New Zealand's 1989 skill ecosystem reform: preparations, implementation, outputs and outcomes

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Abstract

This thesis assesses the impact of the 1989 skill ecosystem reform, whereby New Zealand initiated a comprehensive reform of its skill ecosystem. The reforms radically transformed the education and training system and were driven primarily by the approval of the Education Act 1989 and the Industry Training Act 1992 and their amendments. For this thesis, the reform ended in 2020 with the approval of the Education and Training Act 2020. The reforms were part of a broader political transformation in New Zealand that ended up embarking on market policies to increase its productivity. Education and training were identified as a necessary condition to achieve that goal.

New Zealand's skill ecosystem has its foundations in the strong system built in the country since the arrival of the first settlers, but that had slowed its dynamism in the 1970s, with enrollment rates lagging behind comparable countries and concerns about the ability of the skill ecosystem to respond to current and future skill needs. The reform decentralized the education system at the primary / secondary and post-secondary levels but created an institution, the New Zealand Qualification Authority (NZQA) that should allow students and trainees a seamless navigation across it. The reform had a strong involvement of the private sector. To evaluate the impact of the reform, the thesis faces several challenges: there is no adequate counterfactual, the design is continually changing, and the country experienced a series of international shocks during its implementation. To address these challenges, the thesis presents a comprehensive set of indicators to evaluate the reform's outputs and outcomes at different levels. In terms of outputs, which include the reform, enrollment in education and training, participation rates increased. In terms of outcomes, which include indirect and behavioural changes, the measures are mixed. At the end of the reform, the ease of finding high-level skills in New Zealand is similar to its long-term trend despite the more sophisticated economic structure, albeit with significant differences by firm size and industries. And the ease is lower than in comparison countries, raising questions about whether that level could change given the small size and remoteness of New Zealand's economy.

Contents

Introduction

Between 1989 and 1992, New Zealand started a comprehensive reform to its education, apprenticeship and training, among other skills-related systems through the Education Act 1989 and the Industry Training Act 1992. The reform decentralized the education system, introduced market mechanisms and increased the participation of the private sector. Complementary reforms were implemented until 2020 when the Education and Training Act 2020 was approved and a new approach was launched. This thesis groups the reforms between 1989 and 2020 as the 1989 skill ecosystem reform and assess its impact on the underlying skill ecosystem and the economy. This thesis constitutes a case study of a skill ecosystem reform.

This thesis employs the skill ecosystem definition introduced by Finegold (1999), Crouch et al. (1999) and Buchanan (2006). The ecosystem definition captures the complexity observed in skills systems in terms of actors, institutions and changing environments to which the ecosystem have to accommodate. This definition has been employed in New Zealand before in a study of the Canterbury's skill ecosystem (Dalziel, 2010).

In the 1980s, New Zealand faced significant economic challenges due to changing global conditions. The country needed urgently to "enhance its long-term economic performance and economic resilience" (OECD, 2017B, p. 78) to participate in the global economy successfully and started a series of market-economy reforms. The improvement in labour productivity through more responsive skill ecosystem was identified as a key area for reform as there was a: lack of a clear and implementable definition of skills, low efficiency in the secondary education system, low participation rates in post-secondary education and mismatches between supply and demand of skills (OECD & New Zealand Qualification Authority, 2004).

The 1989 skill ecosystem reform introduced a decentralized provision of skills and a robust quality assurance system, leadership of the private sector and a unified governance structure. The reforms granted greater autonomy to schools and universities and private providers of tertiary education expanded their participation. The reform strongly focused on skills relevance measured through qualifications and created the New Zealand Qualification Authority (NZQA) to develop, deploy, and quality assure all qualifications. Later, the New

Zealand Qualification Framework (NZQF) was created, grouped all qualifications and became "the heart of the education system in New Zealand" (NZQA, n.d., para. 1). Through the creation of the Industry Training Organizations (ITOs), the private sector got a leadership role in the skill ecosystem. And, as a result of the reform, at least de jure, the academic and vocational education and training shared financing and regulatory frameworks. The reform ended in 2020 as the reform of Vocational Education (RoVE) was launched. The ROVE gradually eliminates the ITOs and creates a new governance structure for the vocational skill development.

In chapter 1, this thesis provides a theoretical framework to analyze skill ecosystems, describing its five key elements: the environment under which the skill ecosystem operates, the process to create skills definitions and establish the purpose of the education/training systems, the institutions established to develop skills, the institutions established to deploy skills and the quality assurance institutions to oversee the system.

In chapter 2 and chapter 3, this thesis presents New Zealand's skill ecosystem evolution and how the 1989 skill ecosystem reform impacted the skill ecosystem and the economy. Chapter 2 presents New Zealand's skill ecosystem gradual development from the early 1800s to 1989. Chapter 3 describes the main changes to the skill ecosystem introduced by the reforms and assesses the impact on the skill ecosystem (level 1 changes), behaviours of individual and firms (level 2 changes) and aggregate variables of the economy (level 3 changes).

This thesis benefited from several complementary sources of information. Besides a literature review and a review of the legal framework since the first half of the XIX century, the thesis includes a comprehensive analysis of existing data covering various elements of the skill ecosystem: (i) qualifications at the New Zealand Qualification Register (NZQR) , including levels, providers, version, approval date, expire date, (ii) enrollments in education, training and apprenticeship programs from the Ministry of Education, information that is complemented with data from World Bank for years not included in the Ministry of Education database and information on comparison countries, (iii) efficiency of the education system and young population Not in Employment, Education or Training (NEET) from the Organisation for Economic Cooperation and Development (OECD), (iv) student learning assessment and student occupation expectations at age 30 from OECD's Program for

International Student Assessment (PISA), (v) adults perception towards training, skills participation from OECD's Program for the International Assessment of Adult Competencies (PIAAC); (vi) employer-employee links from StatsNZ's Linked-Employer-Employee Dataset (LEED); (vii) firms perception on training from StatsNZ's Business Operations Strategy (BOS) Survey 2016 on skills acquisition; (viii) aggregate macroeconomic variables including Gross Domestic Product (GDP), GDP per capita, labour productivity, employment, unemployment rate, participation rates.

This thesis assessment of the 1989 skill ecosystem reform shows that (i) the reform was built on an already robust skill ecosystem developed by the country since the 1800s, (ii) is aligned with international developments on skills and best practices, (iii) the reform was dynamic, it kept changing though main elements remained, (iv) enrolment in education and training increased even though there may have been a small quantity-quality trade-off, (v) it generated strong dynamism, though in the 2010s signals of fatigue are observed, and (vi) in a context of a changing global demand for skills, the overall employer perception of easiness of finding skills did not change, but, the overall dynamics of the economy did.

Chapter 1: A theoretical framework to understand skill ecosystems

This chapter presents a literature review of various topics related to skills. In comparison to previous literature reviews on skills, this review is innovative as it presents a comprehensive vision of the skill ecosystem, including different levels and streams, introducing its elements: environment, skills definitions, development of skills, deployment of skills and quality assurance mechanisms.

1.1 Prioritization of the skills in recent policy debate

In developed and developing countries, skills are at the center of the policy debate. Several authors have noticed the increase in the focus on skills since the 1990s (Roberts, 2004; Brunello & Wruuck, 2019). In the developed countries, the heightened importance of skills coincided with their need to dynamize their economies in the context of a policy shift towards the market-economy and the downscaling of active government interventions (OECD, 2019). In developing countries, the debate responds to their need to strengthen their fundamentals to accelerate their growth rates (World Bank, 2018). Nonetheless, after approximately three decades of this heightened importance of skills, most developed countries report a mismatch between the skills supplied and those demanded (Asai et al., 2020) and developing countries to consider the "promise of education unmet" (World Bank, 2018). Moreover, there is a global fear of a growing mismatch given the rapid speed of technological change brought by Industry 4.0 (OECD, n.d.).

The debate on skills is not new as discussion on the role of schools and apprenticeships started on ancient civilizations (Sennett, 2008). The nature of the debate has changed in recent times. As technological change accelerated significantly with the rapid expansion of automation, the demand for skills toward manual and repetitive tasks decreased, and towards critical thinking and communication skills increased. In the face of these changes, currently institutions that define, develop, deploy and quality assure skills need to adapt their education and training

supply continually. New types of governance systems are required to deal with new conditions.

Given these dynamics, the relatively static preexisting focus on demand and supply of skills needs to be modified. As suggested by James et al. (2013, p. 952), a skills debate shifts "the conceptual narrowness in current research…agenda needs to cover not just the supply but also the demand, development of graduates' skills". An example of the changing conditions is that, in 2012, the OECD Skills Strategy framework (OECD, 2012) established as objectives for skill policies: developing relevant skills, activation of skills supply and using skills effectively. And less than a decade later, the 2019 OECD Skills Strategy (OECD, 2019) introduces the importance of the skills governance system while maintaining the focus on developing relevant skills and using them effectively.

On-going mega-trends of digitalization, globalization, demographic trends and migration pose additional challenges for the skill systems (OECD, 2019, and others). Countries' future success to provide the needed skills to their populations will depend on how their skill systems will incorporate those mega-trends.

1.2 A holistic approach to skills systems: skill ecosystems

Skills need a holistic approach: what skills are, how they are defined, what the actors and institutions intervene in the process of providing skills, including rules, either de-facto or de-jure, and the like. Through time, societies have answered these questions and established skills systems. Codes and laws answer some of these questions, but answers to others are embedded in traditions and other de-facto mechanisms adopted by societies through time. These skills systems adjust to the various internal and external stimuli, evolving through time, mimicking those defined in the Biology Sciences literature as "ecosystems". The definition of skill ecosystem has been brought into the skills literature by Finegold (1999), Crouch et al. (1999), Buchanan (2006), Hall & Lansbury (2006), among others. As defined by Hall & Lansbury (2006, p.576), a skill ecosystem requires detailed attention to "the interdependency of multiple actors and policies in creating and sustaining the conditions under which appropriate skills can be developed and deployed". Initial analyses employing the ecosystem approach

were restricted to certain geographic areas and/or industries (Buchanan & Jakubauskas, 2010). But, later, Smith (2006) used the skill ecosystem approach to cover a national state.

Figure 1 presents the main elements of a skill ecosystem and their interactions. Skills are at the centre of the ecosystem. Their definitions guide their future development and facilitate their deployment, and, are dynamic as they evolve, reflecting the labour demand and supply evolution. As demand and supply interact, shortages/excesses of skills are identified, and that information can lead the changes in skill development and deployment. Moreover, the interaction between supply and demand and development and deployment happens within an environment that changes and keeps evolving.

Figure 1 A skill ecosystem
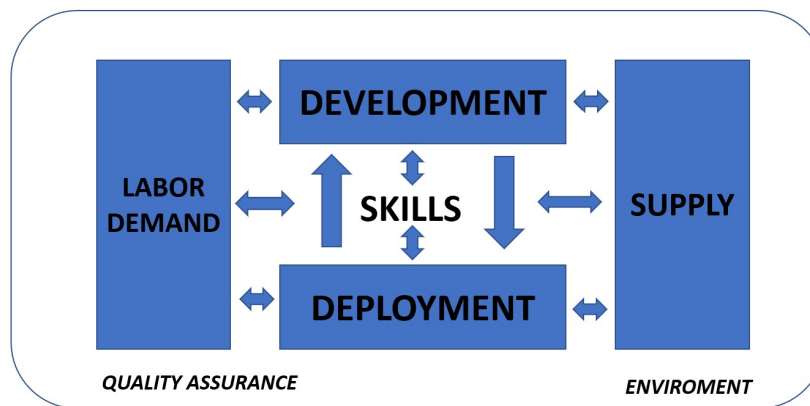
Source: Author

1.3 Elements of the skill ecosystem

1.3.1 Environment

Skill ecosystems interact with and derive from local conditions. For example, in agriculture and tourism areas, local conditions set skill ecosystems different from those present in mining areas; or, at the country level, Germany has a skill ecosystem different from the one in the United Kingdom (UK). The Varieties of Capitalism Literature (Hall & Soskice, 2001) provides elements to understand those differences. It characterizes market economies by their underlying structures into Liberal Market Economies (LME) and Centralized Market Economies (CME). In the first group of countries, the market is the primary mechanism to

assign resources within the economy. Australia, the UK and the United States of America (USA) are included within this group of countries. In the second group, the state has a stronger role in assigning resources, though they still allow a role for the market economy. Germany, Austria, Switzerland and the Nordic countries are included within this group.

Skills institutions in LMEs and CMES have common foundations in the guilds from the medieval times and in the support for public education since the 19th century, but their recent evolutions have been different, especially with regards to the participation of employers versus specialized institutions in the skill development and perceptions towards vocational education and training. LMEs use the market to coordinate the economy and match graduates to jobs, with the change in wages as the primary adjustment mechanism in the short term. CMEs, besides changes in wages, use a non-market mechanism based on social partnerships between employers, unions and the state, and these mechanisms are used to match graduates with jobs. In this line, Iannelli & Raffe (2007) emphasizes that in LMEs, employers pick workers with higher potential (education becomes an indicator of potential), though in CMEs, workers are picked based on their mastery the vocational skills. And alternative approach is to characterize skill ecosystems among systems with "employment logic" and "education logic". There is a strong link between the education/training system in the former and, in the latter, the relationship is weak (Iannelli & Raffe, 2007). Table 1 presents the main differences identified by the literature between LMEs and CMEs.

Table 1 Liberal Market Economies (LME) vs Central Market Economies (CME)

LMEs	CMEs
Prices assign resources.	Resources distributed by prices and community-based decisions, with trade unions, employers, and government working together in a tradition of reciprocal responsibility
Skills in the Anglo-Saxon model: • are an individual attribute or property • are associated with task and jobs rather than occupations set within an industrial context • are related to physical/manual mastery or ability • have no particular association with a knowledge base	In the Germanic model, Kompetenz (competence) consist of : • Expert knowledge • One's potential and to develop one's life plans. • Social relations to realize personal competence.
A narrow interpretation of skills.	Skills are based on occupations. It is partially related to theoretical knowledge and a set of practical skills.
England and France modular approach	Comprehensive approach. Pathways.
Source: Author's compilation based on Iannnelli and Raffe (2007) and others.	

An alternative model to LMEs and CMEs is provided by the Asian Development States that characterized several Asian economies in the 1990s, with a strong presence of the state, but selecting certain industries. For example, in Korea, the industrial model was based on public support towards large industrial conglomerates of Chaebols. The state's skills intervention focused on initial training, and the Chaebol was responsible for upskilling and reskilling (Sung & Raddon, 2017).

1.3.2 Skills

1.3.2.1 Theoretical consideration on skills definitions

A skillful population is the objective of the skill ecosystems, though there is no consensus on what the definition of skills entails. There are multiple definitions of skills which usually include knowledge, ability and skills, either combined or as stand-alone concepts. Various theoretical approaches have analyzed skills with different foci according to their research objectives and methodologies and have come with varying definitions of skills. As summarized by Bryson (2017), a first group of theoretical approaches (Economics, Political Science, Sociology and Industrial Relations) focuses on the Political Economy of skills; a second group (Organization Studies and Human Resources Management) focuses on skills as organizational resources; and, a third group (Psychology and Education) focuses on skills as part of their learning theory. Furthermore, as she identified, in the first group skills is an economic input; in the second group, skills are a resource of individuals and a firm resource; and, in the last group, skills are an attribute, competence of individuals. Beyond multiple approaches, in practice, current work on skills tends to be multidisciplinary, merging different approaches and methodologies.

Michael Young provides an interesting approach towards skills definition as he describes knowledge. He recognizes that "knowledge cannot be reduced to the activities and interests of those who produce or transmit it", and he phrases the question on knowledge as "what is it that people need to have the opportunity to learn or know?" (Young, 2008, p. 94).

The definition of skills has been expanded by some authors, not only reflecting the abilities that individuals have but also their capabilities (Sen, 1992; Bryson & O'Neil, 2010), incorporating the readiness to adapt to a changing environment in the use of skills.

Furthermore, the "capabilities approach starts with the person and not specific skills" (Wheelelan, 2017, p. 645). The European Union (2018) links the skill definition to critical competencies for "a successful life": literacy, language, mathematics, science, technology and engineering); digital competence, personal, social, and learning competence; entrepreneurship competence; and cultural awareness and expression. Green (2013) narrows the definition of skills by imposing three characteristics: productivity, expandability and social determination. According to him, skills at work are of productive value, skills are enhanced by training and development, and skills are socially determined.

In practice, several skill ecosystems tend to operate with fragmented definitions of skills. They separate between the skill components of knowledge, ability and skills. Knowledge captures academic-knowledge linked to university degrees required to engage in academic or professional tasks, while non-knowledge skills are referred to as requirements to perform crafts and trades. Like Young (2008), several authors consider this an artificial division that entails lifelong consequences for individuals. Moreover, this division mimics and promotes social class divisions persistent in some countries.

Besides challenges in reaching a consensus in the definition of skills, there is a strong agreement on the desirability of more skills, and skill ecosystems have established definitions of skills to achieve their objectives. At the individual and aggregate level, there is abundant evidence that skilled individuals, such as years of schooling or international tests results, are correlated with higher GDP growth. There is also evidence that some skills measures are linked to further skills acquisition, signaling a virtuous circle between skills and productivity (OECD, 2019).

Though, practical definitions of skills beyond years of schooling are needed, especially given a large number of actors in the economies and the perceived needs of different types of skills across various industries and occupations. Countries have defined competencies and unit standards as verifiable measures of skills and grouped then into qualifications. The definition of qualifications has been a critical element of the vocational education reform in some countries (Young, 2011). However, recently some authors are recommending to move beyond the narrow focus of qualification definitions and focus on capabilities and skills pathways (for the case of Australia: Wheelahan et al., 2015)

1.3.2.2 Practical approaches to define skills: introduction of Qualification Frameworks

The quest for the correct definitions of skills is not a new, though the task's complexity has increased given accelerating technological progress. Foundational skills, or basic level skills, have been traditionally established by the Ministers of Education and cover basic numeracy and literacy, and social skills. But, as individuals transition into the workplace, the complexity increases significantly, and private sector participation is needed as they demand most of skills.

There are multiple challenges in this process. First, firms have difficulty explaining the skills they need (McGuinness et al., 2017), second, there are thousands of occupations performed by billions of workers educated and trained in millions of institutions around the world. According to the International Standard of Classification Occupation 08 (ISCO-08) published by the International Labour Organization (International Labor Organization, 2012), these occupations can be classified into 460-unit groups, 130 minor groups, 43 major subgroups and ten groups. Those groups are defined by the skill level and skill specialization required for each occupation. On the other hand, education and training programs are classified by the International Standard Classification of Education 2011 (ISCED-11) by the level of education (9 levels) and the field of education (UNESCO, 2012).

In the past twenty years, many countries manage the process of skill definitions, development and deployment through the introduction of Qualification Frameworks (QF). QFs are expected to facilitate the skills definition development, deployment and quality control. QFs establish a common language, promote stakeholder engagement, provide regulation, ensure quality assurance, facilitate development and deployment by modularization and bring transparency of qualifications (Raffe, 2013). The Scottish Credit and Qualifications Framework, launched in 1984, is considered the first successful QF, and its was followed by Australia, England, New Zealand and South Africa, establishing a first generation of QFs.

The popularity of the QF has been growing since the first generation of countries adopted them. A significant development was the enactment of the European Qualification Framework (EQF) by the European Union in 2008 (revised in 2018). The EQF is leading the adoption of the European Union's skills and lifelong learning frameworks, allowing portability

of skills across European countries. By 2017, more than 150 countries have developed QFs (CEDEFOP et al., 2017). There are high expectations on QFs to enhance national competitiveness (OECD, 2007). UNESCO (2018) has identified the importance of qualifications, recognizing the importance of national QFs to support transitions between secondary and post-secondary education, and improve skills deployment by recognizing prior learning, another critical area of the qualification systems. The final value of the QF will depend on their capacity to add value and the commitment and ownership they create among participants: "stakeholders have to buy the system and use them" (CEDEFOP, 2017; p.8).

The common feature that defines QFs is a legal and regulatory framework, effective stakeholder dialogue, institutional arrangements, and quality assurance systems (ETF, 2016). In many cases, some institutions were in place before the QF launch. France is an example of an ecosystem that had institutions similar to the QFs before their formal introduction. Their system linked to levels of work and pay and was established by ongoing relationships between work and education. The French system, denominated National Directory of Professional Certifications (Repertoire National des Certifications Professionnelles), has been functioning since the 1970s.

Assessing the impact of the introduction of QFs is difficult. Despite growing popularity, there are also criticisms of the QFs. Young (2003, p. 232) mentions that "QF are a paradigm case of government intervention in a neoliberal democracy". QFs tend to differ across countries of purpose, scope, prescriptiveness, integration and policy breadth (Raffe, 2003). Research has also found that in some cases, the elements of QFs only exist on paper (Allais, 2017A). Moreover, analyzing qualification frameworks requires a clear understanding of the skill ecosystem it is introduced into (Raffe, 2013). Allais (2017B) investigates the labour market outcomes of the introduction of QFs in Belize, France, Ireland, Jamaica, Sri Lanka and Tunisia. Among other things, she finds that private sector participation was limited, with little relationship with work and pay levels. However, this relationship was strong in France (presented in the previous paragraph) prior to the introduction of the qualification framework. In a later publication, Allais (2018) argues that the popularity of QF may relate to the simple solutions to complex problems rather than observed real outcomes of the QFs.

Among other approaches to evaluating QFs, Young (2007) proposes to characterize frameworks based on some key characteristics: communication vs regulation, weak or strong, partial and comprehensive, unit-based or qualification-based, and institutions-led vs outcomes led. Raffe (2009) mentions three frameworks: communication, reforming and transformational. Qualification frameworks provide a platform for studying the changing relationships between work, qualifications and knowledge. The EQF (CEDEFOP et al., 2017) indicates that future evaluations of National Qualification Frameworks (NQFs) have to focus on four key dimensions: increase in transparency, promotion of lifelong learning, increase in mobility and modernization of education and training system. And Allais (2017B) indicates that the analysis of QF should focus on their capacity to create pathways from education to work rather than in the design of qualifications per se.

Additional criticisms indicate that qualifications do not adequately measure skills (Guile, 2010). The QFs are facing pressures to remain relevant and effective in response to current and emerging needs of the workforce and social needs. In Australia, it has been identified that factors challenging the QF are access to information through the internet and declining trust in institutions and traditional authority sources (Expert Panel for the Review of the Australian Qualifications Framework, 2019). In England, the Sainsbury Report on technical education highlights that standards should not be reduced to a simplistic analysis of narrow job roles or only include individual employers' short-term instrumental need (Independent Panel on Technical Education, 2016).

Furthermore, some authors agree that qualification frameworks have led to practical complexities in some countries, distorting the education and training program and possibly weakening the relationship between education and training systems with work. Another distortion is the appearance of a large number of qualifications, qualification inflation, that may be generating more problems than solutions in the qualification frameworks (Allais, 2018)

1.3.2.3 Assessing future skills

Many OECD countries have explicitly created assessment and anticipation systems (SAA), which, to varying degrees, aim to identify the types of occupations, qualifications, and fields of study in demand in the labour market or become so in the future. These systems vary

greatly across countries as they have different: definition of skills, methods used, geographical coverage, timespan and frequency of the assessments. For example, Denmark's Rational Economic Agent Model (DREAM) simulates and forecasts national education levels 50 or more years into the future. In Germany, the BIBB-IAB-Qualification and Occupational Fields Projections work on a 30-year projection capability, predicting both occupations and qualifications using qualitative and quantitative data (OECD, 2019).

1.3.3 Development of skills

Skill ecosystems have created institutions focused on the developing of skills. These institutions include schools that cover primary and secondary education, post-secondary institutions (general and vocational), training institutions, apprenticeships, and on-the-job-learning. Traditionally, school and post-school institutions are labelled as formal education/training and are under the monitoring of the Minister of Education/Higher Education while training and apprenticeship are under the monitoring of the Minister of Labour is often labelled as informal education/training. Different skill ecosystems have generated different structures of formal/non-formal education.

1.3.3.1 Formal education/training

Formal education/training usually denotes skill development through activities with a delivery location outside the house or the job-place under a regular education/training schedule. Individuals benefit from their participation in the development of skills, but governments intervene in developing skills given the existence of market failures, including externalities, credit constraints, asymmetric information (for example, see Hanushek,2002).

The distinction between types of skills has created different education streams: General and Vocational Education/Training. General/academic programs to focus on engagement skills in liberal arts, usually leading to the university system's entrance. Vocational education and training focus on labour market skills that generally corresponds to specified occupations. These skills are less flexible and transferrable than general skills. The literature does not offer a clear distinction between the pedagogical contents of general/academic and vocational education, and there is no consensus on the right time to assign students or track them into the various streams. In some cases, students are tracked into the two systems at the end of

primary education, and in others, tracking occurs later in the education process after lower secondary or upper secondary. In many cases, movements across systems are not allowed or difficult to implement.

Even though some authors find the distinctions outdated and limiting the development of the overall skills (Young, 2008), both streams are present in LME and CME, though there are differences in their scope and perceived differences in the value of participating in the systems. CMEs tend to separate students across streams at an earlier age than in LMEs. In LME, vocational education tends to have a lower prestige, while in CME, prestige tends to be similar across tracks. In LMEs, vocational degrees tend to be terminal, while in CMEs, they are part of vocational tracks with opportunities for future development.

In some LMEs, the division between general and vocational education/training is related to social status. For example, in England, the separation between tracks is deeply rooted, and it can be traced back to the English class system (Brockmann & Laurie, 2016). In Australia, a lower standing of vocational education affects students' desire to enrol in it and promotes labour market shortages, and recent reforms to narrow the focus of competences may have reinforced the lower status perception of TVET (Billet et al., 2020). Some authors consider the general vocational education divide neither justified nor democratic (Olofsson & Panican, 2017). In South Africa, vocational education/training has been promoted as a quick fix to high unemployment rates of youth and marginalized populations, without assessments of the needs in the labour market and reinforcing the link of vocational education and class status. These interventions have failed, not necessarily due to failures in the education/training courses per se, but their lack of integration with the rest of the skill ecosystem (Allais, 2020). Furthermore, according to OECD (2019), one common reason why vocational education appears unattractive to learners is that VET qualifications are often "dead ends", not leading commonly to higher levels of skills. If the VET attracts able and ambitious students, clear and well-articulated learning pathways must enable progression up to and including tertiary levels. As argued before, this difference in aspiration is a critical distinction between vocational education in LMEs and CMEs, an evolution that may be linked to the dead-end approach.

Though, in other countries perceptions are changing. In Spain, vocational streams are growing their recognition. For example, a positive change in attitude towards TVET has been registered in Spain (Martinez-Morales & Marhuenda-Fluixa, 2020).

Regarding tracking students into systems, the optimal moment to do tracking depends on the advantage of specialization and the cost of early selection. Some authors argue that faster technological change has increased the need for general skills, as they will allow continuous learning; and reduced the demand for vocational skills, which will become obsolete relatively sooner. Tracking has been delayed in some countries. In the UK, tracking was delayed from 11 to 16-year-old in the mid-1960s; in France, apprenticeships after two years of lower secondary were abolished in the 1980s (Brunello, Giannini, & Ariga, 2004). Some countries do not track during secondary schools, like the USA, but implement self-selected tracking later.

International comparison finds that labour market outcomes favour vocational education, in the short run they create lower periods of unemployment and higher salaries, though these benefits change through time. Hanushek et al. (2015), using data from the International Adult Literacy Survey (IALS), finds that vocational training graduates have initial better labour market outcomes, though a turning point in favour of general education occurs at age 50. Other authors indicate that a focus on general skills in the US relative to Europe provides that country with a comparative (Kreuger & Kumar, 2004).

1.3.3.2 Apprenticeships

Apprenticeships have traditionally been a major source of skills development around the world. Apprentices benefit from the learning opportunities provided by the master, while the master benefits from the apprentices' support and the benefits of more qualified workers into the labour force. Through guilds, apprenticeships were at the centre of the skill ecosystem in mediaeval times, which ensured development, deployment, and quality control of skills. Apprenticeships differ from training, as they don't entail a long-term working relationship.

CME and LME have long traditions with apprenticeships linked to their guilds in the medieval era, but apprenticeships' evolution in recent times has been different. Among LMEs, in England, the apprenticeship system was formalized as early as 1563 by the Statute of Artificers. As time passed, the popularity of apprenticeships fluctuated. It decreased as

factories expanded in the nineteenth-century as apprentices were perceived as cheap labour. But then, as professions appeared in the early twentieth century, apprenticeships in trades were popular. However, around 1960, doubts on the capacity of apprenticeships to generate knowledge, vis-a-vis the possibility of participating in formal education and training (Mirza-Davies, 2015). Recently, the UK has implemented policies to increase the younger population in apprenticeship programs (CEDEFOP, n.d.).

Apprenticeship in CMEs, like Austria, Switzerland and Germany, have similar origins, but their evolution has been different, and currently, they are praised systems (Miller, 2013). A key factor to their apprenticeships' success is the underlying social partnership (Stefan & Ryan, 2011). The social partnerships translate into high participation: between one-third and two-thirds of upper-secondary enrollment. The main advantage brought by apprenticeships is that they guarantee a smooth transition into the workplace. Though, demand has been decreasing in recent years, as their efficiency with high dropout rates. Approximately one-fourth of apprentices leave the apprenticeships early. That evolution is related to the economic needs of those in the apprenticeships (Seidel, 2019).

Regarding the economic benefits of apprenticeships, Fuller & Unwin (2017) documents important payoff in terms of salaries for those who participated in apprenticeships in England, though the benefits do not reach those who participated in apprenticeships lower qualification levels. They also found that, even though there are similar participation levels in apprenticeships between males and females, there are differences in the type of programs they participate. Men tend to participate in apprenticeships of a higher level than female.

Besides the economic benefits in terms of higher pay, apprenticeships facilitate transition into work, especially in the CME. In LMEs with reduced apprenticeship opportunities (Nordic countries, Netherlands, New Zealand, UK and USA), younger populations' part-time work partially replace apprenticeships and facilitates the transition into the workplace (OECD, 2010). Though, the skill development element of these working experiences may be different as the employment of youth, as in most countries, is unrelated to what students study (OECD, 2008).

1.3.3.3 Combining formal education and apprenticeships: blended learning

Recently, formal education, especially in the vocational education and training modalities, is reaching firms and apprenticeships are reaching formal education/training opportunities, combining, in both cases, part-time formal education/training with training experience at the workplace. In this context, a broader set of actors of the skill ecosystems intervenes, including employer, trainees, educator and government, and they share their costs and benefits. This trend shows that schools may not be the best environment to provide work experience as those skills may be better learned in an apprentice-like arrangement (for example, Cappelli, 2014).

A key benefit of blended programs versus school-implemented vocational and academic ones is that they provide additional support for a smooth school to work transition. In CMEs, most vocational programs are currently blended and inserted into a tradition of generating a mechanism for promoting learning at the workplace before establishing formal labour relationships. Based on CMEs' results, LMEs have started to emphasize the need for initial labour market experience and promote dual programs and apprenticeships.

However, the challenge is to provide learning opportunities in a school and a workplace and ensure their linkage. Some countries have started to close potential gaps between the school context and the workplace context. For example, in Sweden, workplace learning has been recontextualized to fit a pedagogical context tailored to meet the institutional goals of vocational education; in that case, even students take an important role in this process. This process works better when the collaboration between school-based and workplace-based learning is well-established (Gustavsson & Persson Thunqvist, 2018). This integration process is challenging, given the context of rapid technological change with the growing number of high-level skills required by the labour market (Graf, 2020).

1.3.3.4 Training

Training is another common skill development activity. Traditionally, it is shorter than the education courses and, for those employed, happens outside the regular tasks with the main objective of development skills (in contrasts to on-the-job learning/training to be addressed below). There are several training types, depending on who finances them (firms,

governments or individuals) and/or its main objective (productivity-enhancing or to provide opportunities to disadvantaged populations).

1.3.3.4.1 Productivity oriented - Firm lead training

Through training their employees firms improve their firm human capital and improve their productivity. Firms train in transferable and non-transferable skills to address skills employer's needs. Providing training is a risky decision by the firms, i.e. they face several uncertainties on the payoff of training generated by market failures: a firm loses any investment in training if the trained-employee changes jobs or does not have the incentive to apply the newly training-developed skill at the workplace. The willingness of firms to invest in transferable skills was questioned in the past, and it was expected they would only do in non-transferable skills in a joint arrangement with workers (Becker, 1964). Further developments have shown that if markets are imperfect, the firms will have an incentive to invest in transferable skills, consistent with empirical evidence as German firms financing transferable skills (Steven, 1994; Acemoglu & Pischke, 1999; Booth & Snower, 2008). Further analysis has identified the impact of other market imperfections; for example, a compressed wage structure incentivizes firms to train (Bassinini & Brunnello, 2008).

In many cases, the training efforts are supported by the government given the existence of market failures. Various governments have stepped into the training market to encourage employers to train their workers. A common way to do this is by imposing a levy. For example, Singapore established through levies a Skills Development Fund to facilitate employees' training (Chew, 2011; Froy, 2013). Though the limits of government intervention have been identified, and there is a search for "market-inspired solutions, with policy problems becoming narrowly defined challenges of appropriate 'market design'" (Buchanan et al., 2017, p. 458).

Existing evidence shows that investing in training has positive benefits on firms. For example, Van de Wiele (2010), using microdata from Belgium, finds that an additional 1 percent expenditure on workforce development increases the firm's value-added by 0.1 percent for manufacturing firms and 0.2 percent for non-manufacturing firms. Nonetheless, the impact of training may be different across countries. There is evidence that the country institutions,

i.e. their skill ecosystems, affect training results as identified by Nguyen et al. (2011), analyzing the differences between training results in China and Vietnam.

International comparisons also show important differences in training behaviour by type of firms. For example, by firm size, data from the Organization of Economic Cooperation and Development (OECD) data shows that small and medium enterprises (SMEs) implement 50 percent less training activities than large firms. The same data shows that drivers of training are the need to address market needs, designed to increase the competitiveness of their firm. The evidence also indicates that small firms prefer to fill their skill needs by attracting new employees than training (OECD, 2013).

Additional characteristics of training strategies by SMEs are that they prefer informal training to formal. Low skilled employees usually get training in generic themes, routine, occupational health and safety, and information technology. High skilled employees are usually trained in productivity-enhancing skills. Evidence of faster-growing SMEs shows that their training investment is twice the ones of the non-fast-growing firms. Additionally, there is evidence that SMEs have difficulty in assessing their skills needs and that assessment of future skill demand is seldom implemented in SMEs (OECD, 2013).

