union. Table 2 further decomposes annual labour productivity growth over the period 1995-2004 (col 3) into the contribution of labour composition (the quality of labour input; col 4), capital deepening (changes in the ratio of capital used per hour worked; col 5) and multifactor productivity (col 8).

In New Zealand, more than half of the growth in labour productivity in the market sector came from multifactor productivity. Multifactor productivity is a residual measure generally thought of as reflecting innovation and the overall efficiency of the production process; however, as a residual it will also capture mismeasurement, such as the existence of economies of scales, the degree of competition and regulation, and

⁸ See, for instance, Jorgenson, Ho and Stiroh (2008).

the importance of each of these may vary across industries. It can also reflect changes in labour composition if these are not measured separately.

Capital deepening was more important for UK, US and European Union. ICT capital deepening has contributed to a little over a quarter of labour productivity growth in the US and almost 40% in the UK during this period.⁹

2.5 Labour productivity growth in the market economy by industry

This section discusses the contribution of each sector of the economy to growth in labour productivity. Appendix A shows that New Zealand has a smaller market service sector and larger goods producing sector compared to the UK and the US.

In the period 1995-2004 the largest contributor to labour productivity growth in the US and UK was market services; they accounted for around 60% of the growth in this period (see Table 3).¹⁰ This has been due both to productivity growth and an increase in the relative size of market services in both countries (and was a situation in which labour productivity increased while employment grew).

The picture in New Zealand is different to the UK and US. Half of the labour productivity growth in the market economy came from goods production. This is both because goods producing industries account for a bigger share of the New Zealand economy and because the industries within goods production experienced positive labour productivity growth, and in some cases (primary industries, mining and electricity, gas and water supply) growth rates were above 3%, higher than the average for the economy. Market services contributed to 40% of labour productivity growth.

The picture for New Zealand is more similar to European Union 15, and to most of the individual countries that belong to this group. In most countries, market services contributed less than a third of labour productivity growth.¹¹

In Appendix B we show details of growth in a number of further disaggregated industries.

⁹ See van Ark et al (2008), Table 4.

¹⁰ See van Ark et al (2008); table 5.

¹¹ See van Ark et al (2008), table 5.

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As emphasised in the introduction, caution should be taken in making comparison of levels and growth rates of labour productivity across industries and countries; it is likely that countries are heterogenous in important ways, so that the optimal structure of production differs; it is not necessarily the case that what is optimal in one country will be optimal in another location or circumstance; in this situation we would expect to see differences in the use of factors of production or specialisation. (Aghion and Howitt, 2006).

Productivity growth in New Zealand was strong in many manufacturing and ICT producing sectors. Where growth has been slow has been in services. Market services have made a lower contribution to overall labour productivity growth in New Zealand than in the UK or US.

Wholesale and retail performed similar to the New Zealand average but worse than in the US and UK, although similar to the European Union 15. New Zealand experienced slow growth in transport and storage, hotel and restaurants and business services compared both to the New Zealand average and to other countries. Financial services are the only service sector that outperformed the New Zealand average and other countries (though measurement of output in this industry is very problematic).

Business and financial services are tradable and so offer the potential for growth, and with high skills and an English speaking population New Zealand seems like it could be well placed to take advantage of this. Yet this sector has not performed well in NZ in terms of productivity growth, and NZ has a negative trade balance (see Figure 11b). Did opening up to competition in this area dampen productivity growth. Bombarda et al (2010) consider the situation in France where business services firms are increasingly under pressure from foreign competition. They consider the effects of trade liberalisation, allowing for the possibility of some degree of market power in the industry. Greater import penetration led to French service firms exiting, with imports from high-income countries having the biggest impact. They do not investigate the impacts on productivity. Aghion, Blundell, Griffith, Howitt and Prantl (2007) show that increased competition from abroad can either increase or dampen the incentives of domestic firms to invest in productivity enhancing activities depending on whether they are initially close to or far away from the technology frontier. The basic intuition is that for firms that are very far away from the frontier competition from the

frontier will reduce their incentives, because they stand no real chance of competing with the frontier firms; but for firms that are initially already near to the technology frontier, competition from abroad can spur them on to invest even more in improving productivity, because by doing so they may be able to gain an important market advantage over the incumbent.

3. Investment, innovation, skills and trade

3.1 *Investment in physical capital and ICT*

Investment

The ratio of capital to GDP (capital intensity) in New Zealand is lower than in many other countries. In 2002, New Zealand had around 70% of the capital intensity of the US, and lagged behind the United Kingdom and Australia.¹² Further evidence for the market economy, for the period 1995-2003, points to the fact that New Zealand has lower capital intensity per worker relative to the UK.¹³ Investment (gross fixed non-residential capital formation) per worker in New Zealand lags behind the US and Australia and the average for the OECD; and the gap between New Zealand and the average for OECD has been widening since 1995.¹⁴ There is evidence that increasing capital accumulation may have a positive impact on output per worker not only in the short run but in the long run.¹⁵

The OECD has raised concerns about thin capital markets and low saving rate as contributing factors to low capital investment by firms, and NZ Treasury (2008) highlights thin equity markets,¹⁶ and the fact that NZ taxes corporate income on the high side compared to other countries (see discussion below on taxes), as leading to a high cost of capital. However, the evidence on what impact this is actually having on investment seems unclear from the statistics on financial activity (see discussion below on financial regulation). In addition, high foreign direct investment (FDI) stocks should partly compensate.

¹² See Figure 6, New Zealand Treasury (2008).

¹³ See Figure 4, Mason and Osborne (2007)

¹⁴ See Figure 2.5, OECD (2009) New Zealand Report.

¹⁵ See Bond et al (2010).

¹⁶ See New Zealand Treasury (2008), pages 23-24.

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New Zealand experience relatively high inward investment flows of FDI in the early 1990s. More recently, inward investment has been lower at a similar share of GDP as in Australia, the UK and US (see UNCTAD Statistics).¹⁷ However, the stock of FDI grew over the 1990s and remains high compared to these countries. See Figure 5. This is despite the fact that the OECD comments that FDI restrictions are high relative to other small OECD countries.¹⁸

Notetheless, even with high inflows of FDI the thin equity markets might have a detrimental impact on technology transfer resulting from FDI. Aghion et al (2009) develop a model in which FDI from the technological frontier plays an important role in transferring technology. However, in order for the technology to be effectively transferred it is important that the FDI is in collaboration with local (non-frontier) entrepreneurs. In order to do this local entrepreneurs need to have capital to invest to overcome the agency problem (i.e. foreign investors will not be willing to transfer technology unless the local entrepreneur has also invested in the project). To the extent that New Zealand entrepreneurs are facing constraints to investment in physical assets and research and development, technology transfer may also be constrained in New Zealand. This in turn could be affecting productivity growth. It could be interesting to investigate this in more detail.

Investment in Information and Communication Technology

The OECD comments that ICT investment and broadband penetration are low in New Zealand.¹⁹ New Zealand invested a relatively high share of total non-residential gross fixed capital formation in ICT, see Figure 4; while it is less than the UK and the US it is slightly more than Australia. However, ICT has made a lower contribution to GDP growth than in Australia, the UK and US, and it still behind these countries in the most recent period, see Table 4.

Some of the ICT using sectors show slow growth; these are the sectors that contributed the most to labour productivity growth in the US and UK, in particular retail in the US and business services in both the UK and the US. The literature

¹⁷ (<http://unctadstat.unctad.org/ReportFolders/reportFolders.aspx>)

¹⁸ See Figure 2.7 OECD (2009)

¹⁹ See page 77, OECD (2009), and ICT indicators OECD (e.g. business with broadband).

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emphasises the idea that the benefits from ICT only arise when complement internal and external reorganisation also occurs.

A large and growing literature has emphasised the importance of the adoption and use of ICT as one of the main factors behind the strong US productivity growth over the late 1990s.²⁰ A number of papers have suggested that to reap the benefits of ICT adoption firms need to make complementary changes to their internal organisation. A number of empirical studies have showed that complementarities in production between ICT and the internal reorganization of the firm are one reason why ICT investment has been so productive - i.e. firms become more productive when they both adopt ICT *and* restructure.²¹ The literature has also emphasised the impact of ICT on the ability of firms to vertically disintegrate production facilities²² and to outsource business services.²³ There may also be further complementarity in production between ICT and corporate restructuring in the form of outsourcing business activities.²⁴ The idea is that by outsourcing their non-core business processes to specialised business services providers firms can focus on their core activities, and this enables them to better exploit ICT to introduce further innovations, such as changes in the processes they use, the products they produce, and other organisational changes. At the same time firms that invest more in ICT are better able to outsource business services and to gain a productivity advantage from focusing on their core competencies and introducing other organisational changes. These complementarities generate productivity gains that are additional to the direct gains created by investment in ICT and outsourcing of business services.

Growth in outsourcing of business services has been one of the major changes to firms' corporate structures, as evidenced by a range of aggregate statistics. Trade in intermediate services has been one of the fastest-growing economic activities around

²⁰ See, *inter alia*, Jorgenson (2001), Stiroh (2002), Oliner and Sichel (2002), van Ark et al (2002), Inklaar, O'Mahony and Timmer (2003), Van Ark and Piatkowski (2004).

²¹ See, for example, Brynjolfsson and Hitt (2000) for a summary of this literature and Bartel, Ichniowski and Shaw (2005), Bresnahan, Brynjolfsson and Hitt (2002) and Bloom, Sadun and Van Reenen (2007).

²² See, for instance, Baker and Hubbard (2002), Feenstra (1998), Grossman and Helpman (2005) Antras (2003) and Hitt (1999).

²³ Abramovsky and Griffith (2006) showed that firms that were more ICT intensive also purchased a greater amount of services in the market, and they were more likely to purchase offshore, when compared to less ICT intensive firms.

²⁴ See Abramovsky and Griffith (2009) and Broersma and van Ark (2007).

the world.²⁵ A large range of business services such as finance and accounting, human resources, sales and marketing, supply chain management, and even research and development, which were previously seen as core to a firms' business, are now increasingly being outsourced.²⁶ The importance of business service outsourcing is also apparent from the very rapid growth in employment in business service sectors in the US and UK, accounting for around one-third of the total employment growth in the US and over 40% in the UK between 1995 and 2001.²⁷

3.2 Innovation and skills

Long run growth is driven by innovation. Investments in skills and new technologies have an important impact on long run outcomes.

New Zealand invests a relatively high amount in software and higher education compared to other OECD countries, but invests a lower proportion of GDP in Research and Development (R&D).²⁸

The education level of the adult population in New Zealand is above the OECD average. New Zealand had the 5th highest proportion of adults that attained a tertiary degree or above as their highest qualification in 2004, see Figure 6.²⁹

The proportion of GDP invested in R&D represents a measure of the share of today's income that is being invested in developing future technologies. Business R&D investment in New Zealand is low by international standards. In 2006 Business expenditure on R&D (BERD) in New Zealand was just 0.49 per cent of GDP compared to the OECD average of 1.49 per cent, see Figure 7. BERD did grow as a proportion of GDP in the early 2000s but has remained static since then. See Figure 8. Business R&D investment in New Zealand is lower partly because it is specialised in

²⁵ WTO (2004), Annual Report 2004 (Geneva: World Trade Organization Conference on Trade and Development), Helpman (2006).

