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Industry training and productivity – a literature review

Report to the Industry Training Federation

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Preface

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NZIER was established in 1958.

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Executive Summary

The purpose of this literature review is to identify the macro-economic benefits of industry training, and, from the literature, attempt to estimate the possible impact of industry training on productivity. It is very much an initial investigation into this area.

Industry training is essentially an investment in human capital, the economic benefits of which can be thought of as being shared between:

- The individual trainee, through higher wages (a proxy for labour productivity)
- The firm, through enhanced profitability (a proxy for capital productivity)
- Society as a whole, through "externalities" (returns over and above the private returns to the individual trainee or firm who pays for the training).

These benefits are difficult to measure. However, there is a weight of evidence from the literature relating to the positive wage effects of training. From the literature, we can infer that an industry training qualification is likely to increase the earnings of an individual by between 5% and 20%.

This means that, on average, a trainee after industry training is likely to be 5-20% more productive than they would have otherwise have been.

The findings from the literature in relation to the profitability effects of industry training are less clear-cut than for the wage effects. However, some studies indicate that returns to the firm from training could be greater than the returns to the individual trainee.

There is also limited evidence relating to externalities arising from industry training. Possible positive externalities include the spill-over effects of training on the productivity of a co-worker. Negative externalities include a firm not training for fear of workers being poached.

One consistent finding from the literature is that those groups of people who gain the most from training, such as those with lower educational achievements and economic status, in fact receive the least amount of training. This implies that returns from industry training could be relatively high, as the previous educational achievements of industry trainees tend to be quite low.

When policymakers consider government's investment in industry training, they need to evaluate possible market failures, including externalities. Government's investment in industry training should, theoretically, equal the difference between the socially optimal and the private optimal level of training.

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1. Introduction

1.1 Objectives

The purpose of the research is to assist the ITF in better understanding the benefits of industry training, focusing on:

- the economic benefits of industry training, in particular productivity
- the macro-level (economy wide) benefits of industry training, as opposed to the benefits to the firm or the individual.

1.2 Methodology

The research consisted of a literature review of existing New Zealand and international sources (see section 9 below for references). The literature was used to provide a sense of the effect of industry training on productivity, as opposed to NZIER ourselves directly estimating the effect.

Although the focus of the research is at the macro-level, many of the findings from the literature relate to the firm or individual trainee. In addition, much of the literature relates to education and training generally, as opposed to industry training specifically. Therefore these findings have been extrapolated as far as possible.

This report should be viewed as a preliminary investigation into the economic impact of industry training.

1.3 Report structure

The report has been structured as follows:

- Section 2 briefly touches on the current context
- Section 3 describes the theoretical framework and definitions, which are referred to throughout the remainder of the report
- Section 4 aims to link the economic theory with industry training
- Section 5 and 6 are the key sections, outlining the findings from the literature and what they imply for industry training
- Section 7 suggests some possible policy implications of the findings
- Section 8 provides a brief conclusion.

2. Context

One of the objectives of the government's Growth and Innovation Framework (GIF) is to return New Zealand's per capita income to the top half of the OECD rankings and maintain that standing.

Productivity is a key contributor to income levels. Although improving in recent years, New Zealand's productivity is poor.

There is currently a policy focus on improving productivity within New Zealand. For example, the Workplace Productivity Working Group was established in February 2004 to advise the government on how New Zealand is doing in terms of workplace productivity, and on possible future policy for lifting workplace productivity. In addition, the Treasury has been considering various possible measures for productivity.

One of the key drivers of productivity is a skilled labour force. The Ministry of Economic Development (2003) has stated that "the quantity and quality of skills and the match of these with labour market requirements are critical for improvements in productivity and sustainable economic growth".

However, New Zealand is currently facing skill shortages in most sectors of the economy. NZIER's Quarterly Survey of Business Opinion (2004) found that for the March 2004 quarter the number of firms reporting labour as the biggest limiting factor to growth was at a 30-year high (23%), compared with only 8% in 2001 and 2% in 1999.

3. Definitions and theoretical frameworks

3.1 Defining productivity

Productivity is the ratio of output to one or more of the inputs used in production - labour, land, capital (plant, machinery and equipment) etc. For the purposes of this report, Total Factor Productivity (TFP) is defined as: output/total inputs. Labour productivity is defined as: output/labour inputs, and is therefore a partial productivity measure. Productivity provides us with a way of looking at how efficiently production inputs are used in an economy.