There is also evidence in the European countries that training may promote labour poaching. Brunello & De Paola (2004) finds that there is a positive and statistically significant relationship between employer-provided training and turnover in almost half of those included in their study. They also found that the empirical evidence does not support the existence of liquidity constraints in training

1.3.3.4.2 Productivity Oriented - Non-firm lead training

Previous section covered training in wich firms have a direct involvement, but there are trainings programs lead by the government, in many cases in behalf of firms. This type of programs may offer economy of scale in the provision but may reduce responsiveness to labor market needs as it creates additional level. This type of training is usually monitored by the Ministries of Labour.

An example of these programs is found in Germany. That country spends 0.1% of GPD on publicly subsidized adult education. They offer four types of programs: Basic education for adults, Further vocational training and related programs for job seekers, Target group

unemployed or at risk of becoming unemployed and Further vocational training for employed workers. Programs of the second and third type are examples of non-firm lead productivity enhancing interventions.

To be presented in the deployment section.

1.3.3.5 Learning in the workplace

Besides the education, apprenticeship and training opportunities to develop skills, there is a growing consensus that many skills are developed at the workplace, and this learning is a critical driving force for organizational success (Clark, 2004). Learning in the workplace includes mechanisms such as mentoring, coaching, job rotation, job-shadowing and special projects or assignments (Marsick & Watkins,1997; Gray, 2001). Also, learning in the workplace includes learning gained as employees go about their daily work, referred to as incidental learning or learning by trial-and-error. As Raelin (1998, p.280) suggests: "If knowledge is viewed as arising as much from active participation in the very apparatus of our everyday life and work, then we have to expand our conventional format of the classroom and, indeed, interpret the workplace as a suitable locus of learning".

Though, there is little evidence on how to facilitate or assess that learning process at the workplace. PIAAC shows that only 41% participate in formal or non-formal training (OECD, 2019). The literature to date on factors influencing learning assessment is significantly limited in being heavily training focused. Informal learning, by contrast, refers to that learning which occurs on-the-job, falling under the general rubric of workplace learning or development. In this line, the literature also highlights the importance of long-term relationships between workers and firms (Gibbons & Waldman, 1999) .

Learning opportunities have to expand beyond the workplace. Given the changing nature of skills, there is a consensus that skill ecosystems have to provide opportunities to develop skills through the life cycle of individuals, including opportunities for upskilling and reskilling. As indicated by the OECD (2019, p.20), "Skills development systems have to translate into life-

learning models with coordination from early childhood, including schools, vocational training, universities and adult learning".

1.3.4 Deployment of skills

As skills are developed, their effectiveness depends on the skill ecosystem's capacity to deploy them in the labour market. Deployment complexity has increased recent decades as the population grew, the labour market kept changing due to technological progress, and new occupations appeared as others disappeared. Further complexity has been added in recent years by globalization, digitalization, and the population's ageing (Brunello & Wruuck, 2019). Several efforts have been made to estimate deployment challenges through estimates of skills mismatches. The skills mismatch limits productive capacities and can generate underemployment through the inefficient allocation of resources across firms and even within firms. The origins of the skills mismatch can be related to the labour market's allocative efficiency or inadequate or insufficient education and training, either formally or informally (Asai et al., 2020). In the literature, several measures have appeared to assess the extent of skills mismatch. Some authors have identified that self-reported skills mismatch measures may not be accurate as individuals tend to over-report the required skills (Hartog, 2000). There are also potential problems with the firm's information. A study of European firms found that 47 percent reported difficulties in recruiting graduates, but genuine shortages were only 34 percent (McGuinness et al., 2017).

Evidence indicates differences in the deployment and redeployment of skills across countries. For example, Elsby et al. (2011) finds that labour dynamics in Anglo-Saxon (Australia, New Zealand, the UK and the USA) and Nordic countries much higher than the Continental European economies, i.e. there is a higher reallocation of labour.

Deployment challenges can be linked to asymmetric information with regards to the skills an individual has or the individual will exert once deployed into the work-place. These situations have been labelled as agency problems in the literature. A common approach to address agency problems is creating information through QF, and other solutions include optimal contracts to incentivize individuals to reveal their skills truthfully. QFs aims to reduce the information asymmetry, reducing a potential source of mismatches. Qualifications could be characterized into two levels, certifications and license. In both cases, they certify the

achievement of a minimum skill that should enable certain capabilities in the implementation of some tasks. Though there is a difference in what occupations require licensing. Usually, these are occupations in which societies perceived a negative impact of potential malpractices. Another major element of the information in qualification systems is that, as they are incorporated into the Register of Quality Assured Qualifications, it should support employers to "specify competencies for employment competencies and students know what competencies are needed" (OECD, 2008).

Mechanisms have emerged to support the deployment process by promoting better coordination between actors in the skill ecosystem in some countries. For example, a previously fragmented system in Norway has been replaced by an overarching coordination body (OECD, 2020).

A major challenge in skills deployment is the transition from school to work. Programs that promote labour market deployment directly seem to have the highest returns than those that address skills development (OECD, 2010, Achatz et al.,2020). Though, the impact is higher among disadvantaged young people (Musset & Kurekova, 2018).

In several countries, the deployment of vulnerable groups is supported by active labour market policies. Training is expected to provide better labour market opportunities to vulnerable groups, under the assumption that vulnerable groups lack employable skills (OECD, 2019). These training programs tend to focus on school dropouts, but they also focus on other groups in need of upskill and reskill. McCall et al. (2016) presents evidence on active labour market policies across developed countries:

- In the USA, evaluations of training programs do not provide systematic evidence in favour of those programs. Though among the evaluated interventions, the ones focused on adult women tend to be effective, the ones focused on adult man somewhat effective, and the ones focused on youth are not very effective.
- In the UK, evaluations find that active labour market interventions on the 18-24-year-old increase employment. However, there are differences in education/training programs vs labour placement programs, with a positive advantage over the former.

- In Germany, programs seem to be more effective for workers with less favourable employment prospects and when they provide sizeable amounts of job-related on-the-job training.

- In France, these programs' results mostly show negligibly impacts participant's employment rates and only sometimes positive ones. Though, the studies provide robust evidence of positive effects in post unemployment employment stability.

- In Sweden, active learning programs provide four lessons: First, general training on the compulsory and upper secondary increases earnings but after a long time. Second, effectiveness for the unemployed depends on economic conditions and institutional features. Third, programs that perform on job training fare better. Fourth, there important spillover effects of these programs.

- In Denmark, evidence from these programs shows that classroom training is largely ineffective in raising participants employment rates. On the job training performs considerably better than vocational classroom training. More interactions with caseworkers are more effective in reducing unemployment duration than participation in various activation measures.

1.3.5 Quality assurance

As skill ecosystems grew, the potential of agency problems (described above) to materialize increased. To address those problems, skill ecosystems have established quality assurance mechanism. However, quality assurance mechanisms are not new. For example, during medieval time, the guilds had precise quality assurance mechanisms: the graduating apprentices had to demonstrate their capability to satisfactorily perform tasks related to the chosen occupation not only to their master but also by peers.

In formal education, there are long traditions in several education systems to assess student learning by direct and indirect test. In post-secondary education QFs have a central role reducing reduce information asymmetries, and, by doing so, improved quality assurance leads individuals into higher employability, skills use and job satisfaction. Moreover, QFs can also be a bridge to re-engage with formal learning by limiting the amount of time and cost required to complete a credential. For employers, having a better understanding of their employees' skills can help avoid skills mismatches and lead to higher productivity and reduced staff

turnover. For society at large, skills recognition can improve skills matches in the labour market, leading to lower unemployment benefits and higher tax revenue (OECD, 2019).

The success of QFs relies strongly on their quality assurance mechanisms. As to the extent that the qualification descriptions match qualification holder skills mastery, actors in the system will trust it and potential reduction of agency cost reduced.

Chapter 2: Building a skill ecosystem: from initial institutions to the 1989 skill ecosystem reform

2.1 Introduction to the chapter

This chapter describes the evolution of the skill ecosystem from the early 1800s until 1989. It is divided into six sections. After this introductory section, the following four sections cover the evolution of the skill ecosystems linked to the period under the influence of a specific Education Act: 1847, 1877, 1914 and 1964. In each of these sections, the relevant legislation to the skill ecosystem is included to understand the underlying institutions. And, they include the environment, skills definition, skill development institutions, skill deployment institutions and quality assurance. The last section of the chapter summarizes the skill ecosystem's evolution and the institutions prevailing in the skill ecosystem in 1989, presenting the skill ecosystem's main elements vis-a-vis the literature review presented in chapter 1.

2.2 The early foundations of the skill ecosystem (the early 1800s – 1877)

2.2.1 Environment

This period covers European settlers' arrival in Aotearoa from the early 1800s until the economic downturn registered in the 1870s. Settlers brought the institutions that existed in the UK at that time, though they also brought the aspiration to build a more equalitarian society (Easton, 2016). The economic activity during this period was based on the extraction of natural resources: flax, timber, gum, gold, and the available fertility of the soil. A large number of settlers arrived during this period, especially after 1855, fueling economic growth. On the institutional side, a major development was the approval of the Constitution Act 1852, which established a representative government in the colony with a parliament and six provinces.

2.2.2 Skills definition

Regarding the definition of skills and the purpose of education, as settlers arrived in New Zealand, they brought the value of education and training that existed in the UK during those years: support for the provision of industrial training and instruction of the English language. One of the first legal references on the contents and objectives of schooling in New Zealand is found in the Native Trust Act 1844. The Act linked education with instruction "in the English language, and for a systematic course of industrial and moral training in English usages and English arts, and in providing for the relief of the sick…", that would lead to "their advancement in the scale of social and political existence" (Native Trust Act 1844, s.5). This objective of education is comprehensive as it covers academic, vocational and social skills and recognizes the value of education as skills to improve an individual's wellbeing

The first comprehensive legislation towards education in the colony was the Education Act 1847. This Act expanded the public support to education established in the Native Trust Act 1844. The objectives of education described in the Act: English language training and industrial training. The act also included religious education as the objective of education, but religious education was not compulsory (Education Act 1847).

Regarding the objective of non-formal education, one of the first references to apprenticeships' role in the colony is in the Destitute Persons Act 1846. Though the Act focused on a reduced group of the population, it defined apprenticeships as "any trade business of employment" (Destitute Persons Act 1846, s.11). The Master and Apprentice Act 1865 confirmed apprenticeships' focus, as indicated in the Destitute Persons Act 1846. Furthermore, it allowed the government to create apprenticeships expanding possible areas of apprenticeships.

2.2.3 Development of skills

The initial institutions in New Zealand to support the development of skills were private schools, an apprenticeship. Initially schools were private and offered heterogeneous quality of service delivery. Children from wealthy households attended fee-paying schools, while the rest had the opportunity to attend church schools and/or Sunday schools. Formal public funding to support the development of skills through schools started with the provisions of

the Native Act 1844, expanded by the Education Act 1847. This Act entitled the government "to establish and maintain schools for the education of youth and contribute towards the support of schools otherwise established" (Education Act 1847, s. 1).

Settlers also brought institutions for secondary education and universities. At the secondary level, private secondary schools appeared: the Otago Boys' High School (1863), Wellington College (1867), Auckland Grammar School (1869) and Otago Girls' High School (1871). With regards to universities, tertiary education started in New Zealand with the establishment of Otago University in 1869. Later, the New Zealand University Act 1870 was passed, and the University of New Zealand was established in 1874 as the only degree-granting university in New Zealand (this university absorbed Otago University).

In terms of governance of the emerging education system, the Education Act 1847 gave a strong role to the local education boards. The education board provided grants for existing schools and additional funding for additional schools (Cumming & Cumming, 1978). The University of New Zealand had oversight of the university system.

The Master and Apprentice Act 1865 was the first act focused on apprenticeships. The Act regulated ongoing practices and defined the provider of the apprenticeship as "any householder tradesman farmer or other person exercising any trade art or manual occupation", and the apprentices as individuals to "be instructed in such trade art or occupation" (Master and Apprentice Act 1865, s IX). The limited requirements on the providers facilitated the expansion of the practice. There was no formal public involvement.

2.2.4 Deployment of skills

There is no major reference in the regulations in this period on the deployment of the developed skills. However, there was a close relationship between local schools and apprenticeships, with the local labour market supporting the school to work transition, school to apprenticeship transition, and/or apprenticeship to work transition.

Regarding institutions in the skill ecosystem to support disadvantaged groups skills' development, the Destitute Persons Act 1846 showed initial concerns to provide skill development opportunities to those populations.

2.2.5 Quality assurance

There were no output-based mechanisms to monitor quality during this period, either for the schools or apprenticeships. Though some quality assurance actions, mostly focused on assuring the quality of the service delivery, were implemented. The first formal quality assurance in the emerging skill ecosystem was the establishment of the school inspectors, appointed by the governors. The inspectors reported on the "nature and extent" of the industrial instruction and the attainment of the children. The inspectors had that mandate to inspect schools at least once a year (Education Act 1847).

Regarding apprenticeships, the Master and Apprentice Act 1865 focused on ensuring proper conditions for apprentices and limiting the likelihood of employers taking advantage of their apprentices. The minimum and maximum age reference age participate in apprenticeships were established at fourteen and eighteen-year-old, respectively. Furthermore, the Act established that apprenticeships should not exceed five years and should expire when apprentices reached 19-year-old or married. Furthermore, the Act also established that apprentices could be as young as twelve years old and perform unskilled labour.

2.3 Setting up a modern skill ecosystem (1877-1914)

2.3.1 Environment

The period began with an economic depression that lasted until the early 1890s, when the economy moved into a period of prosperity until the 1920s. The economic depression originated by the end of the extraction oriented economic period, and the collapse of the City Bank of Glasgow (Hunt, n.d.). There was a migration from rural areas to urban areas that led to the appearance of a pre-industrial economy and a growing union movement.

Technological change supported the recovery as the economy benefitted from the introduction of refrigeration into international transport, which opened overseas markets for meat and butter, and New Zealand became a major exporter of staple goods. The continuous prosperity of this period allowed the expansion of local industries and services.

At the beginning of the period, there was not enough industrial base in New Zealand to sustain a strong demand for skills development (Abbott, 2000) , but, as the economy grew, the demand for skilled individuals increased as demanded per the new technologies' requirements.

2.3.2 Skills definition

Responding to the growing complexity of the economy and a growing need for specialization, formal differences between academic and technical skills appeared. Through the Education Act 1877, schooling increased its academic focus from the broader scope included in the Education Act 1847, as it established instruction in "Reading, Writing, Arithmetic, English grammar and composition, Geography, History, Elementary science and drawing, Object lessons, Vocal music". The Act did not address the labour market, nor the industry needs, with the exceptions that it allowed, in the case of girls, "…sewing and needlework, and the principles of domestic economy" (Education Act 1877, s. 84), and, with regards to boys, Military drills (Education Act 1877, s. 85).

With regards to technical skills, the Manual and Technical Elementary Instruction Act 1895[1] presented the definition of technical skills. The Act defined:

> "***Manual instruction*** means instruction in the practical handling of tools, and in the actual construction of models and other articles in wood, metal, clay, or other material."
>
> "***Technical instruction*** means instruction in the principles of science and art applicable to industries, and in the application of special branches of science and art to specific industries or employment; it does not exclude such instruction in the use of tools and appliances as is necessary to the full illustration of the application of any branch of science or art to any specific industry or employment."
>
> (Manual and Technical Elementary Instruction Act 1895, s.2)

An important element regarding the definition of schooling and its objectives was the 1904 school curriculum reform. The reform represented a change from previous curriculum approaches based on the mainland and proposed a more practical educational approach. The

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1 Later replace by the Manual and Technical Instruction Act 1900.

reforms allowed the curriculum to include practical subjects, de-emphasized fact cramming and rigid standards and allowed teachers more liberty (van Rij, 2008).

2.3.3 Development of skill

The Education Act 1877 introduced free and compulsory education to 7 to 13-year-olds. This mandate was reinforced by the School Attendance Act 1894 and later adjusted to 14-year-olds in 1901 (Tearney, 2016). The Education Act 1877 expanded education options later complemented by the Manual and Technical Elementary Instruction Act 1895 and the Secondary Schools Act 1904.

In 1886, the Wellington School of Design established as New Zealand's first technical school, followed by the Dunedin Technical School (1989), Wanganui Technical School (1892) and Auckland Technical School (1895). The Manual and Technical Elementary Instruction Act 1895 expanded the supply of technical education. The Act established the mechanisms to finance technical education, including charges. The Act was complemented by the Manual and Technical Instruction Act 1900 and later amended in 1902 and 1904. Under these acts' provisions, technical High-Schools were created, establishing de-facto an academic and vocational education system in New Zealand. There was an initial high demand for vocational schools as it was perceived as free training to acquire skills relevant to trades and office work (Swarbrick, n.d.).

Additional opportunities for skill development came from the Secondary Schools Act 1904 expanding the Education Act 1877 to secondary education. The act officialized public support to those schools and mandated free secondary education for primary school certificates holders. The Act did not address the objective of this level of education or its contents. Secondary education was focused on university entrance exams (Tearney, 2016).

With regards to the governance of the formal education system, the Education Act 1877 changed the governance structure for the education system, with the participation of a Department of Education, twelve education boards and school committees. Boards received significant autonomy in the management of schools (Tearney, 2016). The act also created rules for the appointment of teachers and inspectors by the boards.

Regarding non-formal education, during the period, the Master and Apprentice Act 1865 remained valid, though the functioning of the apprenticeship system changed in response to the Industrial relations legislation changes in the 1890s.

2.3.4 Deployment of skills

There is no formal reference to skill deployment in the legislation. However, there are growing links between providers of education/training and the private sector, though increasing participation of the business community in education boards likely supported the relevance and favored the school to work transition. For example, in technical schools, the Governor established the subjects of manual instruction and technical instruction and the subjects to be taught in continuation classes considered under that Act.

To support the development of skills to the disadvantaged population, the Industrial Schools Act 1882 was approved. It focused on developing skills for a relatively small population segment, the neglected and delinquent children. However, it provides information on the importance of education and the ongoing vision towards education at that time, and how to transition from formal education (schools) and non-formal (apprenticeships). The Act established the requirements to transition from industrial schools to apprenticeships establishing minimum standards to protect apprentices: candidates had to have obtained the primary education certificate or be 14-years-old to join an apprenticeship.

2.3.5 Quality assurance

During this period, a proper system of quality assurance for education started. First, the Education Act 1877 sought to standardize education results, reducing differences in service delivery. For example, the class-books to be employed in class should be approved by the education council. Second, to quality assure learning and proper use of resources, the Act expanded the role of school inspectors created under the Education Act 1847. The inspectors became assessors of student learning for all years. If students failed the examination given by the inspector, they had to repeat the school year. Later, two types of student assessment were introduced: inspectors issued the Proficiency and the Competency awards for students

that passed Standard 6 and Standard 5, respectively, and schoolteachers assessed other grades (Tearney, 2016).

With regards to technical schools, the Manual and Technical Elementary Instruction Act established a parallel quality assurance system for technical schools based on inspectors for manual and technical education. Additionally, the Act gave the Governor the power to issue Certificates, introducing certification for technical studies.

The Industrial Conciliation and Arbitration Act 1894 and its Arbitration Court limited negative impacts of potential abuse of the apprenticeship program by employers. The Act helped to set minimal conditions for apprenticeships. These changes came as trade unions pushed for improvements in apprentices' conditions: adequate training and appropriate apprentices' ratios to skilled workers.

2.4 Expanding the reach of the skill ecosystem (1914-1964)

2.4.1 Environment

New Zealand's participation in World War I and II and the post-war period marked this period. After World War I, a brief period of commodity-export led to economic growth that ended as the Great Depression affected the economy. In the post-war period, the economy enjoyed a relatively long period of growth led by the commodity-export sector. The economy was focused in agriculture, with a substantial public sector, commercial employers and building construction (Abbott, 2000).

After the wars, there was a concern to sustain high economic growth rates, and some authors have indicated that significant economic distortions were introduced to guarantee full employment between 1940 and 1970. Though, authors also indicate that those distortions created high economic inefficiencies (Singleton, 2008).

Linked to economic growth and technological change, the demand for skills accelerated throughout the period. Pressure started early in the period as the introduction of new equipment in response to developments in electricity, and motor cars made some trades irrelevant. This raised concerns about the education system's capacity to provide the required

skills early in the period. At the beginning of the period, the Cohen Commission was tasked to assess the situation of the education system in New Zealand. Their report covered the relevance of the education being delivered as well as governance issues of the sector. Regarding the relevance of education services, the report found that education was not closely related to most post-primary students expected vocational requirements. Regarding governance, the report found a complex system that lacked uniformity and financial accountability (Tearney, 2016).

Despite those initial concerns and limited initial demand in comparison to Australia and the UK given the relatively more minor industrial basis (Abbott, n.d.), vocational education and apprenticeships were popular throughout the period, and during "the first half of the twentieth century young New Zealanders acquired skills mainly through apprenticeships and on the job training" (Abbott, 2000, p. 94). For example, in the 1950s, approximately 30 percent of male school leavers expected to enter a skilled trade by completing an apprenticeship. However, female school leaver participation in apprenticeships was scarce, except in traditionally female trades such as women's hairdressing.

Though, in the 1950s, the technology changes increased the demand for more sophisticated training, especially in engineering, creating a need for additional institutions in New Zealand's skill ecosystem.

2.4.2 Skills definition

During the period, the skill ecosystem evolved with a stronger focus on fundamental skills and efforts to accommodate the larger, heterogeneous demand for skills. A new curriculum was published in 1929 which supported flexibility in teaching and opened with character-training (Tearney, 2016). This was followed in 1944 by the creation of a new secondary education curriculum that included English language and literature; social studies; general science; elementary mathematics; music; a craft or one of the fine arts (or home craft for girls); and physical education (Swarbrick, n.d.).

Major efforts started to define occupation-specific skills. For example, definitions were put together by the Department of Education that started assessing trade qualifications in 1928. The local apprenticeship committees established by the Apprentices Act 1923 participated in

the process, which continued under the Apprenticeship Act 1948 and later with the creation of the New Zealand Trades Certification Board (established in 1949). The process was reinforced by the creation of the New Zealand Council for Technical Education by the Ministry of Education in 1958 (Murray, 2001).

2.4.3 Development of skills

Supported by the Education Act 1914 and following regulations, a strong expansion of the education and training sector continued during this period. Several key measures supported the expansion: greater financial support to secondary schools (Education Amendment Act 1920); creation of intermediate schools during the 1920s (Tearney, 2016); creation, in 1922, of Correspondence Schools to provide primary education instruction to students in remote areas of New Zealand and later in 1928 for secondary education; and the elimination of entrance exams into secondary education in 1936. Taking advantage of the expanded school opportunities in secondary education, an Order in Council in 1944 raised the school leaving age to 15 years old.

Regarding governance, the Education Act 1914 created a national system for grading and appointing teachers, a role that previously rested on the school committees. The act also transferred the inspectors from the Boards to the Department (Alliston, n.d.). With regards to school finances, the Education Lands Act 1949 nationalized educational endowment. This evolution simplified payments to schools.

In the governance of the post-secondary education, the University of New Zealand was dissolved in 1961 (Education Act 1961), resulting in four independent universities and two associated agricultural colleges: the University of Otago, the University of Canterbury, the University of Auckland, Victoria University of Wellington, Canterbury Agricultural College and Massey Agricultural College. The Act created the New Zealand Vice-Chancellors' Committee as a coordinating body and the University Grants Committee (UGC) with financial and academic responsibilities. To finance universities, the UGC established the full-time student equivalent and a five-year financing period.

Apprenticeship and related training opportunities grew significantly during the period. There was an important growth in training opportunities given the expansion in the education

system. Expansion that continued as Apprentices Act 1923[2] started the formalization of apprenticeships and their requirement for training. The Act included provisions on technical schools, creating links between formal and non-formal education. For example, in 1925, the first levy on employers to support training link to apprenticeship was implemented (Murray, 2001).

The virtuous relationship between apprenticeships and training generating skills development accelerated by the Apprenticeship Act 1948. The Act established a national apprenticeship committee with representatives of the industry and unions. The National Apprenticeship committee took the lead on the development of training as they prepare the apprenticeship requirements. By 1950, technical education became standard within the apprenticeships, introducing training away from the workplace[3]. The establishment of the New Zealand Certificate in Engineering followed by building, architecture, and land surveying sector contributed in dynamizing the supply of training providers (Abbott & Doucouliagos, 2004) . With regards to the governance of apprenticeships, the Apprentices Act 1923 became the Registrar of Apprentices, and factory inspectors became the District Registrars (Murray, 2001).

The expansion of training and new ideas with regards to secondary education led to a shift of technical education into post-secondary level instruction. By 1960, the first technical institutes appeared in large metropolitan areas, followed by community colleges in the rest of the country. However, these institutions were not allowed to grant degrees (Abbott, n.d.).

2.4.4 Deployment

The demand for skills grew and diversified, efforts to support the deployment expanded through the period as well as effort to support those that were not benefitting from the development of the skills development. An early effort to improve school graduates' deployment happened as the Department of Labour set up juvenile employment offices. The Department collected information on school leavers to help them in the school to work

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[2] This Act was later updated by the Apprentices Bill 1932.
[33] The expansion of this practise was facilitated by the establishment of the Technical Correspondence School in 1946.

transition. This innovative strategy ended in 1926, though, focus on the youth and the relatively lower opportunities remained through the period.

By the Apprenticeship Act 1948, a focus to better anticipate the industry's skill demand appeared as the Apprenticeship Committees were required to estimate the manpower requirements of the industry.

The appearance of certifications with the Ministry of Education's support, local committees, and national committees allowed for the reduction of asymmetric information. Furthermore, the committees' participation, with stronger ties with the industry, made training and apprenticeships more relevant to the industry, likely facilitating the deployment of the apprentices.

2.4.5 Quality assurance

During this period, there were important developments to quality assure education and training. To ensure the quality of the education system, in 1934, a school certificate was created, while in 1936, the proficiency certificate with a focus on primary education was abolished. The system was strengthened as the school certificate became a test the Fifth Form and the creation of the university entrance examinations (Education (Post-Primary Instruction) Regulations 1945).

With regards to quality assurance of training, an initial effort was made by the Department of Education as it introduced technical examinations for plumbing, carpentry, joinery, building construction, painting and decorating, motor mechanics, and mechanical engineering (Abbott, n.d.). Committees established under the Apprentice Act 1923 and Apprentices Act 1948 also participated in the training programs' quality assurance. In 1949, the New Zealand Trades Certification Board was established, launching a New Zealand Certificate in Engineering in 1955. Other trades followed the lead of engineering issues certificates—the Technicians Certification Act 1958. The Act created Technical Certification Authority which introduced additional formality in the sector, as it had the mandate to appoint examiners, moderators, supervisors and assessors for those examinations. The Authority also prescribed conditions for entry to such courses and to give exemptions where it considers it appropriate.

The Authority issued diplomas or certificates independently or in conjunction with any other examining body for persons in recognition of his having completed the required courses.

With regards to quality assurance of apprenticeships' service delivery, the Apprenticeship Act 1923 gave the Arbitration Court the power to quality assures the Apprenticeships, in terms of wages, hours, conditions, the proportion of apprentices to journeymen, the period of apprenticeship, minimum wages of apprentices in any industry. But, later, greater power was given to the committees by the Apprenticeship Amendment Act 1927.

2.5 Later changes between 1964 and 1989.

2.5.1 Environment

Two major factors affected the skill ecosystem during this period. On one side, further technological progress supported the economy, but the growing automation affected the mix of the skills demanded. On the other side, New Zealand's high protection levels started to disappear as the UK joint the European Union. Given the economic changes during the period, unemployment, especially youth unemployment, became a significant challenge for New Zealand.

Nonetheless, given the technological progress and the changing dynamics across sectors, skilled workers in key trades were in short supply. At the same time, the number of apprentices declined as the interest in trades diminished, and the social status of workers in trades dropped as it was perceived that relevance was declining given the changing training requirements (Ministry of Education, n.d.).

2.5.2 Skills definition

Efforts to ensure the relevance of the skill ecosystem continued during this period. A key development during this period was the creation of the Vocational Training Council through the Vocational Training Council Act 1968. Among others, the council had the responsibility to make recommendations and carry out research on contents and other functions in respect of the training of persons for vocations, including demand trends, etc. Under the guidance of the Council, industry training boards were created, starting in 1971 (Maurice-Takerei, 2016).

Later on, by the Vocational Awards Act 1979, the Authority for Advanced Vocational Awards (AAVA) was created. It took a leading role in skill definitions for qualifications, and its authority was a continuation of the Technicians Certification Authority (Vocation Awards Act 1979). The AAVA was responsible for assessing the curriculum for trades qualifications, certifying institutions suitable for delivering those qualifications and setting examinations and issuing qualifications.

2.5.3 Development

The Education Act 1964 consolidated several changes introduced in the education system since 1914. The Act formalized the polytechnics, institutes of technology, technical institutes and community colleges created in 1960. Later, in the 1980s, Wānangas were established to provide post-school technical education and training for Māori.

The Apprenticeship Act 1983 was approved giving a stronger role for industry in the apprenticeship program (Murray, 2001). Apprenticeships within the act had on-job and off-job components. The off-job training was aimed to happen at polytechnics, while the on-job component of the apprenticeship system was a time served model, and the program received strong financial support from the government. For rural areas, the Primary Industry Cadet was established, which also combined on-the-job and off-the-job training (though, to a lesser extent). By 1991 there were 36 NZ apprenticeship committees and 350 local apprenticeship committees (Ministry of Education, n.d.).

By the end of the period, and linked to an ongoing market-led wave of reforms, several traditional providers of apprenticeships, including the Post Office, New Zealand Railways, the Government Printing Office and other institutions of the public sector, stopped training.

2.5.4 Deployment

In this period, there was a growth in the system's capacity to monitor skill demand and provide support for disadvantaged populations. For example, the Labour Planning Unit was established in 1966 at the Department of Labour's Research Section.

To address rising youth unemployment, the Department of Labour launched the Young Persons Training Program. Under the assumption that a lack of skills caused unemployment,

the program provided pre-vocational or life skills for 18 and 19 years old. Another program focused on the 15-16-year-old called the School Leavers Employment and Preparation Scheme (STEPS). Additionally, the Transitions Teacher Program was created to support the school to work transition (Gordon, 1989).

To further support youth's needs in their school to labour market transition, the government launched the ACCESS program. The was sponsored by the Department of Education and the Department of Labor. The former was in charge of the school-related activities while the later of the post-school training (Murray, 2001).

2.5.5 Quality assurance

Regarding formal education, there were important changes, as there was a push towards a more labour market-oriented school certificate that recognizes and reports on the full range of learning. In 1969, Sixth Form exams were introduced. The exams started to be used by employers to assess achievement in academic and vocational subjects. In 1986, the University Entrance exam was eliminated, and its functions were replaced by Sixth Form Certificate.

As mentioned above, the AAVA was created, having as one of its functions the awarding certification and certifying institutions as suitable for delivering those qualifications and setting examinations and issuing qualifications. It do so by "vigorous and comprehensive" (Imrie, 2012 (Reprint), p. 105) process. It complemented the Trades Certification Board, as that Board focused on entry-level trades qualifications, while the AAVA focused on the New Zealand Certificates (later to be included in the NZQF levels 5 and 6).

2.6 Summary of the skill ecosystem before the 1989 skill ecosystem reform

The previous sections in this chapter described the evolution of New Zealand's skill ecosystem from the arrival of European settlers in the early 1800s to 1989. The initial elements of the ecosystem were brought from the UK, but, the ecosystem adapted to the local environment and the aspirations of the settlers of a more equal society. The development of the skill

ecosystem has been intense through the almost two centuries covered by the chapter, with constant adjustments as reflected in several acts and amendments (see Figure 2).

Figure 2 Main Legislation 1800s to 1989
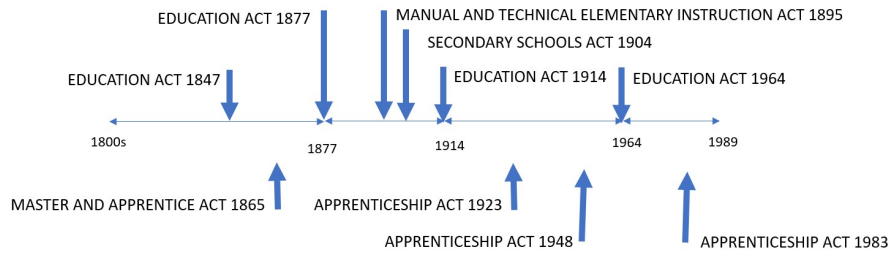
The emerging skill ecosystem had the strong belief that education and training has the potential to improve individual's wellbeing. The strong belief of the benefits of education and the desire of an equalitarian society made New Zealand one of the first to expand education through public support, support that continued through time. By 1944, all the New Zealander's younger than 15 years old should be in school.

Since early days, there was a consensus a broad-focused skill ecosystem, covering both general and vocational themes. However, the country has struggled to find the right balance between types of skills, especially as the technological change reached New Zealand. Both, the public and the private sector had an active role. A strong public sector participation compensated the low industrial base. Private sector participated early on governance mechanism, participation strengthened in 1923 with the appearance of the first local committees, and later the participation in the Technical Certification Authority and the AAVA. By 1980, industry councils were instrumental to assess local demand with participation of private sector.

The modality of delivery also evolved. In late 1890s, there starts a de facto separation between general and vocational secondary education and early 1900s, apprenticeships responding to high demand of skills, started to have an on-job and off-job component. Off job-component was possible given the development of technical high school and incentivized

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the initial development of the system. By the 1950s, technical education was solid and, the division of in secondary education was eliminated, guaranteeing a solid foundations to everyone.

Despite some initial efforts to support deployment of skills and facilitate access of the disadvantaged population, a major move on that line came in the 1970s and 1980s as the prevailing economic model faced major changes and there were high unemployment rates. Though, the effective of those measures is yet to be determined. Apprenticeships started to be employed as active labor market polices, likely affecting the overall perception towards those programs.

Even though New Zealand is traditionally labeled as an LME, the development of its skill ecosystem had elements commonly associated with CMES as the strong commitment to universal schooling early on and a constant supply of vocational education. The popularity of vocational education in the 1950s ratifies the strong role that vocational education had in New Zealand. However the system, despite the efforts to adjust and allow larger provision of the private sector, was in crisis in the late 1980s.