²⁶ See Adler (2002) and Sako and Tierney (2005).

²⁷ Authors' calculations using GGDC data on total persons engaged in employment. See also Goodman and Steadman (2002) and Abramovsky, Griffith and Sako (2004) for more detail analysis of the growth in business services.

²⁸ For comparison of New Zealand's relative position in these areas see Figure 2 of New Zealand Treasury (2008).

²⁹ Szeto and McLoughlin (2008) report that skills levels of the workforce have been increasing in New Zealand.

less R&D intensive industries³⁰ but also it seems mainly due to lower R&D intensities within industries across countries.³¹

R&D expenditure provides a measure of the input to innovation. Alternative measures provide a gauge of innovative outputs. One such measure is the number of patent which represents a direct measure of new technologies. In New Zealand the number of patents per million inhabitants is also low by international standards (see OECD in Figures 2006-07, OECD Science, Technology and Industry Outlook 2006).

3.3 Trade

Much has been made of the importance of geography and New Zealand's distance from the rest of the world.

We see that New Zealand has a trade deficit (i.e. imports are greater than exports) in computer services and other business services. This is not mirrored by more ICT intensive and dynamic countries such as the UK, US and, in recent years, Australia, in which business services sectors have done better. See Figure 11.b. Notably, in 2005 New Zealand became a net importer of goods; in previous years goods exports had been greater than imports. Australia, the UK and US are also net goods importers.

4. Regulation and institutions

Regulation and institutions provide the framework within which firms operate and can therefore have important implications for economic outcomes. Regulations, as they relate both to the labour and product markets, broadly affect the ease with which firms are able to do business. New Zealand ranks favourably on most measures of functioning of institutions.³²

OECD ranking places New Zealand 7th (out of 24 OECD countries) for promoting competition in product markets.³³ The 2010 Economic Freedom of the World

³⁰ See, for example, <http://www.pmcsa.org.nz/issues/commercialisation-of-publicly-funded-research/>

³¹ OECD (2007), Reviews of Innovation Policy New Zealand, see table 2.4.

³² See p11-12, New Zealand Treasury (2008).

³³ See Conway, Janod and Nicoletti (2005). Note, however, that a number of other smaller OECD countries, such as Denmark, Ireland and Iceland, have increased more rapidly since 2005 and now rank higher.

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publishes by the Fraser Institute shows that New Zealand scores very well on almost all labour market measures, and notably low on hiring and firing regulations.³⁴

In 2008 the World Bank's ease of doing business indicator ranked New Zealand second. The scoring was particularly favourable with respect to the ease of starting a business, dealing with licenses, registering property, getting credit and protecting investors.³⁵

The World Economic Forum's 2010-11 Global Competitiveness Report, which provides a broad measure of countries' competitiveness, ranked New Zealand 23th (out of 139). New Zealand ranks relatively highly in health and primary education, financial market sophistication, labour market efficiency, institutions and goods market efficiency.³⁶

The OECD concludes that there are "no obvious regulatory barriers impeding financial market development".³⁷ Although, the same report emphasises that New Zealand has a small capital market (see figure 3.1 and surrounding discussion on financial market size and composition (p87)).

However, there is little evidence that New Zealand suffers from financial constraints. See data compiled by Ross Levine at Minnesota on financial deposits, private credit; on all of these New Zealand has at least as high an amount, as a % of GDP as the UK, US and other countries. Where New Zealand has lower liquidity is in shares traded and other measures of stock market activity. An index which assesses capital access shows that, while New Zealand has a lower overall world rank than Australia, the UK or the US, they are similar in many areas. Where they stand out as having a notably lower score is in relation to bond market development and sources of capital. An article by the World Bank backs up the relatively poor ranking in terms of equity markets and also bonds markets. See Appendix B of Claessens and Tzioumis (2006).

³⁴ See Economic Freedom of the World: 2010 Annual Report, page 117. Section 5 of the Table - Regulation of Credit, Labor and Business

³⁵ Doing Business 2008, The World Bank.

³⁶ See The Global Competitiveness Report 2010-11, World Economic Forum. The GCI is based on 12 measures: institutions, infrastructure, macroeconomic environment, health and primary education, higher education and training, goods market efficiency, labour market efficiency, financial market development, technological readiness, market size, business sophistication, and innovation.

³⁷ OECD (2007), Chp 3 "Deeping financial markets".

This should only be a constraint to businesses' investment in physical and intangible assets such as research and development if banks are more likely to finance investments that have collateral physical, such as residential investments, than other type of (riskier) investments. It would be interesting to investigate this issue further. For example, evidence for the UK suggests that firms that report R&D are more likely to raise funds by issuing shares than firms that report no R&D, and this probability increases with R&D intensity; and that the importance of bank and secured debt are lower for R&D active firms.³⁸

4.1 Taxes

In terms of the amount of revenue that governments raise from different types of taxes, New Zealand is notable in raising a relatively high share from taxes on individual income and corporate income. See Figure 12. New Zealand raises the highest share of total tax revenues through income and profit taxes (62%) among OECD countries (average of 36%).³⁹

New Zealand has a corporate tax rate which is higher than in many other countries, especially other small economies, see Figure 13. The top rate of personal income is reasonably low, see Figure 14; however, the threshold is low. Table 7a shows marginal rate thresholds, and in Table 7b they have been converted to US \$. These show that New Zealand's top marginal rate applies at a relatively low level of income.

OECD report says "Flattening the tax structure – bringing the rates of tax on various kinds of income and profits closer together – would also help improve the efficiency of the tax system." This is in line with recommendations from the recent Mirrlees Review (2010). However, it seems unlikely this would have any impact on highly skilled workers, who would likely be above any threshold chosen.

5. Discussion

New Zealand has undertaken wide spread reforms to regulations, and it ranks very highly on most international measures of institutions that are thought to promote growth. Yet it seems that growth in labour productivity has stalled. Slower labour

³⁸ See Aghion et al (2004).

³⁹ See OECD (2009), p20.

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productivity growth in New Zealand relative to other countries seems to be mainly related to a relatively faster growth in labour input across the whole economy; a lower contribution of increases in capital per worker in the market economy; and slower labour productivity growth in most market services –with substantial variation in performance across individual industries in the market economy. What can we learn from the academic literature about what the underlying causes of this might be, or at least where we might look to try to find them?

There has been a lot of reform in New Zealand over the past few decades. This may be counterproductive. Uncertainty in policy has been shown to dampen firms' incentive to investment. For example, Hall (1993) showed that the US R&D tax credit only had an impact after it was made permanent; during the many years when it was temporary, and renewed annually by Congress, the impact was much weaker. Bloom, Bond and Van Reenen (2007) show that uncertainty reduces the responsiveness of investment to demand shocks, it makes firms more cautious. They show that empirically these effects are large. Consistency of policy is therefore thought to improve investment incentives.

Globalisation and opening of markets increases uncertainty; the domestic economy becomes more susceptible to global shocks in technology and demand. This type of uncertainty can also dampen investment incentives. What is important to succeed in such an economic environment is to have individuals and firms to be able to respond to new incentives, e.g. with the appropriate general skills and flexibility in labour and product markets.

The current policy framework for discussing labour productivity growth in New Zealand seems to focus on the “five drivers” of productivity. This does not seem to be the most useful framework, and the UK governments, for example, has moved away from this approach. A more direct approach is to focus on the impact that policies and institutions have on the incentives that individuals and firms in the private sector face. The key to policy intervention is to undertake reform where policies or institutions are impeding growth in New Zealand, and to intervene in cases where there are very clear and large ways in which existing institutions fail to give individuals and firms the right incentives, and policy can effectively improve them. Where existing institutions

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are providing appropriate incentives, or where government is not able to effectively intervene, it is better to do nothing.

For example, private businesses' incentives to invest in ICT may depend on other firms' and households' ICT usage. The presence of network effect or externalities means that ICT may be more effective when many firms in a region or industry are using similar levels or types of ICT; and usually leads to underinvestment in this area. This means that the government has a role in providing communication and general infrastructure investment such as broadband connections. This may be important for New Zealand since firms' adoption and usage of ICT and the contribution of ICT-using sectors to growth in New Zealand has been low compared to other developed countries. Investment in ICT affects labour productivity through an increase in capital per labour input and multifactor productivity to the extent that ICT is a complement to internal and external reorganisation of the firm.⁴⁰ In addition, rapid broadband connection would overcome some of the geographic barriers that New Zealand faces.

Business R&D is another area in which existing institutions may not provide incentives to firms to invest the socially optimal amount. Firms do not usually capture the full returns from their R&D (knowledge 'spills over' to other firms and individuals). In addition, banks are often not willing to lend to companies who are investing in risky R&D, where there is often a lack of collateral assets, resulting in a shortage of external finance, especially for smaller firms.⁴¹ Equity and venture capital markets are generally thought to be better for this type of investment. Both these types of failing in markets to provide the appropriate incentives may result in firms underinvesting in R&D relative to the socially optimal level.

Business investment in R&D is low in New Zealand compared to other developed economies; partly because it is specialised in less R&D intensive industries⁴² but it seems mainly due to lower R&D intensities within industries across countries.⁴³ The New Zealand government provides support to private R&D investments through discretionary direct grants; and has recently increased the amount devoted to this with

⁴⁰ See for instance Bresnahan, Brynjolfsson and Hitt (2002); Abramovsky and Griffith (2009); and the discussion in section 3.1.

⁴¹ Hall (2009)

⁴² See, for example, <http://www.pmcsa.org.nz/issues/commercialisation-of-publicly-funded-research/>

⁴³ OECD (2007), Reviews of Innovation Policy New Zealand, see table 2.4.

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the aim of increasing private investment in R&D.⁴⁴ Discretionary grants are generally thought to be a poorly targeted form of policy, which usually results in a small number of firms specialising in applying for and obtaining grants. Where the government wants to encourage research in very specific and targeted areas, because the government believes that it has better information on future demands for technology than firms do (for example, in promoting green technologies or in addressing major health problems such as the AIDS epidemic or malaria), then the use of tournaments or competitions has been shown to provide more effective incentives than targeted discretionary grants.⁴⁵ If the government simply wants to increase firms incentives to invest in R&D generally then a more market based policy, such as an R&D tax credit, is thought to be more effective. However, there has been considerable debate in the literature about how to effectively design an R&D tax credit such that it does not provide perverse incentives or entail large deadweight loss.⁴⁶ In 2007 NZ introduced an R&D tax credit that became effective in the income year 2008-2009; but repealed from the income year 2009-2010.⁴⁷ Whether or not NZ want to have an R&D tax credit is a debatable point, but what is clear is that stable policies are essential for creating an environment in which firms can make long-term investment decisions.