It is important to bear in mind the distinction between labour productivity and TFP. An improvement in labour productivity (when defined as GDP (Gross Domestic Product) per hour worked) may not reflect an improvement in the efficiency of labour; it may result from the substitution of capital for labour, for example.

It is also important to consider productivity over the long run. This is because, in the short run, productivity is strongly influenced by cyclical factors. So, for example, in the early part of a recession, labour productivity falls as output falls at a faster rate than labour is shed. During an economic upturn, labour productivity tends to rise, as labour is more fully utilised, and firms are able to expand with a less than proportional increase in employment.

3.2 The link between economic growth and productivity

Productivity is important because it is a direct contributor to economic growth and higher per capita living standards.

TFP has a direct impact on economic growth ie a 10% increase in TFP will result in a 10% increase in GDP.

The impact of labour productivity on economic growth depends on the relative share of labour in GDP (see figure 1 below). This is because TFP is derived from the weighted sum of input components (labour, capital etc).

3.3 The components of economic activity

Economic activity (GDP) can be expressed in terms of aggregate incomes, as follows.

Figure 1

GDP = Compensation of Employees + Operating Surplus + Other Incomes

Note "Other incomes" includes indirect taxes and subsidies
Source: NZIER

If we assume that workers are paid their added value to a firm (or "marginal product"), then the real wage component (ie keeping hours worked and other prices constant) of "Compensation of Employees" becomes a proxy for labour efficiency. In other words, to be able to command higher earnings, the more skilled worker must be sufficiently more productive than their co-worker.

Similarly, an increase in capital productivity (assuming capital stock and other prices remain constant) will increase a firm's profit or "Operating Surplus". Such an increase in profit can be thought of as a proxy for capital productivity. In other words, as capital becomes more efficient, profits increase.

3.4 Determinants of productivity

A more general form of the link between overall productivity and economic activity is shown in Figure 2.

Figure 2

$Y = Af(K,L)$

where
Y is the level of aggregate output (usually GDP)
A is the total factor productivity
K is the level of capital stock
L is the size of the labour force
Source: NZIER

This equation states that output is a function of TFP, capital stock and labour.

But what determines TFP (or "A") in the equation?

Romer (1990) in the US attributes economic growth to the existing **stock** of human capital, which generates innovations or improves a country's ability to initiate new technology.

Chen and Dahlman (2004) in the US state that the knowledge economy framework assumes that TFP is affected by the education level of the workforce/population, the level of innovation that occurs in the economy, the economic and institutional regime and the level of information and communications technologies.

So we can start to see the link between economic activity, productivity and human capital.

3.5 Human capital

There is some debate over the role of human capital in economic growth. One approach sees human capital as an ordinary input in production: the level of output depends on the level of human capital. This implies that the growth rate of output depends on the *rate* at which human capital is accumulated over time. The other approach sees human capital as the primary source of innovation, so that education *levels* (human capital stocks) are linked to productivity growth. If this is the case, human capital would play a more significant role in economic growth.

But what is "human capital"? One widely used definition of human capital is: "The knowledge, skills, competencies and attributes embodied in individuals that facilitate the creation of personal, social and economic well-being" OECD (2001).

According to Blundell et al (1999) in the UK, the main components of human capital are:

- Early ability (acquired or innate)
- Qualifications and knowledge acquired through formal education
- Skills, competencies and expertise acquired through training on the job.

Often these features go hand-in-hand, so that someone who goes on to higher education, for example, would have been successful anyway (the "selection" effect or "selection bias"). Further research is needed to better isolate the influence of one component on an individual's income or life outcomes.

Dowrick (2002) in Australia points to three main features of human capital accumulation which allow it to influence long-term growth:

- Complementarity (the productivity of any worker is enhanced not only by their own skill level but by the average skill level of their co-workers)
- Dynamic feedback (as individuals learn and acquire new skills it becomes easier for them to acquire further knowledge and skills)
- Non-rivalry (ideas and knowledge in the public domain can be developed and built on by others).

This suggests that industry training could generate externalities, or returns other than to the individual firm or trainee who pays for the training, and contribute to long-term growth.

3.6 Market failure and externalities

A market failure is an imperfection in the market mechanism that prevents the achievement of economic efficiency. An example of market failure is where imperfect information, or information asymmetries (the difference in information held by parties to a transaction which is relevant in determining an efficient contract), exist. For example, if a firm is less aware of the full benefits of training than its workers, it may make a sub-optimal decision.