Chapter 3: The 1989 skill ecosystem reform

3.1 Introduction to the chapter

This chapter describes the 1989 skill ecosystem reform and assesses its impact on New Zealand's skill ecosystem and the economy. After presenting a New Zealand focused literature review in Section 3.2, the chapter presents the skill-related legislation between 1989 and 2019 (and related, complementary information). The assessment is done by following the five areas of analysis identified in the theoretical framework (presented in chapter 1): environment, skills definition, skill development, skills deployment and quality control.

Then the chapter assess the impact of the reform. First, by assessing its direct outputs (represented by level 1 changes in Figure 3). Then, focusing in changes in individual and firm behaviours (represented by level 2 changes in Figure 3). And, lastly, aggregate variables of the economy (represented by level 3 changes in Figure 3). Given the lack of a contra-factual, i.e. we could not observe a New Zealand without the reform, and gaps in information, i.e. there are no information on firm level shortages in 1989, Section 3.3 and 3.4 implement several complementary strategies, including comparisons with similar countries, assess differences in data trend before and during the implementation of the reform, and gaps between the reform's actual outcomes vis a vis the expected ones. Section 3.4 also employs econometric techniques to assess changes in the country's economic dynamics throughout the reform's implementation.

Figure 3 Evaluation Strategy
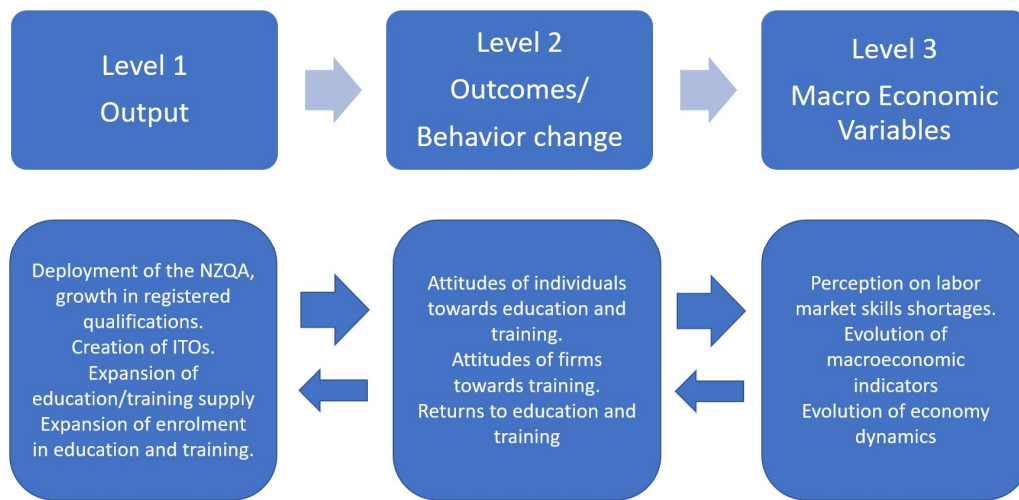
This chapter includes a comprehensive analysis of existing data covering different elements of the skill ecosystem. The data covers: (i) qualifications at the NZQR, including levels, providers, version, approval date, expiry date; (ii) enrollments in education, training and apprenticeship programs from the Ministry of Education, complemented with data from World Bank for years not included in the Ministry of Education database and information on comparison countries, (iii) efficiency of the education system and young population NEET from the OECD; (iv) student learning and student occupation expectations at age 30 from the OECD's PISA; (v) adults perception towards training, skills participation from OECD's PIAAC; (vi) labor market transition from StatsNZ's LEED; (vii) firms strategies on skills acquisition from Business Operations Strategy (BOS) Survey 2016 from StatsNZ; (viii) aggregate macroeconomic variables of GDP, GDP per capita, employment, unemployment rate, participation rates from StatsNZ.

3.2 Selected studies on elements of skill ecosystem in New Zealand

Dalziel (2010) review of Canterbury's skill ecosystem is the first comprehensive but geographically focused study of New Zealand's skill ecosystem. The review identified the

ecosystem's large scope, identifying the Chamber of Commerce, the ITOs, private training providers, private consultants, and institutes of technology's participation. The study also identified regional networks: (i) trade associations, who have the legal responsibility to work with their industries to create strategic plans and the inform the provision of training; (ii) the tertiary network, the Canterbury Training Providers Association and Canterbury Tertiary Alliance, and (iii) informal networks and industry partnerships, such as the Trade Innovation Institute at the Christchurch Polytechnic Institute of Technology (CPIT). All these actors and networks were actively involved in addressing the skills challenges in Canterbury. The analysis focused on post-secondary education skill development.

The 2019 OECD's Skills Dashboard (OECD, 2019) provides a comprehensive assessment of New Zealand's skill ecosystem. Though it doesn't use the ecosystem definition, it shows the good standing across skill ecosystem's components. The dashboard shows that New Zealand outperforms most OECD members in the development and use of skills. Regarding the development of skills, New Zealand is among the top fifth of OECD countries on the inclusiveness of its tertiary education, the foundational skills of adults and culture of adult education. New Zealand is above the average on: skills comprehensiveness including the inclusiveness of the process development, and provision of tertiary level skill to the youth. On development, New Zealand's performance is only below Sweden, Netherlands, Korea, Japan, Finland, Estonia and Canada. Regarding the use of skills, New Zealand performs in the top fifth of OECD countries in activation of skills in the labour market, inclusiveness in the labour market, intensive use of skills and use of skills in daily life. Above the average on designing the workplace to use skills effectively and skills use stimulated by innovation. However, New Zealand is below average on alignment between skills and the labour market. In deployment, New Zealand has the second-highest indicators among OECD countries, only behind Denmark. The dashboard does not assess how the 1989 skill ecosystem reform helped New Zealand to achieve its current good performance.

Several studies have been put together in New Zealand to assess the functioning of different elements of New Zealand's skill ecosystem. The studies themes can be categorized in: assessment of the 1989 reform, the impact of NCEA, characterization of firm activities towards training, returns on post-secondary education and training, mismatches and turnover rates. Results of these studies are in general supportive of the reform and different

policy actions been implemented with regards to skills in the country. A summary of those studies is presented in Table 2.

Table 2 Research on New Zealand's skill ecosystem

Author	Assessment
Grey & Scott (2012)	**Scope of the 1989 skill ecosystem reform** The reformed aimed to: "i. Implementation of free-market ideas; ii. The creation of a single tertiary education sector; and, iii.The implementation of the sector's strategic steering to meet pre-determined government objectives".
Strathdee (2003) Strathdee (2009) Strathdee (2011)	**Scope and impact the 1989 skill ecosystem reform** The qualifications framework in New Zealand is reproducing existing inequalities. The reform may be creating a more elitist tertiary education system.
Productivity Commission (2017)	**Scope and impact the 1989 skill ecosystem reform** The tertiary education system was not "good at trying and adopting new ways of delivering education and does not have the features that will allow it to respond flexibility to changing circumstances".
Chamberlain (2003)	**Impact of NCEA** Schools that have embraced NCEA have reported benefits.
Goh (2005)	**Impact of NCEA** NCEA aims to equip secondary school students with skill-based education better to compete in the global economy. New Zealand will once again feature as a world-class model in education delivery.
Vaughan et al., (2011)	**Firms Activities Towards Skills Development** Characteristics of successful training environments. The study identifies suitable training environments in New Zealand. Training systems have support at the institutional level, have a structured orientation to the job, using good teaching strategies to support structured learning activities, learning from experience and use formative and summative assessments.
Coetzer & Campbell (2006)	**Firms Activities Towards Skills Development** In New Zealand, employees in SMEs acquire knowledge and skills mainly through informal interactions. In general, employers have a limited vision of what learning is, for example, it won't include personal development.
Pio (2007)	**Firms Activities Towards Skills Development** Positive views of firms towards training. Firms are increasingly becoming aware of the importance of training and development as they become more technologically sophisticated, multiethnic and older. There is evidence that the government and the corporate sector are working together to strengthen the quality and capability of the system, provide more opportunities for on-the-job training and increase the skills of all the population for effective participation in the knowledge society
OECD (2013)	**Firms Activities Towards Skills Development** Individuals indicated difficulties in accessing skills while many firms did not have training strategies or have trainees/apprentices (based on a 2008 survey). Some firms indicated that preference to hire skills than building skills in house. Though, some firms highlighted that developing a learning culture is a key element in to build a competitive strategy of the firm.
Maurice-Takerei (2016)	**Firms Activities Towards Skills Development** Employers are historically reluctant to support training, and there are different perceptions on how to support training. Many employers have incorrect expectations on what to expect from new employees.
Patel (2019)	**Firms activities towards Skills Development** Focused on ITOs. Limited capacity to identify needs and transform them into training contents.
OECD (2008)	**Returns of post-secondary education**

	Returns to tertiary education are low in New Zealand.
Scott (2009)	**Returns of training** Participation in education and training yields a positive result, with differences only by level and not by the type of provider. Though, the positive results appear after three years of participation. The study also finds differences across fields of study. With regards to the type of provider by the level of study, in most cases, there are no statistically significant differences after one year or three years (only Wanangas have a lower pay among Level 1 to 3 certificates and ITPs among bachelor's degrees).
Crichton & Dixon, (2011)	**Returns of training** No gains for completing level 1-3 or 4 qualifications over three years following completion of the degree. Completing a level 5-6 qualification benefits women, but there were differences across fields of study.
Crichton (2012)	**Returns of training** Positive increases in earnings associated with completed training qualifications, ranging from 2% for those completing a limited credit program to 7% for those completing a level-4 qualification.
Earle (2020)	**Assessments of mismatches** The study uses data from OECD's Survey of Adult Skills. The study finds that New Zealand has one of the highest rates of qualification level mismatch among OECD countries.
Elsby et al., (2011)	**Turnover rates in NZ** A distinctive feature in New Zealand's labour market is its high turnover rate in comparison to other countries.
StatsNZ (2013)	**Turnover rates in NZ** Using LEED and HLFS, confirm high turnover rates.
Coleman & Zheng (2020)	**Turnover rates in NZ** Using LEED confirms high turnover rates.
OECD (2008)	**Skill deployment activities.** The STAR program provides students with pathways with learning plans to gain skills and knowledge in a workplace in a local community. TEC evaluated the program in 2003 finding positive outcomes

3.3 The design of the 1989 skill ecosystem reform

This section describes the key legislation enacted by the 1989 skill ecosystem reform (See Figure 4). It covers: environment, skills definition, skill development, skill deployment and quality assurance. It is important to highlight that there were three subperiods in the reform. In the first, from 1989 to 1999, the reform was introduced. In the second, from 1999 to 2011, the reform was adjusted to generate a better dynamism. And, in the third, the reform saw its quality assurance mechanisms strengthened.

Figure 4 Legislation 1989 skill ecosystem reform
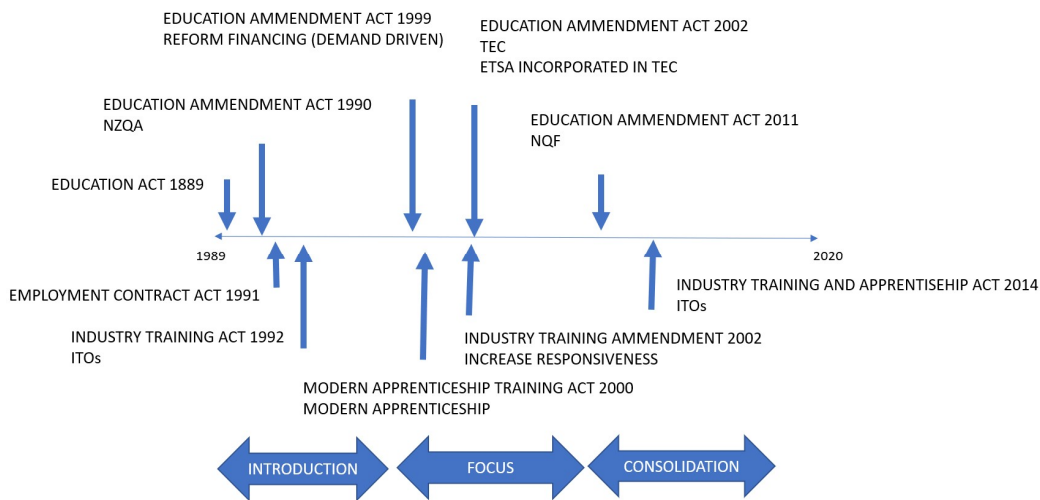
3.3.1 Environment

Before the reform, New Zealand's economy was one of the world's most regulated countries (Government of New Zealand, 2021). That model rendered positive results for several decades, but, global changes in the late 1970s and 1980s affected the model, leading to deteriorating economic conditions. New Zealand had to move relatively fast from a closed secure economic environment in which the economy was isolated from the rest of the world to a very competitive and dynamic global market. Diagnostics identified the economy's low productivity as a major risk towards the adaptation to the new circumstances. To boost its productivity, the country engaged in a series of bold policy reforms, most of which were market-led, including a wave of privatization of public enterprises. Reforms were successful and New Zealand became a faster-growing economy. However, the structure of the economy changed dramatically: Agriculture and Manufacturing were replaced by Professional Services, Tourism and Construction as the main drivers of economic growth.

Lack of skills and skills mismatch were cited as areas for improvement. There was a stagnation in attainment as, in 1986, one-third of students were leaving the education system without qualifications and tertiary education enrollment rate was low (Productivity Commission, 2017). And there was a perceived lack of relevance of skills and the tertiary education providers' perceived capacity to respond to changing needs was limited. And, through out the reform's implementation, there was a perception that demand for skills was growing, a

broader participation in post-secondary education was required (particularly for disadvantaged groups), and that skill requirements were likely to evolve over an individual's working life (Crawford, 2016). In the 1980s, the training system was perceived as bureaucratic and slow to adapt to the rapidly changing economic conditions. Similarly, the vision towards apprenticeship was not positive, as they did not facilitate portability of the acquired skills across employers as they were not formally recognized (Ministry of Education, n.d.).

Regarding the sector governance, in 1988 the Picot Report identified schools as "overcentralized". The report suggested devolving control to schools (Openshaw, 2014). In the same year, the Hawke Report suggested an increase in tertiary institutions' autonomy and support for lifelong learning regarding post-secondary education governance. The report highlighted that senior secondary schools, alongside other post-compulsory education institutions such as polytechnics, universities and on-the-job training, had a key role in responding to market skills needs and questioned academic, vocational distinctions in education/training (Tearney, 2016). In 1994, the Todd Report address the private sector's participation on expanding the supply of education and training and recommended the expansion of Private Training Establishments (PTEs) through public funding (Stephens & Boston, 1995). In 1987, the Probine-Fargher Report indicated the need for a qualification reform the need to improve the coordination in a system with a large number of institutions (Snook, 1991).

Although the system was perceived as centralized, it had let to disorganization. There were 50 examining or registering bodies, 28 industry training boards, 30 apprenticeships committees and 350 Local Apprenticeship Committees (Ministry of Education, n.d.). A system that could integrate better the different elements was needed with a more flexible system of credit transfer and recognition of prior learning. With regards to quality assurance, for example, apprenticeship was simply a time-served model, without a focus on the skills acquired by the participants.

The economic reforms in the 1980s affected the skill ecosystem directly. Before the economic reform, the development of some key trades like technicians, carpenters, engineers, plumbers, mechanics and electricians was done mostly by the Ministry of Works, Electricity Department, The Forest Service, Railways and the Post Office. The 1989 skill ecosystem

reform had to ensure new mechanisms were established to ensure adequate provision of those trades in the economy. And, another major change that the skill ecosystem had to adapt was the sharp reduction in the participation in unions brought by the changes in the economy and the Employment Contract Act 1991. The share of New Zealand in unions in 1991 was the lowest it had been since 1897 (Abbott, 2000). As unions had a strong presence in the pre-reform mechanisms of skills development, new mechanisms were needed to ensure proper employee's representation.

3.3.2 Skills

The 1989 skill ecosystem reform had, a as major theme, to provide the skills that the industry needed. A first step to on skills definitions was by the Apprenticeship Training Act 1992. The Act defined skills as "includes methods and knowledge" and skill standard as

> "
> means a specification of skills, and levels of performance in those skills; and in relation to any industry training (or proposed industry training), means a specification of some or all of the skills in which training is (or is proposed to be) received, and the levels of performance in those skills intended to be attained by people receiving the training."
>
> (Industry Training Act 1992, s.2)

The operationalized the objective of the reform, a focus on skill outcomes across the education and training system was launched. On primary and secondary education, in 1993, the New Zealand Curriculum Framework was published, with its focus changed from contents to outcomes. The new curriculum was expected to generate an inquiry-based learning approach and, by doing so, produce better citizens. A revision of the curriculum was published in 2007, to strengthen the education system's lifelong learning approach (Tearney, 2016).

For practical definitions of skills beyond the foundational skills, the Education Amendment Act 1990 created the NZQA. The NZQA has the mandate to oversee the process for definition, development, deployment and quality assurance of skills. Regarding the definition of skills at the industry level, the NZQA relied on the ITOs, created by the Apprenticeship Training Act 1992. The ITOs received the mandate to "Set skill standards for its industry (or their industries)" (Industry Training Act 1992, s.10). For industries not covered by the ITOs, the National Standard Bodies (NSB) developed generic standards, and National Qualification

Service developed skill standards for areas not covered by ITOs or NSBs. ITOs also supported the development and deployment of skills. The role of the ITO on skills designed was expanded in 2002 by the Industry Training Amendment Act 2002 as they were required to have a dynamic approach towards skills, asking them the "identify current and future skills needs" (Industry Training Amendment Act 2002, s. 6), though, this role was taken from them later in the reform period.

To organize the different definitions of skills, the Industry Training Act 1992 mandated the NZQA to develop a national framework for qualifications, including qualifications from secondary to tertiary education. Following this mandate, the NZQA introduced the NQF in 1991 (NZQA, 2016) with the formal definition of "the framework for national qualification in secondary schools and postschool education and training developed by the Qualifications Authority" (Modern Apprenticeship Training Act 2000, s. 4). The qualification framework was based on "units of standards"[4] , and it initially covered eight levels, following the Australian Model; though, to accommodate postgraduate qualifications, it was later extended to 10 levels in 2001[5]. By the Education Amendment Act 2011, and given the existence of different registers, the NQF was integrated with the New Zealand Register of Quality Assured Qualifications (NZRQAQ) and created the NZQF. The NZQF is "the definitive source for accurate information about all quality assured qualifications, covering senior secondary school and tertiary education qualification" (NZQA, 2016). Given this central role in New Zealand's skill ecosystem, the NZQF has been recognized as "the heart of New Zealand's education system" (NZQA, n.d., paragraph 1).

Currently, the NZQF has ten levels of qualifications grouped according to their complexity. Level descriptors are based on what a graduate is expecting to know, understand and be able to do as part of learning. The breadth and depth in the field of study or work define the level of qualifications. All qualifications on the NZQF have a credit value. To assign credits, qualification developers estimate the typical time for a learner to achieve the learning outcomes and assign credit values based on the estimate. One credit is equivalent to ten notional learning hours, and a typical learner undertakes 120 credits per year (NZQA, 2016).

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[4] The initial term was "units of learning"
[5] Later, the NQF was modified to allow the introduction of achievement standards to allow discrimination by performance.

Administratively, the NZQF Register is the single authority to register data of qualifications in New Zealand. Before the appearance of the integrated NZQF, the register was known as the Sector Qualifications Register. The NZQF Register's data includes information on all qualifications, including issuance date, expiry date, version, and link to education/training providers and institutions that develop/implement them.

Later on, by the end of the reform, an implicit and comprehensive definition on skills was provided by the Education Amendment Act 2017's definition of education and learning, which was:

> "
> a. to focus on helping each child and young person to attain educational achievement to the best of his or her potential; and
> b. to promote the development, in each child and young person, of the following abilities and attributes:
> 1. resilience, determination, confidence, and creative and critical thinking:
> 2. good social skills and the ability to form good relationships:
> 3. participation in community life and fulfilment of civic and social responsibilities:
> 4. preparedness for work; and
> c. to install in each child and young person an appreciation of the importance of the following:
> 1. the inclusion within society of different groups and persons with different personal characteristics:
> 2. the diversity of society:
> 3. cultural knowledge, identity, and different official languages:
> 4. the Treaty of Waitangi and te Reo Māori."

(Education Amendment Act 2017, Part 1AA)

3.3.3 Development

The 1989 skill ecosystem reform introduced several measures to accelerate the development of skills in the schooling, post-secondary, training and apprenticeship systems. A distinctive element introduced by the 1989 skill ecosystem reform was its several attempts to unify the development of skills: a unified qualification system materialized by the creation of the NQF in 1992, a single financing system for secondary education through the Tertiary Education Commission (TEC) in 2001 . Responding to the reform's commitment to expanding education achievement, the reform raised the school leaving age to 16-years-old. Another important element of the reform, as suggested by the Hawke Report, was its aim to support lifelong

learning by allowing entrance to tertiary education institutions (TEIs) to all those interested in continue studying, regardless of previous education attainment (Education Act 1989).

There were significant changes in governance to decentralize schools. The Act eliminated the Department of Education and Regional Education Boards, and they were replaced by the Ministry of Education and the Education Review Office. Within the Ministry of Education, the following institutions were created: TEC, the NZQA and Education and Training and Support Agency (ETSA). Moreover, through the Education Act 1989, schools' administration became responsible for a board of trustees that incorporated the principal, a teacher and parents elected by the local community and financed through grants by school characteristics. And, the Education Amendment Act 1991 abolished school zoning.

In post-secondary education, there were also changes in its governance regarding the member institutions and their financing. The autonomy of universities increased, and private training establishments (PTE) were allowed to provide high-level degrees, creating more competition for traditional universities. The 1989 skill ecosystem reform eliminated the UGC, replacing it by the New Zealand Vice-Chancellor Committee (NZVCC). As the Education Amendment Act 1990 established a consistent approach towards recognizing academic and vocational qualifications through the NQF and encouraging the participation of new institutions. According to the act, beyond universities, tertiary education includes colleges of education, polytechnics and wananga. Initially, the non-university institution focused on qualifications of low level; however, through the Education Amendment Act of 2002, non-university institution's role expanded, as they were allowed to participate in higher levels in tertiary education provision, eliminating restrictions that were present for several decades.

Funding of tertiary education changed: students loans were introduced in the early 1990s, caps on student enrollment were removed (1998), funding to TEIs became demand-driven (Education Amendment Act 1999), funding introduced the equivalent full-time student (EFTS) metric and became targeted to high-priority areas as decided by TEC, an institution that was also responsible for funding vocational education starting in 2006. New Zealand became a unique example among OECD countries having vocational and academic tertiary education financed by a single agency, the TEC. As a result of these changes, students paid on average

33 percent of their education costs in 2000 and 18 percent in 2006. The level that has remained unchanged afterwards (Productivity Commission, 2017).

With regards to the governance of the non-formal skills development, according to the Education Amendment Act 1990, the training functions previously under the Department of Labour were transferred to the newly created ETSA. Later, ETSA transformed into Skills New Zealand and later, it was absorbed by the TEC (Education Amendment Act 2002). ETSA also had the mandate to recognize ITOs, institutions that received the mandate to implement training as ITOs as they have to set "the mechanisms to enable trainees to attain those standards" (Industry Training Act 1992). Initially, training by ITOs focused on the lower levels of the qualification framework, but later, by the Industry Training Amendment Act 2002, they were allowed to intervene in higher levels of the NQF. The government funded the ITOs, but later, co-funding schemes were introduced to ensure that funding was properly focused (Productivity Commission, 2017).

Regarding apprenticeships, initial changes in apprenticeships were facilitated by the Employment Contract Act 1991, as it allowed for direct negotiation between firms and apprentices. Later, they were transferred to the ITOs. Key definitions on the nature of apprenticeships were included in Industry Training Act 1992. They were required to: be industry-led, based on competency-based training, provide flexibility for employers and unions and allow expansion to include new areas of training.

The financing of training and apprenticeship through the ITOs became a joint responsibility of the government and the industry. For example, for 2018, the government covered 70 percent of the cost of training programs, and 80 percent of the cost of apprenticeships and employers had to cover the rest (Ministry of Education, n.d.).

3.3.4 Deployment

To address a perceived macro-level mismatch, Tertiary Education Advisory Commission (created in 2000) identified that a market-driven allocation of resources will not be efficient and proposed the TEC to implement government policy on tertiary education created by the Education Amendment Act 2003. Its objective is to ensure that tertiary education responds to New Zealand's priorities. TEC was expected to link the needs of the labour market with

education and training. Additionally, TEC was expected to increase the public sector's involvement with other stakeholders in the establishment of sector priorities (Goedegebuure, et al., 2006).

To improve transition to the labour market at the micro-level, the Education Amendment Act 1990 established the Career Development and Transition Education Service (CDTES). CDTES had the following functions

"

1. *To establish and maintain a database of information about occupations and about post-compulsory education and training*
2. *To make that information available to the public and to institutions, private training establishments, students, and other interested bodies and persons*
3. *To provide-*
    (i)   Training and assistance to persons who advise about occupations; and "
    (ii)   Career advice and associated counselling relating to post· compulsory education and training:
4. *To liaise with, and monitor the needs of, institutions, private training establishments, students and other bodies and persons with respect to*
    (i)   Information, training, and advice relating to occupations; and
    (ii)   Career advice and associated counselling relating to post -compulsory education and training
5. *To provide support services for the purpose of promoting transition education that prepares students for employment, or further education and training, or both."*

(Education Amendment Act 1990, s. 280)

To improve deployment of populations at risk: to improve the school to work transition and address the perceived challenges of youth entering into the labour force, the Ministry of Education launched the Secondary Tertiary Alignment Resources (STAR) program. The STAR program focused on students in years 11 to 13, looking to expand learning opportunities and help students transition towards workplaces or further studies. In 2008, this program was delivered by almost all schools within New Zealand. The courses developed by the program were student-tailored and locally relevant. The program also organized workplace visits and labour-market-relevant workshops, and a similar initiative was the Gateway program.

Existing programs at the beginning of the reform, the ACCESS Training Scheme, the Apprenticeship Scheme, the Primary Industry Cadet Scheme, and such other activities programs relating to education or training towards disadvantaged populations were absorbed

by ESTA. In 1993 the Training Opportunities Programme (TOP) was introduced to replace ACCESS.

Later on, in the early 2000s, the Modern Apprenticeship program was created. Its purpose was "to encourage and help people (especially those aged 16 years or older, but younger than 22 years) to take up and complete apprenticeship training" (Modern Apprenticeship Training Act 2000, s. 3). This program aimed to promote training among young people, though it also allowed retraining.

In the late 2000s, the Youth Guarantee policy was created to provide youth opportunities to support 16 and 17-year-olds to achieve education success and progress into further education, training and employment (Crawford, 2016). It supports schools, tertiary education organizations and employers to work together in new ways. From 2014, the age range was extended to include 18 and 19-year-olds.

In the governance size, ESTA was later absorbed by TEC and then by the Ministry of Social Development and Youth Services. This ministry was created in 2016 to support teenagers that were not in employment.

3.3.5 Quality assurance

Given the strong focus on a decentralized education and training system, a strong quality assurance system was needed for the 1989 skill ecosystem reform. To do so, the Education Amendment Act 1990 created the NZQA:

> "
> a. To oversee the setting of standards for qualifications in secondary schools and in post -school education and training:
> b. To monitor and regularly review, and advise the Minister on, the standards for qualifications in secondary schools and in post·school education and training, either. generally, or in. relation to a particular institution or private training establishment or a particular course of study or training:
> c. To develop a framework for national qualifications in secondary schools and in post ·school education and training in which-
>> I. All qualifications (including pre-vocational courses provided under the Access Training Scheme) have a purpose and a relationship to each other that students and the public can understand; and
>> II. There is a flexible system for the gaining of qua1ihcations, with recognition of competency already achieved:

d. Subject to subsection (2) of this section, to establish policies and criteria for the approval of courses of study and training at institutions and private training establishments:

e. Subject to subsection (2) of this section, to establish policies and criteria that will enable institutions and private training establishments to be granted accreditation to provide courses of study and training:

f. To ensure there are mechanisms in place to guarantee that different institutions or private training establishments providing approved nationally recognized courses have assessment procedures that are fair, equitable, consistent, and in keeping with the required standard:

…

j. To promote and monitor inter·institutional course approval and moderation procedures: "

(Education Amendment Act 1990, s. 253)

NZQA has delegated to quality assurance bodies the approval of courses and qualifications designed by providers. NZQA also accredits providers. To the university sector, quality assurance is delegated to the NZVCC (also known as Universities New Zealand), and this institution has delegated the accreditation and approval to the Committee on University Academic Programmes (CUAP). NZQA has delegated quality control for the colleges of education to the Colleges of Education Academic Committee (CEAC) through the Association of Colleges of Education in New Zealand (ACENZ); for the polytechnics to the Institutes of Technology and Polytechnics Quality (ITPQ) through the Institutes of Technology and Polytechnics New Zealand (ITPNZ).

The ITOs are also part of the quality assurance process, as they received the mandate to "The monitoring of the training to ensure that it enables trainees to attain those standards; and, the assessing of trainees and of the extent to which they have attained those standards" (Industry Training Act 1992, s. 6). To assure the quality of ITO, the Industry Training Act 2002 introduced satisfactory past performance as a criterion for re-recognition of the ITOs. Later, in 2010 as the government introduced better accountability of ITOs through the introduction of the Industry Training Register. The register had the objective to provide almost real-time reporting of the training activity by the industry.

With regards to secondary education, the NQF was established in 1990, first establishing the National Certificate. Later, in 2002, as the National Certificate of Education Achievement (NCEA) was introduced, it replaces the School Certificate, University Entrance, Sixth Form Certificate and University Bursary, and was aligned with NQF. Three levels of NCEA were introduced: Level 1 in 2002, Level 2 in 2003 and Level 3 in 2004. Later, achievement standards were introduced with four different achievement grades (not achieved, achieved, merit, and

excellence). The NCEA is perceived as a broader assessment, covering skills not previously assessed. NCEA results are based on both internal assessments and examinations.

3.4 Implementation of the reform

In this section, this thesis assesses the implementation of the 1989 skill ecosystem reform (level 1 analysis as described in section 4.1), focusing on its impact on New Zealand' skill ecosystem. The section follows the previous section's approach analyzing the skills definition, skills development, skills deployment, and quality control. Table 3 presents the different analysis presented in this section.

Table 3 Level 1 Analysis

TOPIC	Information Source	Main Result
Skills Definition	Tertiary Education Strategies	Evolving concepts.
	NZQR	Dynamism between 2005-2015.
Development of Skills	Pre-tertiary Education Count/World Bank/OECD	Dynamism at the beginning of the reform. The efficiency of the system has declined.
	Tertiary Education Counts/World Bank	Dynamism till 2005. Significant reduction in 2010's focus on lower NZQF levels.
	Years of education Barro-Lee	New Zealand achievement in terms of education of adult population year of education is stagnant since 1970.
	Learning – basic education PISA	Education results are going down.
	Access to training Education Count	Increase from 2000 to 2010, a decline since then.
	Access to learning in the workplace	New Zealand records higher levels across OECD countries.
	Skills in the adult population	New Zealand outperforms, but basically on younger populations
Deployment of Skill	NA	Activities have been implemented as mandated by the law. Aggressive programs to promote labour market entrance of younger populations.
Quality assurance	NA	Universities reclaimed their independence from a quality assurance system.

3.4.1 Skills definition

3.4.1.1 In the constant quest for a skills definition and purpose of the skill ecosystem

Besides the definitions of skills and purpose of the education and training system in the initial acts of 1989 skill ecosystem reform, the definitions evolved through its implementation. For example, the Tertiary Education Strategies (TESs) published by the TEC for the 2002-2007 (Ministry of Education, 2002), 2007-2012 (Ministry of Education, 2007) , 2010—2015 (Ministry of Education, 2010) and 2014-2019 (Ministry of Business, Innovation & Employment, Ministry of Education, 2014) periods included a changing definition of skills. As observed in Table 4, foundational skills were present across the TES, though there are changes on the broader focus of skills: from the knowledge society in TES 2002-2007 to delivery skills for the industry in TES 2014-2019, likely reflecting ongoing perceptions on skills gaps.

Table 4 Tertiary Education Strategies

TES 2002-2007	2007-2012 with priority update (2008-2010)	2010-2015	2014-2019
Strengthen system capability and quality	Increasing educational success for young New Zealanders more achieving qualifications at level four and above by age 25	Increase the number of young people (aged under 25) achieving at Levels Four and above, in particular completing degree-level qualifications.	Delivery skills for industry
Contribute to the achievement of Maori development aspirations	Increasing literacy, numeracy and language levels for the workforce	Assist Maori and Pasifika students to achieve at higher levels	Getting at-risk young people into a career
Raise foundation skills so that all people can participate in our knowledge society	Increasing the achievement of advanced trade, technical and professional qualifications to meet regional and national industry needs	Increase the number of young people moving successfully from school into tertiary education	Boosting achievement of Maori and Pasifika
Develop the skills New Zealanders need for our knowledge society	Improving research connections and linkages to create economic opportunities	Continue to assist adult learners to gain literacy, language, and numeracy skills that lead to higher-level study or skilled employment	Improving adult literacy and numeracy
Educate for Pacific peoples'		Improve the educational and financial	Strengthening research-based institutions

development and success		performance of providers	
Strengthen research, knowledge creation and uptake for our knowledge society.		Strengthen research outcomes	Growing international linkages.
Source: TES 2002-2007 (Ministry of Education, 2002); TES 2007-2012 (Ministry of Education, 2007); TES 2010—2015 (Ministry of Education, 2010); and TES 2014-2019 (Ministry of Business, Innovation & Employment, Ministry of Education, 2014).			

There were parallel definitions of skills besides the ones at the TEC. For example, in 2008, the Skills New Zealand Tripartite Forum's New Zealand Skills Strategy, with the participation of the government, private sector and education providers mentions "all the skills, competencies, capabilities, knowledge, attributes and experience that enable people to do their jobs" (Skills New Zealand Tripartite Forum, 2008, p. 6). The skills strategy also identified that skills change over time and that countries need to establish the right mix of skills available for their economies at the right time. And, Careers New Zealand defines skills as "abilities that are developed through life and work experiences"(Careers New Zealand, n.d., l. 1). Moreover, Careers New Zealand provides some practical considerations to manage skills. It divides skills into Technical and Personal Skills. The former, Technical Skills are defined as particular skills needed for a job and include two subtypes skills: specialized technical skills (skills are for doing a specific job, such as being able to use a nail hammer to build a house) and basic technical skills (such as computing skills, having a driver's license, literacy and numeracy skills). Technical skills are acquired through study, training and work experience. The later, Personal skills are defined as skills, qualities or attitudes than workers bring to a workplace, and they can also be accumulated through daily life.