International competition and economic integration have been emphasised as ways to increase firms' incentives to improve productivity. Undoubtedly these are important factors for NZ. Competitive pressures from abroad, combined with low regulatory costs of starting up new business should have important 'Darwinian' effects of driving poor performing firms out of business and of promoting the efficient use of resources. However, entry and competition from the technological frontier can also reduce incentives for domestic investment in innovation. Aghion and Griffith (2005) and a series of related articles with various coauthors⁴⁸ show that opening up to foreign competition can reduce the incentives of firms in technologically laggard

⁴⁴ See <http://www.morst.govt.nz/Documents/budget-2010/Supporting-Business-RD.pdf>

⁴⁵ Scotchmer (2004)

⁴⁶ Bloom, Griffith and Klemm (2001) and Hall and Van Reenen (1999)

⁴⁷ See <http://www.ird.govt.nz/technical-tax/legislation/2008/2008-105/2008-105-repeal-rd-tax-credit/>

⁴⁸ See some of Krugman and Freeman's recent work in US that has emphasised this, gain from competition/trade aren't felt everywhere, need to be able to adjust, etc.; and Bonbarda et al on French services sectors]

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industries to invest; these industries can get wiped out by foreign competition. It would be interesting to investigate whether this has in fact been an important factor in NZ's low productivity growth and low R&D investment. This of course may be beneficial from the perspective of global welfare, and it is likely to be beneficial to NZ in the long run, but may require complementary policies that help to facilitate the transition between industries in NZ that get adversely affected by international competition and those where NZ has a comparative advantage.

Appendix A: Structure of the New Zealand economy

Table A.1 shows the industry composition of New Zealand, UK, US and EU in terms of each industry's contribution to value added in 2007. New Zealand has a smaller market service sector (39.9%) and larger goods producing sector (28.4%) compared to the UK and the US. The importance of the good producing sector is similar to the average EU15, though the importance of manufacturing industries in EU15 group is larger than in New Zealand. Primary industries in particular represent a larger share of activity in New Zealand.

Appendix B: Productivity by sector

B.1 Goods producing sectors

Table B.1 documents labour productivity growth in industries within the goods producing sector and shows the contribution from capital deepening and multifactor productivity growth to labour productivity growth in each industry. The goods producing sector accounts for over one-quarter of economic activity and over half of labour productivity growth. Productivity growth has been strong and of a comparable magnitude to other countries in many of these industries in New Zealand. Relative to the US and UK, New Zealand performed particularly well in Mining and quarrying and in Electricity, gas and water supply; and in these industries the role of capital deepening has been important relative to multifactor productivity. New Zealand does well on some of these; e.g. food, bev, tob do well and due to MFP, also basic metals and construction.

B.2 ICT producing sectors

Labour productivity growth in New Zealand has been high in communication industries, especially compared with the US, as a result of strong multifactor productivity growth. Relative performance has been weaker in Electrical and optical machinery where the contribution from capital deepening has been low, see Table B.2.

B.3 Market services sectors

In the US, labour productivity growth came mainly from distribution services (particularly from multifactor productivity in this industry) and finance and business services (particularly from factor intensity growth).⁴⁹ In the UK, wholetrade and retail services and business services are the main drivers of market services labour productivity growth. These are the biggest industries in the UK market services sector (see table 3) and the most intensive users of ICT capital.

Although market services had a smaller contribution to labour productivity in New Zealand compared to goods production, market services contribution has been increasing. In particular, wholesale and retail trade industries and finance increased their contribution to total market sector labour productivity growth, whereas business services contribution decreased mainly due to negative productivity growth (see Warmke et al, 2010).

The market services sectors are where New Zealand's performance is notably weaker than that in the UK and US, but similar to the EU15. Economic activity in New Zealand is more concentrated in lower productivity sectors (wholesale and retail trade) and less in higher productivity sectors (business services). As seen in Table B.3, within these industries productivity growth has tended to be weaker than in the UK and US. This is particularly the case for business services and hotels and restaurant which have seen falls in productivity. The exception is finance and insurance which has seen particularly strong productivity growth. Notably, the experience of New Zealand has been more similar to that of EU countries.

⁴⁹ See van Ark et al (2008); table 6.

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In the US and the UK, the trade and business services industries have experienced both employment growth and labour productivity growth, so labour productivity growth has been positive because of strong growth in capital deepening, in particular ICT, and multifactor productivity in the case of the retail industry in the US. In other European countries, market services labour productivity growth has been also very low, with the exception of the Netherlands.⁵⁰

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⁵⁰ See van Ark et al (2008), page 38.

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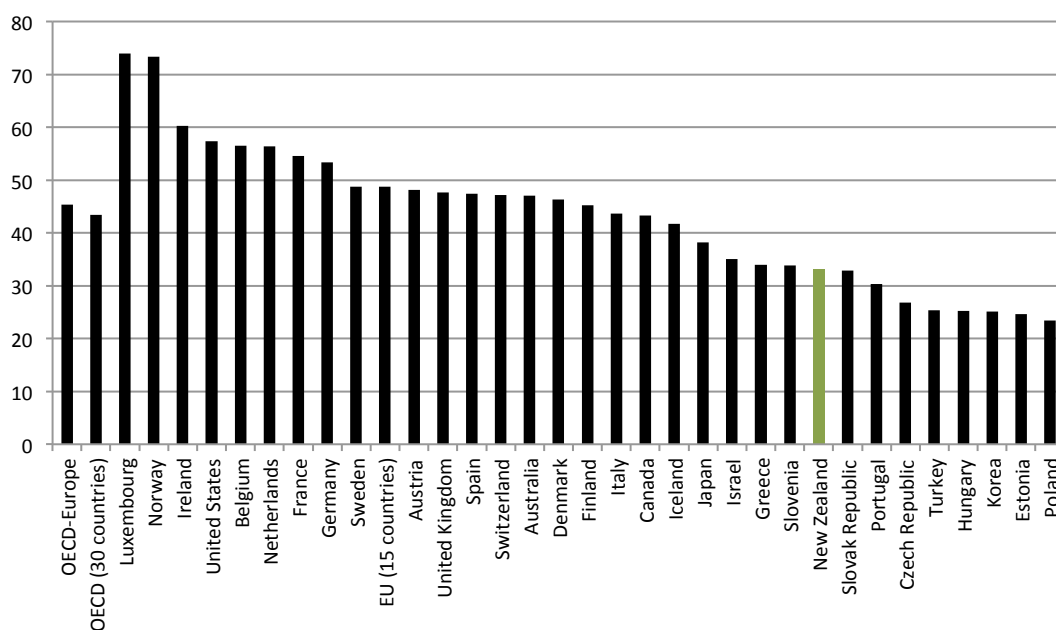
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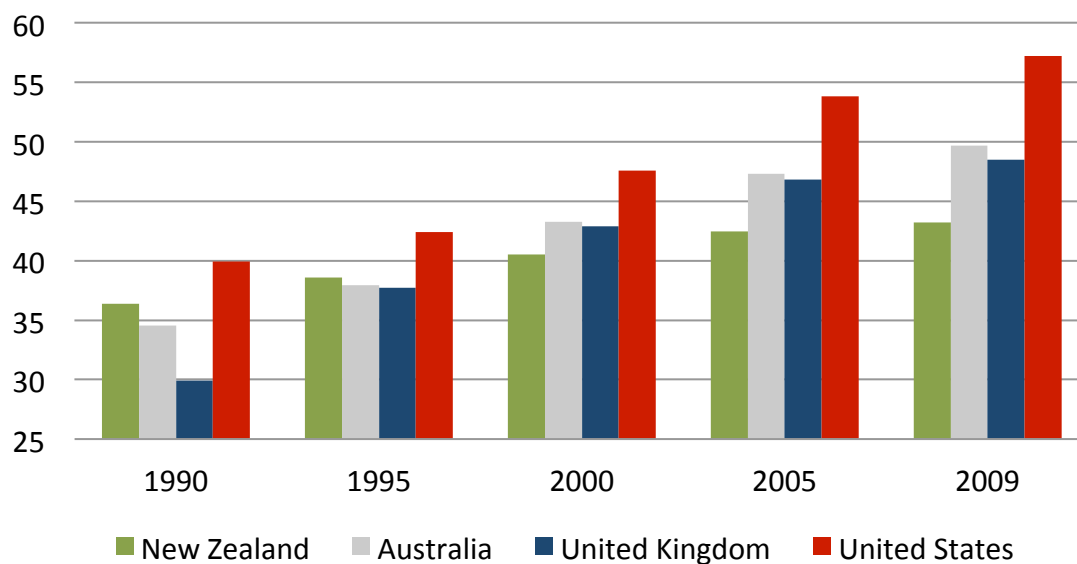
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Figure 1: Output per hour worked in 2009, US\$ whole economy



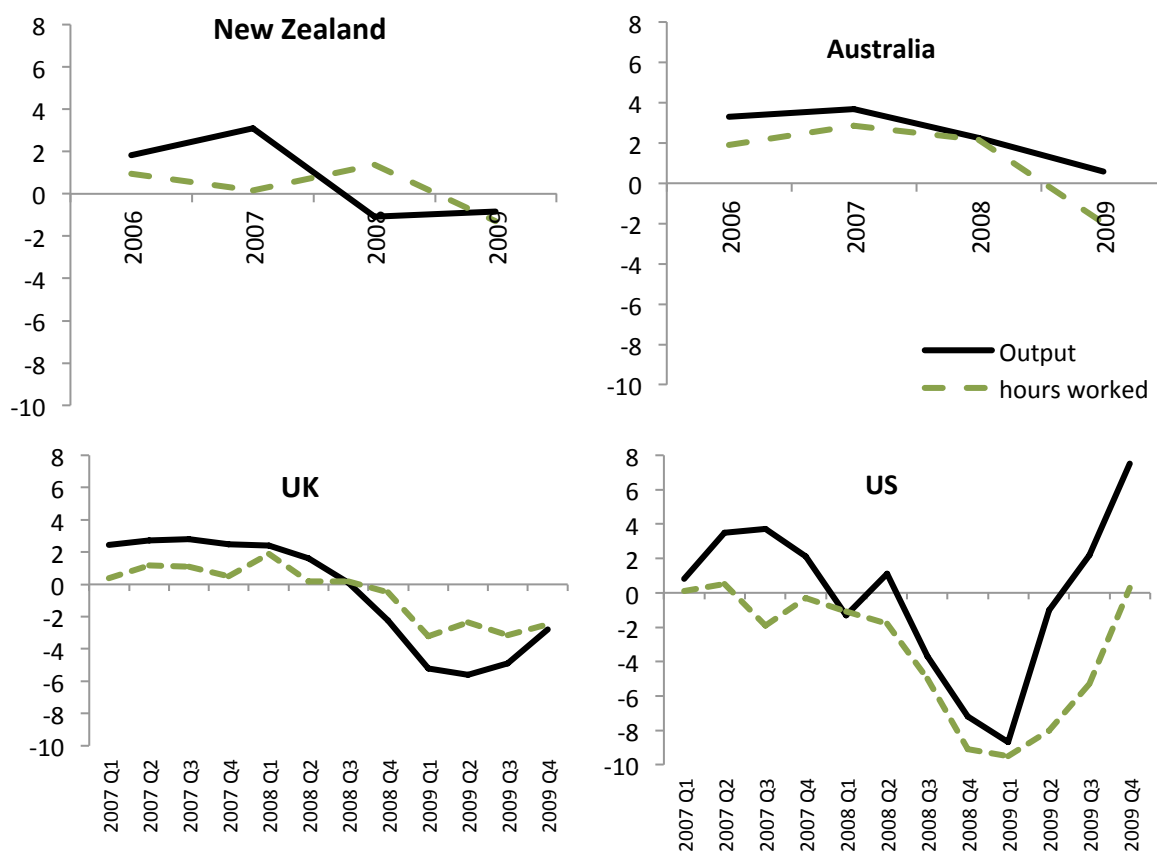
Notes: Output is gross domestic product (GDP) in PPP US\$ dollars.
Source: OECD (2010)

