THE EXPRESSION, EXPERIENCE AND TRANSCENDENCE OF LOW SKILLS IN AOTEAROA NEW ZEALAND

ADULT LITERACY AND NUMERACY PROGRAMMES AND LABOUR MARKET OUTCOMES

ABOUT THIS RESEARCH PROGRAMME

Over half a million adult New Zealanders live with low literacy and/or numeracy (L+N) skills, with a strong over-representation of Māori and Pacific peoples. This has significant economic and social costs, including increased risk of unemployment and poverty, detrimental effects on physical and mental well-being, and decreased social and political attachment.

This programme applies a mixed-method approach to the following research aims: to build a detailed population-wide picture of those with low L+N skills; analyse their life-course pathways and effectiveness of interventions with respect to a range of economic and social outcomes; forecast future changes in population skill level; and develop an understanding of the barriers and enablers that build resilience to risk, along with pathway to transcend low skills.

For further information about our programme and other outputs, see http://workresearch.aut.ac.nz/low-skills

RESEARCH PARTNERS

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Adult literacy and numeracy programmes and labour market outcomes

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Abstract

Having a basic level of proficiency in reading and mathematics is widely seen as a key factor to fully participate in modern societies. Many developed countries, therefore, have policies to raise the literacy and numeracy skills of adults. In this context, we evaluate adult literacy and numeracy (L+N) programmes in New Zealand. These publicly-funded programmes aim to raise adults' skills in order to enable further learning and increase the employability and/or workplace productivity of participants. We use population-wide administrative data to estimate the effects of participation on labour market outcomes, further education and training, and workplace accidents, using matching methods to create a suitable comparison group. We examine the effects of three broad types of L+N programmes separately: Workplace LN, Intensive LN and ILN English (for speakers of other languages). For Workplace LN programmes, we find that employment and earnings increases after programme participation. However, employment and earnings actually decrease for Intensive LN and ILN English programme participants. Similarly, social welfare benefit receipt decreases among Workplace LN participants, but increases among Intensive LN and ILN English participants. However, enrolment in education and training increases after programme participation for all three programme types. Moreover, the decreases in employment for Intensive LN and ILN English participants may be due to these increases in education and training participation since a general activity indicator of whether a person is in employment, education or training shows positive results for all three programme types. There is little effect on workplace accident claims.

Disclaimer

Access to the data used in this study was provided by Stats NZ under conditions designed to give effect to the security and confidentiality provisions of the Statistics Act 1975. The results presented in this study are the work of the author, not Stats NZ or individual data suppliers. These results are not official statistics. They have been created for research purposes from the Integrated Data Infrastructure (IDI) which is carefully managed by Stats NZ. For more information about the IDI please visit https://www.stats.govt.nz/integrated-data/.

The results are based in part on tax data supplied by Inland Revenue to Stats NZ under the Tax Administration Act 1994 for statistical purposes. Any discussion of data limitations or weaknesses is in the context of using the IDI for statistical purposes, and is not related to the data's ability to support Inland Revenue's core operational requirements. All observation counts are randomly rounded to base 3 in accordance with Stats NZ confidentiality rules.

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1 Introduction

Literacy and numeracy skills are key to participating fully in modern societies. Low literacy and numeracy skills are correlated with many adverse outcomes for individuals, including poorer health, justice and labour market outcomes (Meehan, Pacheco, and Schober, 2022b; Meehan, Pacheco, and Schober, 2022a). It also negatively affects the economic development of countries (OECD, 2010b; Hanushek and Woessmann, 2008).

Yet, according to the Programme for International Student Assessment (PISA), more than a fifth of 15-year-old students in OECD countries fail to attain Level 2 in reading or mathematics (OECD, 2019), which is the baseline level of proficiency that is considered necessary to function effectively and productively in society (OECD, 2010a). Reflecting the importance of these skills and the fact that some adults miss out on acquiring them earlier in life, many governments invest in adult basic education programmes to improve the outcomes of these individuals, as well as meet wider goals such as reducing welfare dependency and filling skills shortages. This begs the question: How effective are these programmes in improving labour market outcomes?

This paper, therefore, evaluates the labour market outcomes of adults who participate in adult literacy and numeracy (L+N) intervention programmes using population-wide administrative data for New Zealand. To varying degrees, these programmes fall under the umbrella of labour-supply-side active labour market policies (ALMP), aimed at improving the employability and earnings of participants and the productivity of workplaces through training. However, many programmes have the wider aim of improving the ability of adults to participate in society and the community.

There is a large literature evaluating ALMP, covering a range of different types of training programmes. However, there are just a few studies that examine L+N training programmes specifically. Moreover, the ALMP literature highlights that the impact of these programmes is context specific, depending on factors such as the nature and length of the programme. The importance of context and the dearth of evaluations on L+N programmes specifically highlights the need to examine these programmes in more detail.