Closer to the end of the reform period, the New Zealand Productivity Commission (2017, p.1) indicated that "education develops knowledge and skills that allow them to live an enriched life. It helps people to understand and navigate the world around them *[students]*, as well as question and challenge the way things are". The Productivity Commission, besides the private benefits, list the "public benefits of stronger civic society, the advancement of knowledge, preservation of cultural heritage, and the development of a skilled workforce that can contribute to productive and wellbeing".

Throughout the 1989 skill ecosystem reform implementation, there was a strong focus to include practical definitions of skills to support the industry with the outcome focus. However, the higher objective of the skill system was laid out at the reform, likely reflecting strong policy discussions on the it.

3.4.1.2 Towards implementable definitions of skills

The reform aimed to create a simple system of development and recognition of qualifications. NZQA decided to implement a system of qualifications based on "unit standards" that will easily allow students/trainees to migrate across providers and levels. Though, this approach was strongly resisted by the universities (concerned to maintain their distinctive character and international standing) and by the Ministry of Education (Crawford, 2016). The NQF was created by the Education Amendment Act of 1990 covering mostly qualifications from levels 1 to 6 and lately. The system benefited from previous qualifications as the National Certificate, National Diploma and National Degree. It was complemented by the New Zealand Register of Quality Assured Qualifications (NZQA, 2007), which focused on higher levels of qualifications. Both systems were merged in 2011 by the Education Amendment Act 2011, creating the NZQF.

Following the mandate of the Industry Training Act 1992, the newly created ITOs received the mandate to develop the qualifications under the guidance of the NZQA. The qualifications aimed "to identify the underpinning skills, knowledge and attributes graduates need to perform a range of roles across a broad context" (NZQA, 2016).

Data at the New Zealand Register provides detailed information on the evolution of qualification since 2004. By 2004, the New Zealand Qualification Register was fully operational. At the end of the period (December 2020), the Register included information of more than 17,000 qualifications (NZQR, n.d.). Of the total number of qualifications, 3,834 qualifications were "current", 591 qualifications were "expiring", and 12,584 qualifications were "discontinued".

Analysis of the evolution through time of the qualifications at the Register shows that the number of active qualifications (current and expiring) at the Register reached a peak of 7,026 in April 2016, and it has decreased since then. The number of qualifications and their

evolution through time has been different by NZQF levels. Active level 1 qualifications included the Register reached a peak of 142 in November 2008; active level 2 qualifications reached a peak of 631 in October 2004; active level 3 qualifications reached a peaked of 1,244 in November 2009; active qualification levels 4, level 5 and level 6 reached their peaks of 1,218, 1,006 and 600, respectively, in April 2016; level 7 qualifications reached its peak of 1,256 in October 2017; and, qualifications level 8 and level 9 reached their peak of 771 and 595 in December 2019. As observed in Figure 5, this evolution reflects the growing importance of higher-level qualifications in the Register in later years and the decline in the dynamism of qualifications levels 1 to 6 since 2015.

The declining patters in qualifications of level 1 to 6 may have responded to NZQA's effort to make them more efficient and make to them user-friendly and easier to differentiate. For example: in 2010, there were 275 English language qualifications; in 2015, there were 6 New Zealand Certificates in English Language (NZQA, n.d.).

Information at the register also allows the classification of qualifications by field of study according to the New Zealand Standard Classification of Education (NZSCED). Among broad fields of study, *Society and Culture* has the largest number of qualifications, with a total of 1,007 qualifications in December 2019. The field of study with the smallest number of qualifications is *Natural and Physical Sciences* with 157 qualifications (See Table 5). With regards to the time evolution, the number of qualifications across NZSCED fields has been heterogeneous. The field with the largest increase in the number of qualifications since 2005 was *Natural and Physical Sciences*, a field that registered a 63 percent increase between 2005 and 2019. The field with the largest decrease was *Food, Hospitality and Personal Services* reporting a 55 percent decrease.

Figure 5 Evolution of the number of qualifications by NZQF level (2000-2020)
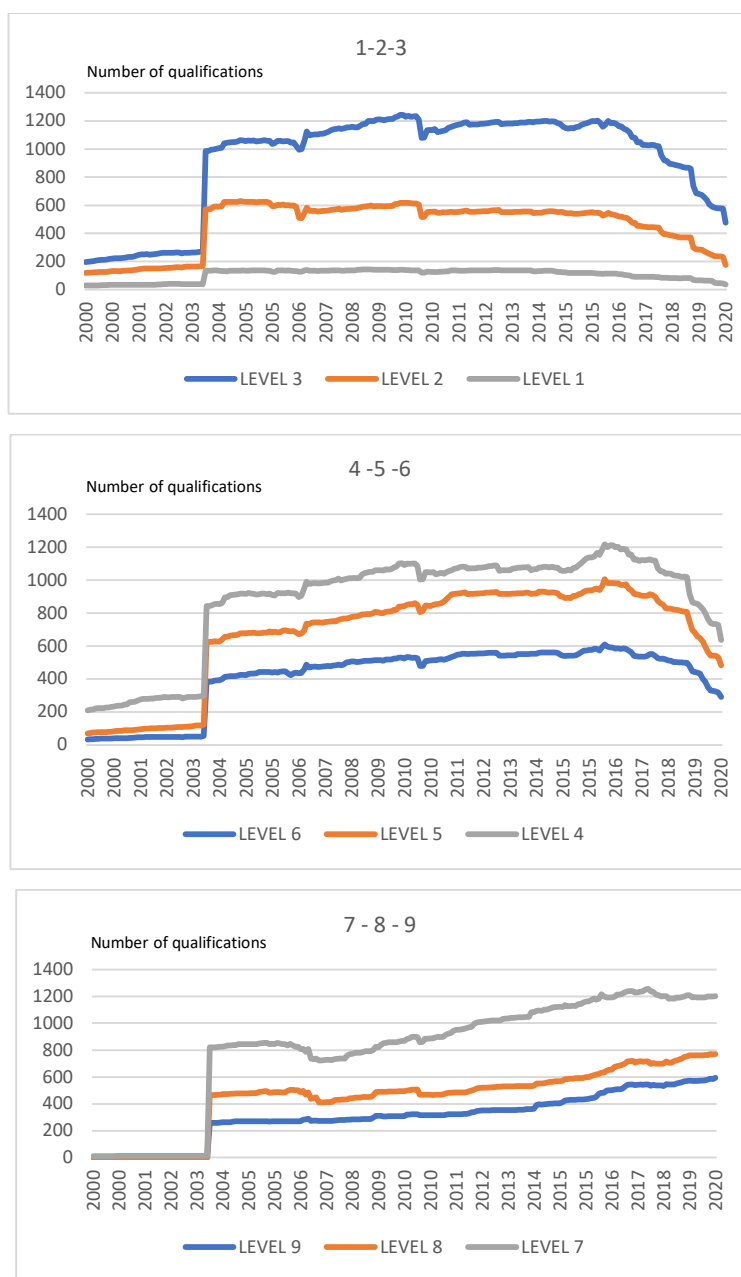
Note: the big increase in 2003 reflects the merge of different registers during that year.

Data source: NZQR (n.d.)

Table 5 Qualification by NZ Standard Classification of Education (NZCED)

NZCED (Broad)	2005	2019
Natural and Physical Sciences	96	157
Information Technology	202	191
Engineering and Related Technologies	911	807
Architecture and Building	177	214
Agriculture, Environmental and Related Studies	358	351
Health	391	481
Education	358	331
Management and Commerce	801	699
Society and Culture	1195	1007
Creative Arts	542	535
Food, Hospitality and Personal Services	383	173
Mixed Field Programs	204	193
Not specified	1165	539

Data source: NZQR (n.d.)

Qualifications in the register follow a cycle of creation and destruction: as first, they are approved, then, they are improved/kept relevant through the appearance of new versions, and eventually, they expire or are cancelled becoming inactive. The qualifications under the register had relatively long survival rates, indicating an adequate description of the underlying occupation. On average, 5 percent of the qualifications form levels 1-3 became inactive before their fourth year, while 10 percent of qualifications level 4-6 and 7-9 did. By the end of their fifth year, an additional 10 percent of qualifications expire on levels 1-3 and 4-6, while only 5 percent on the levels 7-9 do, i.e. survival rate at year 5 is higher for higher levels than lower levels (see Figure 6).

Figure 6 Survival of qualifications by NZQF level 1/
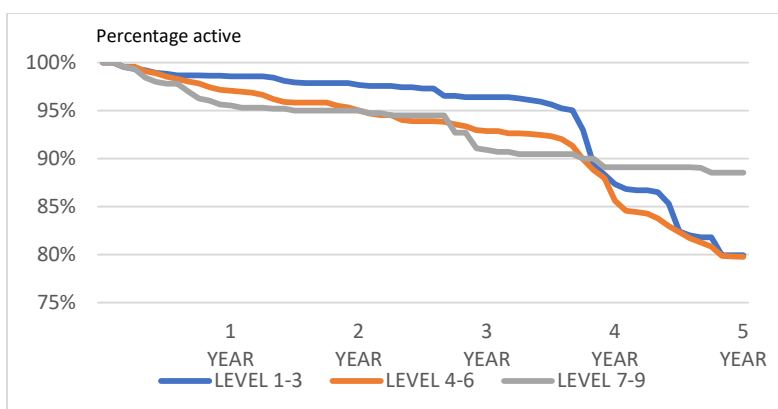
1/ Analysis corresponds to qualifications approved between 2006 and 2015.

Data source: NZQR (n.d.)

By field of study, the cycle of the qualifications also presents differences. After 1 year, 5 percent of *Information and Technology* and *Natural and Physical Sciences* qualification*s* became inactive, the lowest survival rate among the different broad fields in the NZSCED. *Information and Technology* also had the lowest survival rate after 2, 3 and 4 years of issuance. After five years of issuance, the lowest survival rate corresponds to *Food, Hospitality and Personal Services* (78 percent), while the sector with the highest survival rate is *Agriculture, Environment and Related Studies* (93 percent) (see Table 6).

Table 6 Survival of qualifications by NZSCED (broad) field

	Percentage of qualifications active after XX years of issuance:	
	1 year	**5year**
Natural and Physical Sciences	95%	84%
Information Technology	95%	84%
Engineering and Related Technologies	99%	91%
Architecture and Building	98%	89%
Agriculture, Environmental and Related Studies	100%	93%
Health	98%	84%
Education	97%	82%
Management and Commerce	97%	85%
Society and Culture	98%	86%
Creative Arts	98%	86%
Food, Hospitality and Personal Services	99%	78%
Mixed Field Programmes	98%	86%
Not specified	98%	90%

Data source: NZQR (n.d.)

Reflecting underlying differences and dynamics, across NZSCED fields, there are differences in the structure of the qualification by NZQF level, and their structures have changed between 2005 and 2018. *Natural and Physical Sciences* has the highest share of qualifications level 7, 8 and 9, reaching approximately 80 percent of its qualifications in 2019, a share slightly higher than the registered in 2005. On the other side in the field *Agricultural, Environment and Related Studies* had the highest share of qualification levels 1 to 3 (40 percent). In all sectors, but in *Health* and *Education*, lower-level classification share has decreased between 2005 and 2018 (See Figure 7).

Figure 7 Distribution of Qualifications by NQF level and ANZSIC (2005 vs 2018)
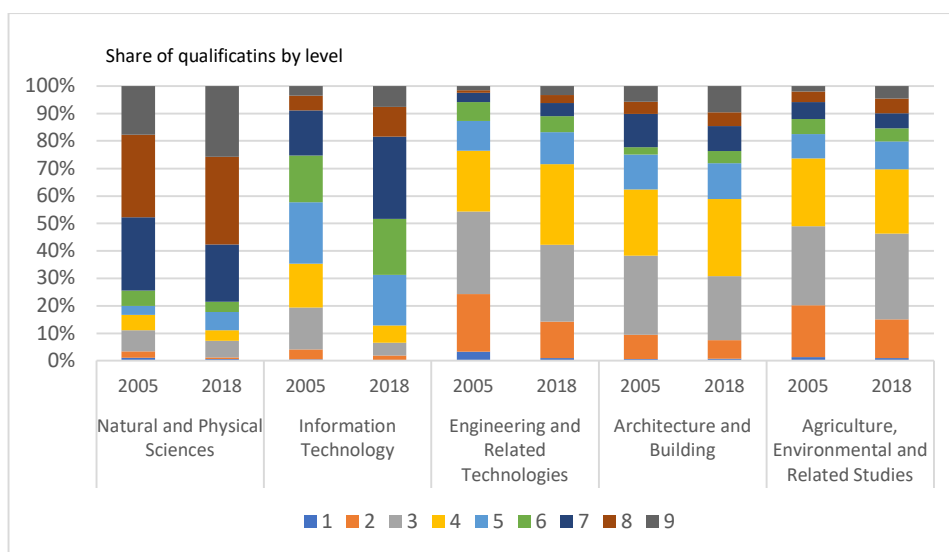
Continuation…
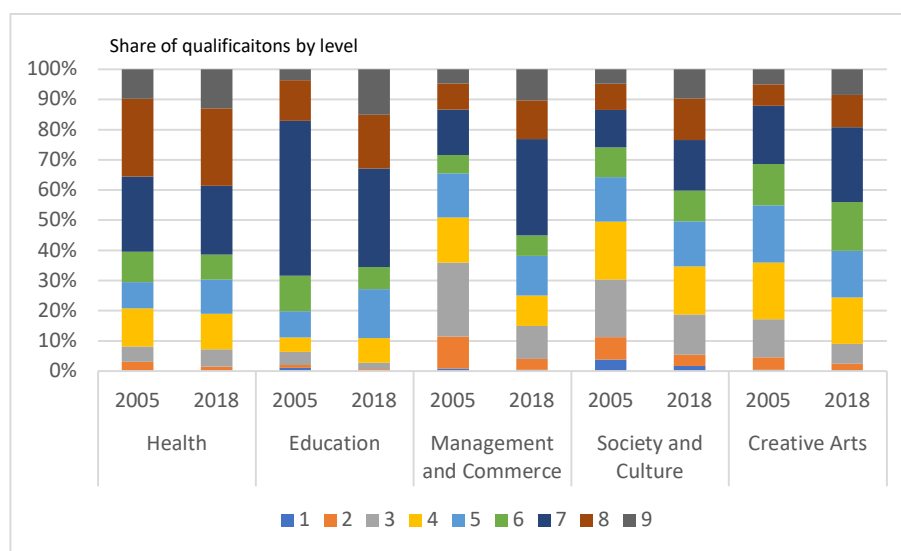
Data source: NZQR (n.d.)

With regards to the providers of the qualifications, for most qualifications, there is only one provider, especially in the qualifications of NZQF levels 7 to 10 (Figure 8). For example, in 2019, there were seven qualifications related to tourism (NZCED code 807) at level 7 of the NZQF each linked to a provider. The qualification with the largest number of providers in the *New Zealand Certificate in Foundation Skills*, a Level 1 qualification.

Figure 8 Number of providers by NZQF level
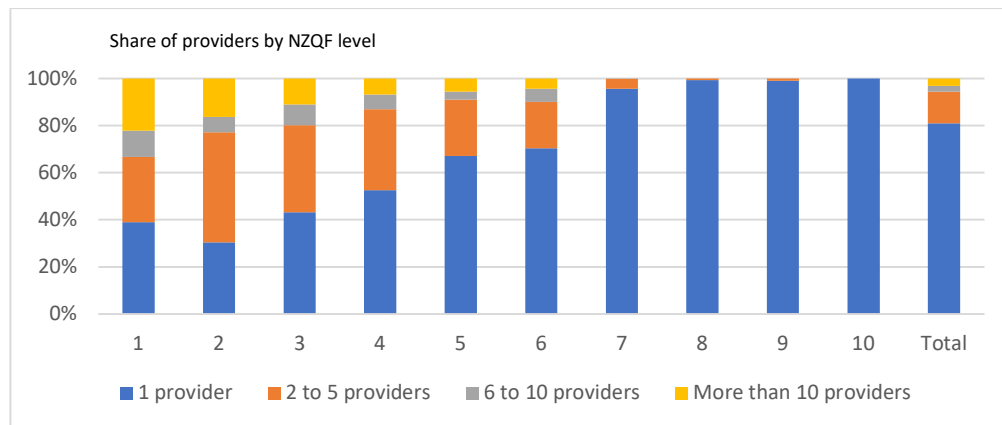
Data source: NZQR (n.d.)

A strong NZQF was necessary for the implementation of the 1989 skill ecosystem reform. Available data from the NZQR starting in 2004 shows a dynamism in the issuance of qualifications during the 2000s, a process that has slowed significantly, especially since the second half of the 2010s for low level qualifications. The dynamics may have responded to initial adjustments as the system looks to balance certainty on skills and freedom to providers (Productivity Commission, 2017) and, later, to new guidance on the provision of tertiary education (to be discussed below). Despite the effort, the data also shows that an objective of the reform to provide a common language may not have been achieved as most qualifications are provider-specific.

3.4.2 Development

3.4.2.1 Evolution of enrolment in pre-tertiary Education

Low attainment of lower secondary education was one of the main concerns at the start of the 1989 skill ecosystem reform. During its implementation, primary and secondary education enrollment grew. Regarding primary education, during the first decade of the implementation of the reform, enrollment increased by 48K, followed by a slight decline of 15K between 2000 and 2013, and an increase by 41K between 2013 and 2019. With regards to secondary education, enrollment increased significantly during the implementation of the reform. It increased by 90K, equivalent to 26% growth, between 1989 and 1998, and by 100K,

equivalent to 20% growth, between 2001 and 2010. Enrolment in secondary education reached a peaked of 542K in 2010, and it has declined since then to approximately 490K (UNESCO Institute for Statistics, n.d.) (Figure 9).

Figure 9 Indicators of primary and secondary education enrollment

Enrolment in primary and secondary education (1989-2019)

NER in secondary education – New Zealand and comparison countries (1971 – 2016)

Data Source: UNESCO Institute for Statistics (n.d.)

Data Source: World Bank (n.d. C)
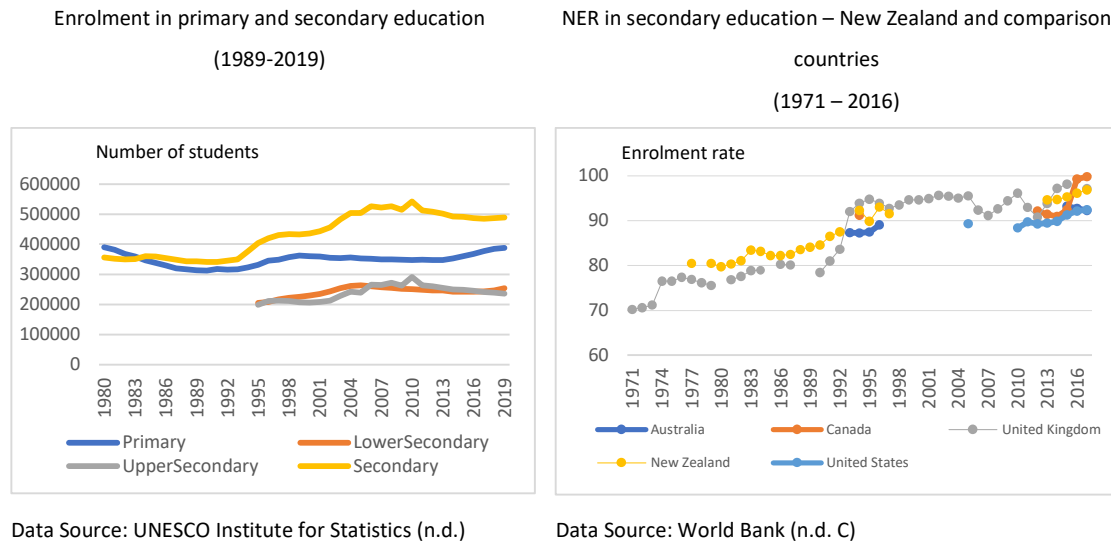
In 1989, in New Zealand the net enrollment rate (NER) in secondary education was 84 percent, higher than the UK (74 percent), similar to Australia (87 percent), but lower to Canada (91 percent)[6]. By the end of the implementation of the reform, NER grew in New Zealand in line with the comparator countries' evolution. By 2017, New Zealand's NER in secondary education was 96.9 percent, slightly lower than Canada and the UK (99.8 and 97.1 percent, respectively) and higher than the USA and Canada (92.4 and 92.3 percent, respectively). New Zealand has brought almost all the young population into secondary schools and kept them there as its comparison countries.

At the onset of the reform, secondary education's completion rates were deemed low. In 1986, one-third of students left the education system without qualifications (OECD & New Zealand Qualification Authority, 2004). Available data for the period of implementation of the reform shows that in 2005, the secondary education graduation rate in New Zealand was 86 percent, and it reduced to 78 percent by 2018. Among OECD countries, in 2005, New

[6] International data is not available for all the countries for every year. NER for UK corresponds to 1990, Australia to 1993, and Canada to 1994.

Zealand's graduation rate was the fourth-highest rate among the 22 countries with available data, though, by 2018, New Zealand dropped nine positions (Figure 10).

Figure 10 Graduation rate secondary education New Zealand and OECD countries

(2005 vs. 2018)
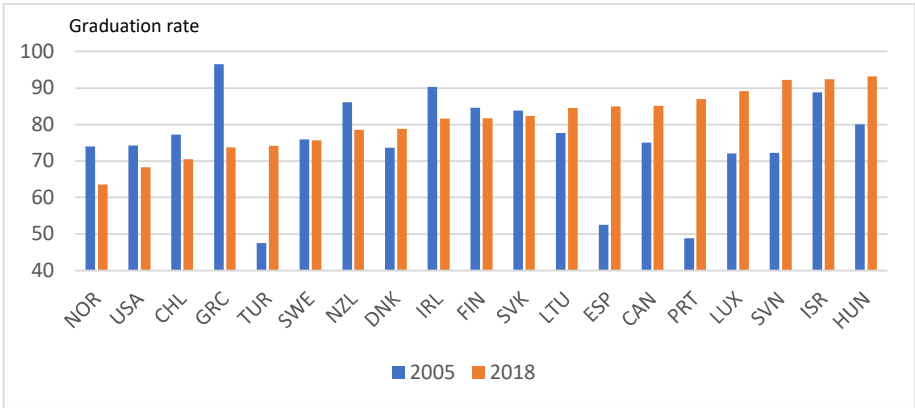
Data Source: OECD (2021)

During the 1989 skill ecosystem reform implementation, New Zealand enrollment in pre-tertiary education has grown, an evolution aligned to the registered in comparator countries. Changes in the governance in primary and secondary education likely contributed to the positive evolution in enrollment as better labor market perspectives, but the lower graduation rate (with lower scores in PISA tests to be described below) signals remaining challenges

3.4.2.2 Evolution of enrolment in tertiary Education

In addition to enrollment in primary and secondary education, another of the 1989 skill ecosystem reform's main focus was to increase enrollment in tertiary education. To do so, several actions were taken: tertiary education definition and eligibility was increased, financing agreements were changed, and new actors were included in the system.

In 1989, the sector was dominated by the universities. However, in 2019, as a result of the expansion in the supply, there were 468 tertiary education providers. Of those, 8 were universities, 17 were polytechnics, 398 were private training establishments, and 3 were Wanangas. From the PTE, 42 PTEs are focused on business/management, 40 on trade and services, 38 on first aid, 38 on the English language.

Providers are focused on certain areas and levels. According to the NZQR, there are 420 qualification-developer or qualification-provider institutions in New Zealand in 2019. Most of these institutions focus on a small number of levels within the NZQF. Of the total number of institutions, 136 institutions have a qualification level 1 as their minimum level of qualification and 12 institutions have level 10 as their higher level, and 144 institutions only offer one education level (see Table 7, bolded cells in the diagonal in the table represent institutions that only cover one qualification leve: 43 institutions only offer level 1 and 1 institution only offer level 10).

Table 7 Providers by NQF qualification levels

	1	2	3	4	5	6	7	8	9	10		
1	**43**											43
2	10	**24**										34
3	14	12	**20**									46
4	16	13	11	**20**								60
5	8	11	16	18	**15**							68
6	12	8	10	9	23	**7**						69
7	15	5	4	14	4	1	**13**					56
8	1	1		1		1						4
9	11	1	4	7	2		1	1	**1**			28
10	6	1	2	2						**1**		12
	136	76	67	71	44	8	15	1	1	1		420

Note: Rows represent the highest qualification level, columns represent the lowest

Data source: NZQR (n.d.)

With regards to enrolment in tertiary education, at the onset of the reform 141K New Zealanders attended tertiary education. Between 1980 and 1989, enrollment in tertiary education grew only by 2 percent annually, lower than the growth rate of the relevant age group. During the implementation of the reform, there were two major periods of growth in tertiary education enrollment. In the first period, between 1989 and 1994, enrolment in tertiary education accelerated, achieving an annual rate of 12 percent, likely linked to the changes in financing arrangements. In the second period, between 1999 and 2005, the yearly rate of growth in tertiary education was 8 percent, reaching a peak of 430K (see Figure 11), likely linked to the expansion in the number of PTEs, following the changes in the goals of

tertiary education included in the Education Amendment Act 2002 that included demand-driven funding. After that peak, the enrollment in tertiary education has declined at an annual rate of 2 percent, reaching 335K in 2019 (Tearney, 2016). The negative trend after 2005 may be related to the introduction of financing caps into tertiary education financing (Productivity Commission, 2017).

Figure 11 Evolution of enrolment in tertiary education (1980 – 2019)
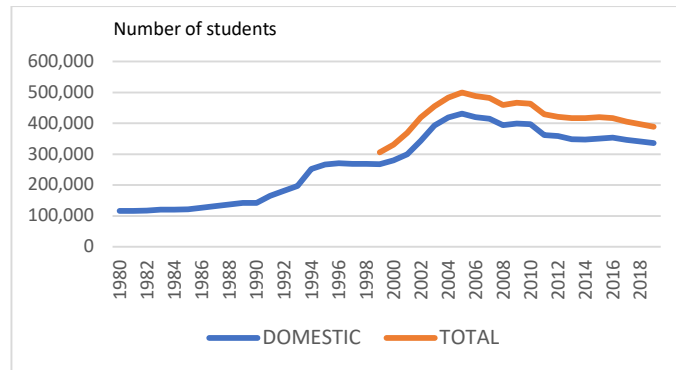
Data source: Education Counts (n.d. C)

In the international context, in 1989 the gross enrollment rate (GER) in tertiary education of 42 percent was similar to the rates registered by Australia and the UK, but lower than Canada and the USA. During the implementation of the reform, New Zealand had a positive evolution regarding the UK, Canada, and the USA; New Zealand's GER has consistently outperformed the UK's and surpassed Canada and reduced the difference between its GER and USA's GER. With regards to Australia, GERs were similar in 1989, but in 2018, Australia's GER was 30 percent points higher (Figure 12).

Figure 12 GER in tertiary education New Zealand and selected countries (1970-2018)
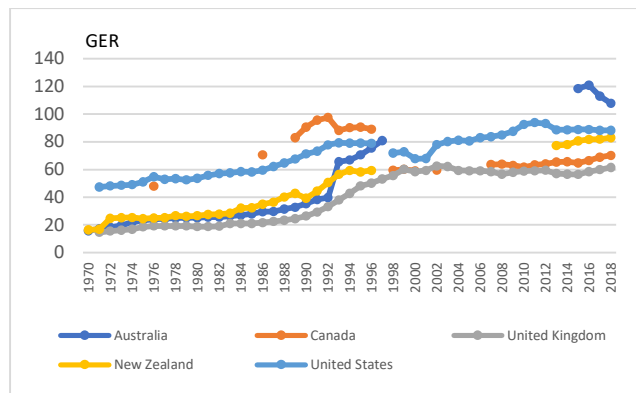
Data source: World Bank (n.d. D)

The evolution registered in tertiary education enrollment after 2006 is explained by a decline in enrollment in lower levels of the NZQF. Available data from 2010 to 2019 shows a continuous decline in enrollment in tertiary education in New Zealand. This decline is explained by the decline in the enrolment in certificates of levels 2, 3, 4, and 5, and Diploma of level 7. This evolution is consistent with the guidance of the TES 2010-2017 (Productivity Commission, 2017). In the meantime, enrollment at Bachelor, Graduate Certificates, Honors, Master and Doctorate, degrees in level 7 to 9 of the NZQF, has remained relatively stable during that period. With regards to the field of study, all but *Architecture and Building* have declined. The sector with the largest decline was *Agriculture, Environmental and Related Studies*, with a decline of 46 percent. *Architecture and Building* increased by 6 percent (Figure 13).

Figure 13 Composition of enrolment in tertiary education (2010-2019)

By level

Number of students

- Certificates1
- Certificates 2
- Certificate 3
- Certificate 4
- Certificates & Diplomas 5-7
- Bachellor 7
- Graduate certificates/diplomas 7
- Honors 8
- Master 9
- Doctorate 10

By field

Number of students

- Natural and Physical Sciences
- Information Technology
- Engineering and Related Technologies
- Architecture and Building
- Agriculture, Environmental and Related Studies
- Health
- Education
- Management and Commerce
- Society and Culture
- Creative Arts
- Food, Hospitality and Personal Services
- Mixed Field Programmes

Data source: Education Counts (n.d. C)

During the implementation of the reform, enrollment in tertiary education grew, though there is a decline in the dynamism in the last decade of its implementation. The decline may respond to the financing mechanisms' changes as overall lower support to enrollment in lower levels of the NQF. The evolution has made enrolment more "traditional": students are becoming younger and more likely to be school leavers (Productivity Commission, 2017). Changes in enrollment also show a skill ecosystem with a stronger focus on the higher degrees, and it has also reacted to changes in the industries, as agriculture degrees went down and construction went up.

With regards to the creation of a more integrated tertiary education system, during the implementation of the reform, some traditional views have been reinforced, as the higher status of university studies, while others have, like the vocational roots of ITPs, have ameliorated (Productivity Commission, 2017). At the same time, data also shows that system is not integrated across levels as most providers focus on a reduced number of levels. Even though this may have advantages in terms of providers' efficiency, it may limit the continuous learning efforts of the reform.

3.4.2.3 Combined result of improvements in enrollment: education attainment in the labour force

New Zealand has traditionally been one of the high performer-countries in terms of years of schooling. Among the comparison countries, New Zealand had the highest achievement in terms of years of education in 1870 with 3.6 years of schooling, a number similar to the registered by the USA in that year. In the next 105 years, the educational attainment of the adult population grew continuously, reaching 11.6 years of schooling in 1975. The years of schooling in New Zealand has kept relatively stable since then, in a context that education attainment continued growing in the comparison countries: reaching 13.6, 13.1, 12.6 and 11.9 in the USA, Canada, UK and Australia, respectively. As a result of the evolution in New Zealand and one of the comparison countries, New Zealand lost its advantage in years of schooling (Figure 14).

Figure 14 Educational attainment for selected countries Pop 25-64 (1870-2010)
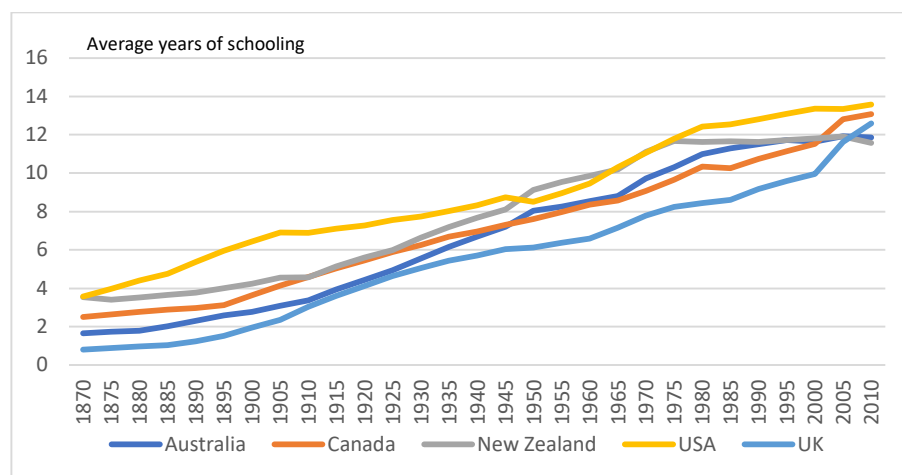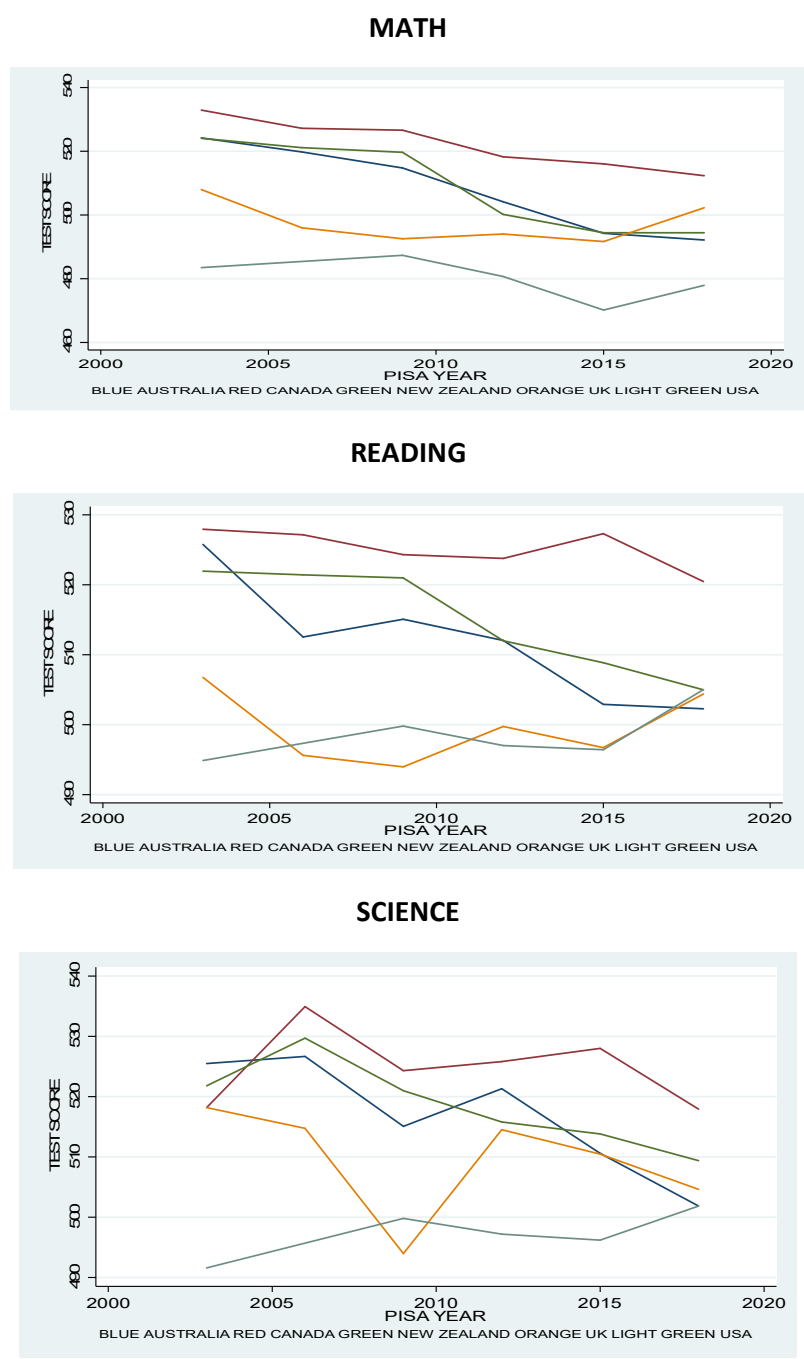

Source: Lee & Lee (2016)

Despite the progress in enrollment in pre-tertiary and tertiary education, available information shows that overall achievement, in terms of years of education, in New Zealand remains stagnant since 1970, i.e. the changes in enrolment patterns described in previous subsections have not been large enough, or efficiency of the system is limiting the outcome. Even though this indicator is only available till 2010, the tendency is likely to remain unchanged as enrollment in tertiary education registered a declining trend in the 2010s.

