

Zuccollo, James; Maani, Sholeh; Kaye-Blake, Bill; Zeng, Lulu

Working Paper

Private Returns to Tertiary Education - How Does New Zealand Compare to the OECD?

New Zealand Treasury Working Paper, No. 13/10

Provided in Cooperation with:

The Treasury, New Zealand Government

Suggested Citation: Zuccollo, James; Maani, Sholeh; Kaye-Blake, Bill; Zeng, Lulu (2013) : Private Returns to Tertiary Education - How Does New Zealand Compare to the OECD?, New Zealand Treasury Working Paper, No. 13/10, ISBN 978-0-478-40346-6, New Zealand Government, The Treasury, Wellington

This Version is available at:

<https://hdl.handle.net/10419/205634>

Standard-Nutzungsbedingungen:

Die Dokumente auf EconStor dürfen zu eigenen wissenschaftlichen Zwecken und zum Privatgebrauch gespeichert und kopiert werden.

Sie dürfen die Dokumente nicht für öffentliche oder kommerzielle Zwecke vervielfältigen, öffentlich ausstellen, öffentlich zugänglich machen, vertreiben oder anderweitig nutzen.

Sofern die Verfasser die Dokumente unter Open-Content-Lizenzen (insbesondere CC-Lizenzen) zur Verfügung gestellt haben sollten, gelten abweichend von diesen Nutzungsbedingungen die in der dort genannten Lizenz gewährten Nutzungsrechte.

Terms of use:

Documents in EconStor may be saved and copied for your personal and scholarly purposes.

You are not to copy documents for public or commercial purposes, to exhibit the documents publicly, to make them publicly available on the internet, or to distribute or otherwise use the documents in public.

If the documents have been made available under an Open Content Licence (especially Creative Commons Licences), you may exercise further usage rights as specified in the indicated licence.



<https://creativecommons.org/licenses/by/4.0/>

Private Returns to Tertiary Education

How Does New Zealand Compare to the OECD?

James Zuccollo, Sholeh Maani,
Bill Kaye-Blake, Lulu Zeng

New Zealand Treasury Working Paper 13/10

July 2013



New Zealand Government

**NZ TREASURY WORKING
PAPER 13/10**

Private returns to tertiary education
How does New Zealand compare?

MONTH/YEAR

July 2013

AUTHORS

James Zuccollo
NZIER
PO Box 3479
Wellington 6140, New Zealand

Sholeh Maani
University of Auckland Business School
Room 653, Owen G Glenn Building
12 Grafton Road
Auckland 1142, New Zealand
Email s.maani@auckland.ac.nz
Telephone [+64 9 373 7599 Ext 87346] Fax [+64 9 373 7427]

Bill Kaye-Blake
NZIER
PO Box 3479
Wellington 6140, New Zealand
Email econ@nzier.org.nz
Telephone [+64 4 472 1880] Fax [+64 4 472 1211]

Lulu Zeng
NZIER
PO Box 3479
Wellington 6140, New Zealand

ISBN (ONLINE)

978-0-478-40350-3

URL

Treasury website at July 2013:
<http://www.treasury.govt.nz/publications/research-policy/wp/2013/13-10/>
Persistent URL: <http://purl.oclc.org/nzt/1568>

ACKNOWLEDGEMENTS

This paper was prepared at NZIER and the University of Auckland. It was quality approved by John Stephenson (NZIER). The assistance of Sarah Spring, Paul Gini, Julia Pearce, Roger Smyth, Sylvia Dixon, and all those who participated in discussions and provided comments on earlier drafts is gratefully acknowledged. We also wish to thank Xingang Wang for research assistance.

NZ TREASURY

New Zealand Treasury
PO Box 3724
Wellington 6008, NEW ZEALAND
Email information@treasury.govt.nz
Telephone 64-4-472 2733
Website www.treasury.govt.nz

DISCLAIMER

The views, opinions, findings, and conclusions or recommendations expressed in this Working Paper are strictly those of the author(s). They do not necessarily reflect the views of the New Zealand Treasury or the New Zealand Government. The New Zealand Treasury and the New Zealand Government take no responsibility for any errors or omissions in, or for the correctness of, the information contained in these working papers. The paper is presented not as policy, but with a view to inform and stimulate wider debate.

Abstract

How do private returns to tertiary education in New Zealand compare internationally? According to the latest OECD measures, the private rate of return for New Zealand is 8.9%, compared to an OECD average of 12.4%, placing New Zealand toward the bottom of the OECD ranking. The aim of this study is to better understand the reasons for that gap and determine whether the low returns could be considered as problems amenable to policy interventions. We identify a number of measurement issues with the OECD standardisation. We develop a decomposition approach and provide a series of decompositions of the New Zealand-OECD gap. Our analysis shows that about half of the gap in New Zealand's private returns can be explained by the way OECD private tertiary returns are measured (eg, old tax rates, New Zealand's higher employment rates, and compositional issues which have not been controlled for in the OECD analysis such as the mix of degrees and graduates in New Zealand) rather than a "real" gap. However, once those factors are taken into account there remains a gap between New Zealand and the OECD average. We identify a number of endowment, policy, and decision-related contributing factors, and identify directions for future research.

JEL CLASSIFICATION

J24 Human Capital Formation
J31 Wage Differential by Skill and Training
J38 Economic Policy
B49 Economic Methodology

KEYWORDS

Private Returns; Higher Education; Earnings; OECD Index;
Decomposition, Measurement Issues

Executive Summary

Skills are an important part of any economy. They can act as a driver for higher living standards through their strong connection to increased personal and social wellbeing, as well as through increased earnings, tax revenue and productivity. Skills are seen as a significant contributor to economic growth in several ways:

- Directly through positive effects on labour utilisation, labour productivity and earnings.
- Indirectly as skills are complementary inputs to innovation, capital investment and entrepreneurship, and contribute to labour market adjustment, international connectedness, and social mobility. Skills also have spill over effects at firm, industry and regional level.

As well as other goals, one factor which may drive an individual to become more highly skilled is that they will likely be rewarded through a higher wage than they could otherwise have commanded had they not undertaken further education. An economy which does not reward its more highly skilled workers with higher wages may have issues in relation to supply of and demand for skills. For example:

- Skill demand – there may be excess demand for highly skilled workers. This can be broken in to two elements:
 - skill development - people may not undertake tertiary education, because they expect little or no value from a higher qualification, therefore there is excess demand and/or
 - skill retention – people tend to migrate to economies where their skills are rewarded with higher pay, therefore there are not enough skilled people to keep up with demand.
- Skill supply – an economy may have an over-supply of highly skilled people which acts to drive down the monetary value of skills,

These effects can have serious consequences for the skill levels available to the economy as a whole, and are likely to hinder economic productivity and innovation.

Although New Zealand has low private returns to tertiary education compared to other OECD countries, the returns to an individual in New Zealand with a tertiary qualification are still significantly greater than those without tertiary qualifications. For example, analysis by the Ministry of Education shows that 2008 median earnings for an individual with a Bachelor's degree or higher were around \$500 per week better off than an individual with no qualification.

The aim of this research is to explore at a deeper level which factors may be influencing New Zealand's seemingly poor financial recognition of tertiary qualifications compared to other economies. A deeper understanding of the factors which influence private returns to tertiary education is intended to position and inform government policy around participation in tertiary education, skill supply and attracting/retaining highly skilled people in New Zealand. We see this study as a first step towards further work in this area.

The first finding from this research is that about half of the measured gap in New Zealand's private returns to tertiary education can be explained by the way returns are measured rather than a "real" gap. The remainder of the gap in tertiary returns is closely related to New Zealand's low returns to tertiary education are strongly linked to the comparatively small increases in earnings from gaining a tertiary qualification (the gross earnings premium) relative to the OECD, which are, in turn, influenced by New Zealand's high levels of

graduates with Type B qualifications (below Bachelor level). In addition, factors that are usually identified as reasons for generally poor economic performance such as low rates of innovation, low capital intensity and distance to markets also contribute to New Zealand's low wage premium.

Unfortunately, research directly linking the drivers of economic performance to tertiary returns in New Zealand is lacking meaning there is a significant need for better analysis of potential problems. Future work should be targeted towards estimating the impact of the factors identified in this report.

Table of Contents

Abstract.....	i
Executive Summary	ii
1 Introduction	1
2 Components of the OECD's findings	3
2.1 Low comparative returns	3
2.2 How is the indicator constructed?	4
2.3 Measurement problems	6
2.4 How important is each component?	6
2.5 Which components are responsible for New Zealand's low returns?	7
3 A framework for dissecting gross earnings	9
3.1 Elements of the system	9
4 Empirical evidence on factors influencing the wage premium	12
4.1 Endowment-related influences	12
4.2 Policy-related influences	13
4.3 Decision-related influences	22
4.4 Adjustment for combined compositional and excluded effects	27
4.5 Summary of influences	28
5 Conclusions and Future Research	30
5.1 Low returns relative to the OECD average are mainly due to a lower relative wage premium	30
5.2 Measurement issues explain around half of the private returns gap	30
5.3 Other Factors	30
5.4 Future research	31
Appendix A – Measurement issues	32
Appendix B – Results from adjusting the OECD measure of private returns	39
Appendix C – Literature search strategy	41
Appendix D – References	43

List of Figures

Figure 1 - Rate of return to investment in tertiary education	3
Figure 2 - Components of return to a man's tertiary education	6
Figure 3 - Contribution of components to the New Zealand-OECD gap	7
Figure 4 - Influences on tertiary returns	9
Figure 5 - Capital-labour ratios	13
Figure 6 - Share of tertiary qualifications that are Type B	14
Figure 7 - Contribution of qualifications mix to the difference between New Zealand's returns and the OECD average	15
Figure 8 - Labour cost ratio and supply of tertiary graduates	17
Figure 9 - Earnings ratio and supply of Type A tertiary graduates	18
Figure 10 - Earnings ratio and supply of Type B tertiary graduates	19

Figure 11 - Contribution of migrants to the difference between New Zealand's returns and the OECD average	21
Figure 12 - Contribution of post-2010 income tax effect to the difference between New Zealand's returns and the OECD average	22
Figure 13 - Level of innovation - spending	25
Figure 14 - Level of innovation – researchers	26
Figure 15 - Share of small firms	27
Figure 16 - Contribution of combined effects to the difference between New Zealand's returns and the OECD average	28
Figure 17 - Tertiary completion rates	33
Figure 18 - Share of mature students.....	35
Figure 19 - Contribution of student loans to the difference between New Zealand's returns and the OECD average.....	38

List of Tables

Table 1 - Earnings index for non-new migrants.....	21
Table 2 - Contribution of earnings distribution to New Zealand's lower returns	39
Table 3 - Contribution of share of degree to New Zealand's lower returns	39
Table 4 - Effect of excluding new migrants	40
Table 5 - Contribution of student loans to New Zealand's loans returns.....	40

Private Returns to Tertiary Education

How does New Zealand Compare to the OECD?

1 Introduction

The private rate of return to tertiary education is a widely used measure of expected net earnings from undertaking higher education. This measure, as projected over the life cycle, reflects the expectations that influence current student decisions to participate in higher education. In addition, this measure is an indicator of the link between educational qualifications and earnings. Therefore, the private rate of return measure is important as it reflects both potential demand for higher education and the contribution of higher degrees to the distribution of earnings.

International comparisons of private returns to education as commonly produced by the OECD¹ reflect added information on how comparable skills are rewarded by the labour market across countries. However, these measures are necessarily standardised across countries with a wide range of classifications.

In the latest OECD measures, the private rate of return to tertiary education for New Zealand is 8.9%, compared to an OECD average of 12.4%, placing New Zealand toward the bottom of the OECD ranking. The aim of this study is to better understand the reasons for that gap.²

We identify a number of measurement issues with the OECD standardisation, and develop a series of decompositions of the New Zealand-OECD gap due to omitted or compositional issues (eg, old tax rates; New Zealand's higher employment rates; and compositional issues, which have not been controlled for in the OECD analysis, such as the mix of degrees, and the mix of degrees and graduates in New Zealand). Once these adjustments are made, around half of the measured gap in New Zealand's private returns to tertiary education can be explained by the way returns are measured rather than a "real" gap.

However, once those are taken into account a gap remains between New Zealand and the OECD average. Explaining the low wage premium relative to the OECD average is a complex issue intimately connected to New Zealand's overall comparative economic performance. In addition, we identify a number of endowment, policy, and decision-related

¹ The Organisation for Economic Cooperation and Development (OECD) produces a report titled 'Education at a Glance' (EAG) annually, which provides an array of education related indicators. Each indicator measures or evaluates a certain aspect of educational performance for each of the 34 OECD countries who supply data. Only 25 countries supplied data for the indicator of returns to tertiary education.

² *Education at a Glance 2011*, OECD

contributing factors (eg, earnings returns to skill for the relatively high proportion of high-skilled immigrants in New Zealand, and factors related to innovation and productivity). We evaluate our findings in light of the existing literature and evaluate their potential contribution, and recommend directions for future research.

It is important to note that the aim of the paper is mainly to understand the key reasons for the measured difference in private returns between New Zealand and the OECD average. We do not compare tertiary education to other investments in New Zealand, nor do we consider non-financial elements of the returns to education. Consequently, while this paper provides information on interpreting and making corrections to the OECD's findings, it is not designed for drawing broad policy conclusions.

In Section 2 we introduce the OECD's findings that form the basis of the paper, and explain the various components of the OECD's measured returns. We identify the wage premium from tertiary education as the major factor in New Zealand's low comparative rank.

Section 3 provides a framework for understanding how the wage premium is determined. It is implicitly based on a human capital framework for understanding investments in tertiary education.

Section 4 surveys the empirical literature on the importance of each identified influence on the wage premium. In this section we produce decompositions of the OECD measures of private returns to education for New Zealand relative to the OECD average. This technique allows us to identify the contribution of omitted and compositional factors to the New Zealand measure.

In Section 5 we draw conclusions and point to future research priorities.

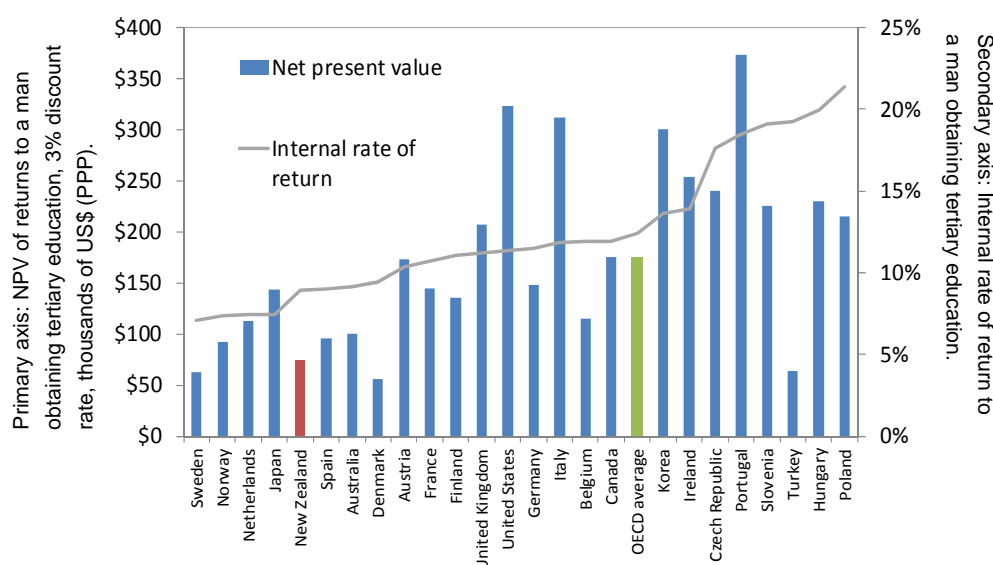
2 Components of the OECD's findings

This section dissects the OECD's findings to determine the main drivers of New Zealand's low rank.