Externalities are a further example of market failure. They are defined as the spill-over effects (positive or negative) of production or consumption for which no payment is made. They occur where the actions of firms or individuals have an effect on people other than themselves. An example of a negative externality is pollution. The effect of Lord of the Rings on the New Zealand tourism industry is an example of a positive externality.

In the context of industry training, externalities can be thought of as the positive or negative effects of industry training on firms or individuals other than those who have paid for the training. One example of a positive externality relating to industry training is the spill-over effects of training on the productivity of a co-worker. However, this only constitutes an externality if the trainee, and not the firm, has paid for the training, otherwise the benefits can be internalised by the firm.

Further industry training examples of market failure which have a negative effect include potential trainees having imperfect information on the benefits of training which reduces their willingness to accept lower wages during the training period or to receive any training at all; or firms holding back from training for fear of poaching.

Market failures and externalities are important because they can present a rationale for government intervention. Theoretically, government investment in a policy area should represent the difference between the social optimal level and private optimal level.

3.7 Industry training

Under the Industry Training Act 1992, industry training is defined as follows.

" 'Industry training' means systematic training, provided for people employed in an industry (or 2 or more industries)—

a) By or on behalf of employers in the industry (or industries); or

b) For the benefit of employers and employees in the industry (or industries),—

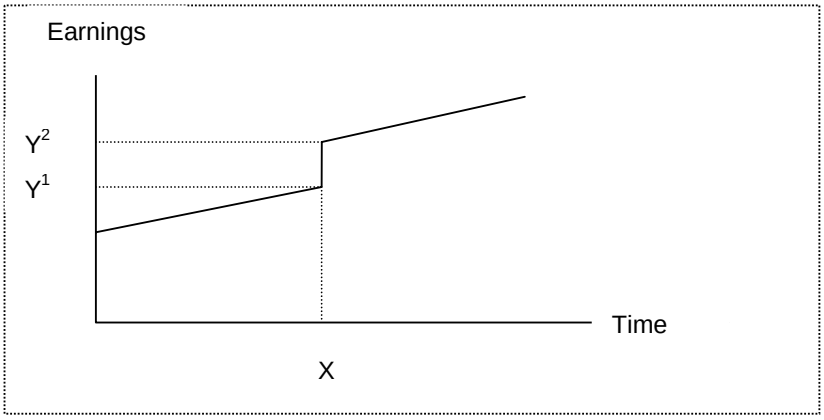
in skills characteristic of, or likely to be valuable to, people engaged in the industry (or industries)."

However, for the purposes of this report, industry training is defined as:

- Skill or competency-based training, undertaken by employees, primarily on-the-job (ie work-based)
- Resulting in a formal nationally-recognised qualification, primarily at levels three and four on the National Qualifications Framework, of an average duration of three years.

These definitions become important when we consider the findings from the literature. For example, we assume that industry training has a wage effect (ie results in higher earnings) through the completion of a formal qualification. This is shown graphically below.

Figure 3
Impact of industry training on an individual's earnings



Source: NZIER

In Figure 3 above, an industry training qualification is achieved at point X. This raises the individual's income from Y^1 to Y^2, as the qualification signals that (s)he is more able than other applicants. For the purposes of this report, we assume that the difference between Y^2 and Y^1 is the wage effect of the industry training qualification.

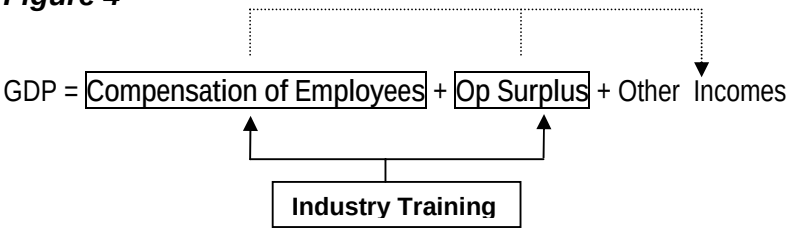
When examining the literature, it is important to consider the economic status and qualifications of a person entering industry training. For example, the wage effect of completing an industry training qualification is likely to be proportionately greater for someone who was previously unemployed than for someone employed. Previous qualifications are important because of the diminishing returns from education (see section 5.2.1).