3.4.2.4 Evolution of learning

Besides education attainment, student learning is an important measure of the education system's capacity to prepare students for the labour force, and measures of student learning may provide a more accurate measure of skills acquired by the students. A standard reference to student learning is PISA organized by the OECD. PISA measures the labour market readiness of 15-year-old as they prepare to leave formal schooling. In 2003, New Zealand registered the second-highest score among its comparison countries, behind Canada in Math and Reading and Australia in Science. Between 2003 and 2018, New Zealand score in PISA diminished in all fields, in line with the evolution observed in comparison countries. All comparison countries registered lower scores in *Math*, and all countries but the USA registered lower scores in *Reading* and *Science*, in a context of higher performance in the test of East Asia economies (See Figure 15).

Figure 15 Evolution of PISA scores New Zealand and selected countries (2000-2008)

MATH

BLUE AUSTRALIA RED CANADA GREEN NEW ZEALAND ORANGE UK LIGHT GREEN USA

READING

BLUE AUSTRALIA RED CANADA GREEN NEW ZEALAND ORANGE UK LIGHT GREEN USA

SCIENCE

BLUE AUSTRALIA RED CANADA GREEN NEW ZEALAND ORANGE UK LIGHT GREEN USA

Data Source: OECD (n.d.B)

The results presented in this section for the second half of implementation of the reform show a decline in student achievement. This is similar to the evolution in PISA scores registered in comparison countries, in a context that of increasing performance of East Asian economies.

However, local measures of outcome may be showing a different evolution, the share of students passing the NCEA at the various levels have increased, though the differences across ethnic and socioeconomic groups remain (Education Counts, n.d.B).

3.4.2.5 Access to life-long learning

The 1989 skill ecosystem reforms aimed to improve all New Zealanders' skills, support younger populations to develop foundational skills, and older generations to upskills and reskill. The OECD confirmed this focus (OECD, 2008B) that indicated that life-long learning was at the centre of policymakers' concerns, especially as "it may be key to improve labour productivity".

Available information shows that New Zealand had high participation levels in life-long learning through high participation of adults in education and training at the beginning of the reform. Also, available information shows that participation has increased since then, both in absolute terms and compared to key comparison countries. In that line, among the countries that participated in the IALS in the early 1990s, New Zealand registered the second-highest rate of participation in training (53 percent), after the UK (56 percent). After 25 years of implementing the reform, New Zealand had the highest participation in training, with 67 percent among the countries that participated in the PIAAC (See Table 8).

Table 8 Adult education and training – selected countries (1995 – 2015)

	1995	2015
New Zealand	53	67
United Kingdom	56	56
United States	49	60

1/ Based on IALS, Adult participation in training

2/ Based in PIAAC. Adult participation in formal and non-formal education.

Source: O'Connel (1999); OECD (2017)

In New Zealand, adult participation in training was among the highest across all age groups and all countries participating in PIAAC. As in the other countries that participated in PIAAC, younger population groups have higher access to training, reaching a participation rate of 93 percent. The participation rate in training diminished to 80 percent for 21-25 year-olds, and then, participation continued diminishing but a decreasing rate, reaching 64 percent for 56-60 year-olds, higher than other PIAAC countries. For the older reported age group, the 61-65-

year-old, the participation was 53 percent, doubling the average of other countries that participated in PIAAC for that age group (See Figure 16).

Figure 16 Access to training by age group New Zealand and selected countries (Circa 2015)
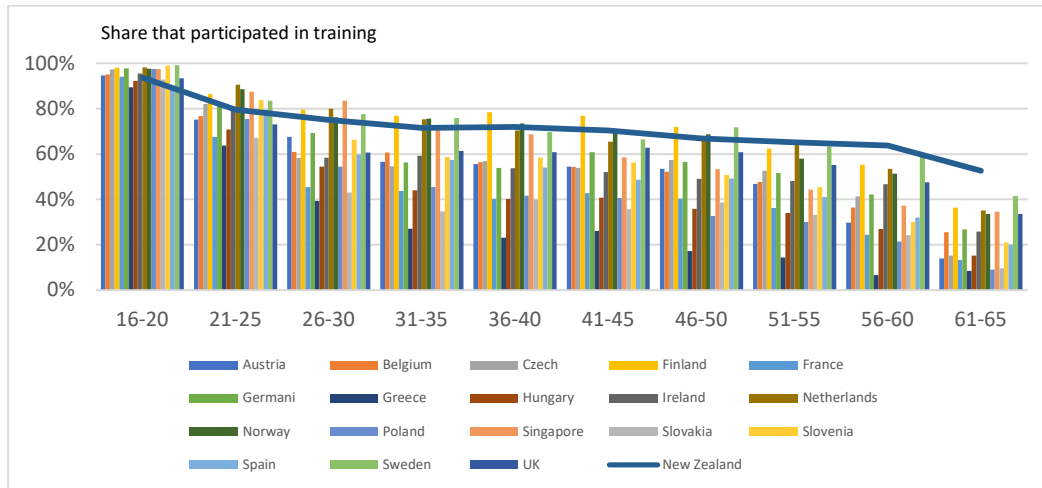
Data Source: OECD (n.d.C)

As an important element of the reform, the Industry Training Act of 1992 created the ITOs. As mentioned before, the ITOs had three main objectives: provide information about industry skill demand, define national skill standards and qualifications, and broker training to meet the needs of employees in the industry. Among the first ITOs to be created were the *Funeral Industry*, *Journalist Industry*, *Furniture Industry*, *Joinery Industry*, *Aviation, Tourism and Travel Industry*. During the implementation of the reform, there were 52 ITOs in 1996, and the number decreased to 38 in 2010. By the end of the reform, there were only eleven ITOs.

The 1989 skill ecosystem merged apprenticeship and training under the leadership of ITOs. The number of participants in the apprenticeship and training programs increased approximately by 50 percent between 2001 and 2019, from approximately 100K to 150K. Though there are two differentiated trends during those years. There was a continuous growth between 2001 to 2009, followed by a slight decline in 2010 and an additional decline in 2011. During that period, participation in apprenticeship and training doubled, mostly by a large increase in trainees' number. In 2011, there is an important decline in the number of trainees, from approximately 150K to 100K, a level of trainees that have remained relatively stable during the decade. With regards to the number of apprentices, it increased from 2001

to 2009 and has remained relatively stable since then. However, there have been changes in the composition of apprenticeship programs. In 2001, most apprentices were participating in Industry Training Apprentices. Later on, as the Modern Apprentices program was launched, it increased its share among apprentices, reaching one-third of total apprentices by 2010. The Modern Apprentice program had been evaluated (OECD, 2008; Ministry of Education, 2021), showing positive result at a high cost. Later on, as the New Zealand Apprentice Program was launched, it slowly replaced the Modern Apprentice and the Industry Training Apprentice. The New Zealand Apprenticeships begin at level 4 of the NZQF (Productivity Commission, 2017). In 2019, almost all the apprentices in New Zealand were participants of the New Zealand Apprentice Program (Figure 17).

Figure 17 Evolution of non-formal education: apprenticeship and training
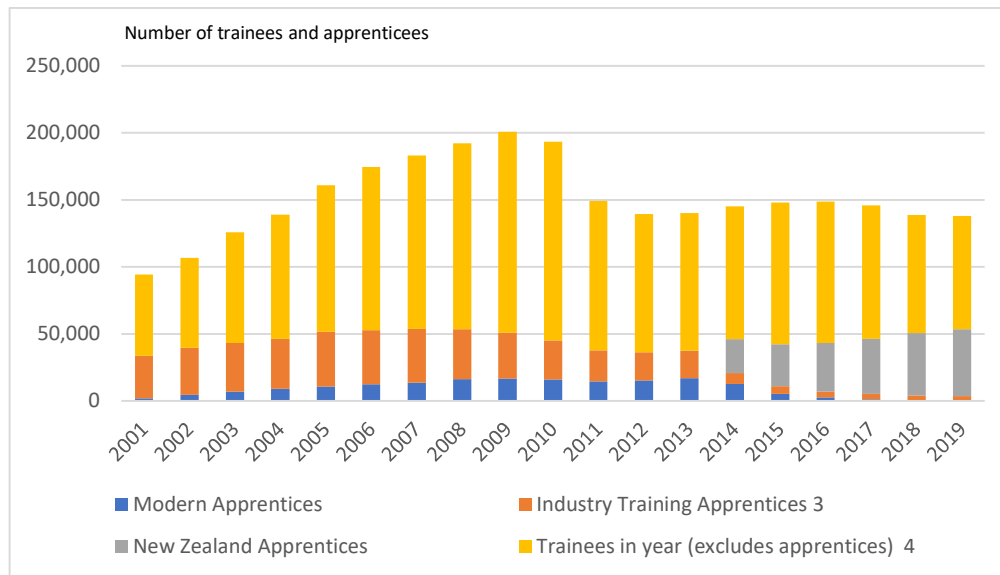
Source: Education Counts (n.d. A)

The reduction in training has affected different training levels, education groups, sectors, background of trainees and training fields differently. Regarding the level of training, training for levels of the NZQF 1,2 and 3 reduced from 120 K to 60 K. On the other side, training for levels four and above, increased from 70K to 75K. Regarding the age of trainees, the number of trainees older than 30 years old decreased from 114 K to 67K, while the number of trainees younger than 30-year-old remained constant at around 60K. With regards to previous education attainment of trainees, the number of trainees with a level 3 diploma or less was

approximately 60K; by 2019, the number decreased to 30K. The trainees with higher previous levels remained relatively constant, around 40K. Among training fields, the data shows an important reduction in training in *Engineering and Related Technologies*, and *Agriculture and Environment and Related Studies*. On the other side, training in *Management and Commerce* doubled in the last decade. Therefore, training has become focused on a younger, more skilled population that is trained on higher-level topics with higher participation of management and commerce and society and culture programs (Figure 18). The reduction may be linked with a decline in participation in retraining (Productivity Commission, 2017). The reduction may also reflect adjustments in ITOs given the low perceived outcomes, for example, low graduation rates (Ministry of Education, 2021)

Figure 18 Characteristics of training: 2010-2019

Training level

Age

Previous education attainment

Training field
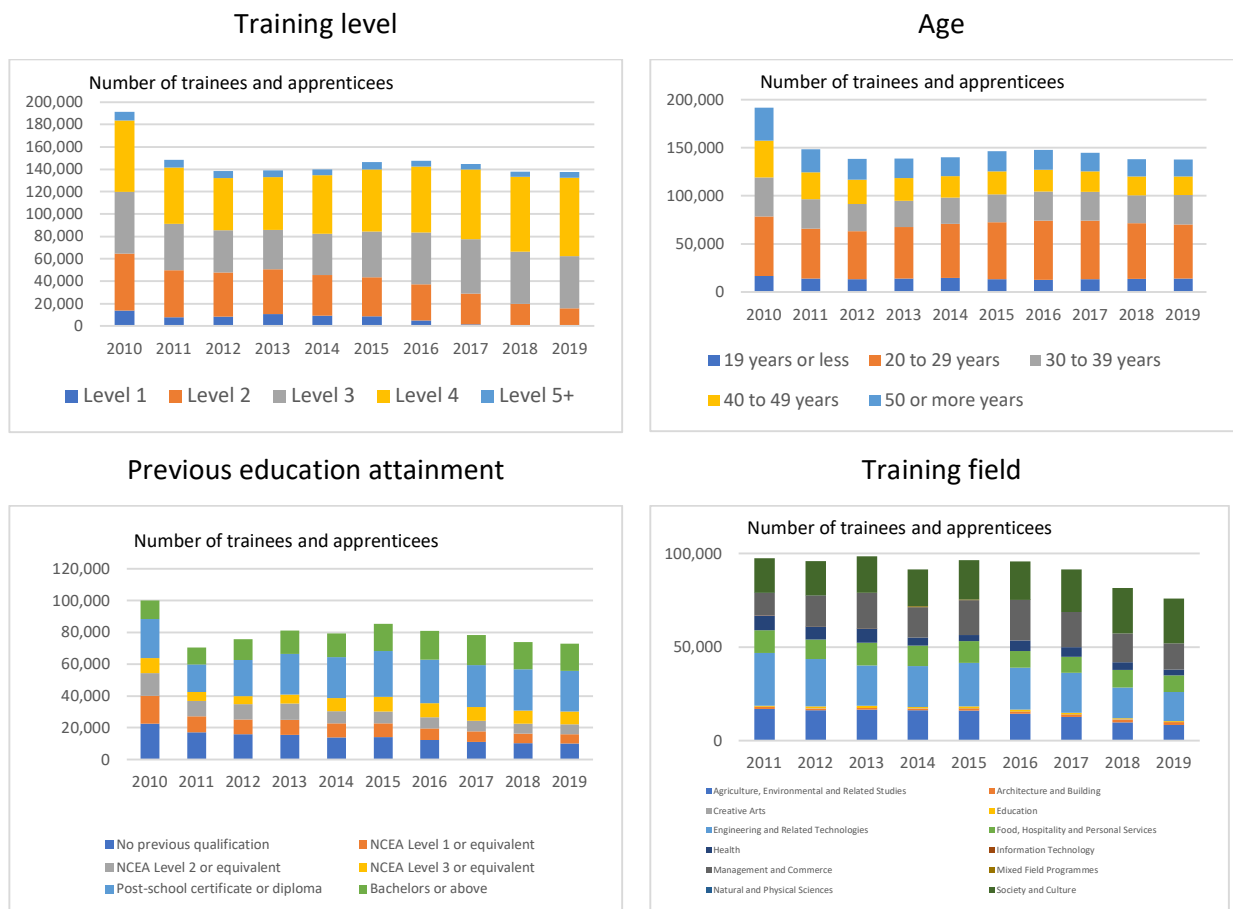
Source: Education Counts (n.d. A)

As in the case of tertiary education, the participation rate in training in New Zealand is high in comparison to the comparator countries. Though there has been a clear positive trend in the first half of the reform followed by a sharp decline trend in the second half. The evolution in the second half may have responded to adjustment on ITOs given the low perceived effectiveness and overall refocus of the system towards formal higher levels of education (university for school leavers).

The ITOs exhibited an important dynamism, specially till 2010, that supported the expansion in training. There was a dynamism in the number of ITOs, that lead to a consolidation in the last decade of the reform. Though, there efficiency may be lower than expected, as to be shown below, a large share of the training of firms seem to be independent of the qualification frameworks.

3.4.2.6 Learning in the workplace

Besides education, training and apprenticeships, there is growing consensus opportunities that happen at the workplace. These learning experiences were highlighted during the implementation of the 1989 skill ecosystem reform, for example, by the Skill New Zealand report produced by the Tripartite Commission (2009). And a key objective of the reform was the recognition of this type of learning.

Given the importance of learning in the workplace, PIAAC has produced an index of learning at work. New Zealand has the highest index of learning at work. As in the case of access to training, New Zealand outperforms other PIAAC countries across the different age groups, activities, and occupations among countries that participated in the PIAAC (See Figure 19).

Figure 19 Learning-at-work (index) New Zealand and selected countries (Circa 2015)

By age
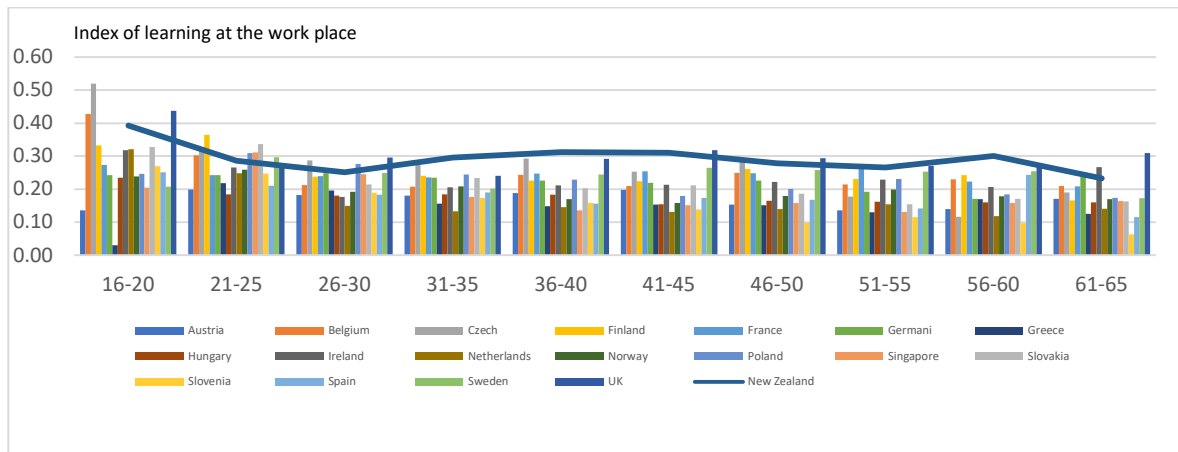
By Industry
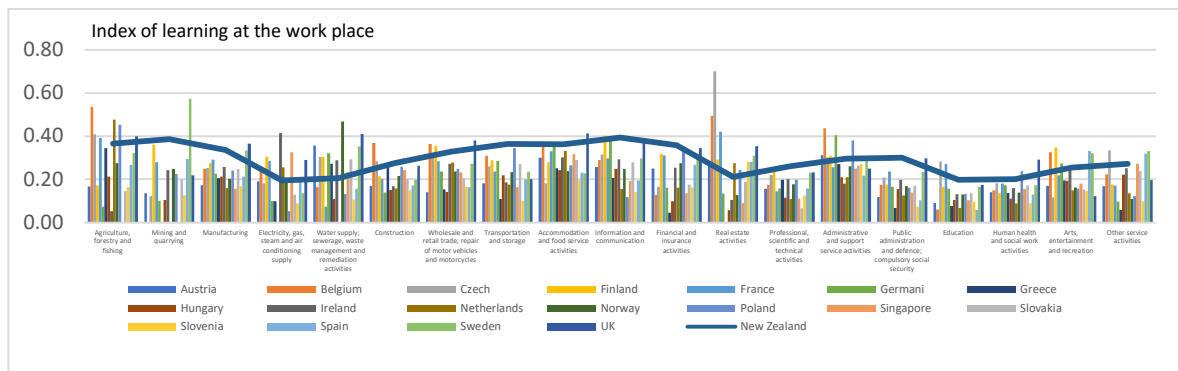
By Occupation
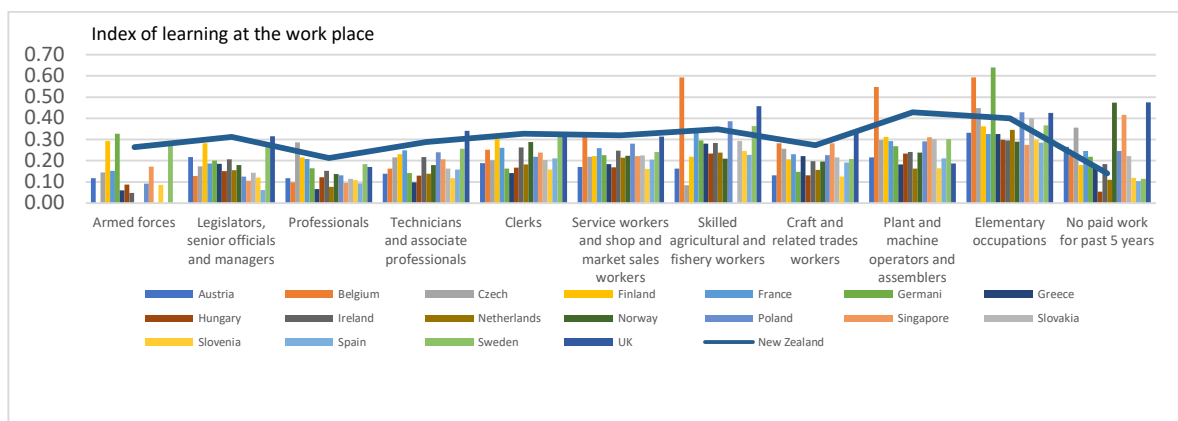
Data Source: OECD (n.d.C)

Recent international literature shows the importance of on the job training. The international data presented in this section shows that New Zealand is one of the countries with a higher

index of learning at work. The high index of learning holds across different ages groups, industries and occupations.

3.4.2.7 Skills in the adult population

Different sources of learning, foundational and life-long, create the skills that the adult population has. As its adult population was assessed on Numeracy (See Figure 20) and Literacy skills (See Figure 21), results were among the highest among PIAAC participating countries in both areas. By education level, results in PIAAC are aligned with high performing PIAAC participating countries, and as expected, more education is related to higher outcomes, though they stand out for individuals with a medium level of education on literacy. New Zealand stands out for the higher performance on the PIACC test of its older population groups with regards to age.

Figure 20 Numeracy skills in the adult population: New Zealand and selected countries (Circa 2015)

By Education Level

By Age Group

Data Source: OECD (n.d.C)

89
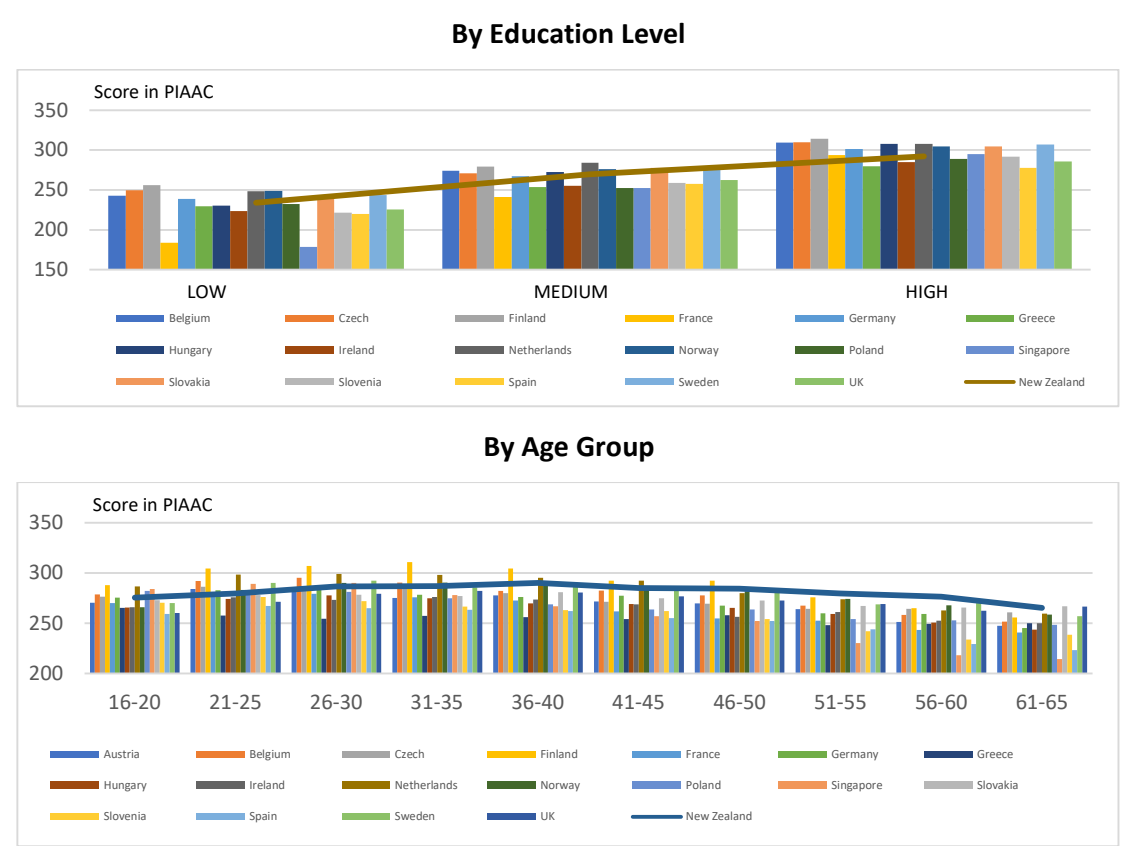
Figure 21 Literacy skills in adult population: New Zealand and selected countries (Circa 2015)

By Education Level

By Age Group
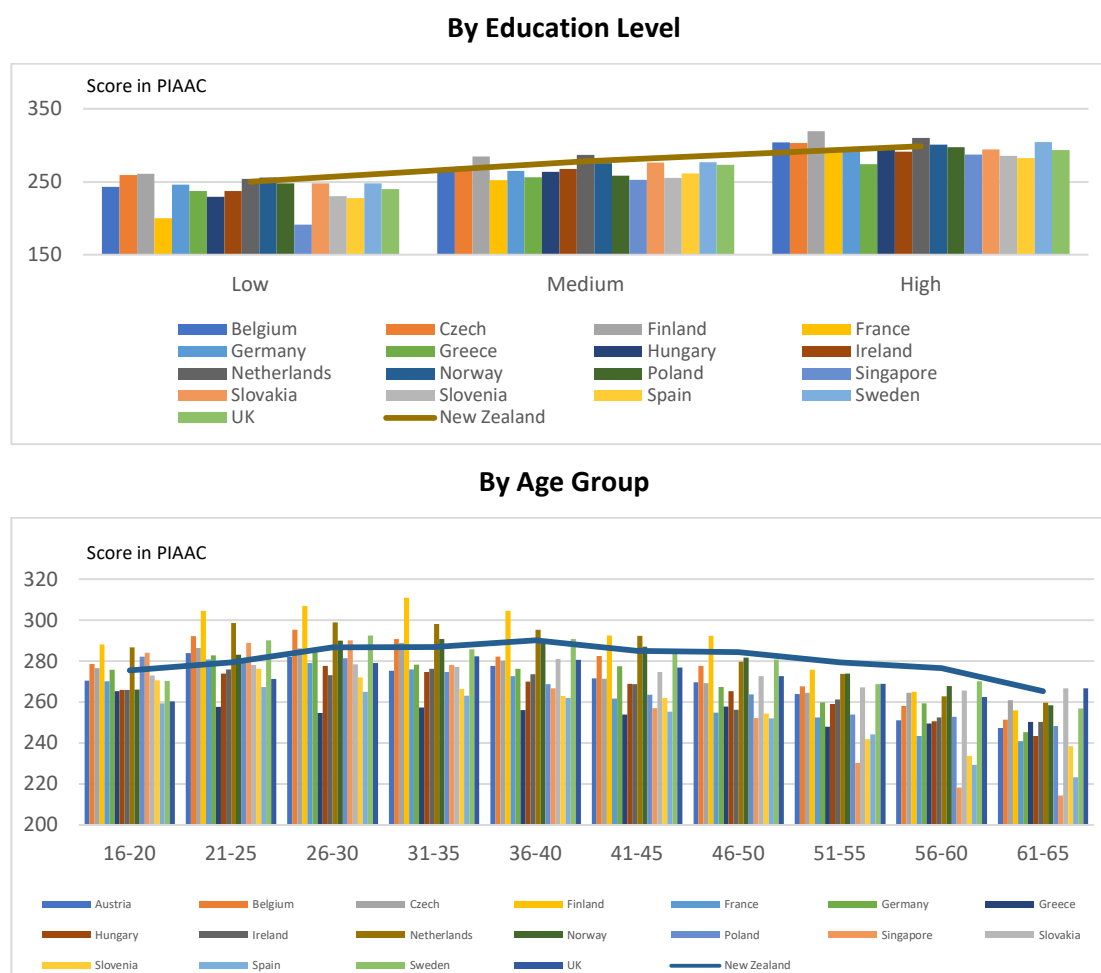
Data Source: OECD (n.d.C)

Skills among the adult population in New Zealand are higher than among other countries that participated in PIAAC. Nonetheless, the data shows that New Zealand's advantage decreases among younger generations. The decline between 21-25 years-old and 16-20 years-old is consistent with PISA's evolution.

3.4.3 Deployment

Improvement of deployment of skills was a significant concern with the 1989 skill ecosystem reform. The reform created ETSA, SkillsNZ and later Careers NZ, which was absorbed by TEC.

An evaluation in 2013 of Careers NZ indicated that its functions are not clear, making it difficult to assess the achievement of objectives (State Services Commission, 2013).

A major theme across the Tertiary Education Strategy and the SkillsNZ was the fucus on skills mismatch, even with some attention to the reduction of mismatches within the workplace. Some authors argued that the introduction of the new qualification systems that recognizes out-of-school experiences might have contributed to a reduction in student dropout (OECD, 2008).

Through the implementation of the reform, several programs were implemented to improve the school to work transition of those graduating or dropping from secondary schools. Among them, we find the Gateway program and the Modern Apprenticeship.

Another major reform was the support towards students during the school to work transition through the strengthening of Career Service to guide students to make better education decisions.

There have also been efforts to improve the information as a way to improve school to work transition. These efforts also included initiatives that connected the youth population with service providers within their communities, and supporting the youth in CV preparation, developing job-search skills and motivation and confidence building. (OECD, 2010). With regards to the Careers Information Service at schools, despite positive results, further developments were needed to develop school-wide systems and process (Education Review Office, 2012).

3.4.4 Quality assurance

The decentralized skill ecosystem created by the 1989 reform required a strong quality assurance system. A two-tier quality assurance system was put in place. On one side, universities are regulated by Universities New Zealand, and the NZQA regulates non-university qualifications.

Universities New Zealand quality assures universities by two mechanisms. The Committee on University Academic Programmes (CUAP) is in charge of approving qualifications, and the

Academic Quality Agency (AQA) is an independent body that performs regular audits. According to the Productivity Commission (2017), the CUAP is not conducive to innovation, and AQA focuses on process rather than outcomes.

Regarding the non-university institutions, they are quality assured by the NZQA, an institution that also has in place two mechanisms. On one side, there is the process for approval and accreditation of qualifications. According to some providers, "time-consuming, costly and a barrier to innovation in the development and delivery of programmes". (Productivity Commission, 2017, p 98). To assess compliance with program approval, providers have to undergo an External Evaluation Review under the guidelines approved by NZQA.

With regards to quality assurance secondary education., the education system was slow to respond to the reform. According to a NQF White Paper was released in October 1999, the NCEA appeared to:

> *"…stake out a middle ground between those advocating Unit Standards, or who were at least sympathetic to what Unit Standards were attempting to do, and those who either favoured national examinations or were down right critical of Unit Standards as a form of assessment suited to school curriculum subjects"* (Locke & Hall (1998, p. 183), as cited in Gooh(2005))

The NCEA was launched in 2001. As reported by Chamberlain (2003) and Goh (2005), the NCEA was well received by the education community. There was a perception that the existing norm-based assessment system was affecting students from certain ethnicities and low-income families (Shulruf et al., 2010). The NCEA has shown that outcome predictability of first-year university results from the NCEA is up to five times stronger than all of the other secondary school assessment systems in New Zealand and worldwide (Shulruf et al., 2008).

3.5 Outcomes of the reform

This section assesses the impact of changes in the skill ecosystem generated by the 1989 skill ecosystem reform, focusing on individual and firms' behaviours (level 2 analysis) and aggregate variables (level 3).

Changes in the ecosystem can change the expected benefits of education, matching, perception of firms towards the outcomes of training, among others. The first part of the

subsection assesses how the changes in the ecosystem may have affected individuals and firms' behaviour. The assessment covers ten different strategies with different data sources and complementary findings (presented in Table 9).

Table 9 Analysis level 2

Theme	Data	Main Result
Changes in occupations	PISA	Students are aligned with market needs.
Demand training for firms	BOS	Training is not the most seek strategy to address skills shortages at the firm level. Skills are not flowing across sectors (and maybe firms).
Collective agreements and training	Blumenfeld, Ryall and Kiely (2019)	Incentives to train are not materialized in collective agreements.
Labour allocation and reallocation	Stats NZ	Large movements of labour across sectors.
Labour dynamics	LEED	Constant changes in the labour force
	PIAAC	New Zealand the country with the highest labour rotation.
Mismatch	PIAAC	The weak explanatory power of education certificates and skill content.
	PISA and ONET	The aspiration of the youngster is aligned with the economy.
	PIAAC	New Zealand is a widespread perception of overqualification.
Return of education	EducationCounts	No difference in payoff by type of provider.

The final part of the section assesses changes in the aggregate variables. It presents five strategies (listed in Table 10)

Table 10 Analysis level 3

Theme	Data	Result
The perceived shortage of skills	New Zealand Institute of Economic Research.	Persistent perception of lack of skills.
	The World Bank	New Zealand in a worse position than its peers
	Business operation survey	Heterogenous perceptions of skills shortages by sector. High demand for foundational skills that are hard to find.
Evolution of macro variables	StatsNZ	Favourable evolution of employment and GDP. Productivity growth was low.
Change in macro dynamics	StatsNZ	Changes in the modality of adjustments. Adjustments made by price and not quantity.