2.1 Low comparative returns

The OECD produces two different indicators of private returns to education and New Zealand ranks towards the bottom of the OECD on both of them (see Figure 1).³

Figure 1 – Rate of return to investment in tertiary education



Source: OECD

The two measures used by the OECD are net present value (NPV) of returns and internal rate of return (IRR) on investment. The NPV figure shows the discounted value of the net benefits of obtaining tertiary education in United States dollars adjusted for purchasing power parity.⁴ The IRR shows the implicit percentage rate of return on investment in one's human capital by obtaining tertiary education.

The OECD prefers the NPV measure because it is a more appropriate indicator for assessing long-term investments such as education. Education tends to have high immediate costs, but benefits that peak over 20 years after finishing study. The nations that shine under an IRR measure are those with low initial costs and immediately higher earnings. Nations in which earnings continue to rise markedly over the 20-25 years following study will not feature so high in the rankings because they imply a low discount rate.

The NPV ranks investments differently from the IRR because of differences in the magnitude of cash flows, and how they are distributed over the lifetime of the investment. For some countries, the measure chosen noticeably affects relative OECD ranking but this is not the case for New Zealand: we rank 22nd by NPV and 21st by IRR.

³ The indicator shown here is the lifetime return to a man obtaining tertiary education as a part of their initial schooling. It is Indicator A.9 in EAG 2011.

⁴ Discounted at 3% per annum.

The NPV measure also has the advantage of being straightforward to decompose easily into its component parts. Consequently, we use the NPV measure for the remainder of this report, since our investigations primarily consist of decompositions and substitutions. However, we also conducted decompositions with the IRR where possible and the results are included in Appendix B. That said, the OECD cautions against evaluating a single nation's tertiary system by its ranking because outliers may be transitory. High returns may be a function of short-term skill shortages and the indicator does not control for this or other transitory influences such as differences in business cycles between nations or differences between skill groups. Low returns can similarly be a function of the magnitude of swings and volatility in the business cycle and thus timing of when returns are measured.

However, New Zealand has had returns below average in every year since the 2008 EAG⁵ and ranked below the median nation for tertiary returns. Our IRR ranking has dropped from twelfth out of eighteen in 2008 to 21st out of 25 in 2011, which may not itself be significant but does indicate the persistence of below-average returns in recent years.⁶ This view is reinforced by the other indicators of tertiary earnings premia that the OECD reports.⁷ In this paper we consider a number of measurement or institutional factors that contribute to this positioning, including eleven measurement and country data comparability factors covered in Appendix A. We find that these omitted or standardised factors are in fact expected to under-estimate the New Zealand returns relative to the OECD average.

2.2 How is the indicator constructed?

The indicator compares the private costs associated with tertiary education with the private benefits of achieving a higher income throughout one's working life. Specifically, it measures the income premium gained from completed tertiary education, relative to upper-secondary education. The OECD projects forward each cost and benefit based on a snapshot of earnings by qualification and age group, then sums the costs and benefits separately, before constructing the NPV and IRR from the resulting series. The original data in the latest OECD EAG 2011 is drawn from Statistics New Zealand's (2007) Household Labour Force Survey (HLFS) and the Income Supplement to the survey.⁸ NPVs reported by the OECD are in equivalent US dollars for the year of the analysis, and IRRs are expected percentage annual returns to investments for a qualification, projected over a working life-time.

HLFS, with the Income Supplement to the survey, is the appropriate data set, and a number of OECD countries incorporate similar data sets. However, as part of its standardisation, the OECD pools together earnings data on part-time and full-time workers in its returns to education calculations. In the case of New Zealand, these adjustments decrease the greater precision that the HLFS data set is capable of providing.

⁵ EAG 2008 had a base data year of 2004.

⁶ Changes in method between annual publications of EAG make direct comparisons of value difficult, which is why we use the rank.

⁷ See, for instance, Indicator A.8 in EAG 2011.

⁸ We use this data set, for comparability, in our analyses in this report.

Qualifications which are classified as tertiary include diplomas (Type B qualifications) and bachelor's degrees and above (so-called Type-A qualifications). Upper-secondary qualifications refer to Year 12-13 qualifications or equivalent.⁹

2.2.1 Measured benefits

The benefits of tertiary study that are measured by the indicator are comprised of a number of components. The gross earnings benefit is the difference in income earned for people with a tertiary qualification relative to an upper secondary qualification. This benefit tends to increase over time for people with tertiary education, which makes choices of discount rate important. The OECD uses average annual before-tax earnings for all employed workers, including full-time and part-time workers, by age group and gender to estimate the gross earnings benefit.¹⁰

The benefits also include an adjustment for better employment outcomes as a result of tertiary education. Any grants made to assist tertiary students financially while studying are counted as a benefit. This does not include the New Zealand student loan scheme's interest forgiveness provisions.¹¹

2.2.2 Measured costs

Those benefits are compared against the costs. Direct costs are those directly associated with tertiary education, such as tuition fees, costs of textbooks and other course materials. In New Zealand two-thirds of these costs are borne by the government and those public costs are outside the scope of this study.

The foregone earnings, what a student could potentially earn working instead of studying, should also be considered. These will depend on the foregone wage and the length of study. The OECD, use a proxy measure based on the full-time equivalent minimum wage in each country.¹²

Increased future income taxes due to higher earnings as a result of tertiary education are a cost to the graduate. As well, increased future income also results in fewer social transfers payments targeted for lower incomes.

Social contributions are the counterpart of taxation for funding public social protection and private funded social insurance schemes. Private social contributions rise as incomes rise, although New Zealand is unusual in the OECD in not having a material level of social contributions deducted from incomes¹³

⁹ Tertiary is defined according to the International Standard Classification of Education (ISCED 97) as ISCED level 5 and above. The upper-secondary education that tertiary earnings are compared to is ISCED level 3-4, equivalent to NCEA levels 2-4.

¹⁰ Sourced from the Household Labour Force Survey.

¹¹ The OECD intends to include loan schemes in a future edition of EAG.

¹² It is more usual to proxy foregone wages by the average earnings of a person with upper-secondary education.

¹³ Although a benefit to the government's accounts this is a cost to the individual.

2.3 Measurement problems

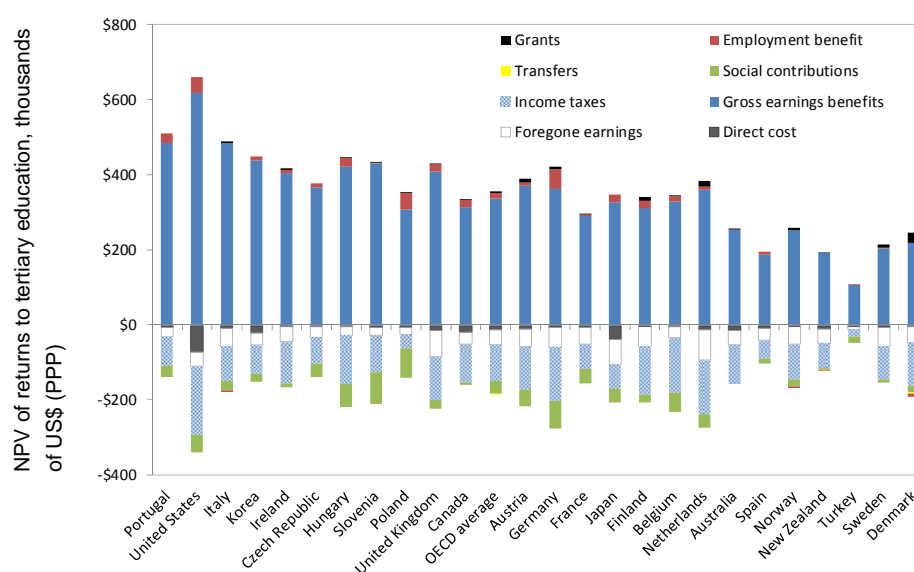
The costs and benefits described above are not straightforward to measure, particularly when the measurement is required to be consistent across nations. There are a number of possible problems with the measures that are particularly relevant to New Zealand; they are reviewed in Appendix A. Despite the measurement errors, which we quantify to some extent, there are still likely to be fundamental differences between New Zealand and the OECD.

One important point to note is that the OECD's time profile of earnings is drawn from cross-sectional data. That means the earnings of today's graduates when they turn forty are assumed to be equal to the earnings of today's forty-year-olds with tertiary qualifications. Because the current cross-section is the result of the past thirty years of policy, which is unlikely to be similar to current or future policy, it is difficult to draw conclusions about the effect of policy settings from this work. That would require cohort analysis but, even then, the analysis would be inherently backward looking.

2.4 How important is each component?

Figure 2 shows the relative size of the various components of male tertiary returns across the OECD.

Figure 2 – Components of return to a man's tertiary education



Source: OECD

The key point regarding New Zealand's relative returns are as follows:

- 1 They are dominated by the gross earnings benefit, the foregone earnings, and the income tax effects.
- 2 The foregone earnings for New Zealand are the closest in magnitude to the OECD average. The use of the full-time minimum wage to proxy the opportunity cost of time results in higher foregone earnings for women when part-time work is prevalent.
- 3 Our income tax cost is 70% of the OECD average, while our gross earnings benefit is only 57% of the average. That reflects New Zealand's highly progressive tax system: despite earning a 43% smaller gross premium than their counterparts across the OECD, New Zealand's tertiary graduates pay only 30% less in additional taxation.

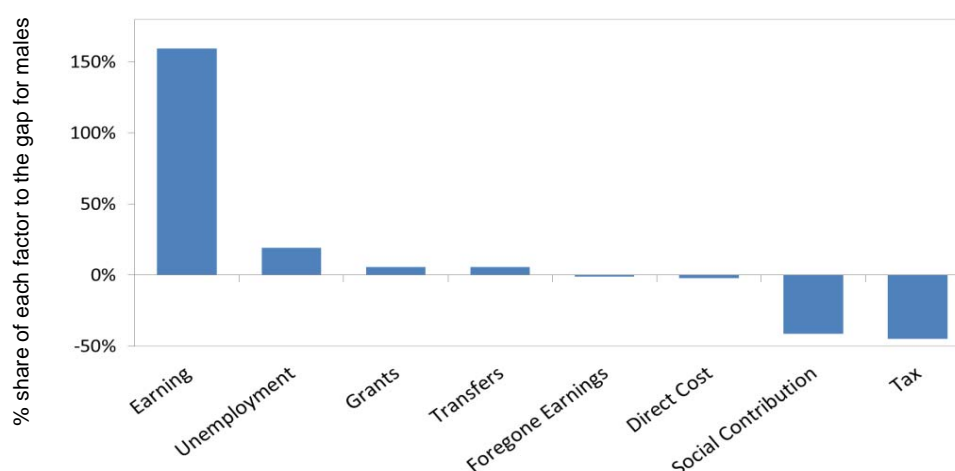
- 4 The OECD considers that New Zealand men have a small, negative employment effect from tertiary education. That suggests there is a greater cost of a tertiary qualified man being employed than a man with only upper-secondary education. This partly reflects New Zealand's near full employment for both secondary school and tertiary graduates at the time of the analysis by the OECD. Other domestic research indicates that this is due to greater lost wages, rather than a greater probability of unemployment (For example, David Earle, 2010a, p.3)¹⁴

2.5 Which components are responsible for New Zealand's low returns?

To determine further which components are most responsible for the difference between New Zealand's returns and the OECD's average returns, we decompose the difference in returns between New Zealand and the OECD average into the effect of each component of the index. For this decomposition we successively substitute OECD and New Zealand contributing factors. This allows us to quantify the relative contribution of each component to the gap between New Zealand and the OECD average.

Figure 3 shows the percentage of the gap accounted for by each of the components of the index.

Figure 3 – Contribution of components to the New Zealand-OECD gap



Source: Authors decompositions, using OECD data

¹⁴ David Autor (2010) finds that in the US employment and wage growth have been highest in high-skilled jobs at the expense of “middle-skilled” jobs and especially jobs dominated by moderately educated men. Autor also points to similar dynamics in the EU.

The results show that the lower gross earnings benefit is the main factor in explaining the gap. In addition, New Zealand's comparatively high employment rates for non-tertiary qualified people reduce returns related to higher likelihood of employment¹⁵. New Zealand's public subsidy for tertiary education results in a slightly smaller direct cost to individuals compared to the OECD average, that helps to narrow the gap in returns, but the lower value of student grants cancels that effect.

Lower average wages in New Zealand also narrow the gap through lower lifetime tax costs and social contributions made, but these gains are not sufficiently large relative to the earnings differential to close the gap. Social contributions in these calculations are the employees' direct contributions to social security funds. These payments are the counterpart of taxation and earmarked for funding public social protection and private funded social insurance schemes.

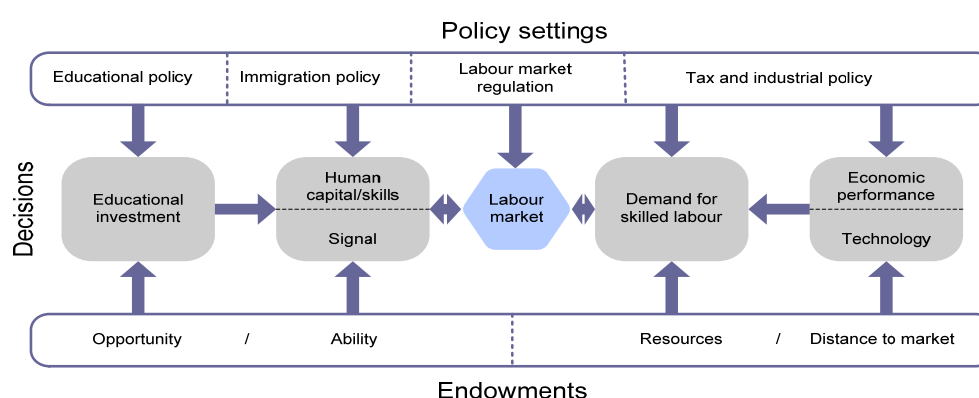
¹⁵ This observation is not independent of low returns to education. For example, it may be that higher rates of employment for non-tertiary qualified people are a function of a comparatively high and growing number of people in tertiary education which reduces the labour supply. This means high rates of employment for non-tertiary graduates may be reflective of dynamics which are driving down returns at one end of the qualification scale while driving up returns at the other (low or no qualification) end of the scale. Further, policy has (over the period covered by this data) increasingly encouraged people at the margin of the labour market to constrain working hours eg, "working for families". This could have the effect of reducing unemployment rates for non-tertiary qualified people by lowering labour force participation.

3 A framework for dissecting gross earnings

The dissection of New Zealand's measured returns above suggests that one component of the index is primarily responsible for our low rank: the gross earnings benefit for tertiary education is extremely low compared to other OECD nations.

We use a simple schematic diagram of the influences upon tertiary returns (Figure 4) to understand the differences between New Zealand's gross earnings benefit and the OECD average. The form of the diagram draws on the work of Dalziel (2010a, 2010b) and adds the labour market, endowments and policy settings. On the supply side it draws on the idea of education as an investment in one's human capital, which graduates then earn a return on through their working lives.

Figure 4 – Influences on tertiary returns



3.1 Elements of the system

The three parts of the framework—endowments, policy settings, and decisions—are inextricably linked. Each factor affecting the earnings benefit is inevitably affected by all three. However, the classification encourages us to consider whether the factors are primarily fixed (endowments), the result of government policy, or private (firm hiring) decisions.

3.1.1 Endowments

The individuals in the economy are endowed with particular opportunities and abilities that influence their human capital and their decisions about investment in it. Disadvantaged groups within society may have fewer opportunities to invest in tertiary education. Similarly, people with a lower aptitude for, or interest in, tertiary education will be less likely to choose to gain a tertiary qualification.¹⁶

At an economy-wide level, New Zealand is endowed with certain characteristics. For example, it is a small country a long way from other markets. It also has a climate and geography suited to particular activities.