The Industry Training Amendment Act (2002) has given Industry Training Organisations a number of new roles which are relevant to economic growth. The development of strategic training plans could improve the functioning of labour markets, through the assessment of current and future skill needs of the relevant industry. Promoting industry training may result in a "recruitment" effect, for example attracting people not previously in the labour force into employment. However, these two aspects have not been considered in detail in this report.

4. The link between industry training and productivity

So what does economic theory tell us about industry training?

Figure 4



Source: NZIER

Industry training is essentially a decision by a firm and individual trainee to invest in human capital. It involves an initial cost to both the trainee (training fees, reduced wages while training etc) and the firm (training fees, opportunity cost of the time of the person training the trainee etc), for which the trainee (through increased earnings) and the firm (through increased profitability) hope to gain a return in the future.

So in Figure 4 above, industry training influences the real wages of individuals (a proxy for labour productivity) and the profitability of firms (a proxy for capital productivity).

This approach also demonstrates that the benefits of industry training are essentially shared between the private gains of the individual trainee, the private gains of the firm, and society as a whole (ie externalities).

If we can demonstrate, through the literature, that industry training affects the wages of trainees, and the profitability of firms, then we have a way of evaluating the effect on productivity.

5. Findings from the literature

The prime focus of the literature review is to explore the macro-level benefits of industry training. However, because of the relative dearth of information in this area, we have included:

- The benefits of education and training generally
- Micro-level benefits (ie those accruing to the individual or firm).

From these, we attempt to infer results for the economy-wide benefits of industry training.

5.1 Impact of education and training at an economy-wide level

5.1.1 Market failure and externalities

As noted in section 3.6, a market failure is an imperfection in the market that prevents the achievement of economic efficiency. The broader social benefits from training, or returns over and above the private returns to the individual or firm who pays for the training, are known as externalities. Market failures and externalities are important as they present a possible rationale for government intervention.

Unfortunately, findings from the literature in relation to externalities arising from training are limited, especially with regard to quantifying them.

The OECD (2004) does find some limited evidence of market failure. They suggest that market failure may cause some under-provision of training, but that it is difficult to quantify.

Durbin (2004) in New Zealand considers some of the co-worker or spill-over effects from training, which:

- May arise when workers change employers, as they act as a source of knowledge transfer between firms
- Can be higher in industries with a higher degree of concentration or close geographical proximity
- May be internalised through industry associations, joint ventures, clusters or vertical integration (firms taking over other firms along their supply chain).

Durbin also considers labour market imperfections relating to training, which may be evidenced by:

- Firms investing in generic training (which theoretically benefits not just themselves but future employers of the trainee)
- Firms paying wage increases after training that are less than the gains in productivity
- Workers under-investing in training due to difficulties funding training.

Durbin notes the tension that exists between some of these areas. For example, the threat of poaching discourages training, and may result in under-provision by the current employer. However, if a trainee leaves their current employer, this could result in spill-over effects to their new workplace.

5.1.2 Societal benefits from education

In its broadest sense, education has an impact on both economic well-being and social inclusion.

Blundell (1999) in the UK notes the societal benefits of an educated and literate population, including increased participation in democratic institutions and social cohesion. Johnston (2004) in New Zealand suggests that the wider benefits of education include better health, less crime, improved civic participation and greater life satisfaction.

A number of studies have attempted to evaluate the effects of education on economic growth at a macro level. For example, in the US, Cohen and Soto (2001), using cross-country time-series data, found statistically significant positive effects of education on economic growth. Dowrick in Australia (2002) found that an additional year of education in the adult population would lead to an increase in long-run growth of between 0.2% and 0.8%.

A common finding from the literature (eg Krueger and Lindahl (2001) in the US) is that there is a positive contribution to growth from the initial *level* of schooling (stock of human capital) measured by literacy rates for example.

In New Zealand, Hendy et al (2003) found that roughly one-third of the variation in employment growth across industries/occupations is associated with qualification factors.

5.1.3 Education/training and productivity

If we turn to the link between education and productivity at a macro level, the OECD (2004) estimate that increasing average education by one year would raise aggregate productivity by at least 5%, with possibly a stronger effect in the long-run. In Canada, Colombe et al (2004) found that a rise of 1% in adult literacy scores relative to the international average are associated with an eventual 2.5% relative rise in labour productivity.