3.5.1 Individual behaviours

3.5.1.1 Changes in demand for education by individuals

A major determinant of the education outcomes of individuals is their expectations. Expectations form by the interaction of education benefits, their own previous experiences with education, family preferences towards education, opportunities to engage, and expectation of the future structure of the labour market and labour opportunities. The 1989 skill ecosystem reform affected expectations. In New Zealand, in 2003, among the students that participated in the PISA test, one-third of 15-year-old had low expectations in terms of the level of their educational outcomes, as they aimed to finish secondary education or a lower degree (ISCED levels 2, 3B-3C and 3 A). Surprisingly, in 2018, a similar share expected to reach a similar degree. However, there were some changes in expectation among those that expected higher levels. In both years, 2003 and 2018, 70 percent of students expected to achieve a degree higher than secondary education (ISCED levels 4, 5B, 5A and 6). Though, the composition of the expected degrees changed: the share that expects to achieve academic post-secondary education has increased (ISCED levels 5A and 6), while the number that expected to achieve vocational post-secondary education (ISCED levels 4 and 5B) has decreased (Figure 22).

Figure 22 Higher expected degree by ISCED (2003 vs 2018)
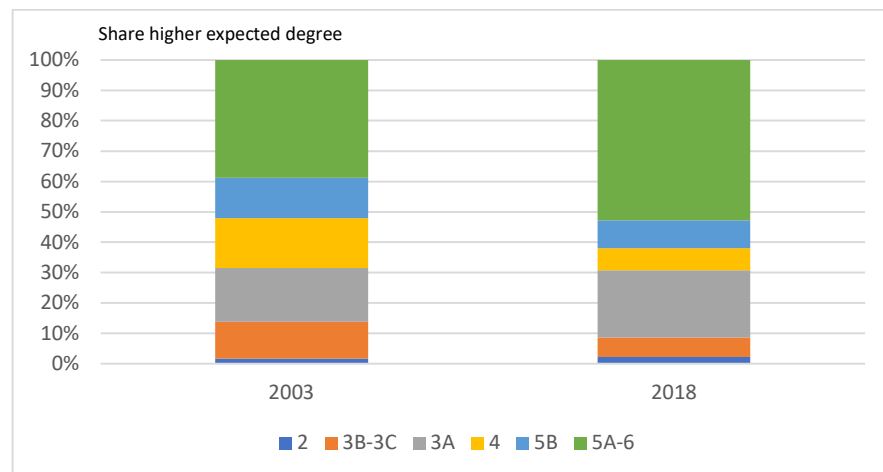
Data Source: OECD (n.d.B)

The share of 15-year-old that expect to obtain vocational tertiary education (ISCED level 5B) as their highest education degree, decreased from 13 percent in 2003 to 9 percent in 2018. This evolution is aligned with global trends. Most countries that participated both in PISA 2003 and in PISA 2018 registered a reduction in the share of students interested in vocational tertiary education, but the decline in New Zealand was among the largest, and New Zealand moved from the 17th highest share to the 23rd (Figure 23). New Zealand participation is higher than Australia, the UK and the USA; only lower than Canada.

Regarding the students who expect to achieve academic post-secondary education (ISCED level5A and 6), New Zealand has one of the lowest shares among countries that participated in PISA 2003 and 2018. The share of students that expect to achieve academic post-secondary education went up from 38 percent to 52 percent. Among OECD countries, New Zealand's share is only higher than countries characterized as CMEs (Austria, Germany and Switzerland) or the Nordic Countries (Iceland, Norway and Sweden) (Figure 24).

Figure 23 Popularity of tertiary vocational education (ISCED 5B) New Zealand and selected countries 2003 vs 2018)
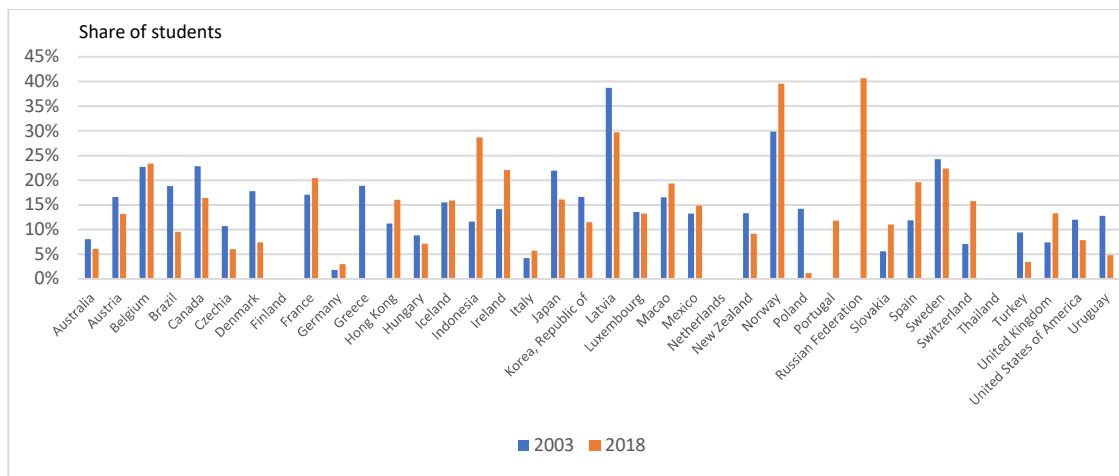
Data Source: OECD (n.d.B)

Figure 24 Popularity of tertiary academic education (ISCED 5A and 6) New Zealand and selected countries (2003 vs 2018)
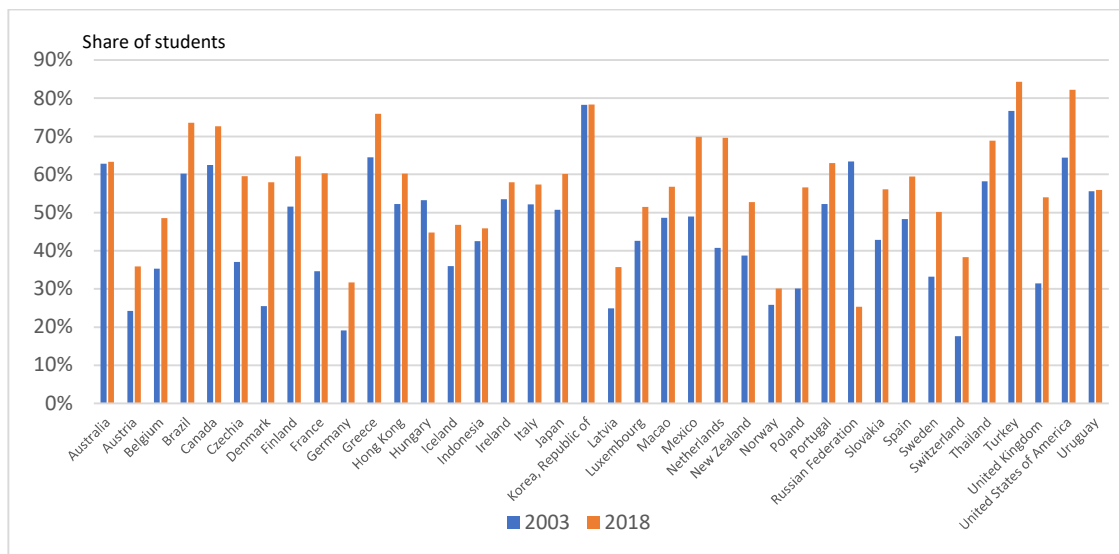
Data Source: OECD (n.d.B)

Besides changes in expected education attainment in terms of education levels, there have also been changes in the occupations that 15-year-old expect to perform as they reach their 30th birthday. In 2006, the top occupations selected by the 15-year-old students that participated in PISA in New Zealand were (i) *nursing professionals*, (ii) *management and organization analysis* and (iii) *accountants*. In 2018, students selected (i) *lawyers*, (ii) *police officers* and (iii) *medical doctors*. In 2018, *Building architects* and *House Builders* were the 4th and the 10th higher selected occupations, while in 2006, *Building finishers and related trade workers* as the 7th occupation, likely reflecting the growing importance of construction in the economy between 2006 and 2018. On the other side, occupations related to agriculture and manufacturing, *Product managers in agricultural production managers in agriculture, forestry and trade* and *Industrial and Production Engineers*, respectively, were among the top 10 selected occupations in 2006. No occupation-related to those activities was among the top 10 in 2018 (Table 11).

Table 11 Expected Occupation of 15-year-old (2006 vs 2018)

2006	2018
Nursing professionals	
Management and organization analysts	Lawyers
Accountants	Police officers
Industrial and production engineers	Medical doctors
Production managers in agriculture, forestry and fisheries	Building architects
Hairdressers	Nursing professionals
Companions and valets	Teaching professionals
Building finishers and related trades workers	Veterinarians
Teaching professionals	Specialist medical practitioners
Motor vehicle mechanics and repairers	Athletes and sports players
Traditional and complementary medicine professionals	Housebuilders
Pet groomers and animal care workers	Managers

Data Source: OECD (n.d.B)

The analysis shows that expectations about the future of students have changed in the last twenty years of the reform. This change indicates a reaction of students to market needs, but at the same time, shows that preference towards higher degrees is low, and with the potential of creating a inequality among New Zealanders.

3.5.1.2 Firms' skill demand

Besides decisions by individuals described above that enhance their labour market productivity, at the firm level, its labour force skills constitute an important component of a firm's current and future productivity. Firms implement different strategies to secure the skills they need, strategies that could be categorized as aggressive hiring, increased use of existing labour force, and training. The skills acquisition module of the Business Operations Strategy (BOS) Survey 2016 carried out by StatsNZ reveals different strategies by industries, likely reflecting different firms' structure, labour and skills needs within them (StatsNZ, n.d. A).

Strategies of firms to deal with skill shortages can be characterized as more aggressive hiring, more aggressive use of resources, and more training. BOS surveyed firms on their preferred strategies. Firms are more likely to employ aggressive hiring strategies, especially among large firms by using increased advertisement. With regards to the more intense use of resources, this is the second preferred strategy, with high usage in the *Accommodation* and *Construction* industry. With regard to use of training, it is the last preferred strategy, with higher use in large firms (Figure 25).

The BOS provides detailed information by skill on the perceived demand and the training been deployed to address the skills gaps by the firms (aggregated at the industry level). For example, in the accommodation sector, 68 percent of the employees in the *Accommodation industry* need training in customer service, but only 18 percent are receiving training, and in the *Professional, scientific, & technical sector*, 45 requires training in professional/technical topics, while only 35 receives it. Figure 26 presents demand of skills and training by skill and industry. It shows a positive correlation between the identified training needs of employees and the training deployed by firms, i.e. training is higher in the skills in which a larger training need was identified. Despite the positive relationship, most of the training provided is below the training needs (below the diagonal line), indicating the existence of training gaps.

Figure 25 Firm strategy to address skills shortages

Strategies towards aggressive hiring

Share of firms employing the strategy

Legend: increased advertising / recruitment spend ■ used new recruitment methods or channels ■ recruited workers from overseas

Strategies on more intense of use of existing labour force

Share of firms employing the strategy

Legend: brought in contractors, or contracted work out ■ employed temporary workers ■ increased hours worked by existing employees (eg overtime) ■ increased wages or salaries

Strategies towards training

Share of firms employing the strategy

Legend: trained less well-qualified recruits ■ increased training given to the existing workforce ■ worked with tertiary education sector to increase supply of skills needed

Data Source: StatsNZ (n.d. A)

Figure 26 Training needs vs deployment by ANZSIC and skill 1/
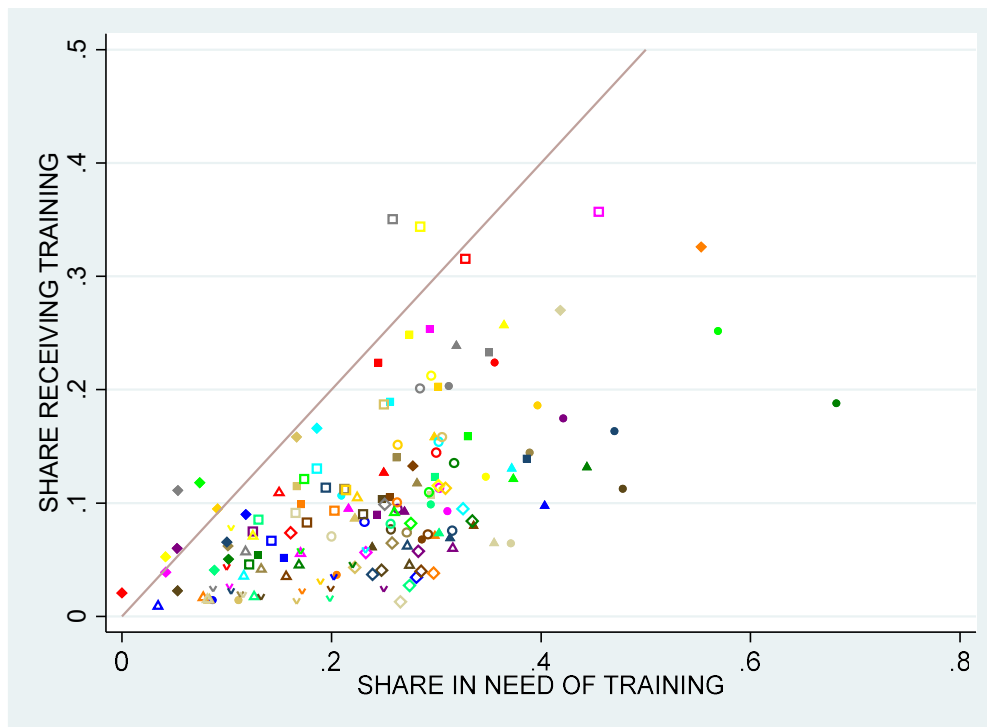
1/ **Each dot represents an industry/skill combination. Industries are identified by colours and skills by shapes. Industries:** Accommodation & food services green; Administrative & support services brown; Agriculture, forestry, & fishing, blue; Arts & recreation services, purple; Construction orange; Education & training, yellow; Electricity, gas, water, & waste service, cyan; Financial & insurance services, red; Health care & social assistance, grey; Information media & telecommunications, olive; Manufacturing, chocolate; Mining, sand; Other services, stone; Professional, scientific, & technical service, magenta; Rental, hiring, & real estate services, gold; Retail trade, lime; Transport, postal, & warehousing, mint; Wholesale trade, navy. **Skills**: Computer skills, small square; Customer service/sales skills, small circle; Management / supervisory skills, hollow circle; Marketing skills, hollow triangle; Numeracy skills (e.g. ability to use numbers and measures), small v; Oral communication skills, hollow diamond; Professional / technical skills, hollow square; Team working skills, small triangle; Trade-related skills, small diamond.

Data Source: StatsNZ (n.d.A)

Grouping needs and training at the industry and skill levels provides additional information on the nature of the skill gaps. As presented in Table 12, all industries registered a gap between the training needs and the training received by their employees, signaling common challenges across industries to address their training gaps. The industries with the largest gaps were *Accommodation & food services,* followed by *Manufacturing* and *construction*. However, on training gaps by skill, the gaps as focalized in certain areas. The largest gaps were registered in Costumer service/sales skills, Written communication skills, Oral communication skills and teamwork skills. The only skill that did not present a gap *is* Health and Safety Training, skill that presents a training larger than the needed, likely reflecting legal mandates related to those areas. Analysis of Variance (ANOVA) confirms that industries effects have a

small explanatory capacity of difference in training needs and training provided. Industry effects only explain 3 percent of the variance in training need and 15 percent of the variance of training provided. But skill effect has a larger explanatory capacity, as they explain 36 percent of differences in training needs and 52 percent of the variance in training provided, i.e., training concentrates in certain skills (Table 13).

Table 12 Training gaps by ANZSIC

TRAINING GAPS

BY INDUSTRY		BY SKILL	
Industry Activity	**Training Gap**		
		Skill	Training Gap
Accommodation & food services	-19%		
Administrative & support services	-14%	Computer skills	-11%
Agriculture, forestry, & fishing	-14%	Customer service/sales skills	-22%
Arts & recreation services	-16%	Management / supervisory skills	-16%
Construction	-17%	Marketing skills	-11%
Education & training	-8%	Numeracy	-13%
Electricity, gas, water, & waste service	-14%	Oral communication skills	-21%
Financial & insurance services	-7%	Professional/technical skills	-6%
Health care & social assistance	-6%	Team working skills	-20%
Information media & telecommunications	-17%	Trade-related skills	-4%
Manufacturing	-18%	Written communication skills	-20%
Mining	-11%	Health and Safety Training	1%
Other services	-19%		
Professional, scientific, & technical se	-13%		
Rental, hiring, & real estate services	-13%		
Retail trade	-15%		
Transport, postal, & warehousing	-17%		
Wholesale trade	-18%		

Data Source: StatsNZ (n.d.A)

Table 13 ANOVA: Decomposing variance of training needed and received by current employees

	TRAINING NEEDED	**TRAINING RECEIVED**
By:		
Industry (18)	3%	15%
Skills (10)	38%	52%

Data Source: StatsNZ (n.d.A)

With regards to the modality of delivery, in most industries there is internal and external training. With regards to internal training, the sector with the highest use of internal training

was *Administrative and support services* with 89 percent, while the sector with the lowest provision of internal training was *Information and telecommunications*, with 78 percent. Across the different sectors, most internal training is not focused on a New Zealand qualification (Table 14).

Table 14 Internal or external training

OFFERING OF INTERNAL AND EXTERNAL TRAINING AND TRAINING CONTENT							
	INTERNAL				EXTERNAL		
	OFFERED	NZ QUAL	NON-NZ QUAL		OFFERED	NZ QUAL	NON-NZ Q
Accommodation & food services	87%	11%	15%		41%	7%	8%
Administrative & support services	89%	8%	15%		63%	7%	11%
Agriculture, forestry, & fishing	81%	13%	13%		60%	10%	12%
Arts & recreation services	82%	6%	10%		72%	17%	17%
Construction	88%	17%	18%		82%	17%	14%
Education & training	85%	16%	17%		78%	18%	18%
Electricity, gas, water, & waste service	81%	8%	13%		76%	14%	20%
Financial & insurance services	88%	11%	15%		76%	11%	14%
Health care & social assistance	85%	18%	14%		90%	12%	20%
Information media & telecommunications	78%	15%	19%		58%	16%	16%
Manufacturing	87%	12%	17%		72%	12%	13%
Mining	83%	13%	18%		94%	18%	17%
Other services	88%	14%	21%		82%	15%	20%
Professional, scientific, & technical se	86%	10%	14%		85%	11%	17%
Rental, hiring, & real estate services	84%	10%	17%		65%	12%	12%
Retail trade	84%	9%	16%		73%	11%	14%
Transport, postal, & warehousing	88%	11%	16%		68%	11%	13%
Wholesale trade	82%	15%	16%		68%	10%	16%

Data Source: StatsNZ (n.d.A)

With regards to external training, there is a larger heterogeneity among industries than in internal training. *Mining* has the highest share of firms providing external training with 90 percent of firms, while *Accommodation* and *Food services* in the industry with the lowest share of firms providing that type of training. In the case of external training, it is more focused on the provision of a New Zealand Qualification than in the case of internal training.

Furthermore, the BOS also provides information on the relationship between the business sector and the external training providers, including tertiary education providers and commercial training. The sector with the highest use of tertiary education provider is *Mining*, followed by *Construction*, while the sector with the lowest use of tertiary education is *Arts and recreation* and *Transport*. Regarding the use of commercial training, the sector with the highest use of commercial training is *Transport*, while the sector with the lowest use was

Accommodation and Food Services. The levels of satisfaction with the training were high, both with tertiary education providers and commercial training.
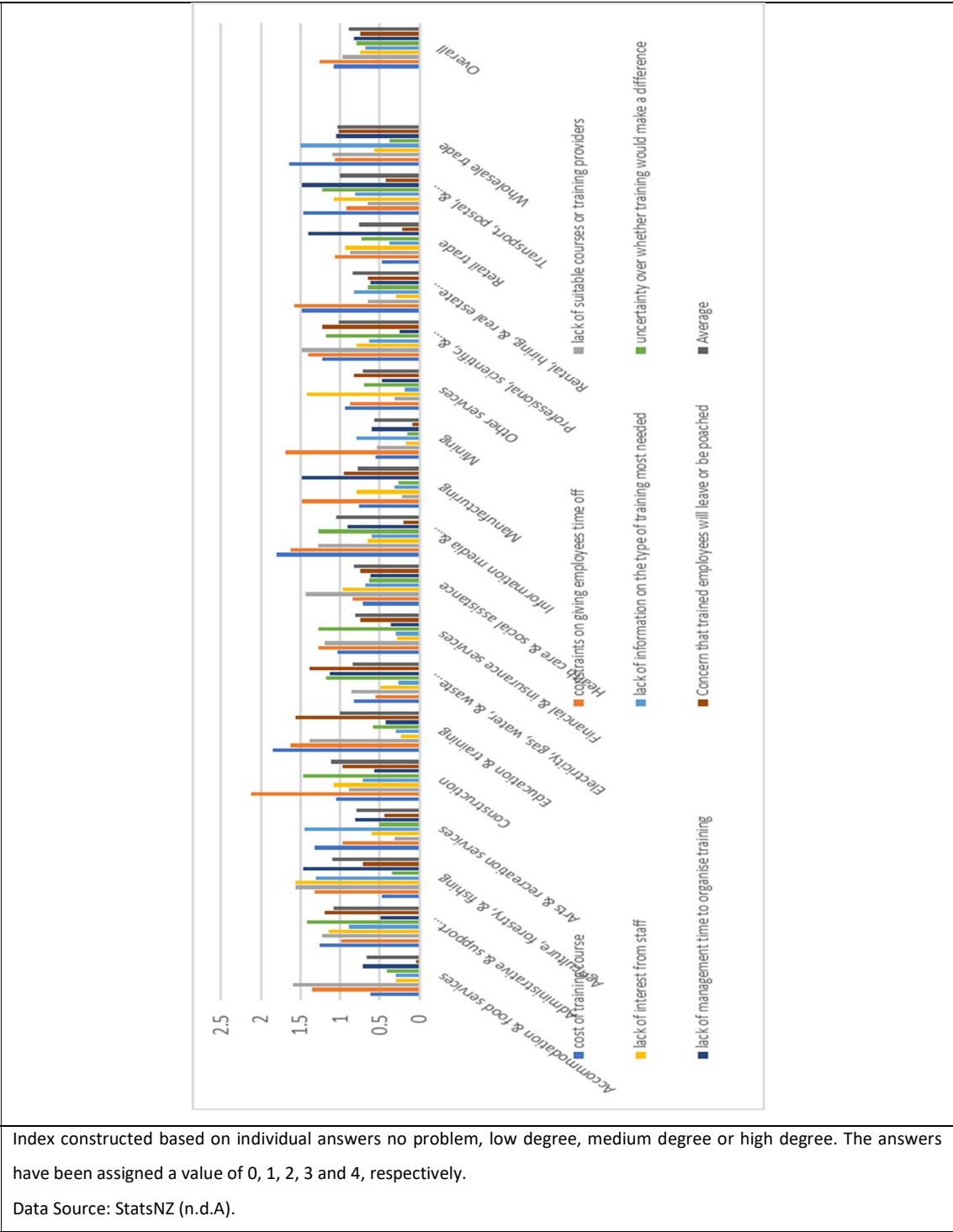
Table 15 Assessment of effectiveness of training by type of provider

External training providers used and effective	Tertiary education providers			Commercial training			Others		
	Did not u	Effective	Ineffective	Did not u	Effective	Ineffective	Did not u	Effective	Ine
Accommodation & food services	74%	26%	0%	53%	47%	0%	77%	23%	
Administrative & support services	69%	29%	1%	24%	75%	1%	43%	55%	
Agriculture, forestry, & fishing	47%	50%	3%	35%	61%	4%	70%	29%	
Arts & recreation services	75%	23%	3%	33%	65%	2%	60%	40%	
Construction	37%	62%	1%	18%	82%	0%	55%	44%	
Education & training	40%	60%	1%	30%	68%	2%	50%	48%	
Electricity, gas, water, & waste services	65%	35%	0%	20%	77%	3%	41%	59%	
Financial & insurance services	64%	36%	0%	33%	67%	0%	30%	70%	
Health care & social assistance	49%	50%	2%	31%	66%	3%	34%	64%	
Information media & telecommunications	72%	26%	2%	39%	59%	2%	35%	63%	
Manufacturing	51%	48%	1%	28%	70%	2%	52%	47%	
Mining	35%	59%	6%	24%	76%	0%	50%	50%	
Other services	39%	60%	1%	37%	62%	1%	53%	47%	
Professional, scientific, & technical services	63%	36%	1%	25%	75%	0%	38%	61%	
Rental, hiring, & real estate services	65%	32%	3%	24%	76%	0%	42%	56%	
Retail trade	58%	39%	3%	36%	60%	4%	41%	58%	
Transport, postal, & warehousing	75%	25%	0%	16%	81%	2%	54%	46%	
Wholesale trade	66%	34%	0%	29%	69%	2%	41%	57%	

Data Source: StatsNZ (n.d.A)

Regarding the restrictions to train, BOS explored different factors that may limit the training decisions of firms. The factors assessed in the survey were the cost of training, constraints on giving employees time, lack of suitable courses or training, lack of interest from staff, lack of information in the type of training, uncertainty on the outcome of training, lack of management time to organize training and concern that trained employees will be poached after the training. Among the different factors, the main limit on training decisions is the reluctance to give employees time off, followed by training costs. On the other side, among the listed factors, "Concern that trained employees will leave or be poached" was less cited as a business constraint. Construction registered the highest constraints to training by economic activities, followed by *Agriculture, Forestry and Fishing*, *Administrative and Support Services* and *Information Media and Telecommunications*. However, the underlying constraints are different across economic activities. In *Construction*, the main constraint is providing time off to employees, while in *Agriculture, Forestry and Fishing*, the main constraint is the lack of suitable training providers (Figure 27).

Figure 27 Restriction to train employees

Index constructed based on individual answers no problem, low degree, medium degree or high degree. The answers have been assigned a value of 0, 1, 2, 3 and 4, respectively.

Data Source: StatsNZ (n.d.A).

Similar challenges are experienced as firms hire new labour with important differences by industries. Data from the BOS of 2016 present differences in access to skills by ANZSIC.

Electricity, Gas, Water and Waste Management and *Accommodation and Food Services* were the sectors reporting the largest number of openings, *while Rental, Hiring and Real State Services* and *Agriculture, Forestry and Fishing* were the ones that reported the lowest share of openings. With regards to difficult hiring. The sector that reported the greatest difficulty in hiring that year was *Construction*, while the sectors with the lowest difficulty *were Financial & Insurance Services*, *Arts and Recreation Services* and *Education and Training*. The relationship between the share of opening and difficulty in hiring across the economic sectors is presented in Figure 28. As observed, there is no direct relationship between the share of openings and difficulties hiring.

Figure 28 Difficulty of finding jobs by ANZSIC classification and share of openings
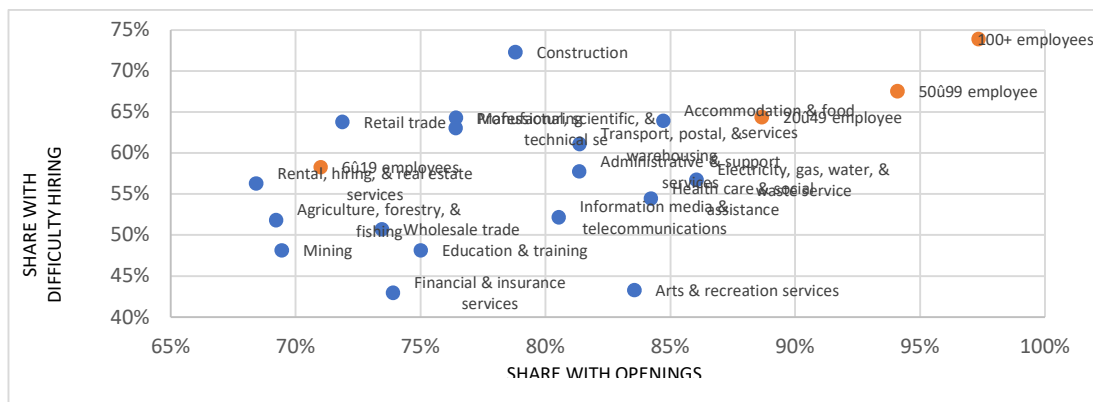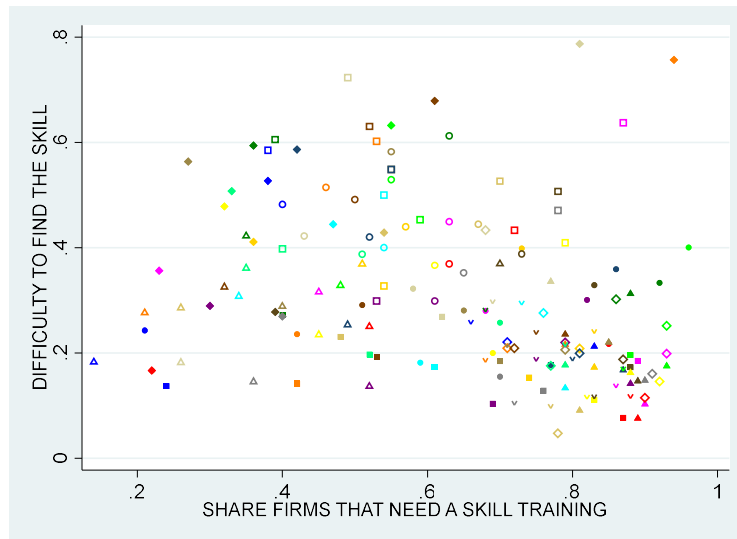

Data Source: StatsNZ (n.d.A)

However, there is a clear relationship between share with opening and difficult hiring by firm size. Larger firms indicated a higher prevalence of openings and greater difficulty in hiring. While smaller firms reported a lower share of firms with opening and a lower difficulty on hiring (Figure 28).

With regards to difficult to find skill by skill type and industry, the BOS data shows that, on average, there is a negative correlation, i.e. skills that are in high demand are less difficult to find (Figure 29). This would signal that the education/training system is responding to the needs of the economy. Though, there are important exceptions, for example, trade related skills are in high demand in construction (94 percent) and there is a large difficulty finding them (75 percent) [orange diamond on top right corner in Figure 29].

Figure 29 Difficulty to find skill by industry and skill

1/ Each dot represents and industry/skill combination. Industries are identified by colours and skills by shapes. Industries: Accommodation & food services green; Administrative & support services brown; Agriculture, forestry, & fishing, blue; Arts & recreation services, purple; Construction orange; Education & training, yellow; Electricity, gas, water, & waste service, cyan; Financial & insurance services, red; Health care & social assistance, grey; Information media & telecommunications, olive; Manufacturing, chocolate; Mining, sand; Other services, stone; Professional, scientific, & technical service, magenta; Rental, hiring, & real estate services, gold; Retail trade, lime; Transport, postal, & warehousing, mint; Wholesale trade, navy. **Skills**: Computer skills, small square; Customer service/sales skills, small circle; Management / supervisory skills, hollow circle; Marketing skills, hollow triangle; Numeracy skills (e.g. ability to use numbers and measures), small v; Oral communication skills, hollow diamond; Professional / technical skills, hollow square; Team working skills, small triangle; Trade-related skills, small diamond.
Data Source: StatsNZ (n.d.A)

Table 16 summarizes Figure 29 by industry and by skills. As in the case of skills need of employees, to find new employees there are small differences industries but large differences by skills. There is a high demand for foundational skills, but they are not difficult to find. The skills that are more difficult to find are professional/technical skills. Analysis of variance (ANOVA) of skills needs and difficulty on finding confirms important differences by skills both on needs and difficulty finding them (Table 17).

Table 16 Skills' requirement from applicants and easiness to find

	Needed	Difficulty to find		Needed	Difficulty to find
Accommodation & food services	60%	41%			
Administrative & support services	62%	34%	Computer skills	66%	17%
Agriculture, forestry, & fishing	45%	31%	Customer service / sales skills	66%	28%
Arts & recreation services	66%	21%	Management / supervisory skills	57%	44%
Construction	58%	34%	Marketing skills	40%	28%
Education & training	72%	24%	Numeracy skills	77%	19%
Electricity, gas, water, & waste service	61%	31%	Oral communication skills	81%	21%
Financial & insurance services	74%	20%	Professional / technical skills	59%	51%
Health care & social assistance	71%	21%	Team working skills	85%	18%
Information media & telecommunications	78%	27%	Trade-related skills	44%	49%
Manufacturing	59%	35%	Written communication skills	76%	24%
Mining	60%	24%			
Other services	60%	42%			
Professional, scientific, & technical se	74%	29%			
Rental, hiring, & real estate services	67%	30%			
Retail trade	76%	33%			
Transport, postal, & warehousing	60%	29%			
Wholesale trade	69%	31%			

Data Source: StatsNZ (n.d.A)

Table 17 ANOVA: Decomposing variance of skills needed of new applicants and difficulty to find

|	SKILL NEEDED	DIFFICULT TO FIND
By: Industry (18)	16%	16%
Skills (10)	53%	65%

Data Source: StatsNZ (n.d.A)

The BOS provides information on whether the 1989 skill ecosystem reform have achieved its objective in terms of achieving adequate training gaps on employee and difficulty of finding skills. The data shows that the main differences are across skills, implying that challenges are similar across industries. The analysis also shows differences in skill among employees and job applicant. Professional/technical skills and trade related skills have relatively small training gaps, but they are skills more difficult to find across applicants, signaling that firms

are satisfied with the skill solutions done internally in the firm but there may be challenges on the skills development/deployment done outside the firm.

3.5.1.3 Labour allocation and reallocation

New Zealand has been identified as a country with high labour turnover. This section compares New Zealand with other OECD countries and assesses possible changes in the turnover dynamic during the implementation of the reform. Dynamics are also identified by the changes in the number of occupations. People changing jobs can be considered as a positive element as it provides opportunities to improve the "allocative", though it may also reduce the likelihood of on the job learning. Several studies have documented the higher levels of labour transition than in other OECD countries. Data from PIAAC confirms the high turnover rates and indicates higher turnover rates in New Zealand across the different age groups. New Zealand has the highest turnover rates for population 30 and older and is among the higher rates for the population aged 16 to 30-year-old (Figure 30).