¹⁶ Becker, Gary (1993), *Human Capital*, third edition; also see Maani, Sholeh (1997), *Investing in Minds: The Economics of Higher Education in New Zealand* (Chapter 3).

Further, current capital stocks, industrial structure, and expertise can be thought of as endowments to the extent that they have been accumulated over time and reflect the comparative advantages of the past. From the point of view of a potential student, the capital stock and distribution within the economy is exogenous to their decision, which is why we class it as an endowment. In the long run it is also a substitute for labour.

All of these endowments have a strong influence upon the choices of the firms that operate in New Zealand, and consequently upon their demand for tertiary qualified labour.

3.1.2 Policy settings

Government policy and regulation also influence each decision identified. Since the government regulates and subsidises the provision of tertiary education in New Zealand, policy influences both the private cost of education and the number of graduates (eg, through enrolment caps¹⁷). The government also affects the supply of skills to the labour market via immigration policy, which can compensate for a lack of domestically provided skills.

On the industry side, the government's industrial policies favour some industries over others, which influences the demand for skilled labour. The tertiary return is then determined within a market for labour that the government regulates. The government is also a major employer, which enables it to directly influence the market.

The government also determines the taxation regime, but this effect is directly accounted for in the OECD's indicator.

3.1.3 Decisions

Individuals' decisions begin with the choice to obtain a tertiary qualification. In the labour market individuals are rewarded for providing skills to firms, which can be thought of as the individuals' human capital. Obtaining a tertiary education both builds the human capital of the individual and provides a signal about the skills and endowments that individuals have. Each is important in the labour market and the individual will weigh their expected return to those against the cost of obtaining tertiary education, which is represented largely by the foregone earnings since the direct cost is borne primarily by those already in work via the tax system.

Firms must decide, based upon the market opportunities open to them, what production technology and techniques to use. Entrepreneurs also decide which industry to enter when they form a company. The topic of New Zealand's general economic performance is beyond the scope of this study, but there are aspects of it that directly relate to tertiary returns. In particular, factors that cause skill-biased technological changes such as the relative cost of capital and labour are likely to increase the returns to tertiary qualified labour. In addition, differences in the composition of our economy—our lower share of large firms relative to the rest of the OECD, for instance—may affect the demand for tertiary qualified labour.

In concert, these two sets of decisions form the market for tertiary qualified labour. By setting the wage for tertiary qualifications they determine the gross earnings benefit to graduates, which is the primary determinant of the returns to tertiary education (Figure 2).

¹⁷ These influences are often mediated by agents and institutions of government such as Universities controlling access to highly sought after courses (eg, medicine) and government sanctioned professional bodies which certify professional qualifications.

It is important to remember that firms are looking for skills, or human capital, as opposed to tertiary qualifications. The qualification itself is partly a proxy measure for the human capital gained, and partly a signal of endowed ability that helps to overcome the asymmetric information in the market. Because qualifications are only a proxy for skills, it is to be expected that there will be some mismatch in a well-functioning labour market between the jobs and qualifications of workers.¹⁸ For instance, a law graduate may work as an education policy analyst using the research, writing, and analysis skills they gained during their law degree. That would register as mismatch on some measures, but may actually be an optimal outcome.

3.1.4 Dynamic nature of the system

The schematic diagram above depicts the process of human capital accumulation and bargaining with firms happening in one direction. In fact, this is a dynamic process with lags and feedback loops.

First, the prevailing wage in the labour market is a signal to people considering investing in their human capital by obtaining a tertiary qualification. Secondly, the strength of the domestic economy is a major determinant of the foregone earnings during study, which influences the decision to study. There are also lags between each of these signals and the entry of the resulting graduates into the labour market because it takes time to complete a qualification. Additionally, the level of human capital in the economy influences the growth of the economy, and consequently the wages paid.

Each of these effects is important when considering the dynamic adjustment of the labour market and the influence of human capital on growth. This is important to bear in mind when interpreting the data and results. What we see in the OECD indicator is cross-sectional data and reflects only the current state. To properly understand what it is telling us requires knowing the historical context and the expectations that people have, based upon current endowments and policy settings.

For example, there are presently a large number of vocationally qualified graduates in the labour force. That is due in large part to individual responses to increased demand for skills, and policies which aimed at encouraging people to gain tertiary qualifications irrespective of level or field of study. Current policy is now more focused on higher level education eg, degree-level. Our analysis has no temporal element and cannot capture these changes, which makes it difficult to say what effect current policy has upon the outcomes observed. That might usefully be the focus of further research.

¹⁸ The exactness of the proxy will vary across segments of the market. For example, the more vocational the qualification, the better the skill set will be proxied by the credentials.

4 Empirical evidence on factors influencing the wage premium

In this section we describe empirical evidence on the factors affecting the gross earnings benefit. Where that is not possible we consider the earnings difference between skilled and unskilled labour as a proxy.

4.1 Endowment-related influences

4.1.1 Capital stock

Capital stock is likely to affect the earnings premium through its differential effect upon the marginal product of skilled and unskilled workers. Capital is generally considered a complement for skilled labour - increasing labour productivity of skilled labour and a substitute for unskilled labour.¹⁹ Consequently, increased levels of capital utilisation in the economy can increase the productivity of skilled relative to unskilled labour, and widen the wage employment gaps, between skilled and unskilled labour.

A study by Krusell and Ohanian²⁰ estimated that the increase in the capital stock in the last 30 years explains 9% of the increase in the wage gap between skilled and unskilled workers in the United States. Hornstein and Krusell reached similar conclusions.²¹

The data on New Zealand's capital stock suggests that it may be low relative to comparable nations, although little research compares across the entire OECD, likely because of data limitations. Aggregate capital-to-labour ratios (Figure 5) suggest that New Zealand is about average.²²

Prior research into the capital per hour worked has used 2002 data to show that New Zealand has low capital intensity relative to comparable, OECD nations.²³ The consistency of those results is striking and indicative of 'capital shallowness'.

It is therefore possible that low capital intensity explains some of the gap in tertiary returns. However, caution should be used in interpreting these results since the effect on tertiary returns depends on the change in the composition of capital. The need for further investigation is confirmed by the fact that capital stock per person does not always play a key

¹⁹ Krusell, Per, Lee E Ohanian, Jose-Victor Rios-Rull and Giovanni L Violante (2000), *Capital-skill Complementarity and Inequality*.

²⁰ Krusell, Per and Lee E Ohanian (1997), *Capital-skill Complimentary and Inequality: A Macroeconomic Analysis*.

²¹ Hornstein, Andreas, and Per Krusell (2003), *Implications of the Capital-Embodiment Revolution for Directed R&D and Wage Inequality*.

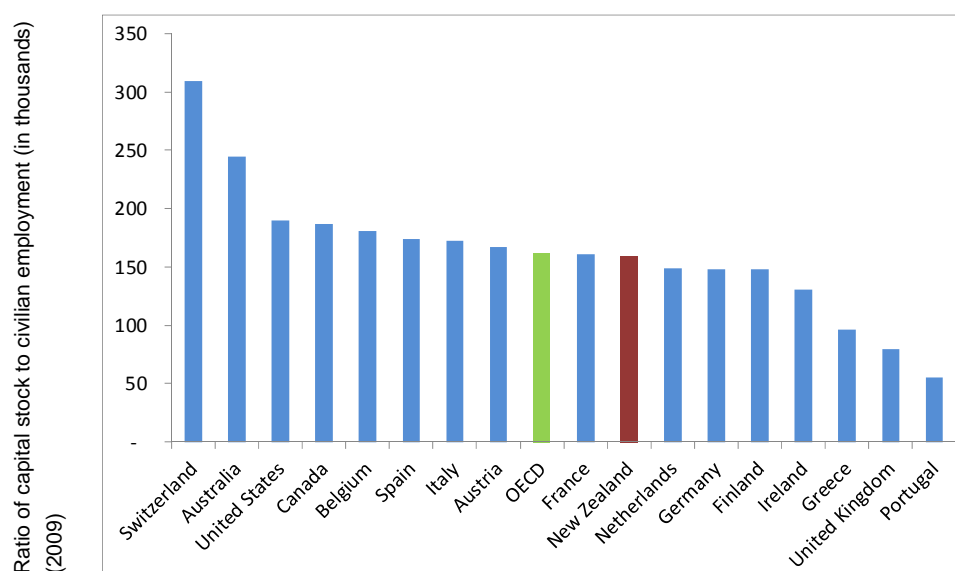
²² This measure includes residential housing and is not necessarily representative of the productive capital available to firms. However it is useful for triangulating results from other measures of capital inputs to production – all of which present difficult measurement issues requiring judgement and assumptions.

²³ Dupuy, Max and James Beard (2008), *Investment, Productivity and the Cost of Capital: Understanding New Zealand's 'Capital Shallowness'* (TPRP 08/03) - The Treasury - New Zealand; Schreyer (2007), *International Comparisons of Levels of Capital Input and Multi-Factor Productivity*; Mason and Osborne (2007), *Productivity, Capital-intensity and Labour Quality at Sector Level in New Zealand and the UK*.

role in determining returns: for instance, countries with the lowest capital per worker, such as the United Kingdom and Portugal have some of the highest tertiary returns.²⁴

Further research into the changing composition of New Zealand's capital stock would be required to confirm the importance of this link.

Figure 5 – Capital-labour ratios



- Note:
- (1) The capital is economy-wide capital stock volume; labour is employment.
 - (2) Countries where data is unavailable are not reported; Denmark and Sweden are excluded as outliers.

Source: Figure based on OECD data

4.2 Policy-related influences

The government has a large role in the tertiary education system: it funds the majority of tertiary education, certifies the qualifications, and in the recent years determines the total amount of funding available. That gives it a significant influence upon the skill set of the labour force through the incentives it provides to students. It also affects the skill set of the labour force through immigration. While individuals make the decision to under-take higher education or migrate to New Zealand, policy control over the supply side of the labour market gives the government a significant indirect influence on the earnings premium.

4.2.1 Mix of tertiary qualifications, and decomposition of the effects

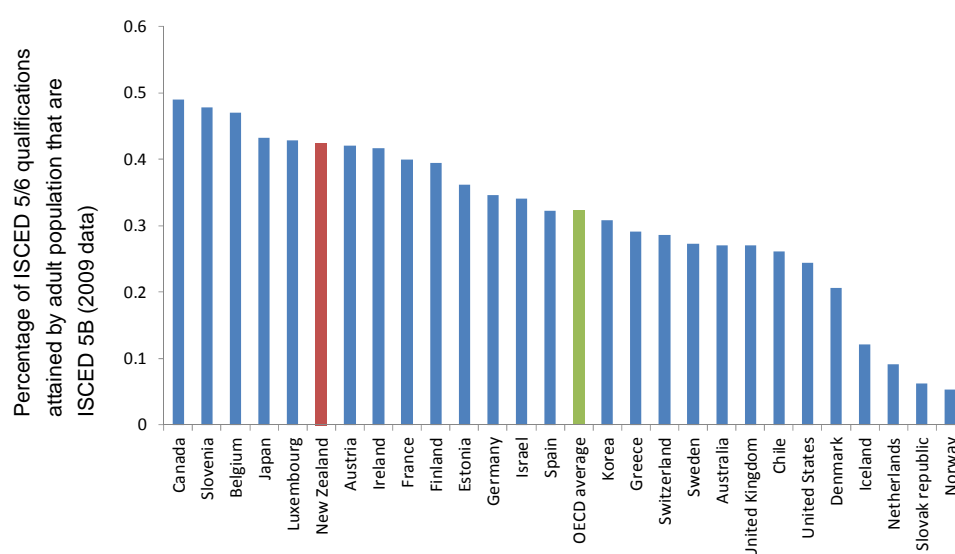
The government affects the mix of qualifications and skills in the labour market through the different subsidy rates for different courses; caps on levels of funding at each level of tertiary education, the mix of qualifications that it certifies, and the qualifications it requires for entry into various professions.

²⁴ Research into the value of human capital stocks suggests that stocks of human capital are many orders of magnitude larger than the value of physical capital stocks. See eg, Le et al (2006). This, combined with the performance of other countries with low physical capital intensity suggests that capital intensity is not necessarily a central determinant of either economic performance or tertiary returns.

In New Zealand, the policy settings have resulted in a large number of lower tertiary (Type B) qualifications in the labour market (Figure 6).²⁵ It is worth noting that the high stock of Type B graduates is not likely to be a consequence of current policies, but rather historical policies. Thus, it cannot be interpreted with respect to the current policies of the government.

Bachelor or higher tertiary (Type A) qualifications are associated with greater gross earnings benefits than lower tertiary (Type B) qualifications.²⁶ Consequently, a country with a relatively high proportion of Type B tertiary graduates is likely to have relatively low average returns to tertiary qualifications when Type A and Type B graduates are aggregated as in the OECD measures. Indeed, it could be the case that a country has better than average returns to each Type and yet has lower than average returns overall due to a high proportion of Type B graduates.

Figure 6 – Share of tertiary qualifications that are Type-B



Source: Figure based on OECD data

Diplomas are generally associated with lower earnings premiums across the OECD, and lower private returns. The OECD provide gross earnings ratios by type of degree, but they produce only aggregated tertiary NPV and IRR private return indices across both Type A and Type B degree types.

To quantify the impact of the mix of qualifications on New Zealand's returns, we adjusted the indicator by re-calculating it using the OECD average shares of Type A and B qualifications instead of the New Zealand shares. To the best of our knowledge this is the first study of its type in the decomposition approach developed in dissecting the country-specific gaps in returns to education compared to the OECD average. The method we have used lends itself to similar dissections and comparison across other countries.

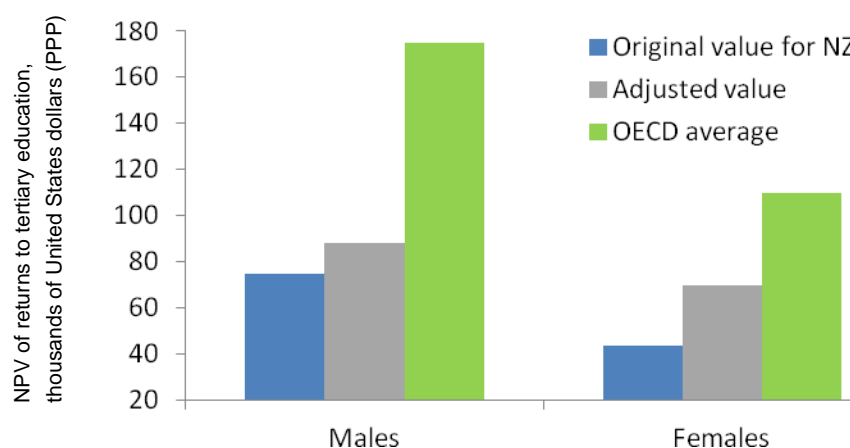
Our results (Figure 7) show that the mix of qualifications explains 14% of the difference between New Zealand's earnings and the OECD average for males, and 40% of the difference for females. The much greater effect of type of degree in explaining the gap for females reflects the greater prevalence of shorter diplomas among females in New Zealand

²⁵ Type B degrees and diplomas (ISCED classification 5B) involve a minimum of 2 years of education, compared to at least 3 years in the case of Type A tertiary degrees.

²⁶ Maani, Sholeh and Tim Maloney (2004), *Private and Public Returns to Investments in Secondary and Higher Education in New Zealand over Time*.

as compared to the OECD average. This disaggregation highlights the importance of considering returns to tertiary degrees by type of degree completion.

Figure 7 – Contribution of qualifications mix to the difference between New Zealand's returns and the OECD average



Source: Authors calculations, using OECD data

The type of degree effect for New Zealand reflects both the compositional effect of our greater share of Type B degrees, but also the lower earnings for Type B degrees relative to upper secondary qualifications in New Zealand. We expect that the earnings effect by degree Type partly reflects a wider range of shorter or older diplomas included in New Zealand's Type B degrees in the translation of NCEA and certificate pathways to the ISCED categories.