However, Barnes and Kennard (2002) in Australia suggest that factors other than increased skill have mainly contributed to Australia's recent productivity surge. They also comment that there does not appear to be a strong correlation across countries between labour productivity growth and movements in skill composition towards skilled workers. Some countries with large contributions of skill change, such as France and the UK, do not have very high labour productivity growth. Having said this, they believe that education and skills remain important for long-run growth.

5.2 Impact of education and training on an individual's wages

A qualification is a signal to employers that the individual is more able than other applicants. An individual will therefore theoretically invest in education or training if the costs are compensated by sufficiently higher anticipated future earnings.

5.2.1 Impact of education on wages

There is a strong weight of evidence relating to the positive impact of education on future earnings. For the western economies, the gross rate of return to an individual of a year's additional education ranges between 5-10%:

- In New Zealand, Norton et al (2000) found that the effect on earnings of an additional year of education is probably around 6-8% and certainly less than 10%
- In the US, Kruger and Lindahl (2001) found that an additional year's schooling appears to raise an individual's earnings by about 10%.

Many studies, including Blundell et al (1999) in the UK, point out that there are diminishing returns to successive investments in human capital: the rate of return declines with the level of schooling.

5.2.2 Impact of training on wages

A number of studies have been undertaken to examine the effect of increasing training on wages; most find a positive effect.

Blundell et al (1999) in the UK found that :

- Individuals undertaking employer-provided or vocational training earn, on average, just above 5% higher real earnings than individuals who have not undertaken such training
- The rates of return are in the 5-10% range if the training also results in a middle or higher vocational qualification being obtained
- Skills acquired from training depreciate over time, suggesting that training needs to be renewed to retain its benefits.

Other studies have included the following:

- Dearden et al (2000) in the UK found that increasing the proportion of workers trained in an industry by 5 percentage points (say from 10% to 15%) is associated with a 1.6 per cent increase in wages
- In Australia, Smith (2001) summarised the international literature that measures the wage effects of participation in enterprise-based training. The wage effects ranges varied within and between studies, as well as by country, with the average range being 8-9%
- Also in Australia, Long (2001) found that the average earnings effects for males of Skilled Vocational Qualifications is 9.2% and for Basic Vocational Qualifications is 7.6%
- In the Netherlands, Groot (1995) found that for participants in enterprise-related training the wage effects are 21%.

5.3 Training type and recipient

5.3.1 Type of training

Please note that, for this section in particular, the research findings appear to be sensitive to the definitions used. In addition, some of the findings (even within the same study) seem somewhat contradictory, so it is difficult to draw strong conclusions.

a) Employer provided v other

Several studies indicate that employer-provided training has a greater wage effect than other types (for example, that the individual has sourced themselves):

- Blundell et al (1999) in the UK found that, not only does employer-provided training have the largest impact on earnings, but its effects are more long-lasting. In addition, employer-provided training acquired in earlier jobs is quite portable
- Alison Wolf (2002) in the UK suggests that a vocational qualification obtained on an employer-provided course seems to be worth (in terms of wage effect) almost twice what it would be when obtained off-the-job.

b) Formal certification

Theory would suggest that training that results in formal certification (such as qualifications registered on the New Zealand Register of Quality-Assured Qualifications) is likely to receive a greater wage effect than non-certified training as it acts as a stronger signal to employers of the individual's capability. This appears to be supported by the literature – for example, Blundell et al (1999).

c) Generic v specific skills

Theory suggests that the wage effects of generic skills should be greater than for specific skills, as they are more portable. Becker (1962) in the US argued that on-the-job training can be divided into "specific" and "general" components. It makes sense for firms to pay for specific training, because they expect to reap the benefits. General skills, which are useful to all employers, should in principle be paid for by employees who become more productive and earn higher wages.

The higher wage effect of generic as opposed to specific training appears to be supported by the literature. For example, Blundell et al (1999) found that managerial training shows the most significant impact on wages, followed by professional and technical training and semi-skilled training.

d) Training content

Black and Lynch (1996) in the US found that, in the non-manufacturing sector at least, it is not so much whether workers are trained, but what they are trained in (eg computer training) that affects productivity.

Wolf (2002) in the UK suggests that it is the traditional core parts of the school curriculum (literacy and numeracy) which most affects future earnings.