Figure 2: Output per hour worked, US\$ whole economy



Notes: Output per hour worked in 2009 PPP US\$ (converted to 2009 price level with updated 2005 EKS PPPs)
Source: The Conference Board Total Economy Database, January 2010

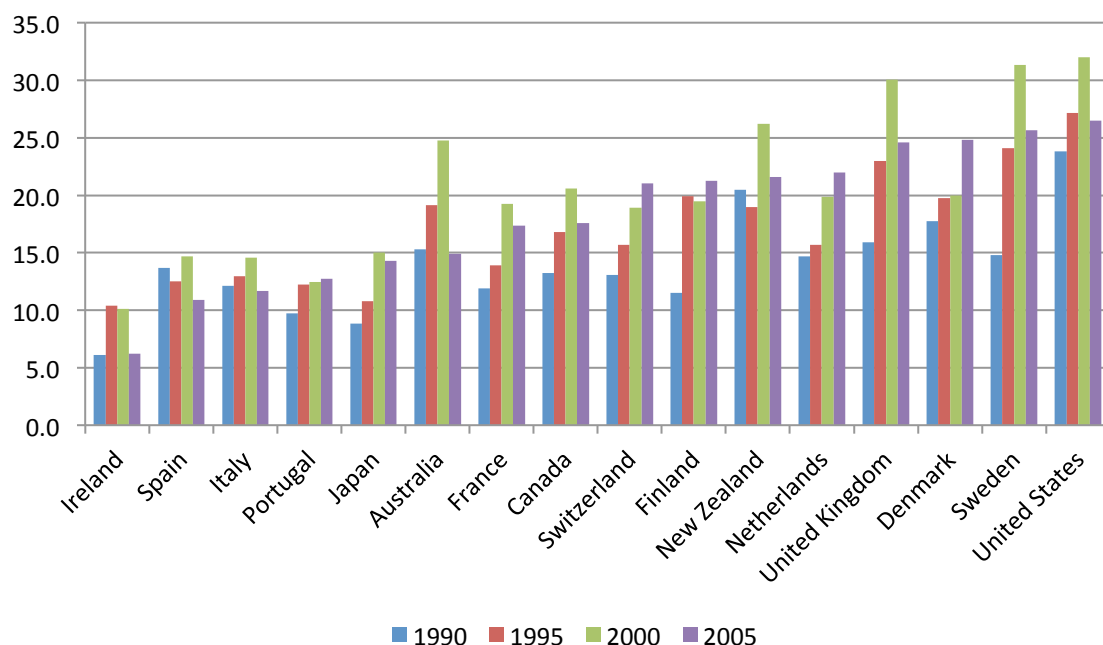
Figure 3: Change in output and hours worked



Notes: In New Zealand and Australia figures, output is total GDP, in millions of 2009 US\$ (converted to 2009 price level with updated 2005 EKS PPPs). UK output is measured by seasonally adjusted Gross Value Added (GVA) at basics prices. US output is a current-weighted index of *business* sector GDP. For all countries except the US, output and hours are reported for the whole economy. Growth rates are calculated as the change compared with the previous year for Australia and New Zealand and compared to the same quarter in the previous year for the UK and US

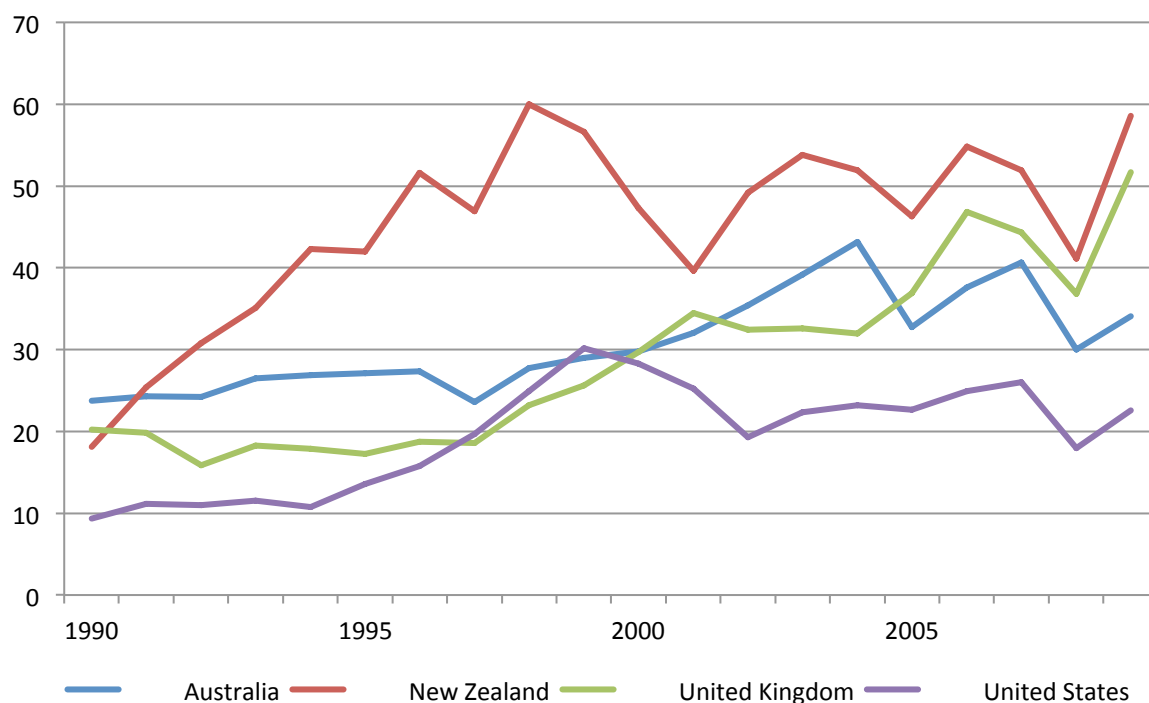
Source: New Zealand and Australia: The Conference Board Total Economy Database, January 2010. For the UK: The output series is from Table A1 (National accounts aggregates) of ONS UK Economic Accounts time series data. The measure of hours worked is from ONS (2010). For the US, Table 1 of Bureau of Labor Statistics.

Figure 4: ICT as share of total non-residential Gross Fixed Capital Formation (%)



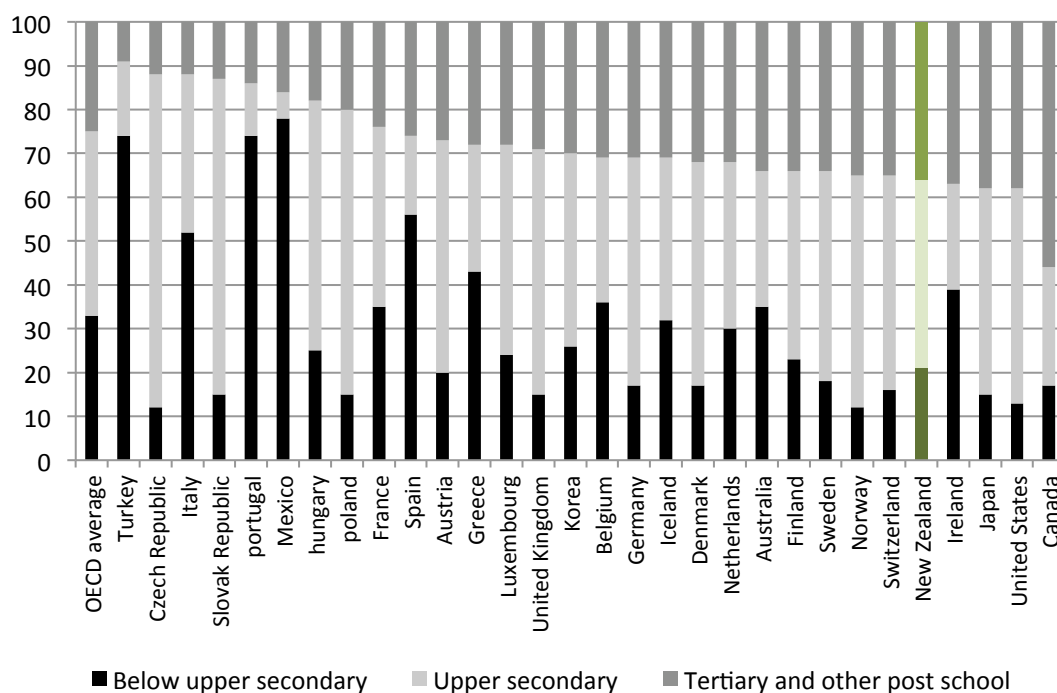
Notes: Current price of ICT as a share of GFCF.
Source: OECD Productivity Database, 08-02-2010

Figure 5: FDI stock as share GDP, 1990-2009



Notes: Stock of inward Foreign Direct Investment (FDI) as a percentage of GDP
Source: UNCTAD Statistics (<http://unctadstat.unctad.org/ReportFolders/reportFolders.aspx>)