4.2.2 Number of graduates

In addition to the mix of qualifications, the government's policies also affect the overall supply of labour. The question of how much the supply of tertiary graduates affects tertiary returns is a crucial one for New Zealand: New Zealand's workforce has a high proportion of tertiary graduates and, in particular, a high proportion of vocationally qualified labour. One in four New Zealand adults aged 25 to 64 hold a degree or higher and New Zealand is ranked eighth in the OECD for this measure. In terms of vocational attainment (tertiary, sub-bachelor's qualifications) New Zealand sits second only to Canada and significantly ahead of Australia, the United States, and the United Kingdom.²⁷

As discussed in Appendix 0, New Zealand also has low completion rates, which implies an extremely large stock of people who have completed tertiary courses but have not completed degrees.²⁸ That stock is the consequence of an accumulation of graduates over time as demand for skills had increased and the government's policy settings encouraged participation in tertiary education. The current government's change of direction with regard to vocational education²⁹ is likely to change the stock of graduates over time, so the data here is unlikely to reflect the future experiences of today's graduates. Time series analysis could be usefully undertaken to understand how the stock of graduates and wage premium have changed over time in response to varying government policies.

²⁷ Ministry of Education (2010), *How Does New Zealand's Education System Compare?*.

²⁸ Although not necessarily entire qualifications.

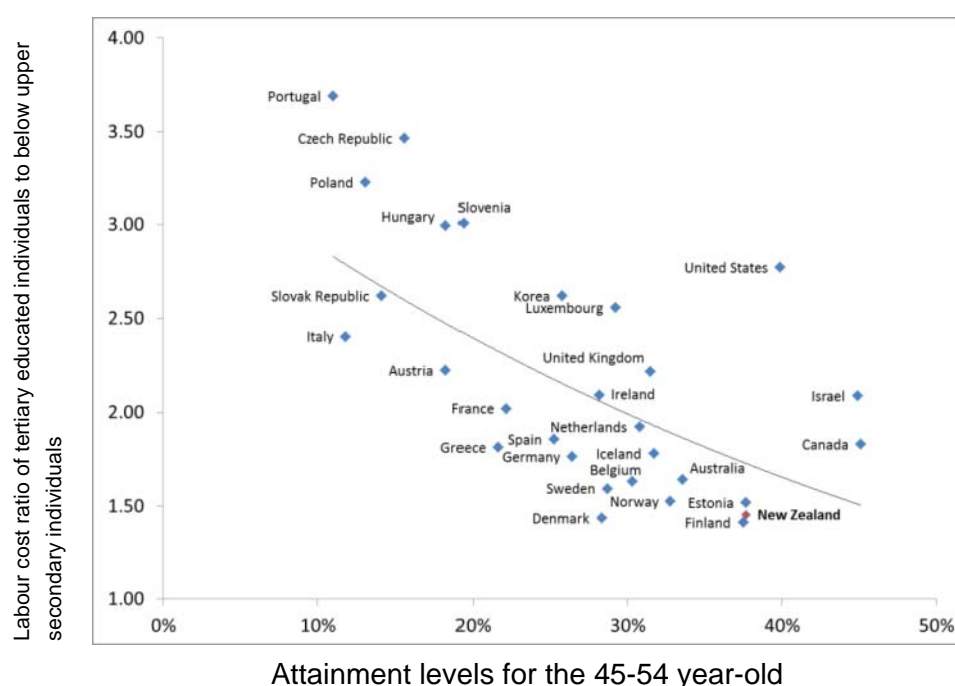
²⁹ Ministry of Education (2010), *Tertiary Education Strategy 2010-2015*.

When considering the number of graduates one must also be mindful of the prevailing economic conditions. The stock of students is likely to be responsive to economic conditions: in times of recession people tend to enter education at a greater rate because of a reduction in expected foregone earnings. Consequently, the stock of graduates is likely to depend, in part, upon the economic conditions of the preceding decades. That could also influence the quality of the graduates since, if there is sorting by aptitude, the lower quality graduates will be those who enter latest. Recessionary periods could then produce a swell of lower quality graduates 2-4 years later. That is not necessarily a problem because those individuals may well have positive returns to their education, but it will likely reduce the average, measured return to tertiary education.

To determine whether there appears to be a relationship between changes in the supply of tertiary qualifications and the gross earnings premium that they attract, the OECD uses the cost ratio of tertiary educated labour to lower-secondary educated labour.³⁰ It then compares that to the proportion of the population with a tertiary qualification. Figure 8 shows the results of plotting those variables against each other for middle-aged workers.

We are cautious about drawing any conclusions from the OECD's graphical analysis (Figure 8) because relationships seem to be heavily influenced by outliers in lower income industrialising European countries. Also, this is only a snap shot. Over time the causal relationship between the supply of workers and earnings runs both ways. Though a high number of tertiary graduates may depress the earnings premium, the low earnings premium may be a market signal of oversupply and correct over time.³¹

Figure 8 – Labour cost ratio and supply of tertiary graduates



Source: OECD

³⁰ Indicator A.10, OECD, *Education at a Glance*, 2011.

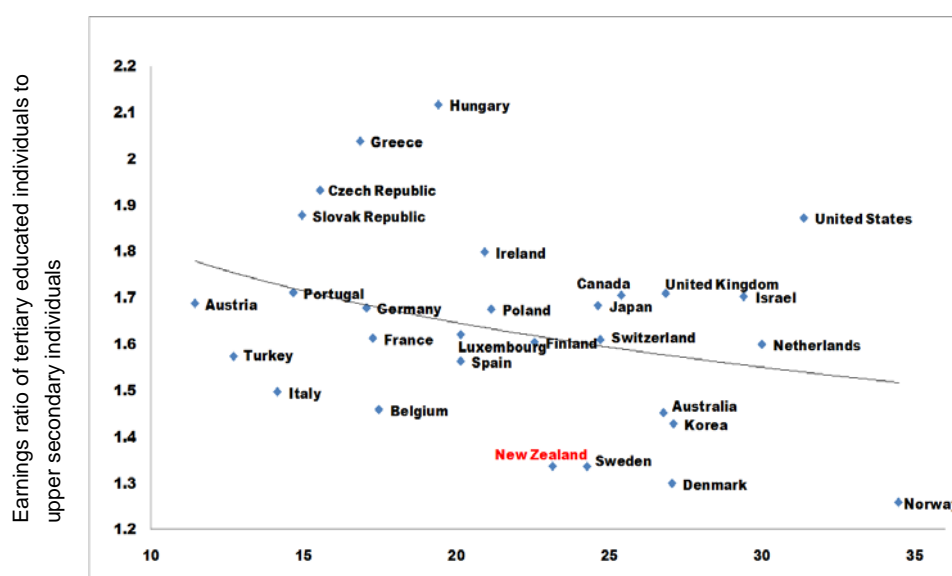
³¹ Controlling for that endogeneity requires analysis that is beyond the scope of this project but which would be an important avenue of enquiry for future research. Ideally, time series analysis would reveal whether markets have adjusted over time, which would shed light on the plausibility of this explanation.

We know that New Zealand has a high proportion of Type B degrees, so the next question is whether the high supply is driven primarily by vocational qualifications. An examination of Type A degrees (Figure 9) and New Zealand's position close to the OECD average reveals that the supply of Type A degrees does not appear to be a significant factor in explaining the comparatively large number of graduates relative to the OECD average.

Indeed, the relationship between the supplies of Type A degrees and earnings ratios does not appear particularly strong across the OECD. The wide spread of data points suggests that factors other than supply are most important for explaining returns to Type A degrees.

Among Type A degrees, New Zealand has one of the lowest proportions of post-graduate degrees (Appendix A.1.2). The aggregation of both undergraduate and post-graduate Type A degrees in the OECD measures may partly explain New Zealand's lower relative returns in Figure 9.

Figure 9 – Earnings ratio and supply of Type A tertiary graduates



Type A tertiary attainment levels (%) for the 25-64 year-old population (2007)

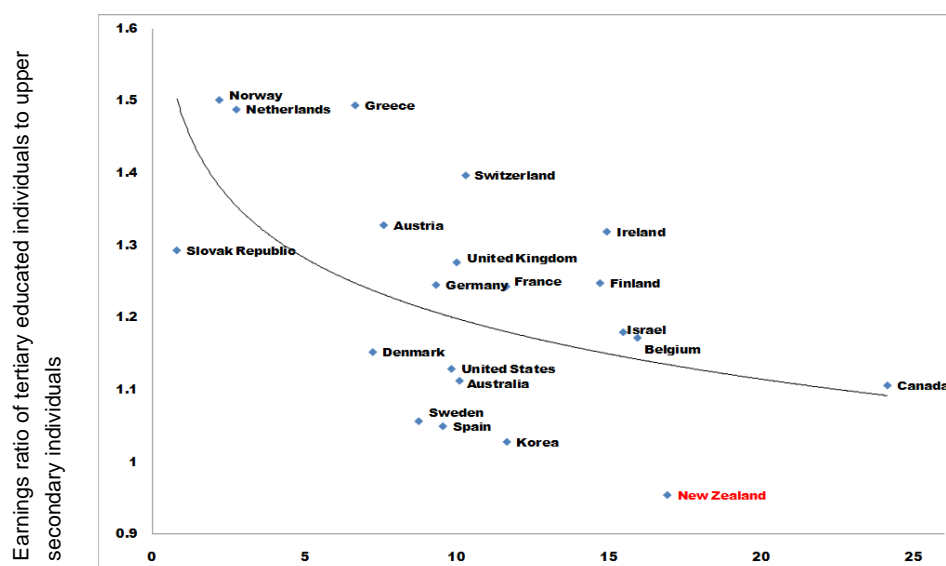
Source: Authors figure, using OECD data

A similar chart for Type B degrees (Figure 10) suggests that New Zealand's significantly above-average supply of Type B graduates may reduce returns. Therefore, the supply of graduates is likely to be more relevant to Type B degrees in explaining the New Zealand-OECD gap, although the effects appear small. In addition, New Zealand's outlier position points to the effect of other factors besides supply in explaining the lower Type B earnings premium.

These observations may, however, be dominated by compositional effects. It is reasonable to believe that high growth in Type B qualifications reflects an increase in the number of less capable students. If that is the case, a rising number of people may be obtaining Type B degrees and experiencing higher wages as a result but if those wages are lower than the average wage received by more capable graduates then the overall average would decline. A higher proportion of New Zealand Type B degrees are also shorter in duration, and they have different secondary school pathways compared to the rest of the OECD (Appendix A.1.1).

That sort of analysis suggests that focussing solely on the average returns may be misleading: if many people are experiencing higher wages then the marginal value of a qualification may be more appropriate. If that is true, then we might wonder about the extent to which people are sorting according to the marginal value they gain from education. It may be that the marginal student gains a lower value from tertiary education than the prior students do, if the sorting is occurring efficiently. Alternatively, the sorting may presently not be occurring, which could result in people with a negative marginal, social return to education gaining a qualification solely because of the existence of a subsidy. That could warrant further investigation.

Figure 10– Earnings ratio and supply of Type B tertiary graduates



Type B Tertiary attainment levels (%) for the 25-64 year-old population (2007)

Source: Authors figure, using OECD data

The existing literature on the effect of supply shifts shows mixed results. In a review paper commissioned by the OECD, Machin and McNally observe that both the supply of and demand for tertiary graduates have been increasing markedly over time.³² That is reinforced by domestic research that draws on census data to show the skill premium remaining virtually unchanged between 1996 and 2001, with both supply and demand increasing in step.³³ However, the Ministry of Education's research into demand for skilled labour, which examines skill groups individually, finds strong evidence for continuing skill shortages in certain fields. In particular, they found the shortages to be greatest in the professional fields related to construction: engineering, architecture, and building.³⁴

That conflicting evidence suggests that the supply effects need to be understood at the skill and industry level, rather than solely the qualification level, although qualifications do appear to be a reasonable proxy for skill levels.³⁵

³² Machin, Stephen and Sandra McNally (2007), *Tertiary Education Systems and Labour Markets*.

³³ Dillingham, William (2002), *Skills and Evidence of Upskilling*.

³⁴ Earle, David (2009), *Advanced Trade, Technical and Professional Qualifications: Trends in Supply*.

³⁵ Smyth, Roger and Chris Lane (2009), *Skills and Education: How Well Do Educational Qualifications Measure Skills?*

4.2.3 Migration and the workforce, and decompositions of the effects

Immigrants, especially those who have lived here for less than ten years, tend to earn less than their New Zealand-born counterparts do. This effect is caused by a host of factors, including slow adjustment to the host labour market, language proficiency, and transferability of foreign degrees.³⁶ Government policy has an impact in two ways: first, it determines who can migrate to New Zealand and how many immigrants New Zealand absorbs. Secondly, it can affect the transferability of foreign qualifications. Qualification recognition is not an exact science and trade-offs need to be made between two types of errors:³⁷

- 1 First, recognising qualifications that turn out to be of dubious value, which decreases the signalling value of overseas qualifications within New Zealand.
- 2 Secondly, not recognising otherwise credible qualifications, reducing the credentials and job opportunities available to migrants.

Nonetheless, it is worth noting that immigrants' choice to move here reveals that, despite their disadvantages in the labour market, they expect a better quality of life than they experienced in the source country. Consequently, we should be slow to point to low returns as a 'problem': it may be that this is more of a compositional issue than a problem.

The difficulty that immigrants have integrating into the local labour market often raises questions about emigration. Since New Zealand has not only a high number of qualified immigrants, but also a high number of qualified emigrants, it may be that emigration of high-ability graduates also reduces New Zealand's measured aggregate returns to tertiary education. We do not quantify that here since there is no way to satisfactorily determine the difference between the earning potential of a New Zealand resident and the earning potential of an equally qualified emigrant.

In a compositional sense the lower earnings for immigrants contribute to a lower average earnings premium in countries with a large number of immigrant graduates, which underestimates the returns for the established labour force. Among OECD nations, the proportion of New Zealand's workforce that came from overseas is the third highest. Around 17 percent of people aged 25 to 65 years do not speak English as their native language.³⁸ More than half of this group have arrived in New Zealand within the last 10 years, mostly from Asian countries.

Within the student population, New Zealand has the fifth highest proportion of its student body coming from overseas; roughly double the proportion of the OECD average.³⁹

To gauge the extent to which the large proportion of migrants in its workforce influences New Zealand's aggregate returns, we re-calculated the index by adjusting the OECD's calculations to try to exclude the effect of the lowest paid new migrants. These new immigrants are defined as having lived in New Zealand less than ten years. To do this, we

³⁶ Maani and Maloney (2004), *Returns to Post-school Qualifications*; Chiswick et al. (2006), *How Immigrants Fare Across the Earnings Distribution*; Chiswick and Miller (2011), *Negative and Positive Assimilation, Skill Transferability, and Linguistic Distance*; David Earle (2010b), *Skills, Qualifications, Experience and the Distribution of Wages*.

³⁷ The New Zealand Qualifications Authority has a process for recognising overseas credentials, but it is a difficult task and there are inevitably problems.

³⁸ Ministry of Education (2010), *How Does New Zealand's Education System Compare?*, page 12.