5.3.2 Who receives the training

One common finding is that the highest returns from training are from those with lower educational achievement and social status, supporting the theory of diminishing returns from training. However, these people receive the least amount of training, reflecting that those who are most capable become more educated and trained (the selection effect).

For example, Blundell et al (1999) in the UK stated that:

- People with higher ability and with higher educational attainment are more likely to participate in training, suggesting a strong complementarity between the three main components of human capital (see section 3.5 above)
- Women, part-time workers and older workers are less likely to receive training than other groups. However, the returns from training may be larger for working women than for working men
- People with no or intermediate-level educational qualifications and those with low social and economic status have high returns from training but low participation in it.

5.3.3 Other influences on the effectiveness of training

Leplagne and Bersted (1999) in Australia note the following:

- Labour productivity growth appears to be enhanced by the joint introduction of training and innovation
- Training is an effective strategy for less efficient workplaces striving to "catch-up" with competitors.

Black and Lynch (1996) in the US found that individuals working in an industry experiencing rapid technological progress experience higher returns. This supports the theory that education and innovation combined have a large influence on productivity.

A number of studies, including one conducted by the Australian National Training Authority (2001), note that skills and training produce the best results when part of an overall business strategy. This is supported by Knuckey and Johnston (2002) in New Zealand, where a survey of businesses identified a high proportion of "leaders" engaging in training compared with "laggers". This concept also underpins the "Investors in People" standard in the UK.

5.4 Impact of training on firm-level profitability

In the same way that an individual will consider the returns to training, firms will undertake training if the returns, in terms of productivity gains and hence enhanced profitability, outweigh the cost.

In general, the effects of training on firm productivity and profitability appear to be less well researched and less clear-cut than those of training on wages. Estimates to quantify the contribution of training on firm productivity range from very large effects to little or no effects.

Some of the studies that indicate that training impacts positively on productivity include:

- The National Institute of Economic and Social Research in the UK has undertaken a number of studies which showed the importance of training to productivity in the manufacturing sector. The final study (Prais et al 1989) involved researching a matched sample of hotels in Britain and Germany. Key findings were that labour requirements were about 50% higher in the London hotels, and that this difference was attributable mainly to qualified manpower (vocational training)
- Research conducted by Dearden et al (2000) in the production sector of the UK found that raising the proportion of employees trained in an industry from 10% to 15% is associated with at least a 3 percentage point increase in the value added per worker
- In Australia, Blandy et al (2000) found a positive impact from investment in training by enterprises on their productivity.

However, some found little or no relationship between training and productivity:

- In New Zealand, Business NZ and the Industry Training Federation (2003) found a range of weak non-linear relationships between training and productivity
- Lynch and Black (1995) found that, in the US manufacturing sector, the number of employees in training had no significant effect on productivity.

Having said this, several studies (including Dearden et al (2000) in the UK) have found that the productivity effect of training is larger than the wage effect. This confirms the theory that not all the productivity gains resulting from training accrue to the trainee through higher wages, so that investment in training remains profitable for the firm.

5.5 Other benefits of training at a firm level

A number of studies have identified additional benefits of work-based training to individual firms, which are briefly summarised below.

Table 1
Benefits derived from work-based training by individual firms

Country	Study	Benefits identified
NZ	Business NZ Skills and Training Survey (2003)	Quality of output, productivity, staff motivation, business growth, health and safety, staff retention, innovation, profitability, reduced costs
Scotland	Scottish Executive Survey of Employers (2004)	Improving quality of service/product, increased competitiveness, improved competence, keep up with technology, increased flexibility, increased productivity, more targeted form of training, improved staff morale
Australia	Blandy et al (2000)	Profitability is directly related to the quality and quantity of training
UK	Collier et al (2003)	Survival of firms is directly linked to training

Note: where applicable, criteria are stated in descending order of importance, not all criteria are listed

Source:as stated

5.6 Other benefits of work-based training at an employee level

A number of studies have identified additional benefits of work-based training to employees, which are briefly summarised below.

Table 2
Benefits derived from work-based training to individual employees

Country	Study	Benefits identified
Scotland	Scottish Executive Survey of Employers (2004)	Better quality of work, increase in self-confidence, keeping up with technological change, ability to take on new tasks, helpful if want to change employer, greater job satisfaction
UK	Blundell et al (1999)	Increased likelihood of promotion, reduced likelihood of quitting, reduced probability of unemployment

Notes: where applicable, criteria are stated in descending order of importance, not all criteria are listed

Source:as stated

5.7 Industry training

The literature has shown that the characteristics of the person receiving training, for example their economic status and previous qualifications, will have an impact on the returns from training. In particular, the highest returns from training are from those with lower educational achievement and social status. So it is important to consider the characteristics of industry trainees.