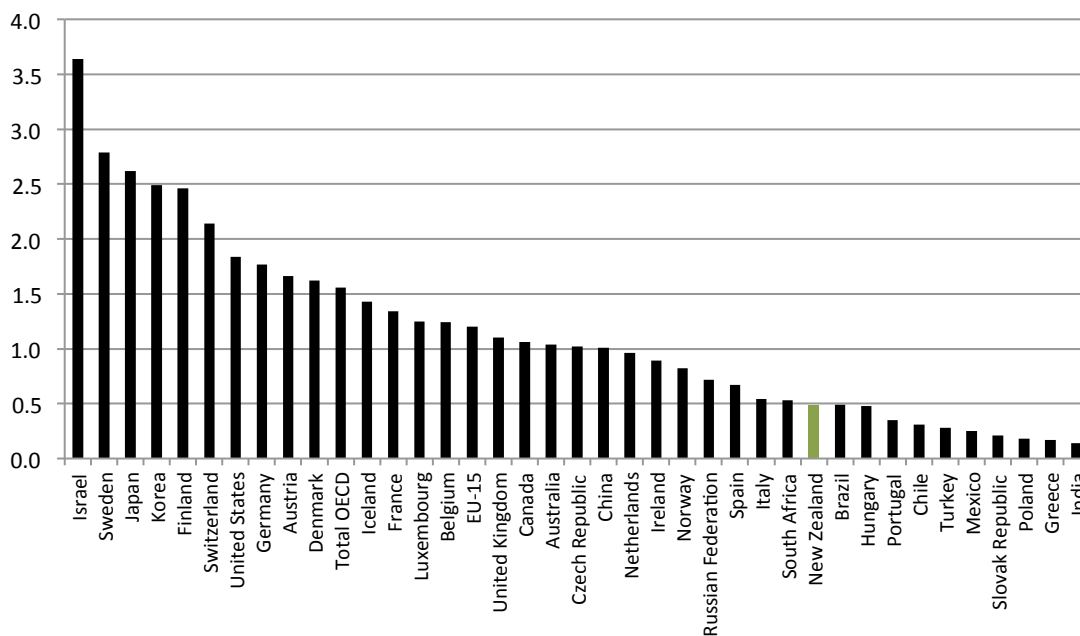
Figure 6: Educational attainment, 2004



Source: OECD Education at a Glance (2006), Table A1.1a.

Notes: Distribution of the 25-to-64-year-old population, by highest level of education attained (%)

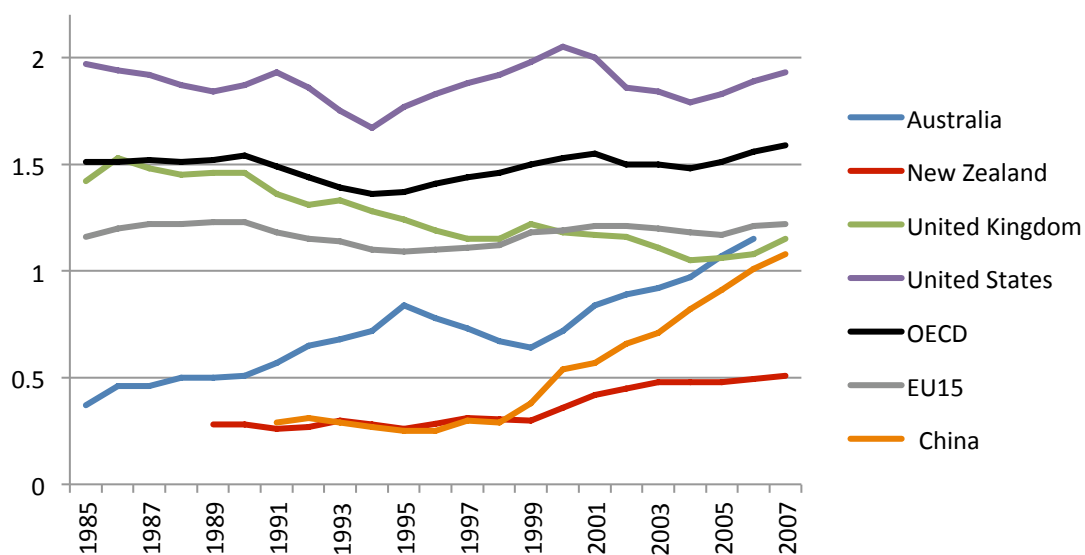
Figure 7: R&D intensity



Notes: Business Enterprise Research and Development (BERD) over GDP in 2006.

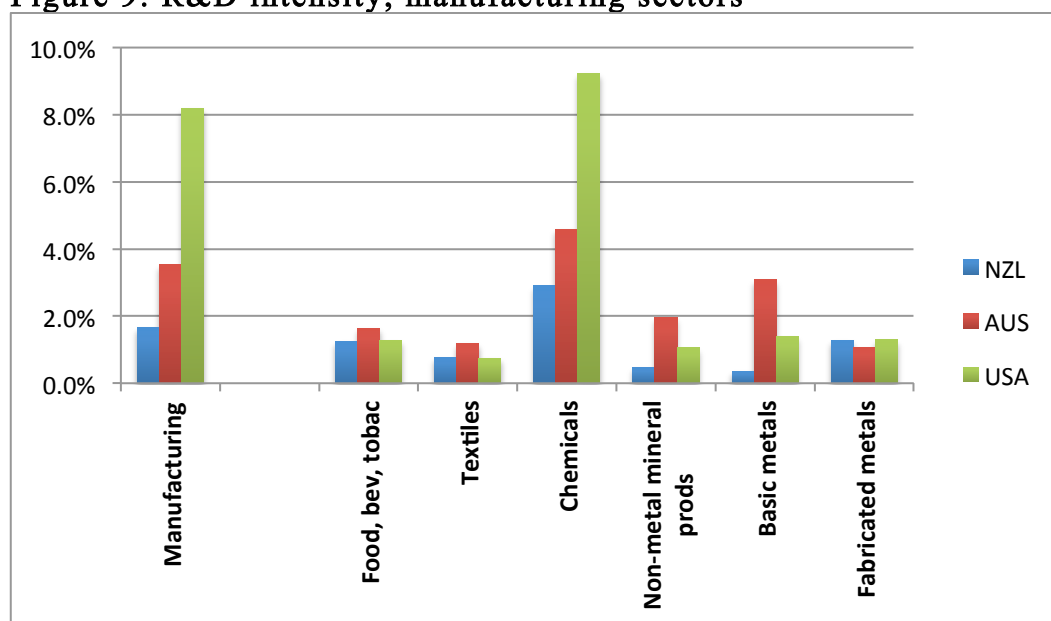
Source: OECD, Main Science and Technology Indicators Database, April 2008.

Figure 8: R&D intensity



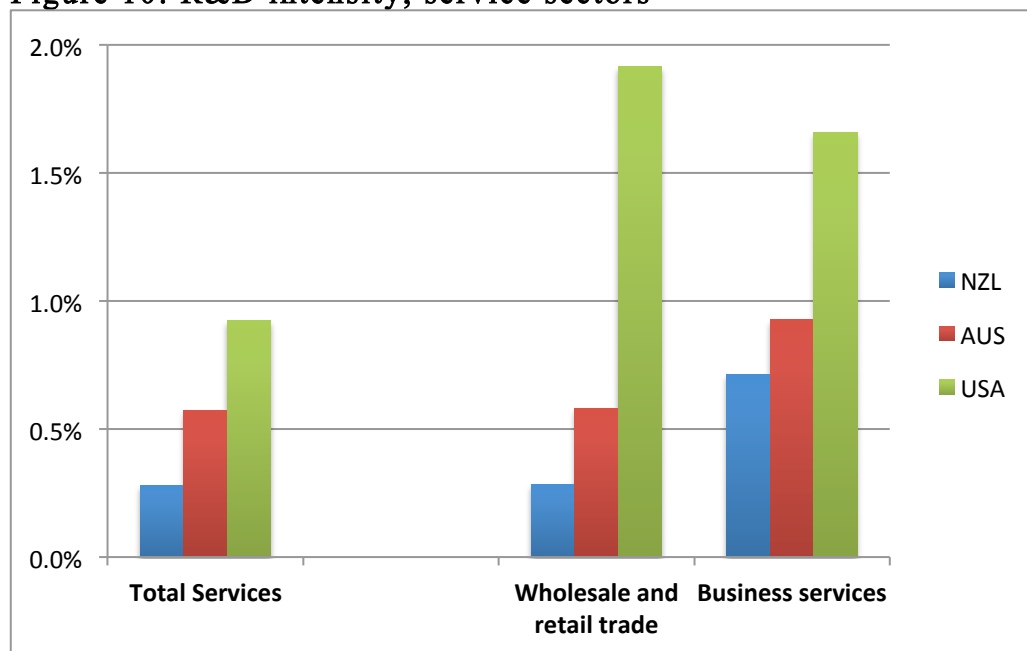
Notes: Business Enterprise Research and Development (BERD) over GDP in 2006. Data for New Zealand is reported every two years and is extrapolated between years.
Source: OECD, Main Science and Technology Indicators Database, April 2008.

Figure 9: R&D intensity, manufacturing sectors



Notes: Business Enterprise Research and Development (BERD) over GDP in 2003, the most recent year for which an industry breakdown is available in all countries; the figure shows information only for industries for which data is available.
Source: OECD, Main Science and Technology Indicators Database, April 2008.

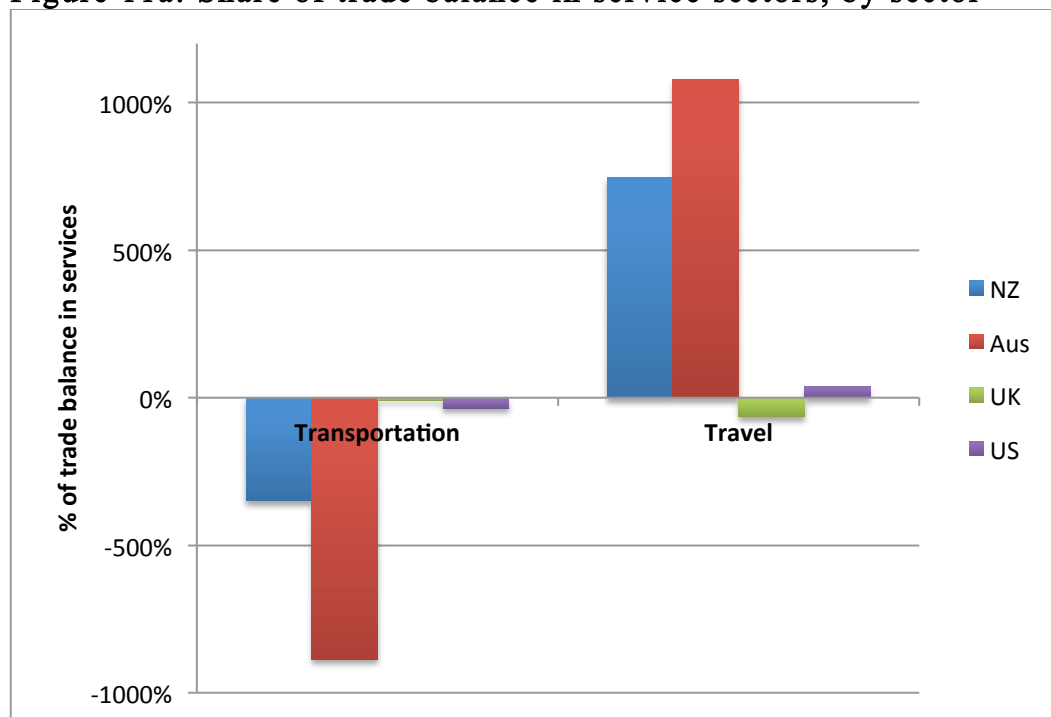
Figure 10: R&D intensity, service sectors



Notes: Business Enterprise Research and Development (BERD) over GDP in 2003, the most recent year for which an industry breakdown is available in all countries; the figure shows information only for industries for which data is available.