Figure 30 Estimates of labour market turnover: New Zealand and selected countries (Circa 2015)
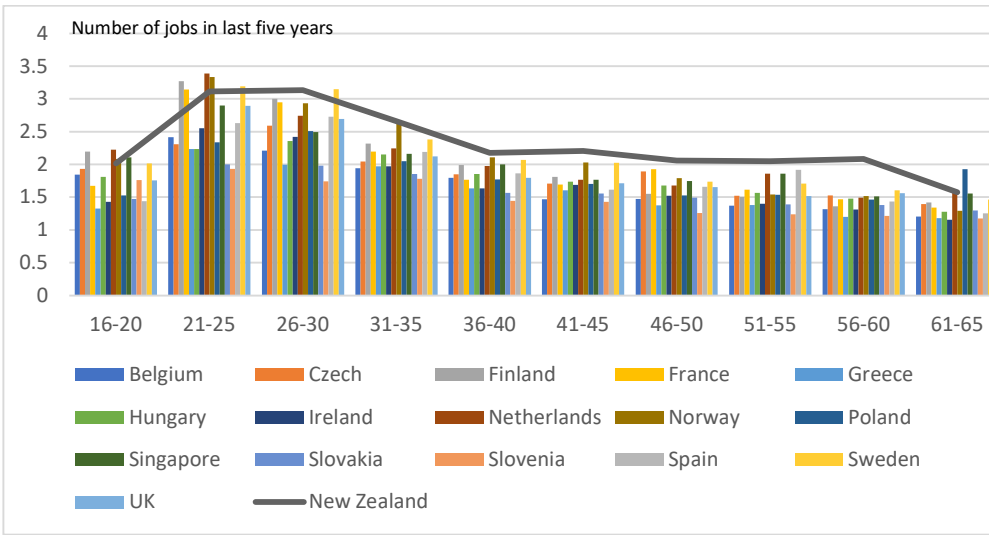

Data Source: OECD (n.d.C)

Data from the Linked Employer-Employee Data (LEED) (StatsNZ, 2021) provides additional detailed information on the labour dynamics in New Zealand. The data is publicly available from 2001. The data shows important jobs creation and destruction in New Zealand. As observed in Figure 31, in New Zealand, on average, approximately 280K jobs are created each trimester, and at the same time, 280K jobs are destroyed, with small net creation or destruction each trimester. However, evolution shows changes in the pattern of employment creation and destruction. The average turnover rate was 18 percent during 2000-2008, with important cyclical fluctuations. The financial crisis impacted the pattern, and the pattern experienced a sharp decline in 2009, followed by a sharp increase in 2010. The series returned to its season patter in 2011, but at a lower level than the pre-financial crisis levels, though there is an increasing rate at the end of the decade.
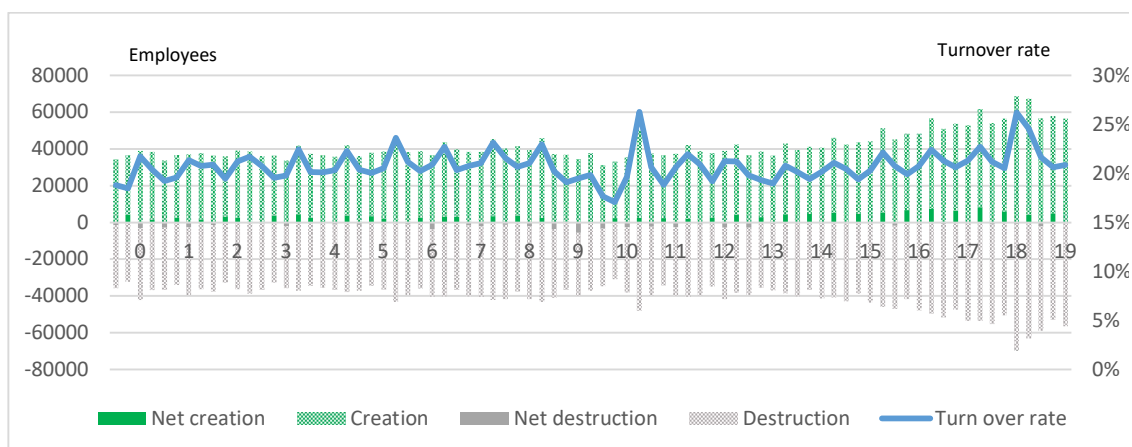
The evolution has been different across age groups. Young population groups register higher turnover rates, and the series has not experienced major changes due to the financial crisis. Older populations have overall lower turnover rates, and the post-financial crisis turnover rates are lower (Figure 31).

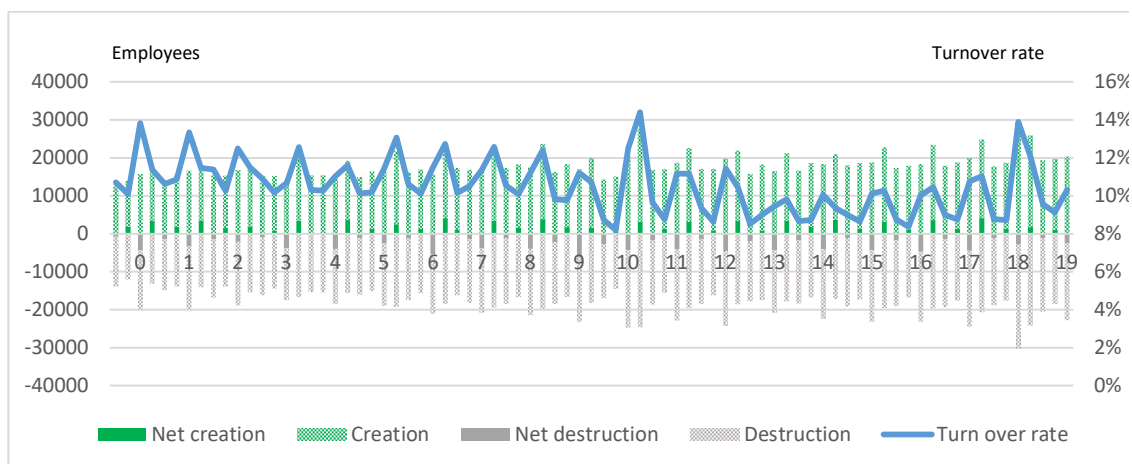*Figure 31 Creation and Destruction of Labour (2000 – 2019)*
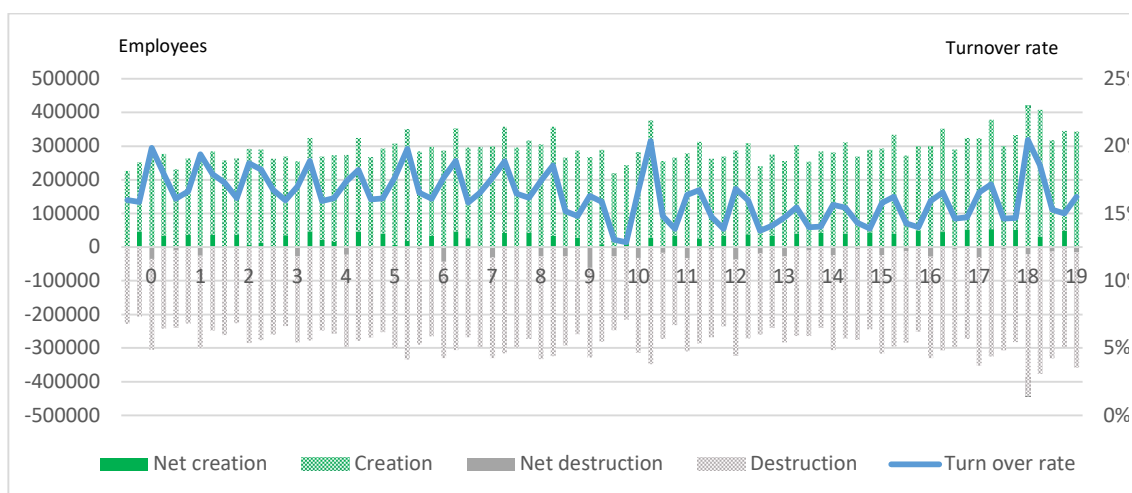
Data source: StatsNZ, n.d.C

Labour turnover is not limited to some industrial activities. Information from the LEED shows that New Zealand transitions occur in most economic sectors though there are differences across industrial activities. Turnover rates are different across different economic activities. The industry with the most significant turnover rates is *Agriculture, Forestry and Fishing* (35 percent in 2000, 29 percent in 2018), followed by *Accommodation and food services* (27 percent in 2000 and 2018). The lowest labour turnover sectors are *Manufacturing* (14 percent in 2000 and 13 percent in 2018). In most sectors, turnover rates are similar between 2000 and 2018 (Table 18).

Table 18 Labour Turnover by ANZSIC classification (2000 vs 2018)

Sector	2000	2018
Accommodation and food services	27%	27%
Agriculture, forestry, and fishing	35%	29%
Education and training	16%	14%
Financial, insurance, rental, hiring, and real estate services	17%	16%
Government, arts, and recreation, and other services	14%	17%
Health care and social assistance	14%	14%
Manufacturing	14%	13%
Mining, electricity, gas, water, and waste services; and construction	16%	15%
Not elsewhere included	24%	21%
Professional, scientific, technical services, administrative, and support services	21%	21%
Retail trade	17%	18%
Transport, storage, information media, and telecommunications	16%	15%
Wholesale trade	14%	13%

Source: StatsNZ (n.d.C)

LEED data presents the evolution of labour turnover by firm size. Smaller firms report has higher turnover rates. The series shows the differences by firm size reduced after the financial crisis. (Figure 32).

Figure 32 Evolution of labour turnover by firm size
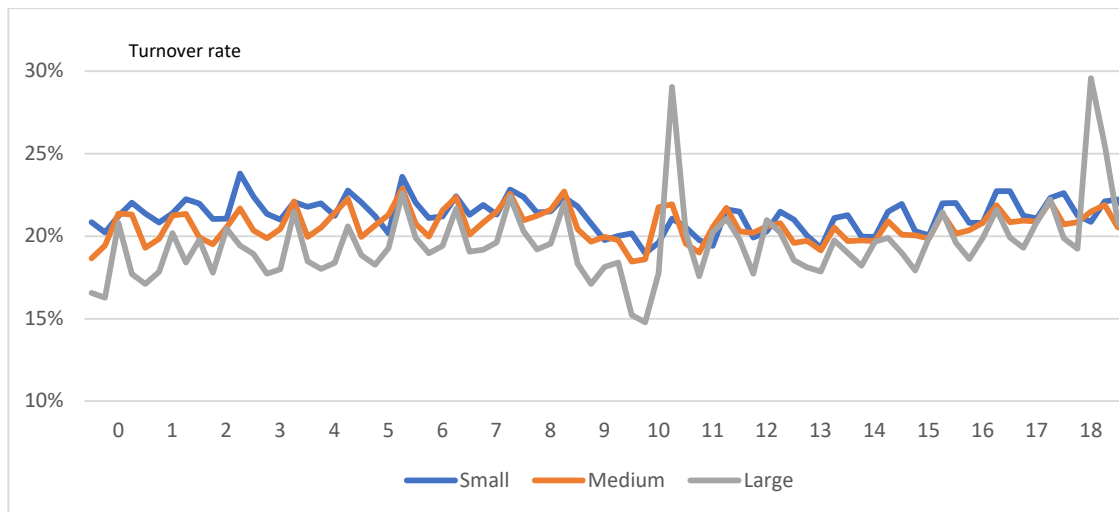
Data source: StatsNZ (n.d.C)

The data presents some characteristics of entrants, leavers and incumbents. In terms of age, entrants and leavers are youngers than incumbents. Leavers are older than entrants, and the difference has increased between 2000 and 2018 (Table 19). On the other side, recent entrants' salaries have reduced the gap with the incumbents' salaries. The data allows identification of salary gaps across age groups. In general, the salary gap is larger for younger generations than the younger generations, but also the analysis shows that the gap has reduced across age groups. The gap may indicate the firm-specific experience and uncertainties on skills of entrants, the evolution may indicate that the importance of both dimensions has decreased through time (Table 20).

Table 19 Turnover - Differences between entrants, leavers and incumbents by ANZSIC

classification (2000 vs 2018)

	2000			2018		
	Entrants	Leaver	Incumbent	Entrant	Leaver	Incumbent
Accommodation and food services	29	29	32	29	29	32
Agriculture, forestry, and fishing	34	34	35	33	34	38
Education and training	38	39	42	39	40	44
Financial, insurance, rental, hiring, and real estate services	35	36	38	37	38	41
Government, arts, and recreation, and other services	35	35	38	36	37	41
Health care and social assistance	38	39	42	39	41	45
Manufacturing	34	35	38	36	37	42
Mining, electricity, gas, water, and waste services; and construction	34	35	37	35	36	39
Not elsewhere included	37	37	41	38	38	42
Professional, scientific, technical services, administrative, and support services	34	34	37	34	35	39
Retail trade	30	31	34	31	32	37
Transport, storage, information media, and telecommunications	35	35	38	38	39	42
Wholesale trade	34	35	38	36	38	42

Source: StatsNZ (n.d.C)

Table 20 Salaries difference between entrants and incumbents by firm size (2001 vs 2018)

	Young		Older		Total	
	2001	**2018**	**2001**	**2018**	**2001**	**2018**
Accommodation and food services	0.75	0.78	0.79	0.83	0.82	0.81
Agriculture, forestry, and fishing	0.81	0.81	0.82	0.86	0.85	0.87
Education and training	0.75	0.78	0.79	0.84	0.82	0.84
Financial, insurance, rental, hiring, and real estate services	0.72	0.8	0.77	0.84	0.79	0.85
Government, arts, and recreation, and other services	0.73	0.79	0.78	0.85	0.81	0.86
Health care and social assistance	0.76	0.8	0.79	0.84	0.83	0.84
Manufacturing	0.74	0.77	0.79	0.84	0.83	0.84
Mining, electricity, gas, water, and waste services; and construction	0.76	0.8	0.8	0.84	0.82	0.86
Not elsewhere included	0.79	0.84	0.81	0.84	0.81	0.88
Professional, scientific, technical services, administrative, and support services	0.76	0.8	0.8	0.85	0.86	0.88
Retail trade	0.74	0.77	0.79	0.84	0.82	0.84
Transport, storage, information media, and telecommunications	0.72	0.78	0.78	0.84	0.79	0.83
Wholesale trade	0.76	0.79	0.8	0.84	0.85	0.86

Source: StatsNZ (n.d. C)

Labour change is very flexible in New Zealand. Characteristics evolve rapidly, including among the same cohort as they evolve through time. A distinctive feature of the labour market in New Zealand is the high levels of labour turnover. During the implementation of the reform, turnover reduced. The data signals that the reduction of the turnover is linked to better-informed matching, a likely result of better information in the labour market as a result of the widespread use of qualifications. Though, the recent trend of acceleration in turnover may also signal that the better signals are increasing labor turnover as they reduced information asymmetries.

3.5.1.4 Perception on labor mismatch

This section presents different measures of skill mismatch in the New Zealand context. This analysis complements previous assessments presented in Table 2 that indicated high levels of mismatch in New Zealand. The first approach is by using the skill content of the occupation performed by individuals as mentioned by O*NET. According to the O*NET, each occupation has an index of non-cognitive analytical, non-cognitive communication, cognitive, non-

routine manual and routine manual. Table 21 shows the relationship between the non-cognitive analytical skill content and the education level across is positive for all the countries that participated in PIAAC, but New Zealand has the second lowest R2, a measure of the match between education levels and skill content. Once the analysis is done with the objective measure skills as provided by the Math test in PIAAC, New Zealand adjustment is 11%, still below most other countries that participated in PIAAC, but higher than the adjustment of Slovak Republic, Poland or Greece.

Table 21 Matching Indicators New Zealand and selected countries

	Skill content and education level		Skill content and score in test	
	Coefficient	R2	Coefficient	R2
Belgium	1.38	0.29	0.015	0.18
Czech Republic	1.42	0.22	0.012	0.11
France	1.42	0.23	0.013	0.20
Greece	0.99	0.20	0.009	0.07
Hungary	0.34	0.32	0.013	0.17
Netherlands	1.11	0.25	0.012	0.11
New Zealand	**0.92**	**0.18**	**0.011**	**0.11**
Poland	1.08	0.17	0.008	0.07
Slovak Republic	1.37	0.21	0.010	0.06
Slovenia	1.56	0.33	0.013	0.15
Spain	0.96	0.24	0.014	0.16
United Kingdom	0.95	0.20	0.014	0.16

Data sources: OECD (n.d.C) and O*Net (n.d)

An alternative measure to skills mismatch is the self-perception of workers whether they have the level of skills to perform a task. Figure 33 presents the share of individuals be age, industry and occupation that assess that they are overqualified to perform their occupation. New Zealand has one of the most significant shares of respondents that assessed they are overqualified regardless of age, industry or occupation. Younger New Zealanders are more likely to assess they are overqualified than older ones, and for all age groups, the share is among the largest of PIAAC participating countries. Regarding mismatch by industry, New Zealanders have among the highest share of mismatch among PIACC countries in almost all industry, but the two largest shares are in Mining and Information and Communications. By occupations, the largest shares are in *Plant and machine operators*, *Elementary Occupations*,

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Skilled agricultural and fishery workers and *Legislators, Senior Officials and Managers* (Figure 33).

Figure 33 Self-perceived mismatch (Circa 2015)

By age

By Industry

By occupation
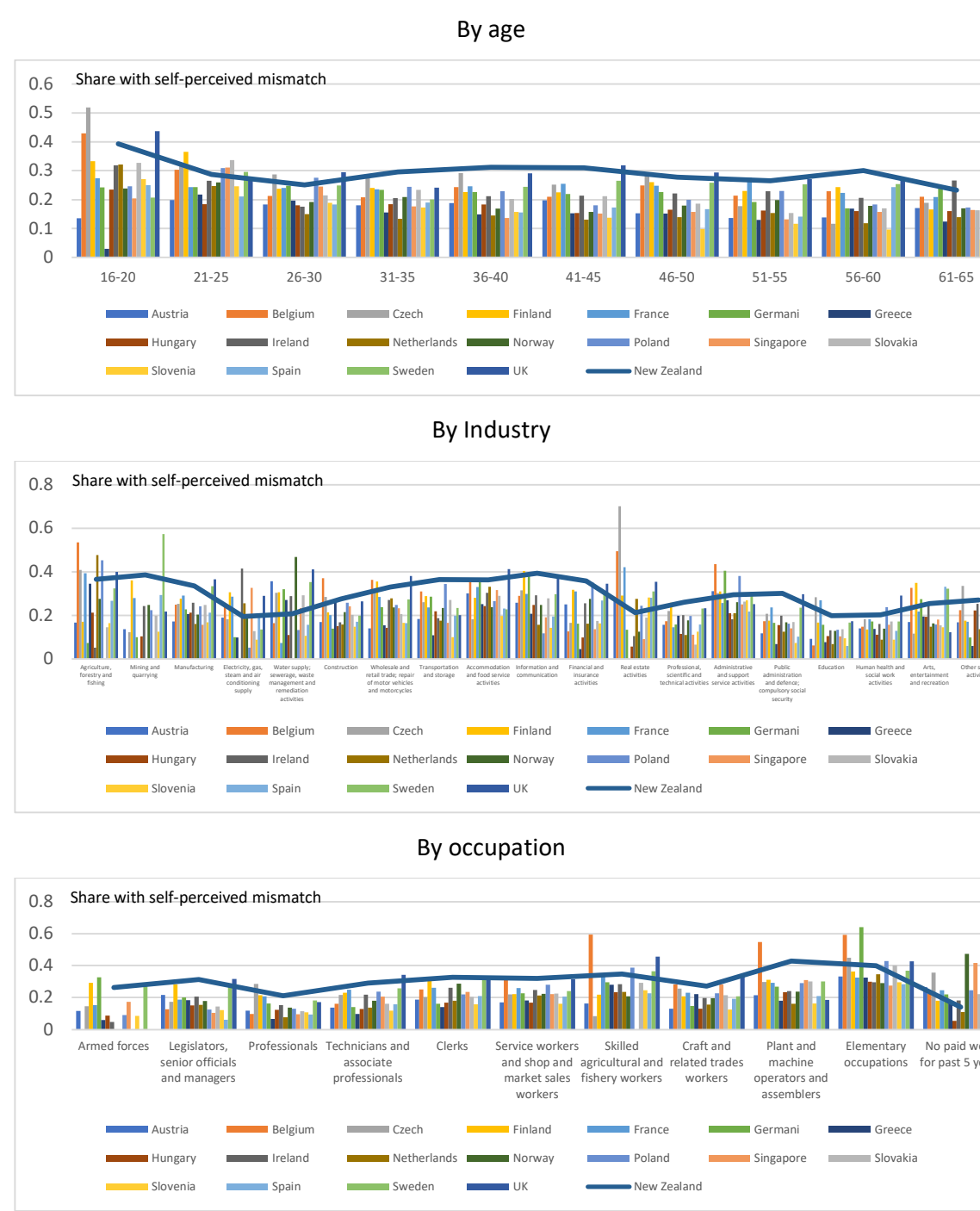
Note: Share of population that thinks their work can be done by someone with lower formal education New Zealand and other PIAAC countries

Data Source: OECD (n.d.C)

This section confirms the potential high mismatch of skills in New Zealand found in the literature. This analysis confirms the mismatch with the focus on the skill content of the occupation. Moreover, it finds an overall mismatch, as even those in armed forces, legislators or professionals self-report a mismatch (having higher than needed skills). This raises the possibility that New Zealanders may have a general bias to indicate a mismatch.

3.5.1.5 Quantitative results on individuals education/training

This subsection explores if achieving a certification/degree has a similar payoff depending of the service providers. If qualifications properly define the expectations of different studies and are enforced, payoffs of studying a qualification should be similar regardless of the provider's nature. Though, given data availability and the fact that there is a single provider for most qualifications, the analysis is done at NZSCED fields of studies level. The analysis is done at different NZQFs level of study, the comparisons are made at the levels 1-3, levels 4-6 and level 7. The analysis compares differences as students graduate and three years after graduation.

For lower levels, the comparison is between ITOs and PTEs. Salaries and employment are higher for those in ITOs but tend to equalize after three years, likely reflecting initial higher participation of ITO workers in the industry as ITO focuses on employees.

Though, in the cases of Universities and polytechnics, the initial comparison favour universities in most NZCED, and the difference increase through time (See Figure 34).
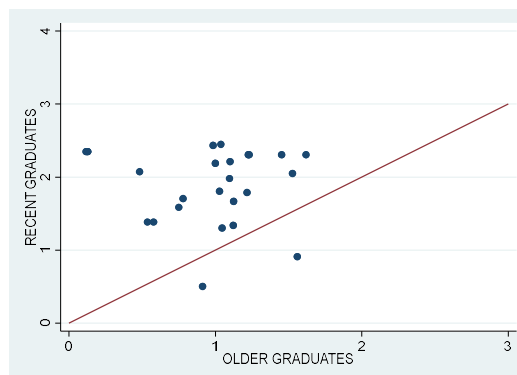
Figure 34 Comparison of labour market outcomes of education/training by NZCED and type of provider

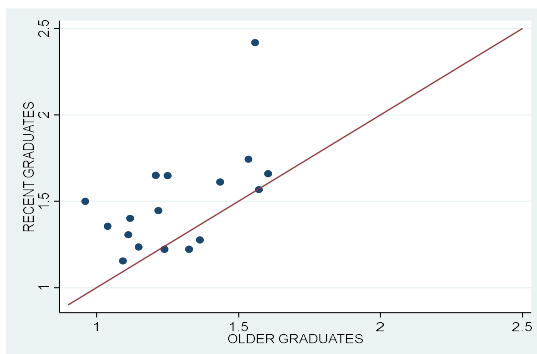DIPLOMAS 1-3: ITO VS PTE or Polytechnic
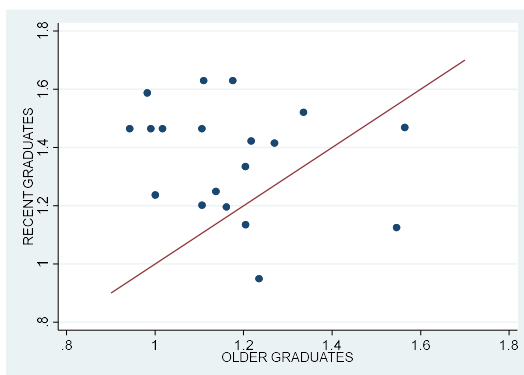
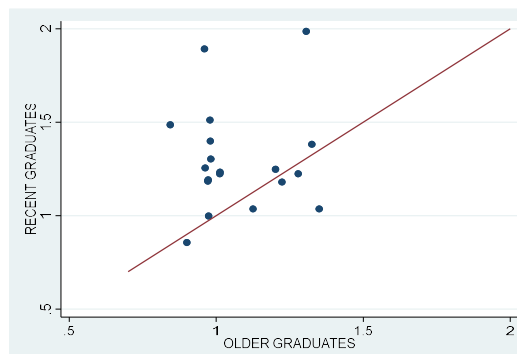RATIO SALARIES   RATIO EMPLOYMENT PARTICIPATION

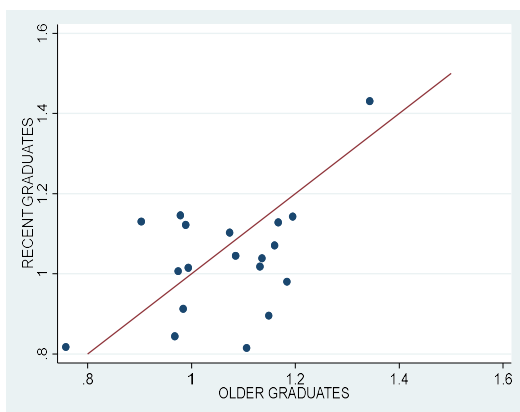Certificates/Diplomas L4+: ITO VS PTE or Polytechnic

RATIO SALARIES   **RATIO EMPLOYMENT PARTICIPATION**
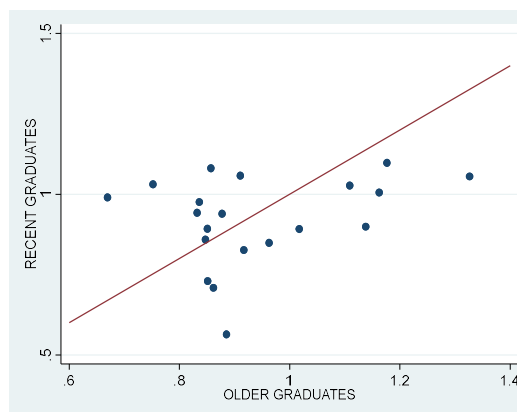

Degrees/Graduate Diplomas: Universities vs. Institute of Technology or Polytechnic

RATIO SALARIES   RATIO EMPLOYMENT PARTICIPATION

Note: dots represent a NZCED that is provided either by ITO and PTEs (for diplomas 1-3 and Certificate/Diplomas L4) and by universities and IPTs (for degrees and graduate diplomas). Data Source: Ministry of Education (n.d.A)

The analysis shows differences across education training providers. In lower levels, initial differences that favor ITOs tend to disappear. Nonetheless, in the case of higher degrees, in most cases initial outcomes favour universities, and those difference increase through time.

3.5.2 Aggregate outcomes

3.5.2.1 Easiness of finding skills

In New Zealand, data on the easiness of finding skilled labour have been collected at least in the last 35 years by the New Zealand Institute of Economic Research. This data shows that there have been four significant episodes of relative high easiness in finding skilled labour (See Figure 35). After 1986, the first period of high-level easiness finding skills was around 1988, the second period was in 1991, the third period was in 1998 and the fourth period in 2009. These periods coincided with a major international financial crisis, likely reflecting the excess of labour supply caused by the laid-offs related to the crisis and firms' reluctance to hire given crisis uncertainties. The data also shows two relatively long periods of low easiness of finding skilled labour; the first period was between 2000 and 2008, and the second period was between 2013 and 2020. There is an overall decreasing trend in the indicator in the second period, signalling growing challenges to find skills (Figure 35).

*Figure 35 Easiness of finding skilled workers*
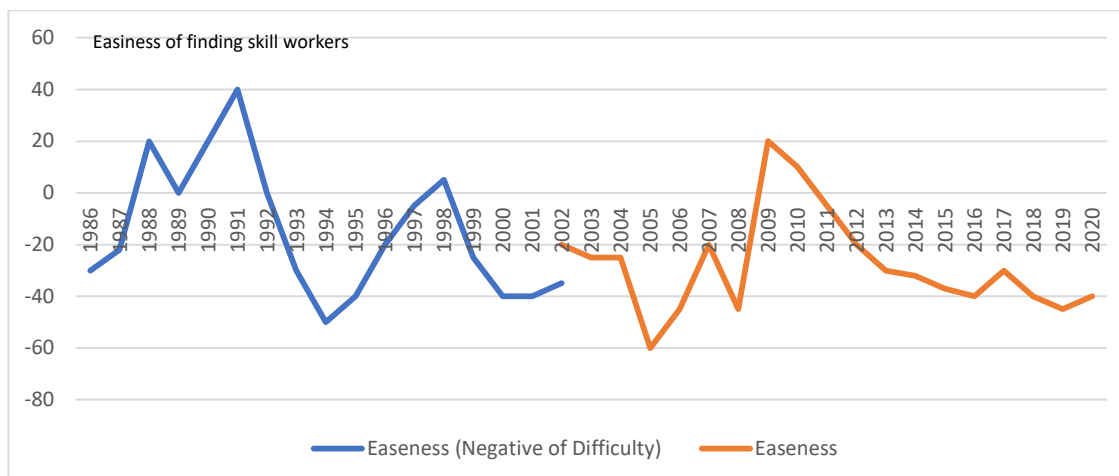
Note: Data from 1989 to 2002 was reported as Difficulty finding skilled labour.

Source: Data from New Zealand Institute of Economic Research as presented by: for 1986-2002: Department of Labour (2003); for 1996-2012 Craigie et al. (2012); for 2005-2020 Ministry of Business, Innovation & Employment (2020).

Though in the international context and despite all the actions put in place by implementing the 1989 skill ecosystem reform, New Zealand is one of the countries with a reported greater difficulty in finding skilled labour within comparison countries (Figure 36). As presented by the World Bank, New Zealand indicators are below those of the comparison countries, and the trend is decreasing as in the data collected by the New Zealand Institute of Economic Research described above.

*Figure 36 Easiness of finding skilled employees - New Zealand and selected countries 2017-2019*
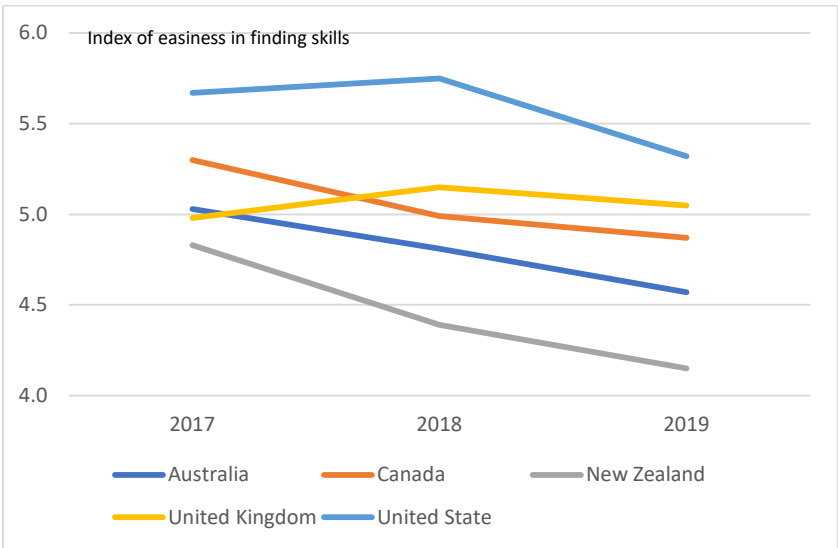
Data source: World Bank (n.d.A)

3.5.2.2 Youth not in employment, education and training (NEET)

A major concern was that the 1989 skill ecosystem reform was perceived as low levels of participation of youth in schooling and potential challenges in entering into the labour force. Data of the Youth NEET, available from 2004, shows that New Zealand NEET rate in 2019 was similar to the rate experienced in 2004, though there was a significant increase just after the 2009 Financial Crisis, followed by a continuous decrease. NEET rates in New Zealand are aligned with those of the comparator countries. The results hold for the 15-19-year-old (Figure 37) and the 20-24-year-old (Figure 38).