The Tertiary Education Commission (2004) stated that in 2003:

- Two-thirds of people engaged in industry training had 6th form certificate or less as their highest previous qualification
- Males were over-represented in industry training (70% of industry trainees were male), compared with the working population
- Maori (17%) and Pacific people (6%) people were also slightly over-represented in industry training.

This suggests that returns from industry training may be relatively high, compared with the employed population as a whole.

Unfortunately there does not appear to be any data available on the previous economic status of people in industry training.

6. Measuring the relationship between productivity and industry training

In section 4 above, we suggested that we could estimate the effect of industry training on productivity and economic activity by identifying from the literature the effect of industry training on wages, profitability and externalities (or spill-overs). However, the findings in relation to the effect on profitability and externalities have been inconclusive, so we are essentially left with the wage effects of industry training.

Estimates of the profitability and spill-over effects in a New Zealand context by primary research is outside the scope of this project, but would be essential to gaining a better understanding of the overall impact of industry training on economic activity.

6.1 The effect of industry training on productivity

If we consider the wage effects of industry training, the literature indicates a range in the order of 5-20%.

This means that, on average, a trainee after industry training is likely to be 5-20% more productive than they would have otherwise have been.

The rationale for this range is based primarily on the findings from the literature on the impact of training on wages – section 5.2.2.

The upper end of the range relates to the finding that an additional year's education is likely to increase earnings by between 5-10%. Assuming that the duration of industry training is three years, and that the effects of an additional year's education are additive, this would suggest a range of 15-30%. However, this range may be somewhat high, in part due to the fact that it relates to education as opposed to training.

6.2 Interpreting the findings

Clearly the findings in section 6.1 have a number of assumptions underlying them. Here we comment on other factors that would affect the impact of industry training on economic activity.

The factors likely to have a **positive** effect are:

- Not including the profitability effect to firms. Some of the literature indicates that the returns to the firm of training can be higher than those to the individual trainee. This may be relatively high for industry training compared with other forms of training (eg more generic training), as the skills are more firm-specific

- Not including externalities (benefits other than private returns). Externalities include the spill-over effects of training on co-workers.

The factors likely to have a **negative** effect are:

- Most of the research relating to gross returns, as opposed to net (of cost) returns. Costs to industry training include training fees plus relatively hidden costs eg reduced productivity of a co-worker training a trainee
- Selection bias ie those who engage in industry training were likely to be successful anyway and command relatively higher wages. (However, selection bias may be less for industry training compared with other forms of higher education, due to the relatively low previous qualifications of industry trainees)
- The research not necessarily implying a causal relationship. For example, companies who train may have better work practices which cause the increased wage gains, as opposed to industry training.

Other notes of caution with regard to these findings include:

- The literature has shown that there are diminishing returns from education/training, and that wage effects depend on the economic status of the person in training. So if the previous qualifications and employment status of trainees in industry training differ from those of the employed workforce as a whole, the wage effects would also differ
- Assuming that the wage effects of industry training are a good proxy for labour productivity changes
- Assuming that the wage effect takes place immediately after an industry training qualification is completed
- Much of the research relating to training or education generally, as opposed to industry training specifically. In addition, most of the research in the literature review was undertaken outside New Zealand, so drawing analogies may be erroneous.

7. Policy implications

7.1 The case for government intervention

It is relatively clear from the literature that industry training benefits the individual trainee, through increased wages, which in turn can be seen as a proxy for labour productivity. The findings in relation to the profitability effects of industry training (which is a proxy for capital productivity) are less conclusive. However, some studies indicate that returns to the firm from training could be greater than the returns to the individual trainee. This makes sense, as firms invest in training to gain a return in the same way as an individual invests in their education. So industry training appears to have a positive impact on productivity.

However, this is not necessarily an argument for increased government expenditure. When considering its investment in industry training, government needs to evaluate the returns to society as a whole (externalities over and above the private returns to individual firms or trainees) as well as other types of market failure. Government's investment in industry training should, theoretically, equal the difference between the socially optimal and the private optimal level of training.