Source: OECD, Main Science and Technology Indicators Database, April 2008.

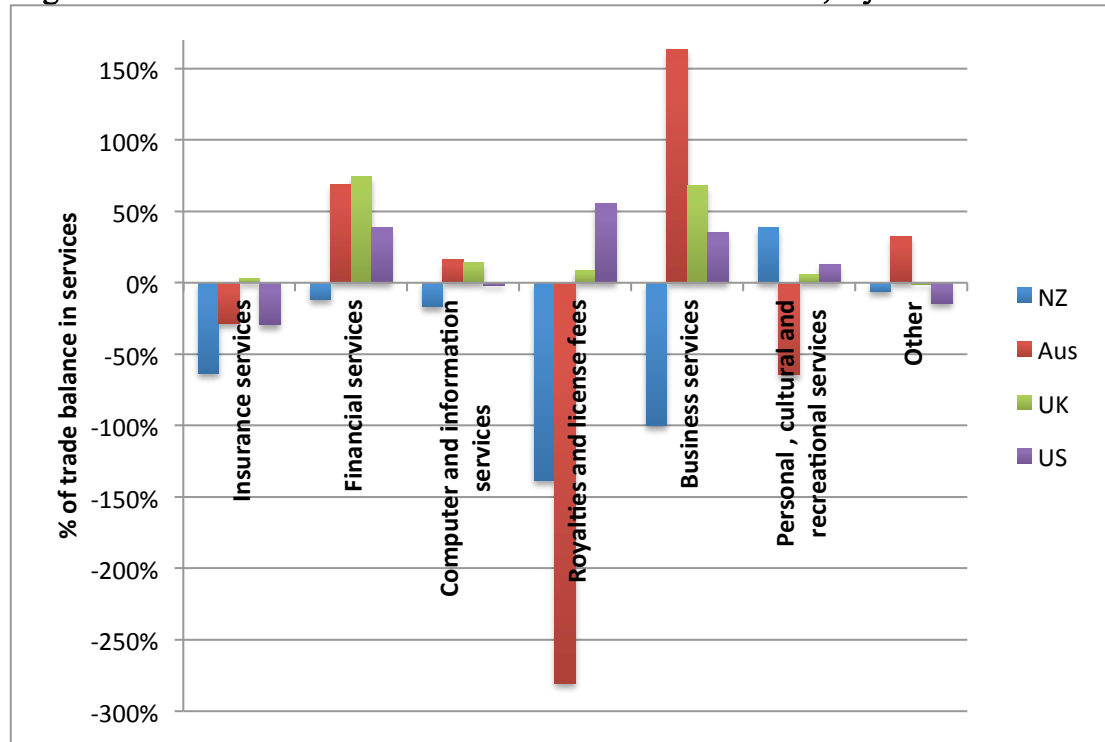
Figure 11a: Share of trade balance in service sectors, by sector



Notes: Data is for 2005. The trade balance is the value of exports minus the value of imports; the share of the trade balance is the trade balance in the indicated sector divided by the total trade deficit in services.

Source: OECD (2010).

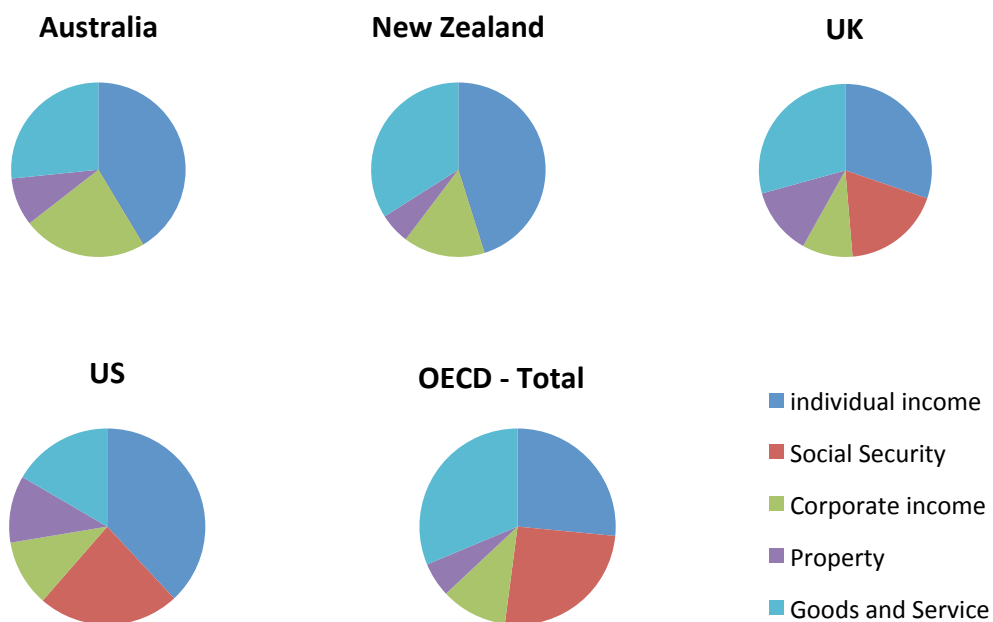
Figure 11b: Share of trade balance in service sectors, by sector



Notes: Data is for 2005. The trade balance is the value of exports minus the value of imports; the share of the trade balance is the trade balance in the indicated sector divided by the total trade deficit in services.

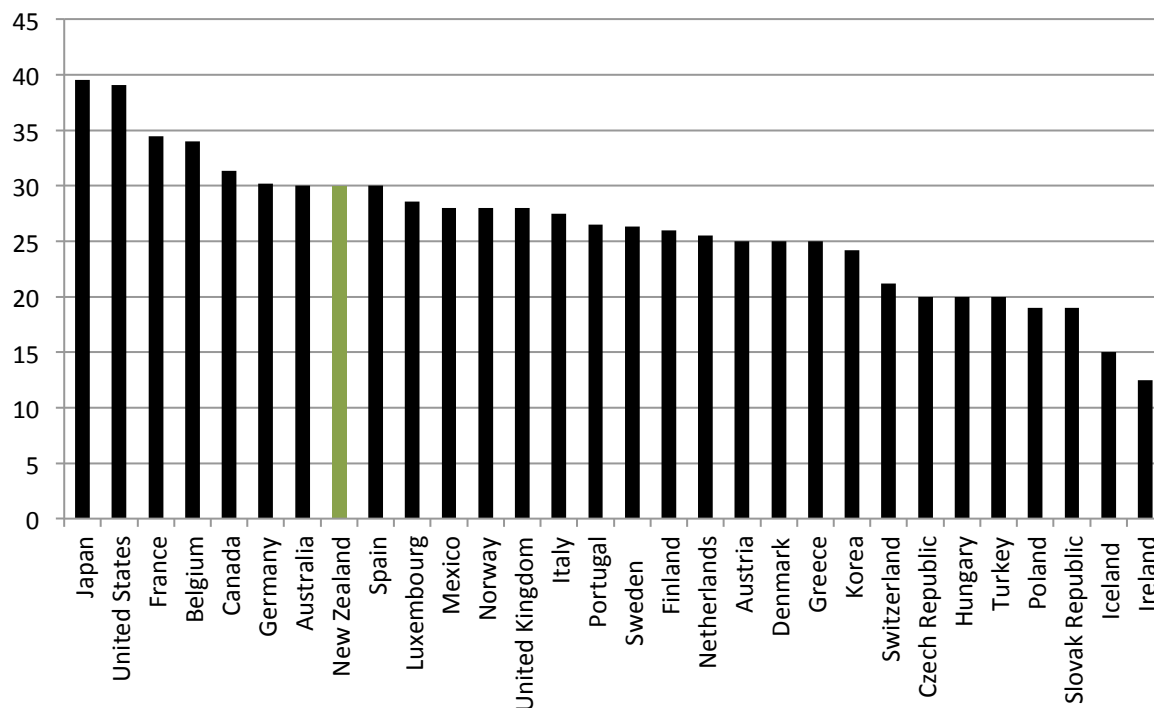
Source: OECD (2010).

Figure 12: Tax revenue



Source: OECD

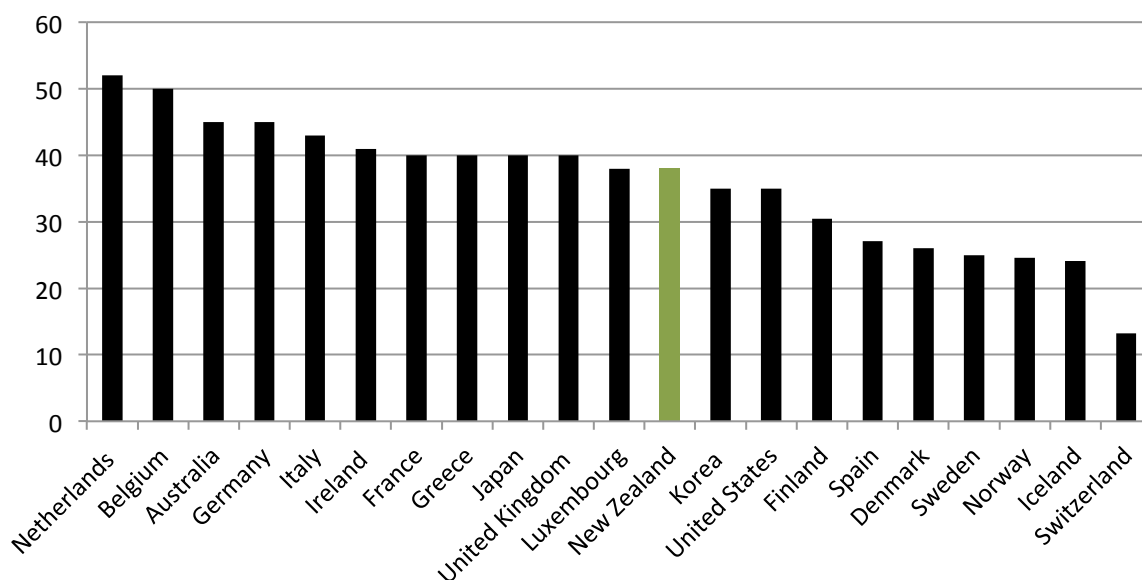
Figure 13: Corporate tax rates 2009



Notes: Combined central and sub-central statutory corporate income tax rates. For Australia, New Zealand and the UK, all with a non-calendar tax year, the rates shown are those in effect as of 1 July, 1 April and 1 April, respectively.