³⁹ *Education at a Glance: 2011*.

scaled up our aggregate earnings level to that of a non-new migrant's by multiplying the aggregated earnings with an earnings index. The earnings index reflects the ratio of earnings of new migrants to the rest of the employed (Table 1) and is calculated as the ratio of the earnings of the employed, excluding new migrants, to that of all employed without the exclusion.⁴⁰

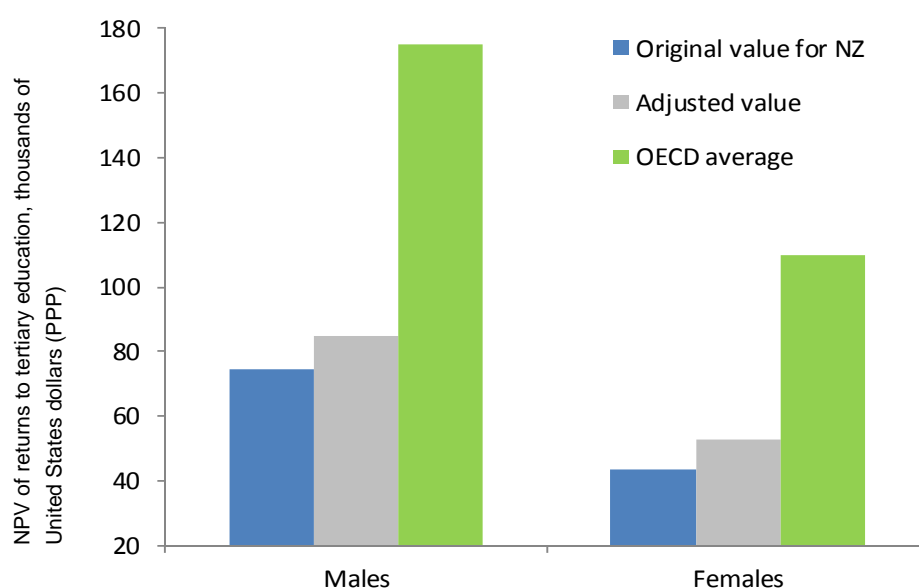
Table 1 – Earnings index for non-new migrants

	Male	Female
Tertiary	1.03	1.02
Upper Secondary	1.01	1

Source: Authors calculations using Statistics New Zealand data (HLFS 2007)

The results (Figure 11) show that adjusting the index by excluding new migrants closes the gap between New Zealand and the OECD average by 10% and 14% for males and females respectively.

Figure 11 – Contribution of migrants to the difference between New Zealand's returns and the OECD average



Source: Authors decompositions, using OECD data

⁴⁰ A second potential factor is New Zealand's relatively high rate of high-skilled emigration. If emigrants are those with expected higher returns to their tertiary education, emigration could also contribute to lower private returns to tertiary education for residents in New Zealand. This empirical question lends itself to future research.

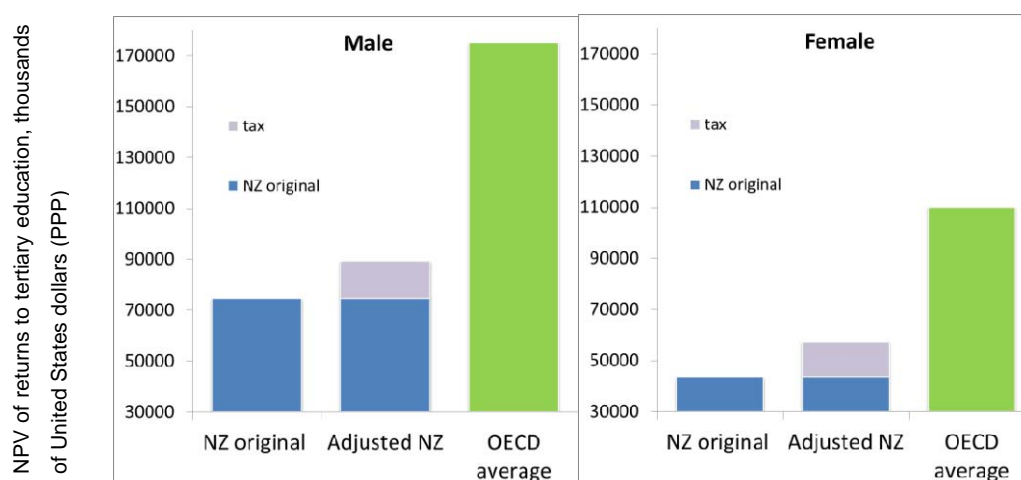
4.2.4 Income tax changes, and decomposing its effect

As discussed above, the tax rates are a component of the OECD's indicator and a significant contributor to New Zealand's low rank.

What is notable about the tax rates is that the OECD's calculations use New Zealand's pre-2010 income tax rates in the 2007 base year. These rates are higher than the OECD average (25% on average for New Zealand men, compared to 22.3% for the equivalent OECD average ratio).⁴¹

In 2010, marginal income tax rates in New Zealand were lowered, including raising the highest marginal tax bracket income threshold from NZ\$60,000 to NZ\$70,000, and reducing the corresponding marginal tax rate from 39% to 33%. Income tax rate reductions were across income levels, but they were relatively higher at the highest income brackets where greater proportions of university graduates are expected to be employed. As a result, private rates of return to higher education, as based on after-tax income, would increase due to the lowered marginal tax rates. It is interesting to consider to what extent the pre-2010 New Zealand income tax rates contributed to the gap between New Zealand and the OECD, relative to our current tax rates. Figure 12 shows the effect of adjusting New Zealand's tax rates to the 2010 level and demonstrates that our relatively low upper tax rates narrow the gap even further.

Figure 12 – Contribution of post-2010 income tax effect to the difference between New Zealand's returns and the OECD average



Source: Authors decompositions, using OECD data

While the tax rate explains a significant part of the gap, we must be careful interpreting that result, since it does not take account of any other changes that may have occurred in New Zealand and across the OECD in the intervening four years. It also does not account for the rise in indirect taxes (GST) in New Zealand at the same time. Nonetheless, it can be taken as indicative of the importance of the changes in our tax system for the private returns to tertiary education, as measured by the OECD's index.

⁴¹ Education at a Glance: 2011.

4.3 Decision-related influences

4.3.1 Industry structure

Since the earnings of an employee are largely determined by their marginal product, the value of the goods produced in their industry has a large influence on their earnings. Both the field of study and the industry in which a graduate is employed affect the earnings benefit of their tertiary education.

The empirical literature shows that students of agriculture, humanities and the arts have the lowest returns, while students of engineering and medicine have the highest.⁴² Studies for Greece, Slovenia, the United Kingdom⁴³, Australia⁴⁴, and the United States⁴⁵ found that studying agriculture or humanities leads to returns between 40% and 90% lower than average. In contrast, engineering and medicine are associated with 10% to 60% higher returns.

In New Zealand, literature is scarce on how returns or the earning premium varies by industry; however, Scott calculated an earnings profile for graduates with a tertiary qualification.⁴⁶ Benchmarking against the returns to a humanities graduate, health graduates earn the most: 1.62 times more than a humanities graduate does in the first year following graduation and 1.25 times higher in the third year. Consistent with the international findings, creative arts graduates have the lowest earnings. Since the field of study is significantly influenced by the industry in which people intend to work, we have conflated these two effects but the distinction is not overly important for our purposes.

It is not surprising that returns vary across industries and fields of study. This variation in returns across industries may be a reflection of the skill requirements associated with the knowledge and technology density of each industry.⁴⁷ Technology-intensive industries are more likely to employ skilled workers who are more able to manage capital with higher technology content, and in turn demand higher pay. These skilled workers are required to have correspondingly greater human capital and stronger signals in the labour market, hence their high tertiary qualifications. The gap in the returns across industries can also be a result of the uneven impact of technological development on productivity.⁴⁸

It is also possible that the average returns to subjects such as engineering and medicine are higher simply because there is a clearer career path in those vocational subjects. That is to say, vocational subjects with a clear line of progression into a high-paying industry may see higher average returns than non-vocational subjects with a broad range of returns in varying industries.

⁴² The international literature may, however, not be a reasonable source of information for an industry such as agriculture given differences between New Zealand agriculture and agricultural policy compared to most other OECD countries.

⁴³ Psacharopoulos, George (2009), *Returns to Investment in Higher Education A European Survey*.

⁴⁴ Borland, Jeff (2002), *New Estimates of the Private Rate of Return to University Education in Australia*.

⁴⁵ Machin and McNally (2007), *Tertiary Education Systems and Labour Markets*.

⁴⁶ Scott, David (2009), *What Do Students Earn After Their Tertiary Education?*.

⁴⁷ Esposto, Alexis (2010), *Measuring Earnings Inequality in Full-Time Earnings: An Australian Example*.

⁴⁸ Hector, Christopher J (2007), *Wage Structures and Employment Outcomes in New Zealand, and Their Relationship to Technological Change*.

Clear lines of progression may also make these kinds of occupations more attractive to people with considerable ability (endowments) as it reduces a range of earnings risks associated with subject choice.⁴⁹

Ultimately, this is likely to be a compositional factor affecting aggregate returns. It suggests that returns need to be examined at an industry level for conclusions to be drawn about the efficacy of New Zealand's tertiary education. Simply observing that returns vary across industries does not help to understand whether the international, intra-industry returns vary, which would point to potentially important differences. The composition of industries in New Zealand is a topic outside the scope of this research, but is likely to be closely related to the nation's endowments.

4.3.2 Qualification mismatch

Not only is the industry and subject important for returns, but so is the matching between the two. So far, the studies covered have examined returns for a person studying and working in a particular field, without considering that the person could work outside the field they qualified in (subject mismatch), or be over or under-qualified. That might occur if the individual had poor information about the state of the labour market when they entered tertiary education. Alternatively, the lag from entering tertiary education to graduation may have seen the labour market change in the interim, leaving the graduate without an opportunity to enter their preferred field of employment.

Studies which try to quantify the impacts of mismatch are difficult to interpret. They typically measure mismatches based on expected qualification as compared to actual qualifications. However these terms hold no meaning in the absence of a robust counterfactual. For example, Quintini⁵⁰ analysed data from the OECD countries and found that over-qualification leads to a 10% wage penalty, while under qualification leads to 6% wage increase. Given that wages depend more on skills than qualifications, it seems likely that this result is due to the imperfection of proxying human capital with qualifications.

There is no international comparative indicator for mismatch to compare New Zealand against the OECD, but Quintini ranked the OECD countries by their level of qualification level mismatch. She found that New Zealand is below the OECD average for over-qualification but is well above the OECD average for under-qualification (2nd highest in OECD). Moreover, she found the under-qualification in New Zealand is mainly driven by people with upper secondary qualifications, 61% of whom are under-qualified. That result is surprising, given that New Zealand has an extremely high proportion of graduates with Type B qualifications. However, it may suggest that New Zealanders possess a higher level of human capital than is average for an individual in the OECD with their qualifications.

⁴⁹ "Clear(er) career path" can be defined as a narrower distribution around employment outcomes and lifetime earnings conditional on tertiary education. The benefits of this might be expected to be competed away however occupations with "clear(er) career paths" are, for better or worse, characterised by relatively high barriers to entry.

⁵⁰ Quintini, Glenda (2011), *Over-qualified or Under-skilled*.

The empirical findings here cannot be taken at face value, but do suggest interesting avenues for future research. First, there is the problem of measurement error: qualifications may be a good proxy for skills in vocational fields, but less so when somebody obtains a philosophy degree, for example. The philosophy graduate may have useful skills for many professions, but they are unlikely to become a professional philosopher. As a result, there will be fewer mismatches observed in vocational fields, which biases the measures in their favour.

Secondly, tertiary education is undoubtedly a consumption good as well as an investment in human capital. Consequently, many students gain higher qualifications than they might strictly require for their chosen career. In addition, they may gain qualifications in a field that does not match their intended career path because of a personal interest. That makes it difficult to point to mismatch as an indicator of problems in the labour market, when it could be a natural consequence of optimal, individual decisions.

4.3.3 Level of innovation

Many studies show that an innovative economy favours skilled, tertiary qualified individuals through skill-biased technological change. Investigation into how innovation affects the wage gap shows that it happens via two channels: automation replaces unskilled workers, and uneven growth across industries as a result of technological changes tends to favour skilled labour.⁵¹ Both of these increase the premium to tertiary education since it signals the higher level of human capital possessed by skilled workers.

In New Zealand, Hector found that technology favours and rewards a skilled workforce.⁵² Similar results from the United States⁵³ concluded that technological change increases the relative wage of skilled labour and widens the wage gap: up to 54% of the wage gap between skilled and unskilled workers can be explained by technological changes.

Furthermore, Brynjolfsson and Hitt⁵⁴ suggest that technology and the wage gap have a two-way relationship. Companies with a higher technology-to-labour ratio and employing skilled labour are, respectively, 8% and 10% more likely to invest in human capital. This investment in human capital is likely to increase the productivity of the workers in those companies, which in turn widens the wage gap to the rest of the labour force.

To compare New Zealand's innovation to the OECD's we use three proxies: business and enterprise expenditure on research and development (BERD) as a proportion of GDP, gross domestic expenditure on research and development (GERD) as a proportion of GDP (Figure 13), and the number of researchers per 1,000 employees (Figure 14).

Using BERD as a measure, New Zealand is ranked the fourth lowest among the OECD. However, when using GERD as an alternative measure, New Zealand's rank is brought up to the tenth lowest, although still behind the OECD average.

⁵¹ The conventional concept of "unskilled" labour is used here for convenience. However, moderately skilled labour is as likely to be replaced through automation as truly unskilled labour. The risk of displacement through innovation is, up to a point, a function of the feasibility and cost of replicating work rather than the relative level of "skill" involved.

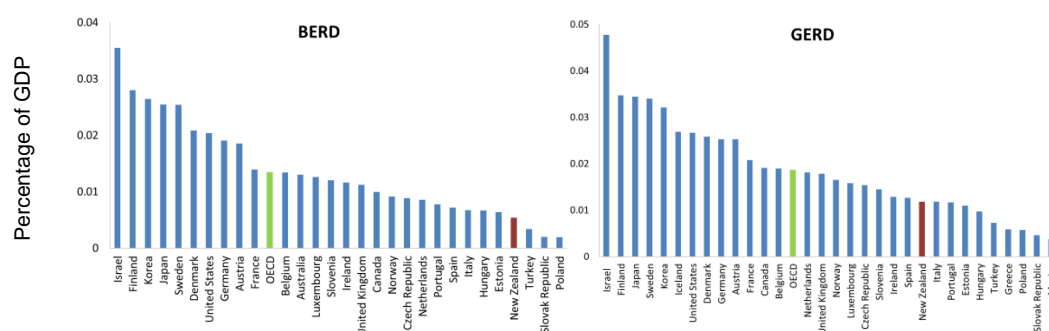
⁵² Hector, Christopher (2007), *Wage Structures and Employment Outcomes in New Zealand, and Their Relationship to Technological Change*.

⁵³ Canals, Claudia (2006), *What Explains the Widening Wage Gap? Outsourcing Vs. Technology*.

⁵⁴ Brynjolfsson, Erik, and Lorin Hitt (2000), *Information Technology, Workplace Organization and the Demand for Skilled Labor: Firm-level Evidence*.