The type of appropriate government intervention will then depend on the nature of the market failure. For example, if information asymmetries exist, government could assist in improving the quality of information, perhaps by certifying the quality of the training.

Government intervention may also be justified on the grounds of equity objectives. As industry trainees appear to have relatively low previous qualifications, this could present a possible policy rationale.

7.2 The special role of industry training

Compared with other types of education and training, the link between industry training and human capital development intuitively seems strong, as it is competency based, employer-driven and results in formal qualifications being achieved. Although little research has been conducted directly on the economic effects of industry training, we can use the literature to consider the effects of other types of training. For example, one of the findings is that employer-provided training appears to have a greater wage effect than other types of training, implying that the wage effect from industry training may be relatively high.

The special role of apprenticeships and vocational training is pointed out by Wolf (2000) in the UK. She states that apprenticeships are a great way to practice and learn in a real environment, and are particularly suited to certain sectors and occupations. However, narrow vocational programmes may not prepare young people well for today's changing labour market.

There are some roles that Industry Training Organisations play in addition to the training/qualification outcome that could contribute to economic growth. The assessment of current and future training needs and the development of strategic training plans could improve the functioning of labour markets through enhanced information. The recruitment effect of promoting industry training could also have a positive influence on labour market outcomes. However, these roles have not been examined in detail in this literature review.

7.3 Types of training and recipient

In its Tertiary Education Strategy, the government is signaling that tertiary education will be assessed on its strategic relevance. It makes sense that government will want to invest in areas of perceived priority.

The literature has identified that certain types of training may have more impact than others:

- Upskilling in areas such as adult literacy and basic qualifications produce a relatively greater return than for higher levels of education
- Computing and managerial skills (ie generic skills) may produce a relatively higher return than specific skills.

We need to be somewhat cautious in interpreting these findings, as most of the literature relates to the wage effect of training (ie benefits accruing to the individual trainee). The benefits of more specific or technical training, which may be particularly relevant for industry training, are likely to accrue to the firm, which is less well covered in the literature.

In terms of the type of industry that could benefit most from industry training, the literature suggests, not surprisingly, that the emphasis should be on those that are experiencing technological change. Another obvious area of focus for industry training are those sectors experiencing long-term skill shortages.

One consistent finding from the literature is that those groups of people who receive the least amount of training (such as those with low educational achievement and economic status) receive the highest returns. This implies that returns from industry training could be relatively high, as the previous educational achievements of industry trainees tend to be quite low.

However, these findings do not necessarily infer that government should target these types of training, sectors or groups of people. Again, government expenditure is justified only where the private optimal level of training is out of line with the social optimal level.

7.4 Indicators and data requirements

This literature review has identified a number of gaps in key indicators and/or data in New Zealand, including:

- Externalities arising from training
- Total factor productivity
- Human capital
- Impact of human capital on firm performance (profitability and productivity)
- Cost of training to firms
- Industry training (eg previous employment status of trainees)
- Longitudinal studies (for example, to measure the link between human capital and productivity over time).

Possibly the most important indicator for the ITF to undertake/promote research on is the previous employment status of industry trainees, as the literature indicates that returns from training are higher for those with lower social and economic status.

A considerable amount of research (at least overseas) has been undertaken on the private returns to training for the individual, and, to a lesser extent, on the contribution of education to economic growth. There is less data available on the impact of human capital on firm performance, especially net of costs, and even less on the externalities of training. Until such data is obtained, estimates of industry training's effects on economic growth will remain subject to significant imprecision.

8. Conclusion

The economic benefits of industry training can be thought of as being shared between: the individual trainee, through higher wages (a proxy for labour productivity); the firm, through enhanced profitability (a proxy for capital productivity); and society as a whole, through externalities.

The literature suggests that the wage effect of industry training may be between 5% and 20%.

This means that, on average, a trainee after industry training is likely to be 5-20% more productive than they would have otherwise have been.

The findings from the literature in relation to the profitability effects of industry training are less conclusive than for the wage effects. However, some studies indicate that returns to the firm from training could be greater than the returns to the individual trainee.

There is also limited evidence relating to externalities arising from industry training.

One consistent finding from the literature is that those groups of people who gain the most from training, such as those with lower educational achievements and economic status, in fact receive the least amount of training.

When policymakers consider government's investment in industry training, they need to evaluate the returns to society as a whole (ie including externalities) and market failures.

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