Figure 37 NEET 15-19-year-old - New Zealand and selected countries (1997-2019)
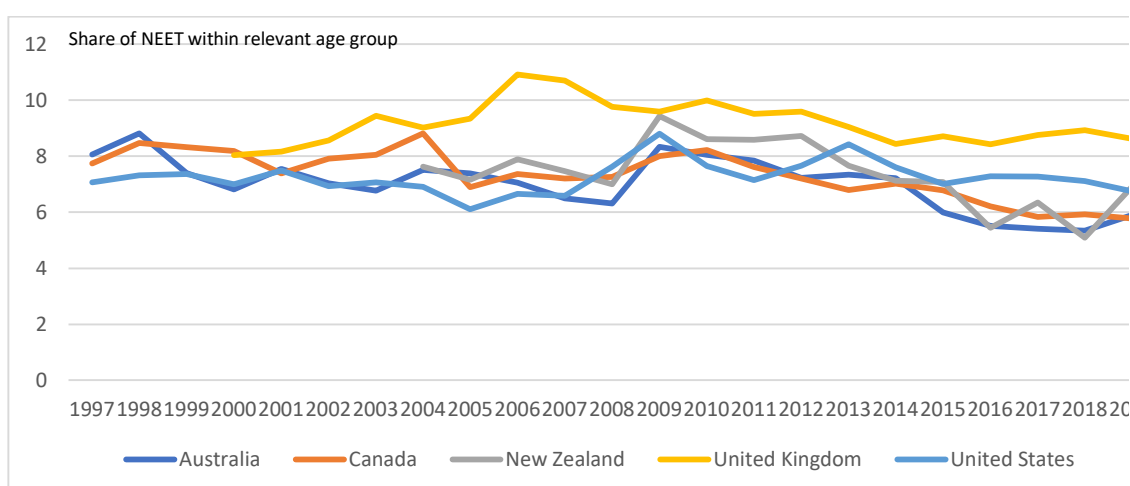
Data source: OECD (n.d. D)

Figure 38 NEET 20-24-year-old - New Zealand and selected countries (1997-2019)
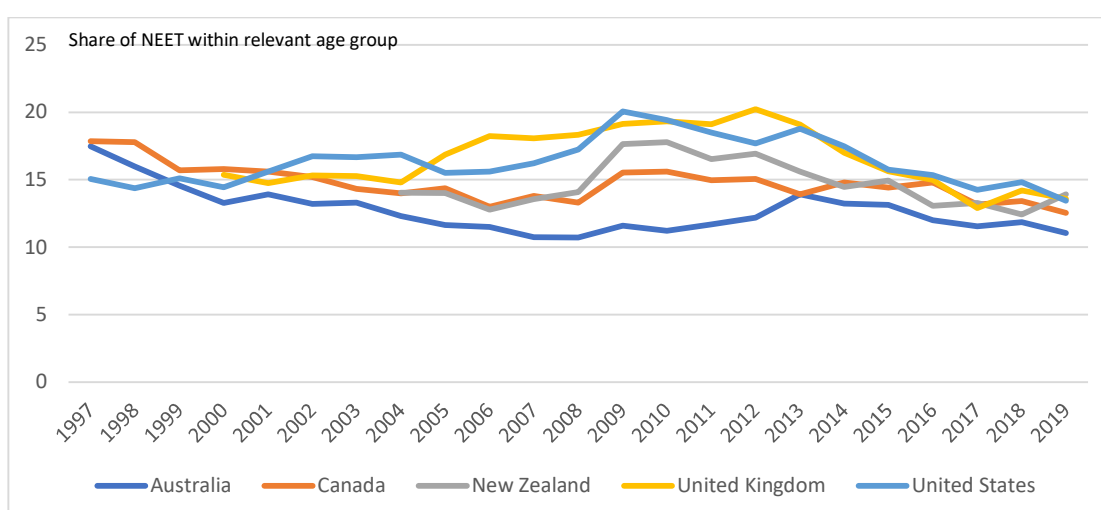
Data source: OECD (n.d. D)

There is no available data on NEET before the reform, but data from 2004 shows that New Zealand figures are aligned with comparison counties and have experienced a decline from the relatively higher levels experienced by the time of the last financial crisis.

3.5.2.3 Assessing changes in the economy dynamics

The 1989 skill ecosystem reform and the changes in the ecosystem that it originated had the potential to change the dynamics of the economy. In particular, to affect how product, labour

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and wages adjust to shocks in the economy. Does a sudden increase in production needs lead to higher wages? Or they do translate fast into higher employment in the sector? And how those sudden increases in one sector affect other sectors. This section of the thesis assesses how those adjustment processes have changed in the first and second half of the reform, reflecting the deepening of the reform process and the changes introduced starting in 2005 and changes in the dynamics of the economy given the 2008 financial crisis.

This section focuses on the following ANZSIC industries: *Construction*, *Accommodation Services* and *Manufacturing*. The reaction of the labour and wages to an exogenous shock in the sector GDP is estimated using a Vector Error Correction Model (Hamilton, 1994). The analysis seeks to identify the mechanism of adjustment to a product shock from wages and labour within the sector. The analysis employs quarterly data on GDP, number of employees and salaries by economic activity from StatsNZ. Data is available from 1989. The analysis present impulse response functions for the first half of the reform (initial deployment) and the second reform (reform mature)

Figure 39 presents the evolution of number of employees and salaries in *Construction* after one shock in the sector's GDP. The responses for the first half and the second half of the reform period are different. Adjustments in number of employees were larger in the first half of the reform but the impact dissipated fast. In the second half, impacts last longer in time. Impact on salaries are important and significant in both cases (first half and second half of the reform) with a maxim approximately 8 trimesters after the shock, but, in the second half, effects last longer through time, with changes in wages remaining high even after 20 trimesters after the shock.

Figure 39 Impulse response functions: exogenous shock to construction sector' GDP
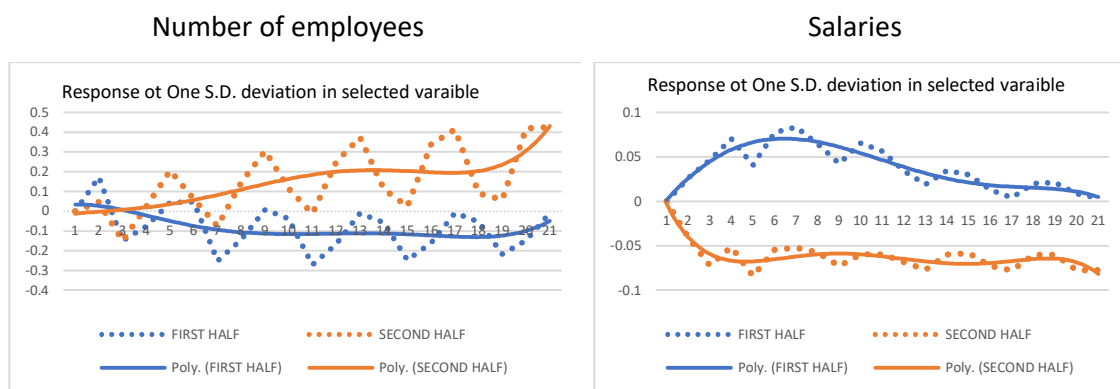
Number of employees
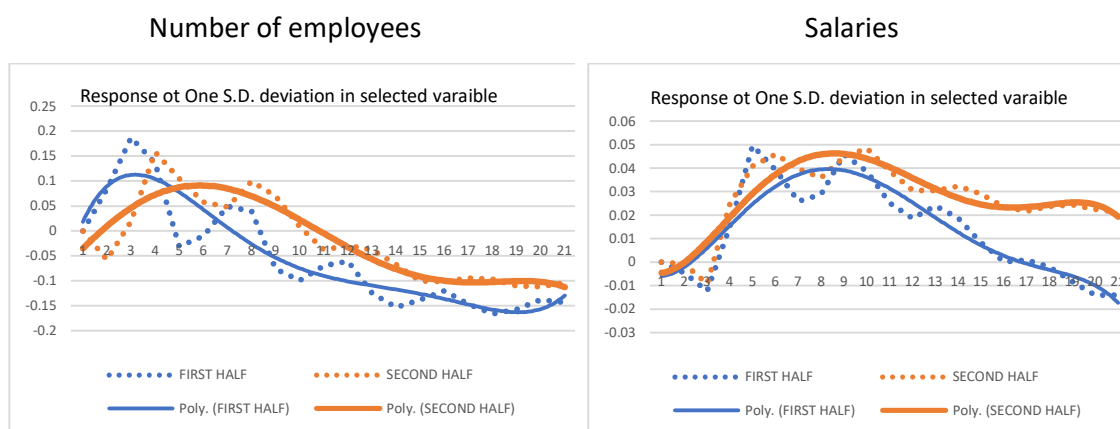
Salaries

Note: Derived from a VAR including sector GDP, number of employees and salaries (and four lags). Impulse response functions derived from to a shock in the sector GDP. Results for the first half (blue line) were elaborated with information from 1990 to 2005 and results for the second half (orange) with information from 2006-2019.

Data Source: StatsNZ (n.d.B)

In the *Accommodation Services*, the dynamics observed during the first half and the second half are different. During the first half, there is a significant increase in salaries and small changes in employees. On the contrary, in the second half, the labour seems to adjust, attracting additional labour into the sector and lowers salaries in the medium term (see Figure 40)

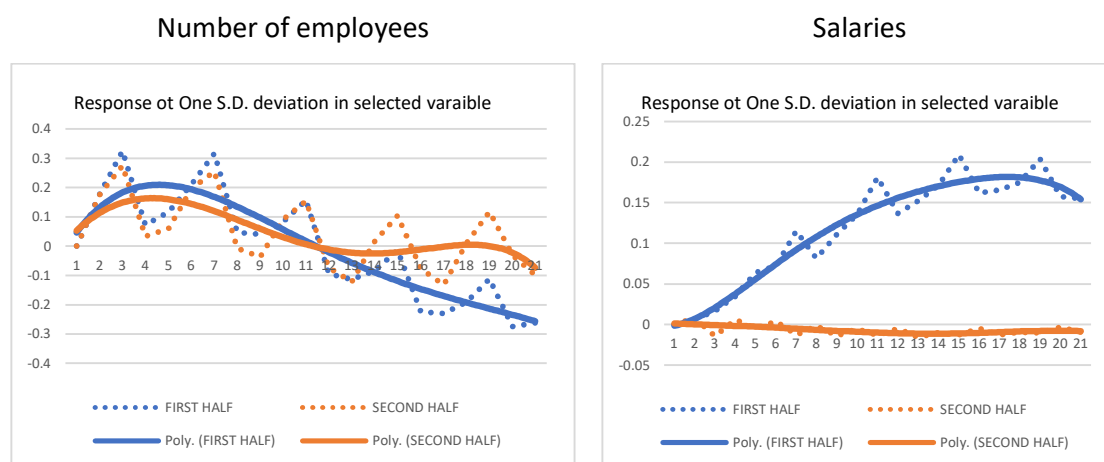*Figure 40 Impulse response functions: exogenous shock to accommodation sector's GDP*

Number of employees

Salaries

In the *Manufacturing sector*, impacts on the sectorial GDP were correlated with an increase in labour in the quarters following the shock in the first half and the second half of the reform. Though, there are important differences in the post-shock evolution of the salaries. In the first half, there were impacts in the wage rate that had their picked 15 trimesters after the GPD shock. In the second half, there are no changes in wages. (See Figure 41)

Figure 41 Impulse response functions: exogenous shoct to manufacturing sector's GDP

An alternative strategy is to assess the relationship among sectors after a shock. In the first half of the reform, a shock in salaries in the *Construction* sector affects other sectors, with a higher impact on *Manufacturing*, followed by *Professional services* and *Accommodation* and they have a long-lasting effect. Though in the second half of the reform, an increase in

Construction salaries affects mainly the *Accommodation* sector, the effect disappears by the 15th trimester. Minor impacts are registered in *Professional Services* and *Manufacturing* (see Figure 42).

Figure 42 Impulse response function: reaction to a shock in construction sector salaries
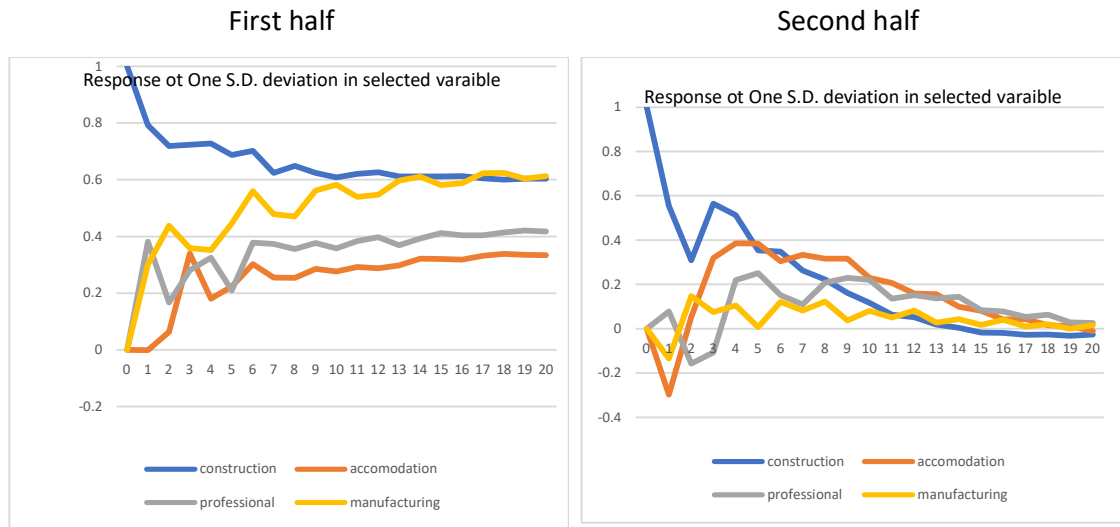
Note: Derived from a VAR including sector salaries in construction, accommodation, professional services and manufacturing (and four lags). Impulse response functions derived from to a shock in the sector GDP. Results for the first half (blue line) were elaborated with information from 1990 to 2005 and results for the second half (orange) with information from 2006-2019.

Data Source: StatsNZ (n.d.B)

This section shows that the adjustment mechanism of the economy has changed during the implementation of the reforms. Interestingly, in *Accommodation* and *Manufacturing*, shocks are not leading to an increase in wages, signalling better access to a pool of labour. At the same time, even though sectors remain connected, distortions created by one sector to the rest of the economy tend to disappear faster in the second part of the reforms. These changes may relate to increased labour mobility generated by the reform, but also to other structural changes experienced by the economy.

3.5.2.4 Evolution in macro variables: GDP, employment, labour participation rate, unemployment rate, wages and labour productivity

This section focuses on changes in macro variables before and after the implementation of the reform. The reform implementation coincided with major changes in the world, given the accelerated speed of technological change, expanding globalization, changes in geopolitical arrangements and the rise of China, changing demographics and migration patterns, among others. During the period, there were three major international financial crises that strongly affected New Zealand, including the Russian Crisis (1998) and the Global Financial Crisis (2008). All these factors have likely also affected the macro variables in New Zealand.

The economic evolution of New Zealand, as measured by the GPD per capita, between 1989 and 2020 has been similar to those of its major comparison countries, Australia, Canada, the USA and the UK. This was an improvement from previous evolution, as the average growth in GPD per capita between 1971 and 1989 was lower than the comparison countries. The low average growth was also observed between 1989 and 2000, the first ten years of the reform. Though, in the last decade of implementation of the reforms, between 2010 and 2019, New Zealand growth rate accelerated, vis a vis its comparison countries (See Table 22).

Table 22 Evolution of GDP per capita: New Zealand and selected countries

	1971-1989	1990-2019
AUS	1.6%	1.6%
GBR	2.5%	1.4%
NZL	1.3%	1.5%
USA	2.3%	1.5%
CAN	2.2%	1.4%

World Bank (n.d. B)

During the 1989 skill ecosystem reform implementation, employment in New Zealand increased significantly, from 1.5 million persons employed in 1989 to 2.5 million in 2020 while the GPD more than twofold, from 117 constant units to 225 constant units (StatsNZ, 2021). For both indicators, growth rates during the reforms were higher than the experienced during the 1980s, and higher dynamism did not materialize till 1993, after the 1992 international crisis. The evolution of the GDP was interrupted by the financial crisis of 2008. That crisis also affected the evolution of total employment (Figure 43).

Figure 43 Evolution of GDP and employment 1978 2020
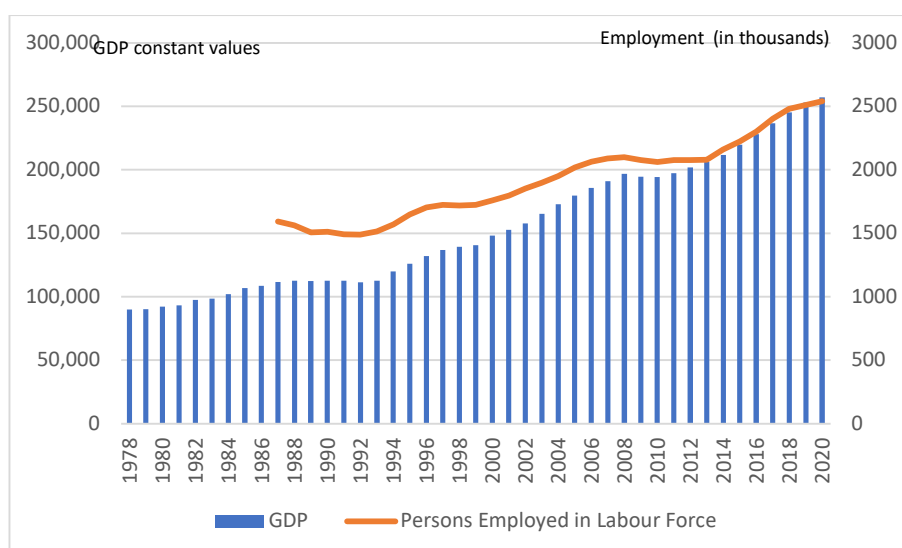
Data source: StatsNZ (n.d.B)

Labour participation also registered a significant increase during the implementation of the reform. It went from 73 percent in 1989 to 81 percent in 2019. At the same time, unemployment rates have dropped significantly from 7.1 percent recorded in 1989 to 4.6 percent in 2019. The evolution was affected by the crisis in 1992 and 2008, periods in which the unemployment rate went up (Figure 44).

Figure 44 Evolution of labour force participation and unemployment
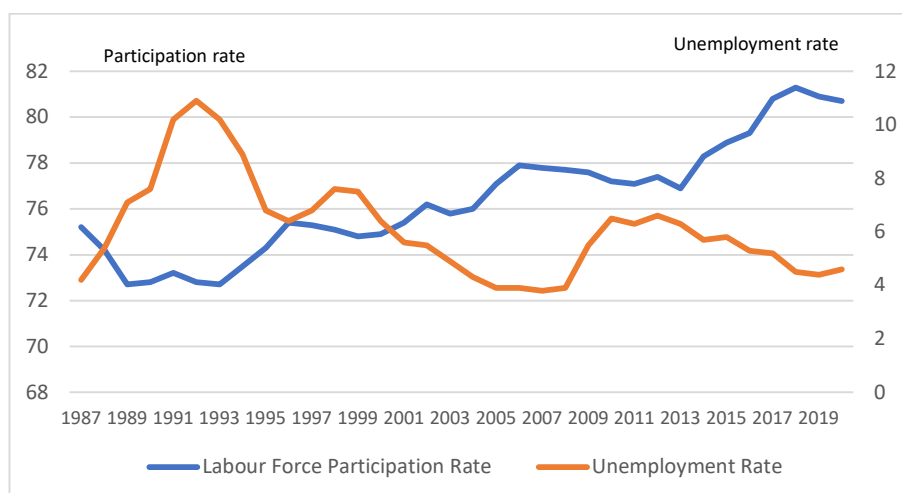
Data source: StatsNZ (n.d. B)

The aggregate numbers hide significant structural changes in New Zealand that the 1989 skill ecosystem reform may have help to accommodate. Between 1972 and 2020, New Zealand's economy experienced major changes in its main industries. In 1972, the largest industry in New Zealand was *Agriculture*, followed by *Retail Trade* and *Food, beverage and tobacco product manufacturing*. In 1989, the top three industries *were Owner-occupied property operation*, *Wholesale trade*, and *Food, beverage and tobacco product manufacturing*. By 2019, the top three industries were *Professional, scientific and technical services*, *Retail hiring 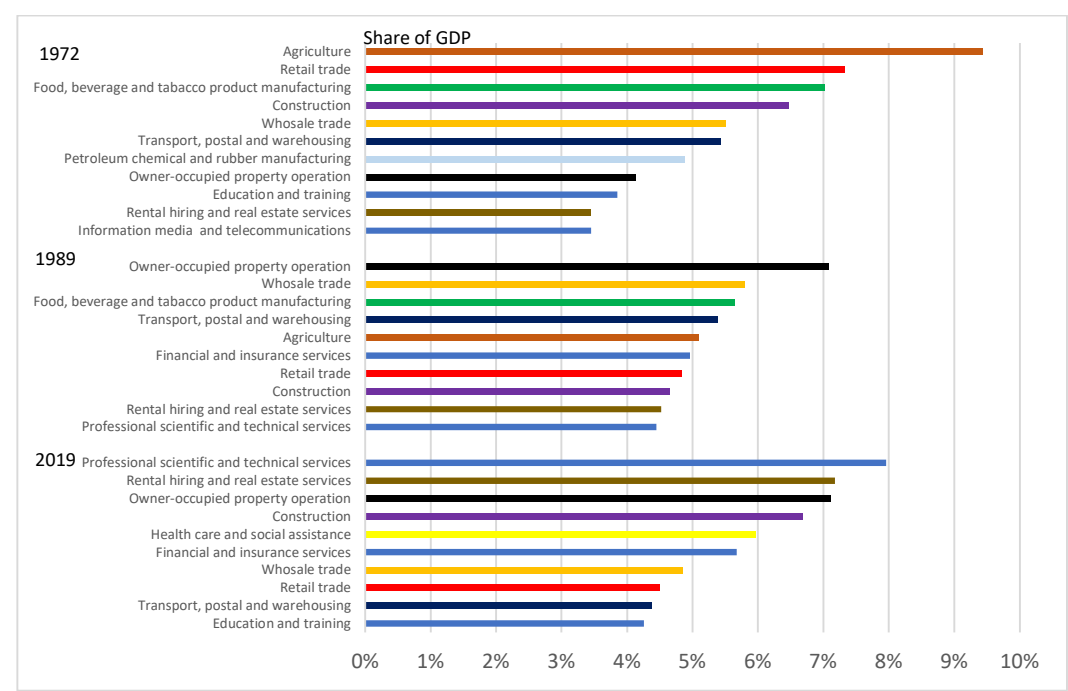and real states services* and *Owner-occupied rental operations*. The magnitude of the changes can be observed by analyzing the most significant industries. Out of the 10th largest industries in 1972, only five were among the 10th largest industries in 2019 (Figure 45).

Figure 45 Main industries in New Zealand 1972, 1989 and 2019 (participation share in GDP)

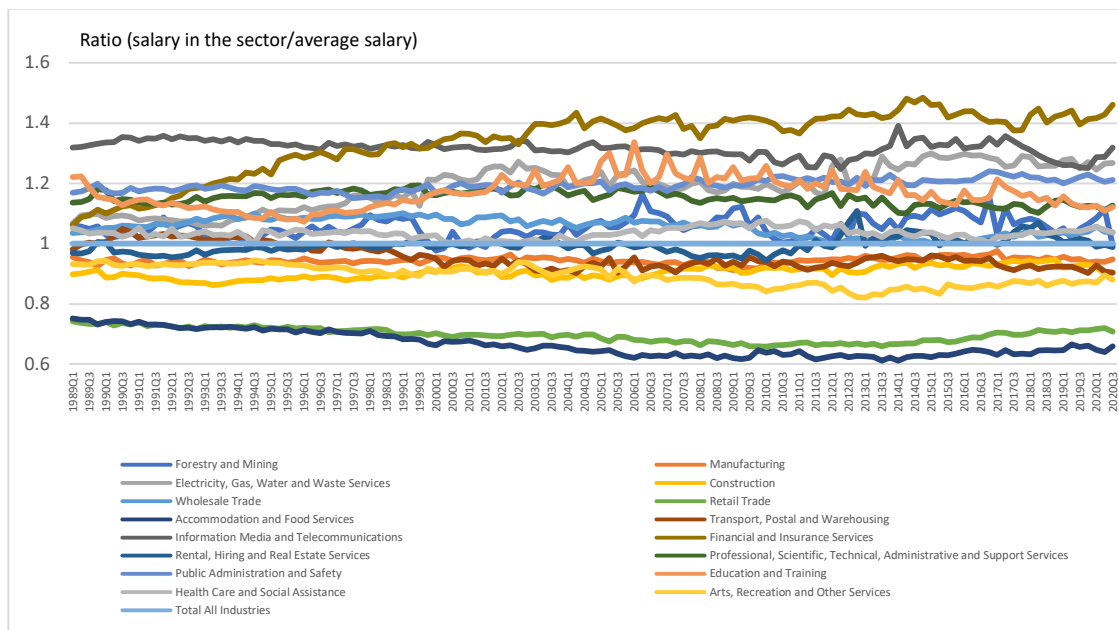Data Source: StatsNZ (n.d.D)

The changing evolution of economic activities required a massive reallocation of labour across industries. The evolution also implied changes in relative salaries across sectors, reflecting relative scarcity of labour generated by these labour reallocation and worker productivity changes. Figure 46 presents the evolution of salaries among different sectors (with regards to

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the national average). In most occupations, salaries have remained relatively stable vis a vis the national average. Salaries among *Professional services* increased during the 1990s, but then decreased between 2000 and 2019, similar evolution was registered by the *Education and training*. Despite the positive trends in its growing contribution to GDP and the increase in labour share, salaries in *Construction* remained relatively stable. Wages in the finance industry increased till 2010 but then stayed relatively stable, at the time that labour participation in that sector declined.

Figure 46 Evolution of Salaries by ANZSIC classification (1989-2019)

Data source: StatsNZ (n.d. B)

Finally, total labor productivity can be considered as a final measure of the impact of the reform. Of 11 industries, only 5 industries registered a higher productivity during the implementation of the reform versus the previous two decades. At the same time, 6 industries registered labour growth. (Table 23). Across industries, before and during the reform, there is a negative correlation between the labor input growth and labor productivity growth, but the correlation decreased from -0.48 to -0.42.

	Labour input		Labour productivity	
	1978-1989	1989-2019	1978-1989	1989-2019
Accommodation and food services	3.0%	3.6%	-2.4%	-0.2%
Agriculture, forestry, and fishing	-0.7%	-0.9%	3.7%	3.1%
Construction	-1.4%	1.8%	1.8%	0.5%
Electricity, gas, water, and waste services	0.6%	0.9%	3.1%	1.0%
Financial and insurance services	3.6%	1.1%	1.5%	2.9%
Information media and telecommunications	1.2%	0.5%	4.5%	5.6%
Manufacturing	-0.7%	-0.1%	1.8%	1.2%
Mining	-0.7%	0.5%	2.7%	0.9%
Retail trade	0.8%	1.3%	-0.4%	2.6%
Transport, postal, and warehousing	-1.5%	-1.0%	4.0%	2.6%
Wholesale trade	0.0%	0.7%	0.8%	1.2%

Data Source: StatsNZ (2020)

3.6 Summary of results

Section 3.4 and 3.5 presented a wide variety of indicators of the impact of the 1989 skill ecosystem reform. The following paragraphs describe how different indicators address certain key areas of the reform and the changes it was creating in the skill ecosystem.

The NZQA is a main element of the reform and the NZQF has been identified as the heart of the skill system. As a result of developments in NZQA and NZQF, the number of registered qualifications grew initially for all NZQF levels and fields of study, but the dynamism was heterogeneous across levels and fields (Figure 5). The reform did not create a single *qualification* language, as most qualifications only applied to a single provider (Figure 8). Lack of a single language is also reflected by different perception across industries on shortages by skill (Figure 29).

Improvements in education/training outcomes was also a major objective of the reform. Data shows that enrollment in primary, secondary and post-secondary education grew significantly in the first years of the reform, though, there was a decline in enrolment later (Figure 11) on post-secondary education. In the late 2010s New Zealand enrolment indicators that measure outcomes of those entering the labour market, were aligned with its comparison countries

(Figure 9, Figure 12). Though, the positive evolution in enrollment education, particularly at the beginning of the reform, was not enough to put New Zealand back among the countries with a more educated labour force, in years of education (Figure 14). And additional challenges may be coming as despite students expectations with regards to their future to respond to the occupation of high demand (Table 11), their desire to engage in tertiary education is among the lowest in the developed world (Figure 24).

The expansion in enrolment may have affected the quality of secondary education. Even though there are not measures before the launch of the reform, available data, PISA, shows a decline in learning at school (Figure 15) and there is a declining efficiency in the education sector measured by graduation rates (Figure 10). Though, a major concern with the reform materialized, as the new providers brought into the tertiary education system (PTEs) to the traditional actors (universities) (Figure 34). Another concern from the implementation of the reform is that indicators of foundational skills in the labour force indicate that New Zealand may be losing its advantage over other OECD countries. Older generations of New Zealanders had a clear advantage over OECD countries, young New Zealanders have lost it (Figure 20 and Figure 21). This skills are in high demand, and despite the trend in the PIAAC test, firms do not find difficulties finding them in the applicants for new jobs (Table 22).

Two distinctive features of the skill ecosystem in New Zealand are the high turnover rate (Figure 30) and the high levels of learning on the job (Figure 19). Though, combining those will indicate that there are many learning opportunities due to the rapid transition among jobs. During the implementation of the reform, it is observed a small decline in labour turnover (Figure 31). The decline seems to respond to better hiring, which may be linked to better signals generated by the qualification framework, though further research in need to understand the high turnover in New Zealand labor.

With regards to the overall quality of the match of skills, the analysis confirmed the assessment of a mismatch between student measure of degrees and objective measure of student qualities (measures of mathematical skills) with requirements of the occupations (in terms of analytical content) (Table 21). Though, the high self-reported mismatch of New Zealanders, reported elsewhere in the literature may represent a countrywide bias, as, for

example, legislator and professionals indicate that they have more skills than the needed to perform the task (Figure 33), professions that require, by definition, high levels of skills.

With regards to training. Training is not the first option of firms to access to skill, despite access to training in New Zealand is one of the highest in the world (Figure 16), though public support to training seems to be declining as reported Ministry of Education (Figure 17). There may be a mismatch between training provided by firms and the supply offered by ITOs and the formal system, as most training in firms do not lead to a qualification (Table 14).

During the implementation of the reform, and likely facilitated by it, the economy underwent massive transition (Figure 45). Looking at the aggregate variables, during the implementation of the reform, despite continuous frustration of the private sector (Figure 35 and Figure 36) there was a productivity increase in GPD per capita, though labour productivity only increased in 5 out of 12 sector economic sectors (Table 22 and Table 23).

Conclusion

New Zealand has been, through its history, a skills powerhouse, though economic changes and technological progress has put the skill ecosystem under large stress in the late 1980s. Early on, the skill ecosystem looked to created skill development opportunities for everybody and provide the skills needed for the economy to grow. To do so, the country was innovative and early adapter of changes happening elsewhere, as mandatory enrolment requirements, development of innovative curriculum in education and introduction of on-the-job and off-the-job components of training in apprenticeships, and introduction of qualification credentials. By the late 1950s, the skill ecosystem was adequately supporting New Zealand's growing economy. However, the economy was subject toa number of distortions that, under new global conditions, lead the economy into low growth and unemployment in the coming decades.

In the 1980s, the economy entered in a process to eliminate distortions that included the skill ecosystem. In education, more skills and more relevant skills were needed. The reform in education was aligned with overall reform and implemented a decentralization of the education system accompanied by the creation of a strong qualification system that will support navigation of students and trainees through the system. The leading role in the several elements of the skill ecosystem moved from the government to the private sector. However, throughout the reform, the public/private balance changed, reflecting difficulties to find the right mix.

Given the nature of implementation of the reform and the changing environment it had to address through its implementation it is difficult to provide a decisive statement on its effectiveness, though, several elements stand out: enrolment in education increased during the reform and the participation in training programs, including apprenticeships; though there may have been a quantity/quality trade off and there was a declining trend in the 2010s; students became responsive to market needs in terms of field of study but not in terms of achieving a more sophisticated in terms of higher degrees labor force, firms seem to be managing their skill shortages through training and most skills they report in high demand are

not difficult to find. Though, professional and trade related skills are hard to find, both across existing employees and potential new recruits.

During the reform, the economy regained its growth process, GDP per capita grew but labor productivity only increased in 5 out of 12 economic sectors vis-à-vis the previous period. Despite the effort, private's sector perception of difficulties in finding qualified skills did not change, signaling the existence of structural challenges related to the small economy size and isolation of the New Zealand economy.

The elaboration of the assessment of the reform was also limited lack of detailed information, especially in the 1990s, on key variables such as perception of difficulty to find skills by firms. The assessment was also limited by the lack of access to individual data given the long approval process at StatsNZ to access detailed information, especially in the COVID context.

The 1989 skill ecosystem reform, as defined in this thesis, ended with the enactment of the Education and Training Act 2020 that created the ROVE process. ROVE is centralizing the vocational education system with the creation of New Zealand Institute of Skills and Technology (Te Pūkenga) and eliminating ITOs. A single institution is perceived to increase the response capacity to front new skills and to smooth transition across system. Coordination committees, with the support of MBIE are expected to ensure relevance of skills.

To continue assessing how to create a more responsive skill ecosystem for New Zealand, future research should consider expanding several of the topics discussed in this thesis by augmenting publicly available information with micro information. For example, industry level figures on training may be hiding important differences at the firm level. And, it will be important to assess ROVE as it is implemented. It is recommended that its interventions are done within a framework that allows constant evaluation.

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ANNEX Main databases employed in the study

This thesis uses several sources of information. Aggregate measure of the economy come from Stats NZ Infoshare (http://infoshare.stats.govt.nz/?_ga=2.59627620.837342666.1614118409-1749164759.1605410181).

The main data access at a disaggregated level:

New Zealand Qualification Register

The register includes information on all the qualifications approved by NZQA (either directly or indirectly). It includes information on the date of issuance, version, expiring date, NZED, description, pathways. It is available at https://www.nzqa.govt.nz/providers-partners/approval-accreditation-and-registration/listing-qualifications-on-the-nzqf/sector-qualifications-register/.

Linked Employee Employer Data (LEED), published by StatsNZ

LEED is published by Statistics New Zealand. The data base integrates longitudinal employer and employee data. The underlying data sources are monthly administrative data from Inland Revenue's taxation system and business data from Statistics NZ's Business Frame (BF). Integration is done by Statistics NZ. This thesis employs the non-disaggregated publicly available data. Data aggregated at ANSIC and age available at http://nzdotstat.stats.govt.nz/wbos/index.aspx?_ga=2.137680889.837342666.1614118409-1749164759.1605410181.

Program of International Student Assessment (PISA), published by OECD

PISA surveys 15-year-olds on general perceptions towards education, and applies comprehensive reading, mathematics and science assessments. It is applied every 3 years, with the first one applied in 2000 and the last one in 2018. In 2018, it covered 80 countries.

New Zealand has participated in all PISA surveys. PISA results are widely cited by education specialist as by policy makers. Microdata available at http://www.oecd.org/pisa/data/

Program for the International Assessment of Adult Competencies (PIAAC), published by OECD

PIAAC surveys adults' proficiency in key information-processing skills: literacy, numeracy and problem solving. It also collects information on the use of skills in different environments: home, work and wider community. The survey also collects information on the labour market participation and expectations. It has been conducted in more than 40 countries/economies. New Zealand participated in the second wave of data collection in 2012. Micro data available at https://webfs.oecd.org/piaac/puf-data/.

Business Operation Survey 2016 – Skills Acquisition

The Business Operations Survey is collected annually by StatsNZ to assess performance measures from businesses to document the practices and behaviors they implement. In 2016, it was accompanied by a Skills Acquisition module that surveyed firms on their practices with relation to skills management. The survey data aggregated at the ANZSIC classification and by firm size is publicly available at https://www.stats.govt.nz/information-releases/business-operations-survey-2016.