Source: OECD tax database

Figure 14: Top rate of central government personal income, 2009



Notes: For Switzerland, the rate shown applies to the income threshold 166,200 - 712,400. Above this a rate of 11.5% applies to all income.

Source: OECD tax database

Table 1: Decomposition of GDP growth, %

	1990-1995	1995-2000	2000-2005	2005-2009
Australia				
GDP	3.26	3.90	3.36	2.46
Labour productivity	1.90	2.69	1.81	1.22
Hours worked	1.36	1.20	1.54	1.23
New Zealand				
GDP	3.15	2.68	3.91	0.75
Labour productivity	1.20	1.00	0.93	0.47
Hours worked	1.94	1.68	2.96	0.29
United Kingdom				
GDP	1.66	3.44	2.44	0.44
Labour productivity	4.78	2.60	1.78	0.90
Hours worked	-2.92	0.82	0.66	-0.48
United States				
GDP	2.54	4.31	2.40	0.69
Labour productivity	1.21	2.35	2.48	1.56
Hours worked	1.32	1.92	-0.07	-0.84

Notes: GDP is whole economy GDP in millions of 2009 US\$ (converted to 2009 price level with updated 2005 EKS PPPs).

Growth is calculated as annual change and the average taken for each five year period.

Source: Authors' calculations using The Conference Board Total Economy Database, January 2010.

Table 2: Labour productivity growth, market economy 1995-2004

	Contribution to labour productivity growth from:							Multi-Factor productivity
	Growth in output	Growth in hours worked	Growth in labour productivity	Labour composition	Capital deepening			
					Total capital per hour worked	ICT per hour worked	Non-ICT per hour worked	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	
New Zealand ^a	3.6	1.6	2.0	--	0.7	--	--	1.3
United Kingdom	3.3	0.7	2.7	0.5	1.4	1.0	0.4	0.7
United States	3.7	0.6	3.0	0.3	1.2	0.8	0.4	1.4
European Union ^b	2.2	0.7	1.5	0.2	1.0	0.5	0.5	0.3

Notes: Figures are the annual average growth rates in percentage points. Labour productivity is output per hour worked.

^aNew Zealand figures are for the 'measured sector' for period 1996-2004 (figures for some service sector industries are only available from 1996 onwards), i.e. average annual growth rates for the period 1997-2004. The measured sector consists of mostly the same industries as the market sector economy. Average growth rates from Table 6, Productivity 1978-2009 – Tables 1-8.xlsx, NZ Statistics (2010). Growth in output is taken from Table 5 (serie S2OMSP). Growth in hours worked is taken from Table 4, growth in labour input (serie S3LMSP). Labour productivity is value added per hours paid. Labour productivity (serie S1LMSP); capital deepening (serie S4DMSP); and multifactor productivity (serie S1MMSP) are taken from Table 6.

^bData for European Union refers to ten countries: Austria, Belgium, Denmark, Finland, France, Germany, Italy, the Netherlands, Spain, and the United Kingdom.

Source: Table 4 from van Ark, O'Mahony and Timmer (2008) and NZ Statistics (2010)

Table 3: Labour productivity growth, market economy 1995-2004

	Total	Goods production	ICT production	Market services	Reallocation
New Zealand ^a	2.0^b	1.0	0.4	0.8	-0.2
United Kingdom	2.7	0.7	0.5	1.6	-0.2
United States	3.0	0.7	0.9	1.8	-0.3
European Union ^c	1.5	0.8	0.5	0.5	-0.2

Notes: Figures are the annual average growth rates in output per hour worked in percentage points.

^a New Zealand figures are for the 'measured sector' for the period 1996-2004 because figures for some service sector industries are only available from 1996 onwards. The measured sector consists of mostly the same industries as the market sector economy. Average growth rates from table 1.02 in NZ Statistics (2010). To calculate the contribution of each broad sector to labour productivity growth in the market economy, we use labour productivity growth figures from IPS-1978-2008- tables-3-01-3-25.xls; weighted by each industry (two-period average) share in total labour income in the market economy (table 4.03 from IPS-1978-2008-tables-4-01-4-06.xls).

^b The figures differ to Figure 2 in Warmke et al (2010), in the table above Goods production includes the primary sector and Good producing and ICT production exhibits strong productivity growth which particularly comes from Communication services, this is in Service economy in Warmke et al Figure 2.

^c Data for European Union refers to ten countries: Austria, Belgium, Denmark, Finland, France, Germany, Italy, the Netherlands, Spain, and the United Kingdom.

Source: van Ark, O'Mahony and Timmer (2008) and authors' calculations using NZ Statistics (2010).

Table 4: Contributions of ICT investment to GDP growth, 1990-95 and 1995-2003, in percentage points

	1990-95	1995-2003 ^a
Australia	0.539	0.915
United States	0.523	0.796
Sweden	0.537	0.717
Denmark	0.549	0.674
United Kingdom	0.488	0.637
Belgium	0.403	0.620
Canada	0.403	0.589
Japan	0.374	0.568
New Zealand	0.308	0.560
Spain	0.314	0.520
Netherlands	0.329	0.501
Portugal	0.000	0.472
Finland	0.352	0.468
Ireland	0.136	0.458
Greece	0.263	0.412
Italy	0.251	0.405
Germany	0.338	0.381
France	0.180	0.362
Austria	0.263	0.347

Source: OECD Productivity Database, September 2005, [www.oecd.org/statistics/productivity]

^a 1995-2002 for Australia, France, Japan, New Zealand and Spain.

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Table 5: Trade balance (in millions of US\$)

	1995	2000	2005
New Zealand			
<i>Services</i>	-172	-119	334
<i>Goods</i>	820	583	-2614
<i>% Services of total exports</i>	25%	25%	28%
Australia			
<i>Services</i>	-969	939	518
<i>Goods</i>	-4225	-4720	-13353
<i>% Services of total exports</i>	23%	24%	17%
United Kingdom			
<i>Services</i>	11039	20767	44971
<i>Goods</i>	-18880	-49901	-124725
<i>% Services of total exports</i>	24%	30%	35%
United States			
<i>Services</i>	75916	72230	71786
<i>Goods</i>	-172301	-452061	-787054
<i>% Services of total exports</i>	27%	28%	30%

Source: OECD (2010). The trade balance is the value of exports minus the value of imports.

Table 6: Capital Access Index, 2008

	Score	Rank	Components						
			ME	IE	FI	EM	BM	AC	IF
Australia	7.26	9	6.67	8.35	8.30	7.83	5.25	7.75	5.92
Canada	7.90	1	9.17	8.24	8.30	7.50	6.50	7.75	5.42
New Zealand	6.92	19	6.33	8.71	8.10	6.50	4.75	6.25	6.00
UK	7.70	4	7.50	8.24	7.20	6.67	7.50	9.00	7.25
US	7.56	6	7.00	8.35	6.90	7.50	7.25	9.00	6.58

Notes: The scores range from 0 to 10, with higher scores representing higher capital access. The 7 components are defined as follows: macroeconomic environment (ME), institutional environment (IE), financial and banking institutions (FI), equity market development (EM), bond market development (BM), alternative sources of capital (AC), and international funding (IF).

Source: Milken Institute (2009).

Table 7: Personal income tax rates and thresholds, 2009

	Top rate of personal tax	Threshold, local currency	Threshold, US\$
Australia	45%	180,000	122,974
New Zealand	38%	70,000	46,767
UK	40%	37,400	60,448
US	35%	372,950	372,950

Notes: The UK and US also have universal personal allowances; UK £6475, US \$8350. Australia also has a surtax at a rate of 1.5 percent of taxable income. The information is applicable for a single person without dependents. Sub-central tax rates are not included but also apply in the US. The marginal income tax rate shown applies to taxable income above the income indicated. New Zealand top personal tax rate reduced from 38% in 2009 to 37% in 2010. There have also been a series of changes in the UK. Thresholds converted into US \$ using 2009 Purchasing Power Parities for GDP. Source, OECD 2010.

Source: OECD

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Table A.1: Industrial composition (contribution to GDP in %), 2007

Industry definition	New Zealand	United Kingdom	United States	European Union ^d
Market economy	73.7	73.6	67.0	70.9
<i>Goods producing</i>	28.4	22.8	21.5	26.8
Manufacturing ^c	12.9	11.0	11.4	15.8
Construction	5.7	6.6	4.6	6.8
Primary industries	5.6	0.8	1.3	1.4
Electricity, gas and water supply	2.9	1.7	2.0	2.2
Mining and quarrying	1.3	2.6	2.2	0.6
<i>ICT producing</i>	5.3	4.0	4.8	5.0
Communications	3.1 ^b	2.7	2.9	2.6
Electrical and optical machinery	2.2 ^a	1.4	1.9	2.4
<i>Market services</i>	39.9	46.8	41.1	39.1
Wholesale and retail	13.3	11.5	11.8	9.7
Business services	9.2	14.4	11.5	12.0
Finance and insurance	7.0	8.4	8.7	5.9
Transport and storage	4.4	4.4	2.7	4.9
Other social and personal services	4.0	5.1	3.8	4.2
Hotel and restaurants	2.0	2.9	2.6	2.4
<i>Non-market services</i>	26.3	26.4	33.0	29.1
Real estate activities		8.0	12.0	11.1
Health and social work		7.3	8.2	6.6
Education		6.0	4.8	5.1
Public admin and defence		5.1	8.0	6.2

Notes: Based on EU KLEMS classification.

^a Includes all machinery and equipment.

^b Communication services.

^c Excluding electrical and optical machinery; for NZ excluding all machinery and equipment.

^d European Union includes the 15 EU member states as of 1 January 1995: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, Sweden and UK.

Source: EU KLEMS data (November 2009 release) and NZ Statistics (2010).