When using the number of researchers as a measure, New Zealand is ranked the third highest among the OECD countries. However, innovation spending across the OECD does not appear to be a very strong predictor of the returns to tertiary education as many countries with below average BERD and GERD spending have high returns (eg, the United Kingdom and Portugal). That suggests our proxies for innovation are poor, probably because we are capturing inputs, rather than outputs or outcomes. In other words, we do not know if higher innovation investment leads to higher levels of innovation.⁵⁵

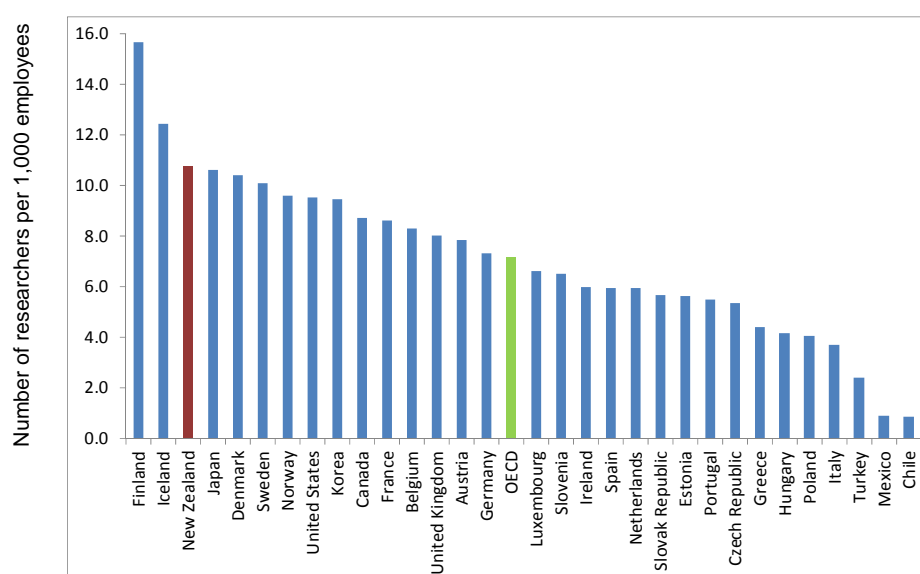
Figure 13 – Level of innovation – spending



- Note:
- (1) The choice of year 2009 gives us more data points; more recent 2010 data has a large amount of missing data.
 - (2) Countries where data is unavailable are not reported.

Source: OECD

Figure 14 – Level of innovation – researchers



- Note:
- (1) The choice of year 2007 gives us more data points; more recent years are subject to large amount of missing data.
 - (2) Countries where data is unavailable are not reported.

Source: OECD

⁵⁵ Indeed it is fairly well known that measures such as BERD and GERD are very limited as measures of innovation. They are frequently cited simply because they are easily measured.

There is no easy way to measure the outputs of research, although some researchers have attempted to proxy it using the volume of patents. By that measure New Zealand does not have low levels of research output, once our size and distance from markets is taken in to account.⁵⁶ Indeed, compared with similarly small, distant nations, New Zealand's BERD itself is not low.⁵⁷

4.3.4 Firm size

Large firms are more likely to hire skilled labour (measured by higher qualification and age) and pay higher wages than small to medium-sized firms.⁵⁸ In general, the high capital-labour ratio of large firms, which enables early adoption of new technology, calls for skilled labour.⁵⁹

Furthermore, large firms are more capable of rewarding their skilled employees with efficiency wages to improve performance, and of providing more training, which increases wages further.⁶⁰ Small firms may also pay less because they have a hostile attitude to incentive schemes based on competition and relative reward.⁶¹

It has been suggested that a lack of development in certain parts of New Zealand's financial system could be imposing a moderate constraint on the growth and performance of New Zealand firms. As a consequence, firms may not have access to a comprehensive menu of financial services through all stages of their development. New and emerging firms may face particular difficulties accessing finance and related services.⁶²

Figure 15 below compares New Zealand's share of small firms (20 employees or less) with the OECD. Our share of small firms is higher than the OECD average, but the difference is not great. Analysis by Mills and Timmins using 2002 data finds the New Zealand's share of small firms by enterprise is very slightly below the OECD average, which is consistent with the data in Figure 15.⁶³

⁵⁶ Shangqin, McCann and Oxley (2009), *Innovation in New Zealand: Issues on Firm Size, Local Market Size and Economic Geography*, for example, note the effect of market size and distance on innovation.

⁵⁷ Crawford, Ron, Richard Fabling, Nick Bonner and Arthur Grimes (2007), *National R&D and Patenting*.

⁵⁸ Oi, Walter Y and Todd L Idson (1999), *Firm size and wages* in Orley Ashenfelter and Richard Layard eds Handbook of Labor Economics.

⁵⁹ Ibid.

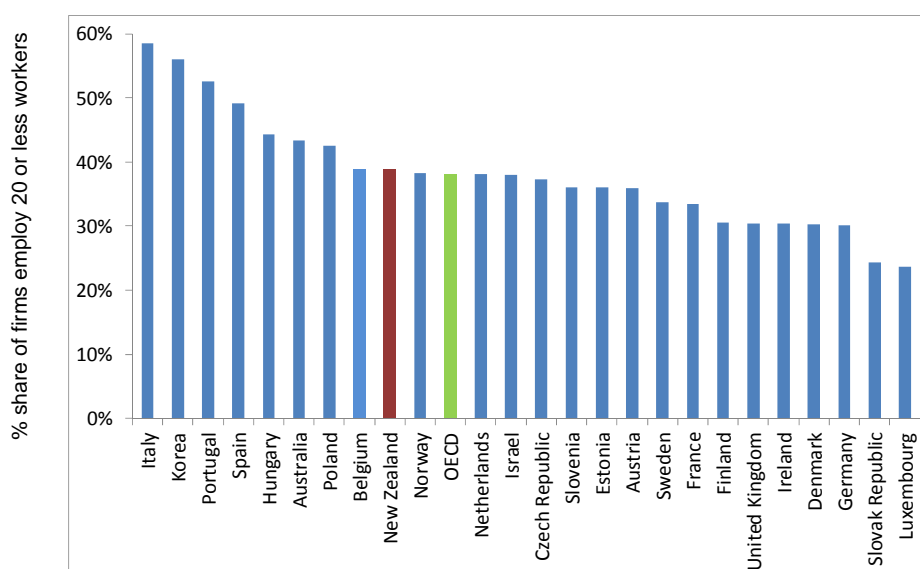
⁶⁰ Black, Noel, and Wang (1999), *On-the-Job Training, Establishment Size, and Firm Size*.

⁶¹ Agell, Jonas (2009), *Why Are Small Firms Different?*.

⁶² Cameron, Linda, Bryan Chapple, Nick Davis (2007), Artemisia Kousis, and Geoff Lewis *New Zealand Financial Markets, Saving and Investment*.

⁶³ Mills, Duncan and Jason Timmins (2004), *Firm Dynamics in New Zealand*.

Figure 15 – Share of small firms



Note: (1) Countries where data is unavailable are not reported.
 (2) Data used are the most up to date possible, from 2006.
 (3) Firms are counted by establishment, rather than enterprise.

Source: Authors calculations, using OECD and Statistics New Zealand data

Importantly, the data also shows that New Zealand has a low proportion of very large firms, which are the ones that generate significant returns for tertiary graduates. It is hard to say from the current research whether this is a significant influence on New Zealand's tertiary returns. In addition to the lack of a large difference between New Zealand and the OECD, countries with a very high proportion of small firms such as Korea and Portugal also have good returns to tertiary education. Therefore, this is an area that lends itself to future research.

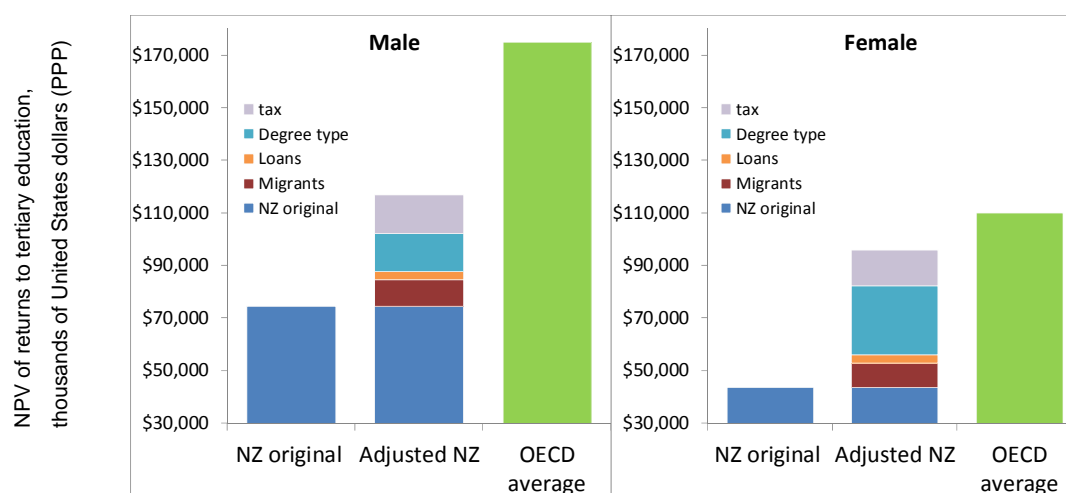
4.4 Adjustment for combined compositional and excluded effects

One of the goals of this investigation is to determine the relative contribution of these effects on the overall difference between New Zealand and the OECD average. Some of those we have been able to, in part, quantify. Here we combine the effects of type of degree, new migrants, and post-2010 tax rates. We also include employment effects and impact of student loans (see Appendix A for details).

The results (Figure 18) show that these combined adjustments explain 42% of the gap for males, and 79% of the gap for females. The combined effects do not include all factors. We also note that some of the factors discussed above (for example type of degree) may incorporate other effects (duration of degree, hours of work, learning on the job and pathways to continued learning). In addition, they can further interact together, or with additional factors that affect the index through earnings (eg, industry mix and firm size). However, the combined effects presented help summarise the overall magnitude of measurable effects.

In addition, by incorporating the impact of New Zealand's higher relative employment rate noted in Appendix 0 (15% of the gap for men and 17% of the gap for women) the combined effect closes a total of 57% of the New Zealand OECD gap for males, and 96% of the gap for females.

Figure 16 – Contribution of combined effects to the difference between New Zealand's returns and the OECD average



Sources: Authors decompositions, using OECD data

4.5 Summary of influences

Capital per worker:

New Zealand is significantly behind Australia and the OECD average in capital per worker. The capital stock also appears to have strong links to skill-biased technological change, so affects returns to tertiary education.

Mix of Type A/Type B qualifications:

New Zealand's mix of degrees is very different from the OECD average, and returns to the two types significantly affect aggregate earnings.

High proportion of immigrants:

New Zealand has a high proportion of immigrants in the workforce and in education. Immigrant status does make an appreciable difference to earnings.

Taxation:

New Zealand has recently changed its tax rates in a fashion that has had a significant effect upon tertiary returns.

Employment:

New Zealand has had higher employment rates than the OECD average for both secondary and tertiary graduates. A relatively higher employment rate for secondary graduates has resulted in lower tertiary returns calculations for New Zealand.

Supply of graduates:

There is some evidence that a higher supply of graduates reduces wages to skilled workers, and New Zealand has a high supply of Type B graduates.

Industries and subjects chosen:

One of the clear findings internationally is that the subject of study and the industry of employment affect earnings significantly; New Zealand is no different.

Mismatch in field and/or qualification level:

Mismatch between field of study and sector of employment has some measured effect on earnings, as does over- and under-qualification; however, it is difficult to determine how much of the difference is due to measurement error, and how to interpret the results.

Innovation:

Innovation increases the premium to skilled workers. New Zealand has not invested in research at the same rate as other countries, which could affect the level of innovation and, thus, the returns to tertiary education.

Firm size:

New Zealand has a lower proportion of large firms compared to the OECD, and larger firms tend to pay a higher premium to education.

5 Conclusions and Future Research

The first finding from our research is that about half of the measured gap in New Zealand's private returns to tertiary education can be explained by the way returns are measured rather than a "real" gap. The remainder of the gap in tertiary returns is closely related to factors that are usually identified as reasons for generally poor economic performance such as low rates of innovation, low capital intensity and distance to markets. Unfortunately, research directly linking the drivers of economic performance to tertiary returns in New Zealand is lacking.

5.1 Low returns relative to the OECD average are mainly due to a lower relative wage premium

New Zealand's low returns to tertiary education are primarily due to comparatively small increases in earnings from gaining a tertiary qualification (the gross earnings premium) relative to the OECD. Therefore, while earnings for a tertiary degree are significantly higher than a secondary degree in New Zealand, the wage premium is lower in comparison to the OECD average. Other components are far less important in determining the overall difference in private returns relative to the OECD average.

The difference in gross earnings is partially offset by our lower direct costs of tertiary education, and the lower tax and social contributions burden on graduates relative to non-tertiary graduates. The latter is itself a consequence of the low gross earnings premium.

Our analyses show that individuals with Type A (University) degrees have significantly higher earnings growth over the life cycle (similar to the OECD average), compared to Type B (below Bachelor) qualifications in New Zealand. New Zealand has a significantly higher proportion of Type B degrees than the OECD average. Combining the earnings of the two Types of degrees, as the OECD does, significantly reduces their reported returns to tertiary education for New Zealand. It is important to recognise this difference in these cross-country comparisons, and in interpreting returns to higher education when combining private returns across different types of degrees. In addition, it is useful to separate estimates of returns to higher education by Type A and Type B degrees

5.2 Measurement issues explain around half of the private returns gap

There are a number of measurement issues with the OECD indicator, which suggest that New Zealand's tertiary returns to individuals are being underestimated relative to the OECD average. Unless adjusted, the current OECD standardisation and measurement issues we have identified in this paper would continue to systematically under-estimate New Zealand's returns to tertiary education and its ranking relative to the OECD average.

5.3 Other Factors

Once the measurement issues are taken into account there remains a gap between New Zealand and the OECD average.

The evidence reviewed indicates that the private rate of return to higher education in New Zealand, as mainly influenced by the wage premium, is also influenced by other endowment, policy or decision factors that affect New Zealand's productivity and innovation.

5.4 Future research

Our findings highlight the need for better analysis of potential problems. Future work should be targeted towards estimating the impact of the factors on returns in New Zealand: for many of the factors, we have had to rely on overseas research from economies different from ours, or proxies for the return to education such as aggregated earnings for full-time and part-time workers for consistency with OECD calculations.

Highest priorities for further research

There is a significant difference between the private rates of return to Type A and Type B degrees in New Zealand. The separate measurement of private returns to higher education, and earnings growth over the life cycle, by type of degree is recommended.

The earnings of immigrants are economically significant and a factor in the OECD index. A first step in understanding the issue is to review the prior research in New Zealand on immigrants and their experiences in the economy.

This research focused on comparing New Zealand to the OECD average for one time period. Further analyses across time in New Zealand, and panel data analysis across the OECD countries is recommended to identify the impact of some of the drivers. This approach can investigate the impact, and stability of factors over time in determining New Zealand's relative performance.

New Zealand has relatively low wage growth, in part due to low rates of investment and innovation. This low wage growth disproportionately affects skilled workers and returns to education relative to the OECD. We recommend future research on life-cycle earnings growth patterns across skill group and industry.

Research at a more disaggregated level for industry and type of degree with New Zealand panel data would further identify the relative importance of some factors and investigate their interactions. Some of the factors affecting returns are expected to work interactively in determining the returns to tertiary education through earnings effects. For example, type-of-degree effects are potentially more prominent in certain industries and they may interact with some other factors, such as capital intensity and innovation.

The relationship between firm size (the lack of large firms in New Zealand) and lower overall returns to tertiary education is worthy of further investigation.

Finally, mismatches between employment and field of study and/or qualification level are often cited as a possible driver of low returns. There is little evidence that observed mismatches are in fact mismatches at all. However, if persistent mismatching is going on due to policy or market failures, this could be having a significant impact on returns. Whether that is the case or not is an open question.

Appendix A – Measurement issues

Measurement issues, as we discuss them here, refer to difficulties in constructing a measure that precisely corresponds to the phenomenon that you wish to represent. They are not necessarily problems, but they do need to be taken in to account when developing policy based on the indicator. They show that the indicator is not always a good representation of New Zealand's private tertiary returns.

A.1 Comparability of qualifications

A.1.1 ISCED and NCEA classifications

New Zealand has a large proportion of tertiary degrees that are classified outside of the standardised Bologna structure of higher degrees (48% compared to 27% OECD average). This difference partly stems from differences between the NCEA and other international structures of pathways that lead to Type B tertiary degrees (ISCED 5B). The result of some vast international differences is that not all structures including the NCEA can be mapped across to tertiary degrees in a completely standardised fashion across the OECD. In particular, pathways through NCEA (3B and 3C to 4B or 5B) may explain a broader range of degrees with shorter overall durations classified as tertiary Type B in New Zealand, compared to the OECD average.