Table B.1: Labour productivity growth in the goods producing sector, 1995-2004

	New Zealand ^a	United Kingdom	United States	European Union ^b
Manufacturing				
Non-metallic mineral				
Labour productivity (LP) growth	0.70	3.88	3.66	2.47
Contribution to LP growth from:				
<i>Labour composition</i>	--	0.61	0.36	--
<i>Capital deepening</i>	-0.01	1.18	1.04	--
Non-ICT capital deepening	--	0.78	0.71	--
ICT capital deepening	--	0.40	0.33	--
<i>Multifactor productivity</i>	0.71	2.08	2.27	--
Basic metal				
Labour productivity (LP) growth	3.03	2.73	3.37	1.62
Contribution to LP growth from:				
<i>Labour composition</i>	--	0.67	0.28	--
<i>Capital deepening</i>	-0.36	0.42	0.80	--
Non-ICT capital deepening	--	0.06	0.49	--
ICT capital deepening	--	0.36	0.31	--
<i>Multifactor productivity</i>	3.44	1.68	2.29	--
Food, beverages and tobacco				
Labour productivity (LP) growth	3.26	0.63	2.77	0.78
Contribution to LP growth from:				
<i>Labour composition</i>	--	0.80	0.18	--
<i>Capital deepening</i>	0.84	0.43	0.89	--
Non-ICT capital deepening	--	0.08	0.61	--
ICT capital deepening	--	0.35	0.28	--
<i>Multifactor productivity</i>	2.46	-0.60	1.70	--
Textiles and apparel				
Labour productivity (LP) growth	1.18	3.81	6.75	1.29
Contribution to LP growth from:				
<i>Labour composition</i>	--	1.03	0.52	--
<i>Capital deepening</i>	0.13	0.93	1.89	--
Non-ICT capital deepening	--	0.39	1.57	--
ICT capital deepening	--	0.54	0.32	--
<i>Multifactor productivity</i>	1.05	1.86	4.34	--

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Table B.1: Labour productivity growth in the goods producing sector, 1995-2004 (continued)

	New Zealand ^a	United Kingdom	United States	European Union ^b
Chemicals and rubber (code 23-25)				
Labour productivity (LP) growth	0.4			
Contribution to LP growth from:				
<i>Labour composition</i>	--			
<i>Capital deepening</i>	-0.9			
Non-ICT capital deepening	--			
ICT capital deepening	--			
<i>Multifactor productivity</i>	1.3			
Coke, refined petroleum products and nuclear fuel (code 23)				
Labour productivity (LP) growth		0.43	-9.47	0.34
Contribution to LP growth from:				
<i>Labour composition</i>		0.63	0.20	--
<i>Capital deepening</i>		0.18	1.54	--
Non-ICT capital deepening		0.10	1.42	--
ICT capital deepening		0.08	0.12	--
<i>Multifactor productivity</i>		-0.38	-11.21	--
Chemicals and chemical products (code 24)				
Labour productivity (LP) growth		3.4	2.52	3.65
Contribution to LP growth from:				
<i>Labour composition</i>		0.50	0.26	--
<i>Capital deepening</i>		1.13	1.8	--
Non-ICT capital deepening		0.35	1.37	--
ICT capital deepening		0.78	0.43	--
<i>Multifactor productivity</i>		1.78	0.46	--
Rubber and plastics products (code 25)				
Labour productivity (LP) growth		1.08	4.42	3.00
Contribution to LP growth from:				
<i>Labour composition</i>		0.58	0.38	--
<i>Capital deepening</i>		1.07	1.37	--
Non-ICT capital deepening		0.47	1.04	--
ICT capital deepening		0.60	0.33	--
<i>Multifactor productivity</i>		-0.54	2.68	--

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Table B.1: Labour productivity growth in the goods producing sector, 1995-2004 (continued)

	New Zealand ^a	United Kingdom	United States	European Union ^b
Construction				
Labour productivity (LP) growth	1.38	0.90	-1.89	0.02
Contribution to LP growth from:				
<i>Labour composition</i>	--	0.35	0.11	--
<i>Capital deepening</i>	0.23	0.63	0.36	--
Non-ICT capital deepening	--	0.50	0.18	--
ICT capital deepening	--	0.13	0.18	--
<i>Multifactor productivity</i>	1.15	-0.09	-2.36	--
Primary industries				
Labour productivity (LP) growth	3.10	3.10	2.43	3.20
Contribution to LP growth from:				
<i>Labour composition</i>	--	0.47	0.08	--
<i>Capital deepening</i>	0.63	0.74	0.44	--
Non-ICT capital deepening	--	0.71	0.36	--
ICT capital deepening	--	0.03	0.08	--
<i>Multifactor productivity</i>	2.45	1.89	1.91	--
Electricity, gas and water supply				
Labour productivity (LP) growth	8.18	5.62	3.53	5.00
Contribution to LP growth from:				
<i>Labour composition</i>	--	0.07	0.12	--
<i>Capital deepening</i>	9.14	3.90	2.02	--
Non-ICT capital deepening	--	3.04	1.68	--
ICT capital deepening	--	0.86	0.34	--
<i>Multifactor productivity</i>	-0.90	1.67	1.38	--
Mining and quarrying				
Labour productivity (LP) growth	4.58	-1.12	-1.31	1.13
Contribution to LP growth from:				
<i>Labour composition</i>	--	0.01	-0.01	--
<i>Capital deepening</i>	2.36	1.1	0.71	--
Non-ICT capital deepening	--	1.09	0.49	--
ICT capital deepening	--	0.01	0.22	--
<i>Multifactor productivity</i>	1.89	-2.23	-2.00	--

Notes: Figures are the annual average growth rates in output per hour worked in percentage points. Labour productivity growth rate equals contributions from labour composition plus contributions from capital deepening (Non-ICT capital deepening + ICT capital deepening) plus contributions from multifactor productivity. Figures may not add to the total due to rounding. Figures for the industry Wood, pulp and paper, printing and publishing are not displayed.

^a New Zealand figures are for period 1996-2004 (since figures for some service sector industries are only available from 1996 onwards), i.e. average growth rates for years 1997 to 2004.

^b European Union includes the 15 EU member states as of 1 January 1995: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, Sweden and UK.

Source: Author's calculations using EU KLEMS data (November 2007 release for UK and US, March 2008 release for EU15) and NZ Statistics (2010), tables IPS-1978-2008- tables-3-01-3-25.xls

Table B.2: Labour productivity growth in the ICT producing sector, 1995-2004

	New Zealand ^a	United Kingdom	United States	European Union ^b
Communication services				
Labour productivity (LP) growth	9.35	9.11	5.36	8.06
Contribution to LP growth from:				
<i>Labour composition</i>	--	0.44	0.12	--
<i>Capital deepening</i>	2.96	3.62	2.78	--
Non-ICT capital deepening	--	-0.01	0.79	--
ICT capital deepening	--	3.63	1.99	--
<i>Multifactor productivity</i>	6.21	5.06	2.46	--
Electrical and optical machinery^c				
Labour productivity (LP) growth	3.08	4.43	15.93	5.48
Contribution to LP growth from:				
<i>Labour composition</i>	--	0.61	0.66	--
<i>Capital deepening</i>	0.89	1.42	2.18	--
Non-ICT capital deepening	--	0.44	1.26	--
ICT capital deepening	--	0.98	0.92	--
<i>Multifactor productivity</i>	2.20	2.39	13.10	--

Notes: Figures are the annual average growth rates in output per hour worked in percentage points. Labour productivity growth rate equals contributions from labour composition plus contributions from capital deepening (Non-ICT capital deepening + ICT capital deepening) plus contributions from multifactor productivity. Figures may not add to the total due to rounding.

^a New Zealand figures are for period 1996-2004 (since figures for some service sector industries are only available from 1996 onwards), i.e. average growth rates for years 1997 to 2004.

^b European Union includes the 15 EU member states as of 1 January 1995: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, Sweden and UK.

^c Includes all machinery and transport equipment (sic codes 29-35) for New Zealand, and just industries electrical machinery (sic code 30-33) for UK, US and EU.

Source: Author's calculations using EU KLEMS data (November 2007 release for UK and US, March 2008 release for EU15) and NZ Statistics (2010).

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Table B.3: Labour productivity growth in the market services sector, 1995-2004

	New Zealand ^a	United Kingdom	United States	European Union ^b
Wholesale trade				
Labour productivity (LP) growth	2.36	2.80	2.69	2.56
Contribution to LP growth from:				
<i>Labour composition</i>	--	0.37	0.29	--
<i>Capital deepening</i>	0.3	1.60	2.11	--
Non-ICT capital deepening	--	0.50	0.44	--
ICT capital deepening	--	1.10	1.67	--
<i>Multifactor productivity</i>	2.04	0.83	0.28	--
Retail trade				
Labour productivity (LP) growth	2.04	2.59	4.70	1.38
Contribution to LP growth from:				
<i>Labour composition</i>	--	0.35	0.26	--
<i>Capital deepening</i>	0.51	1.62	0.80	--
Non-ICT capital deepening	--	0.94	0.47	--
ICT capital deepening	--	0.68	0.33	--
<i>Multifactor productivity</i>	1.51	0.62	3.63	--
Business services				
Labour productivity (LP) growth	-0.66	3.10	1.26	-0.5
Contribution to LP growth from:				
<i>Labour composition</i>	--	0.58	0.50	--
<i>Capital deepening</i>	0.61	1.92	1.40	--
Non-ICT capital deepening	--	0.50	0.22	--
ICT capital deepening	--	1.42	1.18	--
<i>Multifactor productivity</i>	-1.29	0.61	-0.65	--
Finance and insurance				
Labour productivity (LP) growth	6.15	4.70	3.21	2.74
Contribution to LP growth from:				
<i>Labour composition</i>	--	0.60	0.26	--
<i>Capital deepening</i>	3.22	2.06	1.23	--
Non-ICT capital deepening	--	0.44	0.53	--
ICT capital deepening	--	1.62	0.70	--
<i>Multifactor productivity</i>	2.79	2.02	1.73	--

Table B.3: Labour productivity growth in the market services sector, 1995-2004 (continued)

	New Zealand ^a	United Kingdom	United States	European Union ^b
Transport and storage				
Labour productivity (LP) growth	0.69	2.76	1.55	2.13
Contribution to LP growth from:				
<i>Labour composition</i>	--	0.19	0.24	--
<i>Capital deepening</i>	0.21	0.80	0.65	--
Non-ICT capital deepening	--	0.27	0.13	--
ICT capital deepening	--	0.53	0.52	--
<i>Multifactor productivity</i>	0.48	1.77	0.67	--
Hotel and restaurants				
Labour productivity (LP) growth	-1.23	1.06	1.25	-0.33
Contribution to LP growth from:				
<i>Labour composition</i>	--	0.36	0.22	--
<i>Capital deepening</i>	0.25	0.86	0.82	--
Non-ICT capital deepening	--	0.50	0.44	--
ICT capital deepening	--	0.36	0.38	--
<i>Multifactor productivity</i>	-1.49	-0.19	0.20	--

Notes: Figures are the annual average growth rates in output per hour worked in percentage points. Labour productivity growth rate equals contributions from labour composition plus contributions from capital deepening (Non-ICT capital deepening + ICT capital deepening) plus contributions from multifactor productivity. Figures may not add to the total due to rounding. Figures for the industry other community, social and personal services (Cultural and recreational services and Personal and other community services) are not included in this table.

^a New Zealand figures are for period 1996-2004 (since figures for some service sector industries are only available from 1996 onwards), i.e. average growth rates for years 1997 to 2004.

^b European Union includes the 15 EU member states as of 1 January 1995: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, Sweden and UK.

Source: Author's calculations using EU KLEMS data (November 2007 release for UK and US, March 2008 release for EU15) and NZ Statistics (2010).