A.1.2 Lower proportion of post-graduate degrees

A second issue is that Type A (ISCED 5A and 6) degrees in the OECD tertiary qualification specifications are aggregated across Bachelor and higher degrees. However, New Zealand has one of the lowest shares of post-graduate degrees among the OECD (ranked 22nd with 6% of tertiary degrees at the Post-graduate and higher research qualifications, compared to the 18% OECD average). The significantly lower proportion of post-graduate degrees compared to the OECD is a factor that may contribute to New Zealand's overall tertiary returns gap.

A.2 Earnings comparisons

The OECD uses current earnings by age group to estimate the gross earnings benefit of tertiary education, relative to upper-secondary education. That introduces two important difficulties.

A.2.1 Are wages for tertiary graduates low or are wages high for non-graduates

The gross earnings benefit in the indicator is a measure of the premium that tertiary graduates earn over upper-secondary graduates. Conceptually, a small premium could be due to either low tertiary earnings or high upper-secondary earnings. Distinguishing between the two is important, since high upper-secondary earnings could indicate that the value New Zealand's secondary education is high, rather than the alternative conclusion that our tertiary earnings are low.

Indeed, for upper-secondary qualifications, New Zealand is ranked eighth for gross earnings benefit, relative to lower-secondary qualifications, in the OECD, slightly higher than the average and well above the median. Again, that is a gross earnings premium relative to people without upper-secondary education so it cannot be taken as definitive evidence of

relatively high earnings for those with upper-secondary qualifications; however, it suggests that the small gap between upper-secondary and tertiary gross earnings may not be entirely due to low tertiary earnings.

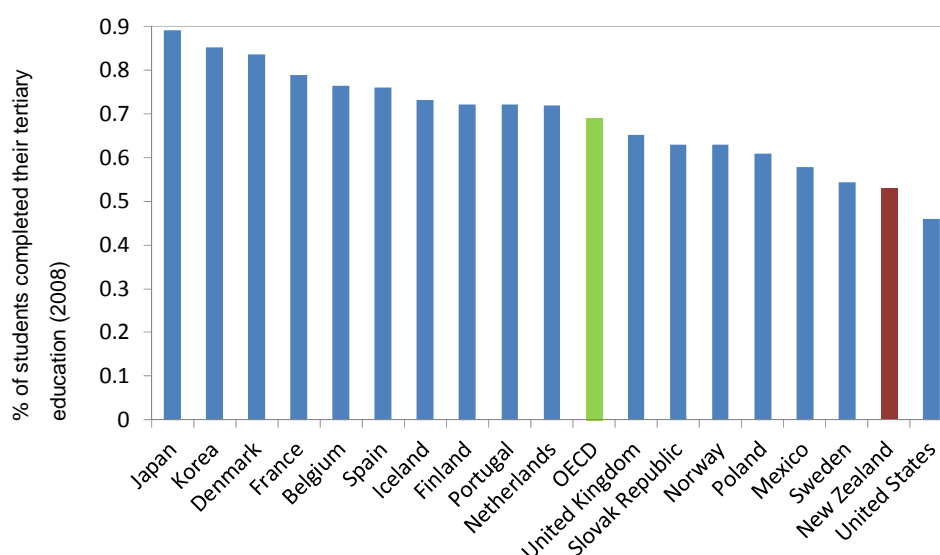
In addition, since age-earnings profile analyses are based on a snapshot (cross-section of degree holders by age at a given time), historical or cohort effects may influence these results. For example, since participation in tertiary education in New Zealand increased significantly in the early 1990s,⁶⁴ there is potentially a larger cohort of high ability/academic achievers among the mature and older New Zealanders with upper-secondary as their highest degree. This cohort was also more likely to enter professional jobs directly after the completion of high school before the 1990s, resulting in higher earnings returns for upper-secondary degree holders due to the cohort's effect. This effect is not expected to repeat over time.

A.2.1 The unaccounted effect of partial completion

Low or partial completion rates can result in unmeasured positive returns to tertiary education. Domestic research shows that a person who passes all of their tertiary courses, but does not complete the qualification, can earn 10-25% more than someone with only upper-secondary qualifications can.⁶⁵ Including those people's earnings in the average earnings for someone with upper-secondary qualifications is likely to reduce the measured gross earnings benefits for tertiary qualifications, relative to the true value.

Furthermore, New Zealand has an extremely low rate of qualification completion relative to the OECD average with 58% of students completing Type-A qualifications, compared to an OECD average of 69% (Figure 17). Thus, returns to tertiary education in New Zealand may well be much higher than qualification-centric data suggests.

Figure 17 – Tertiary completion rates



Note: Countries where data is unavailable are not reported.

Source: OECD

⁶⁴ Maani, Sholeh (1997), *Investing in Minds: The Economics of Higher Education in New Zealand* (Ch. 2)

⁶⁵ Scott, David (2009), *What Do Students Earn After Their Tertiary Education?*, page 45.

However, completion statistics should not be taken at face value. Scott explains that:

- New Zealand has a very high proportion of part-time students, who are less likely to complete. Indeed, it appears that many mature students never intend to complete a qualification at all but are only interested in the individual course, yet they will count as non-completers.
- Many New Zealanders change qualifications during the course of study, which results in the first qualification being counted as incomplete. This is also part of the reason for New Zealand's high proportion of Type-B degrees.

A.2.1 Life cycle and demographic effects

To what extent are returns to tertiary degrees in New Zealand affected by the relative progression of earnings for mature workers? Cohort effects, in particular, could affect returns to education through this effect. An example of cohort effects is when mature workers hold a disproportionately higher share of older and shorter degrees (OECD note older nursing or technical degrees), contributing to lower returns to education due to lower earnings for mature workers.

Tertiary education is generally associated with greater earnings growth over the life cycle compared to upper secondary. One of the main factors that contribute to this greater growth is that work experience is combined with greater new skill formation and further on-the-job learning. Progression of earnings into mature working years is mechanically important in the NPV and IRR calculations due to the greater discounting of more distant future earnings gains. Both cohort effects and actual earnings progression due to learning with experience and job progress can affect earnings progression of the mature age groups.

We calculate earnings progression from the age bracket 25-34 to 55-64, by degree type. We find that the earnings progression for Type A tertiary degrees is very similar for New Zealand and the OECD average (a 30% growth in average earnings for the 55-64, compared to the 25-34 age group, or a 1.3 ratio in both cases).

The earnings progression for Type B tertiary degrees, however, is very flat, showing a much narrower growth of earnings over time: 6% growth in average earnings over a twenty-year-period, or a 1.06 ratio for men and 1.0 for women (and a lower ratio of 0.95 combined across gender compared to the OECD average of 1.04).

Lack of earnings progression and generally lower earnings for Type B degrees relative to upper secondary are important in reducing New Zealand's returns when combined across all tertiary degrees. This type of observed earnings effect usually reflects a combination of lower opportunities for continued on-the-job learning that leads to higher earnings, and/or cohort effects reflecting older or shorter degrees.

A.3 Age

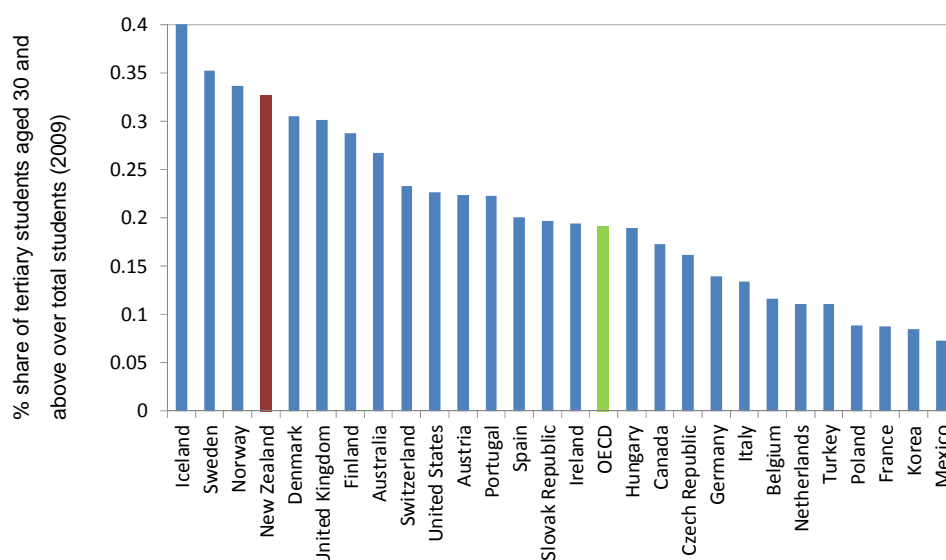
The study by Colegrave⁶⁶ using Australian data suggests that the private returns (IRR) to a bachelor's degree decline as the age at which a student enters tertiary education increases.

⁶⁶ Colegrave, Andrew D (2006), *Why Study at a Mature Age?*

The decline is faster for males than females. Returns are positive for males who begin study before their late thirties and females, much later, before their mid-fifties.⁶⁷

It would not make sense to parse out this effect when considering returns for an individual country. However, to compare New Zealand with the OECD, ideally we would want to know the percentage of the labour force that obtained their tertiary qualification at a mature age (around age 30 according to consensus of literature). Due to data limitations, the share of tertiary student aged 30 and above is used as a proxy (Figure 18).

Figure 18 – Share of mature students



Note: Countries where data is unavailable are not reported.

Source: Figure based on OECD data

A.4 Adjustment by purchasing power parity (PPP)

Costs and benefits are valued in PPP adjusted United States dollars, which introduces all the usual “problems” with PPPs. For example, PPPs will, in theory, represent the long-run equilibrium exchange rate,⁶⁸ but for any given point in time there are short-run deviations around equilibrium (or trend) that make static comparisons between national values difficult. That difficulty is compounded by the use of different data years for some nations. For example, while the OECD has endeavoured to use 2007 universally, Australian data is from 2005. Given the growth in the Australian economy between 2005 and 2007 it is likely that there were some changes in the PPP exchange rate between Australia and other OECD nations over that period, yet the gross earnings benefits was measured in 2005.

It is not possible to robustly correct these problems any more than the OECD have already done; however, it should remind us not to place too much emphasis on the raw dollar values of the tertiary returns calculated.

⁶⁷ Crichton, Sarah and Sylvia Dixon (2011), *Labour Market Returns to Further Education for Working Adults*.

⁶⁸ Stephens, Dominick (2004), *The Equilibrium Exchange Rate According to PPP and UIP*.

A.5 Discount rate

Because we have chosen to focus upon the NPV measure, it is worth noting that the OECD calculates this measure with a real discount rate of 3%, which is far smaller than the New Zealand Treasury's preferred social discount rate of 8%.⁶⁹

We have not recalculated the indicator at different interest rates but it is likely that using an 8% discount rate would change not only the value of the NPV, but also the ranking of the countries' returns. That is because different nations have different time profiles of net benefits – that is, benefits accrue later in life in some countries than other countries. A switch from 3% to 8% would significantly change the indicator's focus from the long run to the short.

A.6 Employment

Tertiary education is generally associated with less unemployment and greater job security. For example, in the OECD, the value of this employment effect accounts for 7.5% of the OECD average NPV measure. It is not always customary to include employment effects, and it is common to calculate returns to education excluding this measure. Including the employment effect of higher education (as in the OECD calculations) gives a more comprehensive private return measure, but an anomaly is that as a result, it systematically produces lower rates of return to tertiary education during high economic activity compared to recession periods.⁷⁰ That is because recessionary periods disproportionately hurt the employment prospects of lower qualified labour. In addition, it assigns a higher rate of return to tertiary education for countries that suffer from higher unemployment rates in general, and at the upper secondary level, in particular. Therefore, a lower comparative returns measure in a country may in fact represent a relative economic boom period with increased demand for labour with upper secondary education.

New Zealand's lower general unemployment rates across all qualifications, and in particular, at the upper secondary level compared to tertiary qualifications for males (ranked first among the OECD in that respect), contributes to producing lower returns for New Zealand. Lower unemployment rates, in particular at the upper secondary level, contribute to the gap in returns: 15% of the gap for males and 17% of the gap for females is due to this effect.

A.7 Hours worked

Returns to education analyses are generally based on samples of employed without restrictions or standardisation of hours of work. The use of earnings for all employed workers is generally based on the objective to present economy-wide returns to education across the entire workforce. As a result, returns calculations in this form focus on earnings, combining the effect of hours of work and the hourly wage across the employed population, and they should be interpreted as such. However, hours of work is not a major factor in explaining the overall returns gap for New Zealand compared to the OECD average due to similarity of hours of work in New Zealand compared to the OECD average.

⁶⁹ The New Zealand Treasury (2008), *Public Sector Discount Rates for Cost Benefit Analysis*.

⁷⁰ *Education at a Glance: 2011*, OECD.

New Zealanders on average work a total of 1741 hours per year (average annual hours of work per person employed) compared to the 1736 OECD average in 2009.⁷¹ The share of part-time employment in New Zealand is slightly lower than the OECD average (25.8% part-time share, compared to the 26.6% OECD average).⁷²

The hours of work effect is, however, relevant when comparing earnings for men and women, and potentially for returns to Type B shorter diplomas, where part-time work may be more prevalent.

A.8 Student loans

The EAG 2011 did not include student loans when calculating the index and it is possible that this omission could be significant to New Zealand for two reasons:

- Student loans increase private returns by deferring direct costs to later years. This effect could be large given the absence of interest on most student loans in New Zealand.⁷³
- The OECD's calculations assume that the relevant tax base for calculating tax costs is gross income, but income tax only applies to earnings net of the student loan repayments.⁷⁴ Thus, the OECD's calculations of tax costs are biased upwards.

To incorporate the effect of New Zealand's student loan scheme on the indicator we recalculated tax payments based on lower earnings net of the student loans repayment, using a 10% repayment rate and the repayment threshold of New Zealand (\$17,784) between 1 April 2007 and 31 March 2008.⁷⁵ We use the average tertiary education completion age in New Zealand (23 years old) as the starting age for calculating the repayment. Applying the loan re-payments and taxes to our calculations results in an average of 8 years of repayments for males and 12 years for females. This is consistent with the average repayment period for student loans in New Zealand.⁷⁶

Our results show that student loans do have an impact on the returns. Adjusting for the impact of student loans explains 3.5% and 7% of New Zealand's lower returns for males and females, respectively (Figure 19).

⁷¹ New Zealanders have higher hours of work per person employed and per capita (Economic Development Indicators 2011, p37 <http://www.med.govt.nz/>). In the NPV calculations, hours of work per person employed is the relevant measure, through its direct effect on average annual earnings across all employed persons is used in deriving the earnings premium.

⁷² OECD data (OECD *StatExtracts*, 2012)

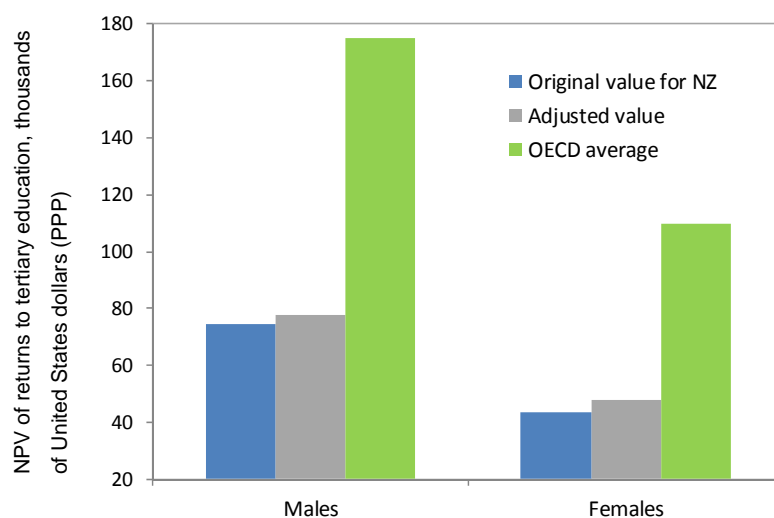
⁷³ There may, however, be an offsetting effect in terms of higher tax rates to fund interest free loans.

⁷⁴ Note that the student loan repayments only affect income over the repayment threshold.

⁷⁵ The index was calculated based on the 2007 data.

⁷⁶ Ministry of Education (2011), *Student Loan Scheme Annual Report 2011*.

Figure 19 – Contribution of student loans to the difference between New Zealand's returns and the OECD average



Source: Authors calculations, using OECD data

Appendix B – Results from adjusting the OECD measure of private returns

All Figures are in US Dollars.

Table 2 – Contribution of earnings distribution to New Zealand's lower returns

NPV	Adjusted value	Original value for New Zealand	OECD average	% variance accounted for
Males	\$212,858	\$74,457	\$175,067	138%
Females	\$148,162	\$43,560	\$110,007	157%

IRR	Adjusted value	Original value for New Zealand	OECD average	% point increase
Males	16.50%	8.95%	12.44%	7.6
Females	15.13%	7.31%	11.55%	7.8

Source: Authors decompositions, using OECD data

Table 3 – Contribution of share of degree to New Zealand's lower returns

NPV	Adjusted value	Original value for New Zealand	OECD average	% variance accounted for
Males	\$88,175	\$74,457	\$175,067	14%
Females	\$69,905	\$43,560	\$110,007	40%

IRR	Adjusted value	Original value for New Zealand	OECD average	% point increase
Males	9.54%	8.95%	12.44%	0.6
Females	9.23%	7.31%	11.55%	1.9

Source: Authors decompositions, using OECD data

Table 4 – Effect of excluding new migrants

NPV	Adjusted value	Original value for New Zealand	OECD average	% variance accounted for
Males	\$84,733	\$74,457	\$175,067	10%
Females	\$52,977	\$43,560	\$110,007	14%

IRR	Adjusted value	Original value for New Zealand	OECD average	% point increase
Males	9.60%	8.95%	12.44%	0.7
Females	8.14%	7.31%	11.55%	0.8

Source: Authors decompositions, using OECD data

Table 5 – Contribution of student loans to New Zealand's loans returns

NPV	Adjusted value	Original value for New Zealand	OECD average	% variance accounted for
Males	\$77,977	\$74,457	\$175,067	3.5%
Females	\$47,951	\$43,560	\$110,007	7%

IRR	Adjusted value	Original value for New Zealand	OECD average	% point increase
Males	9.88%	8.95%	12.44%	0.9
Females	8.33%	7.31%	11.55%	1.0

Source: Authors decompositions, using OECD data

Appendix C – Literature search strategy

C.1 Overview

The objective of the literature search was to identify the private returns to individuals from tertiary education in New Zealand and other OECD countries. As a proxy for 'private returns' we used income.

The literature review was completed in two stages. Stage one was a series of searches aimed at locating material that met the literature search's objective.

Stage two involved developing the search further to look at what impact external factors have on the wage premium afforded to those with tertiary qualifications. The focus for stage two was still New Zealand and other OECD countries.

C.2 Keywords

Undertaking a literature search is an iterative process. Initially keywords are chosen based on the topic of the search. However, once searching has begun more appropriate keywords are often identified that return better hits.

C.3 Stage 1 keywords

For this search keywords could include but will not be limited to the following:

- Education
- Tertiary / vocational / post-secondary / higher education / academic / qualifications
- University / polytechnic
- Private returns / wages / salary / earnings / income
- Skilled / unskilled
- Premia / premium / benefits

C.4 Stage 2 External factors

- Industry structure
- Lower productivity
- Subject mismatch / under or over qualification
- Supply of tertiary graduates
- Emigration of tertiary education
- Company size
- Multi-factor productivity
- Innovation

C.5 Scope

Publications in English. Items could include journal articles, studies and reports.

C.6 Sources

- SSRN
- OECD
- Institute for the Study of Labor (IZA, Bonn, Germany)
- Econlit / Repec
- ERIC
- World Bank
- Google Scholar
- Te Puna
- ILO
- VOCED / NCVER
- Cedefop
- Other sources as required.

C.7 Exclusion criteria

We excluded from our results items that focused on post-secondary, non-tertiary education. Training benefits to the individual whether it was in-house or externally provided was excluded since it normally falls in this category.

C.8 Results overview

We found a broad body of literature on the private returns to individuals from tertiary education. Tertiary qualified men and women earned more than their less qualified peers did, private returns also differed by qualification type (eg, bachelor vs. doctorate) and subject studied (eg, humanities vs. science) and the income gap between tertiary educated and non-tertiary educated persisted over time.

Our results from stage two were somewhat muted. In order to broaden the scope for this stage we used skilled / non-skilled wage premia as a proxy for those with/ without tertiary qualifications. We found there was less material that drew a direct link between the influence (eg, innovation) and the skilled wage premia. For example, the flow-on effects of the influences we found to be two-way: employing people with tertiary qualifications (skilled) resulted in more innovation, and therefore the company became more innovative and recognised the value of tertiary qualifications (skills) and paid accordingly.

Appendix D – References

- Agell, Jonas (2004), *Why are small firms different? Managers' views*, The Scandinavian Journal of Economics 106(3): 437-452.
- Autor, David (2010), *The polarization of job opportunities in the US labor market: Implications for employment and earnings*, Washington, Center for American Progress and the Hamilton Project of the Brookings Institution, April.
<http://www.americanprogress.org/wp-content/uploads/issues/2010/04/pdf/job_polarization_execsumm.pdf>
- Becker, Gary S. (1993), *Human Capital*, third edition, (Chicago: University of Chicago Press).
- Black, Dan A., Brett J. Noel and Zheng Wang (1999), *On-the-Job training, establishment size, and firm size: evidence for economies of scale in the production of human capital*, Southern Economic Journal 66(1): 82-100.
- Borland, Jeff (2002), *New estimates of the private rate of return to university education in Australia*, Melbourne, Melbourne Institute of Applied Economic and Social Research, The University of Melbourne, Working Paper No 14/02, July.
<<http://www.oecd.org/social/labourmarketshumancapitalandinequality/37581238.pdf>>
- Brynjolfsson, Erik and Lorin Hitt (2000), *Information technology, workplace organization and the demand for skilled labor: Firm-level evidence*, The Quarterly Journal of Economics 117(1): 339-376, February.
- Cameron, Linda, Bryan Chapple, Nick Davis, Artemisia Kousis and Geoff Lewis (2007), *New Zealand financial markets, saving and investment*, Wellington, The Treasury, New Zealand Policy Perspectives Paper No 07/01, July.
<<http://www.treasury.govt.nz/publications/research-policy/ppp/2007/07-01/tpp07-01.pdf>>
- Canals, Claudia (2006), *What explains the widening wage gap? Outsourcing vs. technology*, Barcelona, La Caixa, Working Paper No 01/2006, November.
<<http://dx.doi.org/10.2139/ssrn.1011688>>
- Chiswick, Barry R, Anh T Le and Paul W Miller (2006), *How immigrants fare across the earnings distribution: International analyses*, Bonn, The Institute for the Study of Labor (IZA), Discussion Paper No 2405, October.<<http://ftp.iza.org/dp2405.pdf>>
- Chiswick, Barry R and Paul W. Miller (2011), *Negative and positive assimilation, skill transferability, and linguistic distance*, Bonn, The Institute for the Study of Labor (IZA), Discussion Paper No 5420, January. <<http://ftp.iza.org/dp5420.pdf>>
- Colegrave, Andrew D (2006), *Why study at a mature age? An analysis of the private returns to university education in Australia*, Nedlands WA, Business School, University of Western Australia, Discussion Paper No 06.11.
<http://www.business.uwa.edu.au/__data/assets/pdf_file/0009/99288/06_11_Colegrave.pdf>
- Crawford, Ron, Richard Fabling, Nick Bonner and Arthur Grimes. (2007), *National R&D and patenting: Is New Zealand an outlier?* New Zealand Economic Papers 41(1): 69–90.

- Crichton, Sarah and Sylvia Dixon (2011), *Labour market returns to further education for working adults*, Wellington, Department of Labour, June.
<<http://dol.govt.nz/publications/research/further-education-working-adults/further-education-working-adults.pdf>>
- Dalziel, Paul (2010a), *Career management skills: Learning about abilities and opportunities*, Victoria University of Wellington, Paper presented at the New Zealand Labour Market and Skills Forum, September.
- Dalziel, Paul (2010b), *Leveraging training: Skills development in SMEs-An analysis of Canterbury region, New Zealand*, OECD Local Economic and Employment Development (LEED), Working Paper No 2010/03.
<<http://dx.doi.org/10.1787/5km9d6g1nc8p-en>>
- Dillingham, William (2002), *New Zealand's workforce: Skills and evidence of upskilling*. Wellington, Labour Market Policy Group, Department of Labour.
<<http://www.dol.govt.nz/PDFs/new-zealand-labour-upskilling.pdf>>
- Dominion Post (2012), *Graduate incomes to be published*, Dominion Post. Wellington, New Zealand, March 13. <<http://www.stuff.co.nz/dominion-post/news/politics/6566601/Graduate-incomes-to-be-published.>>
- Dupuy, Max, and James Beard (2008), *Investment, productivity and the cost of capital: Understanding New Zealand's 'capital shallowness'*, Wellington, The Treasury, Treasury Productivity Paper No TPRP 08/03.
<<http://www.treasury.govt.nz/publications/research-policy/tprp/08-03>>
- Education at a Glance: 2011*, OECD Indicators. OECD.
- Education at a Glance: 2010*, Paris: OECD.
- Earle, David (2009), *Advanced trade, technical and professional qualifications: Trends in supply*, Wellington, Ministry of Education, June.
<http://www.educationcounts.govt.nz/__data/assets/pdf_file/0005/47723/Report-3-supply-of-graduates-formatted-v2.pdf>
- Earle, David (2010a), *Labour market outcomes of skills and qualifications*, Wellington, Ministry of Education, Tertiary Education Occasional Paper No 2010/05, March.
<http://www.educationcounts.govt.nz/__data/assets/pdf_file/0006/73716/Labour-Market-Outcomes-of-Skills-and-Qualifications.pdf>
- Earle, David (2010b), *Skills, qualifications, experience and the distribution of wages*. Wellington, Ministry of Education, Tertiary Education Occasional Paper No 2010/04, March. <http://www.educationcounts.govt.nz/__data/assets/pdf_file/0005/73733/Skills-Qualifications-Experience-and-the-Distribution-of-Wages.pdf>
- Esposito, Alexis (2010), *Measuring Earnings Inequality in Full-Time Earnings: An Australian Example*, International Review of Business Research Papers 6(5): 77-89.
- Hector, Christopher J (2007), *Wage structures and employment outcomes in New Zealand, and their relationship to technological change*, Thesis.
<<http://researchcommons.waikato.ac.nz/handle/10289/2663>>

- Hornstein, Andreas, and Per Krusell (2003), *Implications of the capital-embodiment revolution for directed R&D and wage inequality*, FRB Richmond Economic Quarterly 89(4): 25-50.
- Krusell, Per, Lee E Ohanian, Jose-Victor Ríos-Rull, and Giovanni L Violante (2000), *Capital-skill complementarity and inequality: A macroeconomic analysis*, Econometrica 68, no. 5: 1029–1053.
- Krusell, Per and Lee E Ohanian (1997), *Capital-skill complimentary and inequality: a macroeconomic Analysis*, Econometrica 68(5): 1029-1053.
- Le, Thinh V T, John Gibson and Les Oxley (2006), *A forward-looking measure of the stock of human capital in New Zealand*, The Manchester School 74(5): 593–609.
- Maani, Sholeh (1997), *Investing in minds: The economics of higher education in New Zealand*, Institute of Policy Studies, Wellington ISBN 0-908935-11-0.
- Maani, Sholeh and Tim Maloney (2004), *Returns to post-school qualifications: New evidence based on the HLFS Income Supplement (1997-2002)*, Wellington, Department of Labour, June. <<http://www.dol.govt.nz/PDFs/PostSchoolQuals.pdf>>
- Machin, Stephen and Sandra McNally (2007), *Tertiary education systems and labour markets*, Education and Training Policy Division, OECD, January. <<http://www.oecd.org/education/educationeconomyandsociety/38006954.pdf>>
- Mason, Geoff and Matthew Osborne (2007), *Productivity, capital-intensity and labour quality at sector level in New Zealand and the UK*, Wellington, The Treasury, Working Paper No WP07/01, March. <<http://www.treasury.govt.nz/publications/research-policy/wp/2007/07-01/twp07-01.pdf>>
- Mills, Duncan and Jason Timmins (2004), *Firm dynamics in New Zealand: A comparative analysis with OECD countries*, Wellington, The Treasury, Working Paper No WP04/11, September. <<http://www.treasury.govt.nz/publications/research-policy/wp/2004/04-11>>
- Ministry of Education (2010), *How does New Zealand's education system compare?* <<http://www.educationcounts.govt.nz/publications/ece/81180/at-a-glance>>
- Ministry of Education (2011), *Student loan scheme annual report 2011*, Student Loan Annual Reports. Ministry of Education, October. <<http://www.educationcounts.govt.nz/publications/series/2555/student-loan-scheme-annual-report-2011>>
- Ministry of Education (2010), *Tertiary education strategy 2010-2015*, Wellington. <<http://www.minedu.govt.nz/NZEducation/EducationPolicies/TertiaryEducation/PolicyAndStrategy/~media/MinEdu/Files/TheMinistry/TertiaryEducationStrategy2010/TES2010to2015.pdf>>
- Oi, Walter Y and Todd L Idson (1999), *Firm size and wages*, in Orley Ashenfelter and Richard Layard eds *Handbook of Labor Economics*, Volume 3, Chapter 33, Part B:2165-2214. Elsevier. <<http://www.sciencedirect.com/science/article/pii/S1573446399300195>>

- Psacharopoulos, George (2009), *Returns to investment in higher education: A European survey*, CHEPS-led consortium for the European Commission, March.
<http://ec.europa.eu/education/higher-education/doc/funding/vol3_en.pdf>
- Quintini, Glenda (2011), *Over-qualified or under-skilled: a review of existing literature*, OECD, OECD Social, Employment and Migration Working Paper No 121.
<<http://dx.doi.org/10.1787/5kg58j9d7b6d-en>>
- Shangqin, Hong, McCann, Phillip, and Les Oxley (2009), *Innovation in New Zealand: Issues on firm size, local market size and economic geography*, Department of Economics, College of Business and Economics, University of Canterbury Working Paper No 04/2009. <<http://www.econ.canterbury.ac.nz/RePEc/cbt/econwp/0904.pdf>>
- Smyth, Roger and Chris Lane (2009), *Skills and education: How well do educational qualifications measure skills?* Wellington, Ministry of Education, September.
<<http://www.educationcounts.govt.nz/publications/series/ALL/56051/1.>>
- Schreyer, Paul (2007), *International comparisons of levels of capital input and multi-factor productivity*, German Economic Review 8(2): 237–254.
- Scott, David (2009), *What do students earn after their tertiary education?* Wellington, New Zealand, Statistics New Zealand and Ministry of Education, September.
- Stephens, Dominick (2004), *The equilibrium exchange rate according to PPP and UI*, Reserve Bank of New Zealand, Discussion Paper Series. April.
- The New Zealand Treasury (2008), *Public sector discount rates for cost benefit analysis*, Wellington, The Treasury, July.
<<http://www.treasury.govt.nz/publications/guidance/planning/costbenefitanalysis/discountrates/discount-rates-jul08.pdf>>