The major issue in evaluating these programmes is that participation is not randomised with participants generally self-selecting into them. This raises the fundamental empirical challenge of how to attribute any observed outcomes to the ALMP programmes rather than unobserved factors that may be correlated with both programme participation and labour market outcomes, such as intrinsic levels of motivation.

Given the absence of a randomised control trial (RCT) or quasi-experimental identification strategy, we follow the majority of literature on ALMP evaluations and employ matching techniques to align the observed characteristics of the treatment group who participate in the programmes with the control group of those who did not participate. We include a comprehensive set of control variables, including labour market histories, which Caliendo, Mahlstedt, and Mitnik (2017) suggests mitigates the issue that unobservable variables may be a threat to the validity of the estimated treatment effects. That is, conditioning on labour market histories implicitly captures most of the unobservable characteristics, meaning that any expected biases associated with not observing all relevant characteristics is likely to be small enough to not fundamentally affect policy conclusions. In addition, a recent meta-analysis finds the programme effects from randomised experiments and non-

experimental designs are similar, which also allays concerns about the reliability of non-experimental methods in ALMP evaluations (Card, Kluve, and Weber, 2018).

We examine outcomes separately for three broad types of programmes: 1. Workplace Literacy and Numeracy programmes ('Workplace LN'); 2. Intensive Literacy and Numeracy programmes ('Intensive LN') and 3. Intensive Literacy and Numeracy - English for Speakers of Other Languages ('ILN English'). We first examine whether programme participation increases measured skills. We find that participants' measured skill levels are higher after programme participation for all three programme types. While measuring the change in skill levels is not the focus of our analysis, this provides further reassurance that any positive relationship between programme participation and labour market outcomes is due to participation in the programme as opposed to unobservable factors that are correlated with both the propensity to participate and labour market outcomes.

We then examine labour market outcomes. For Workplace LN programmes, we find that employment and earnings increase after programme participation. However, for Intensive LN and ILN English programmes, employment and earnings decrease. Similarly, the probability of social welfare benefit receipt and the amount received decreases after programme participation for Workplace LN programme participants, but increases for Intensive LN and ILN English participants.

However, the share of programme participants enrolled in education and training in the years after participation increases for all three programme types. Moreover, the decrease in employment rates among Intensive LN and ILN English participants could be due to higher participation in further education. Indeed, a general activity indicator for employment and/or enrolment in further education or training provides positive results for all three programme types.

Since many of the programmes, particularly the Workplace LN programmes, have a goal of improving health and safety, we also examine workplace accidents. There appears to be little effect of the programmes on workplace accident claims and costs. However, this result is difficult to interpret since the programmes may increase accident reporting rates by raising awareness of health and safety issues and requirements.

The remainder of the paper proceeds as follows. Section 2 discusses the existing literature. Section 3 outlines the policy context. Section 4 describes the data. Section 5 provides descriptive statistics on the characteristics of programme participants. Section 6 examines whether measured skill levels increase after programme participation. Section 7 describes the empirical strategy. Section 8 presents the main results on labour market outcomes, benefit receipt, further education and training and workplace accidents. It then presents heterogeneity analysis to examine whether these effects vary by ethnicity. Section 9 concludes.

2 Literature

The ALMP evaluation literature examines a wide range of different training programmes, from general education to apprenticeships, on-the-job training and classroom learning, short and long training programmes, and so forth. Existing research finds that, overall, ALMPs have little positive impact on labour market outcomes (Crépon and Berg, 2016). However, the results vary depending on the time period covered, the length of the training programmes and group examined. Two meta-

analyses, Card, Kluve, and Weber (2010) and Card, Kluve, and Weber (2018), conclude that generally, training programmes have small or even negative impacts in the short-run but more substantial, positive effects in the medium run (1-2 years post programme) and longer run (2+ years post programme). Bergemann and Van Den Berg (2008) finds that the effects of training programmes are greater for women than men. This is also consistent with the meta-analysis, with larger effects for female participants, as well as the long-term unemployed, and smaller effects for older workers and youths (Card, Kluve, and Weber, 2018). Lechner, Wunsch, and Miquel (2011) follows training participants over a longer time than is typical (eight years) and differentiates results by training duration. It finds that all types of training programmes have substantial positive impacts on employment outcomes over reasonably short time periods (within 6-24 months of the training programmes).

There appears to be just a handful of studies that examine L+N training programmes specifically. In the education literature, there are several studies of adult basic education (ABE) in the US, which are summarised in Kim and Belzer (2021). For example, Reder (2014a), Reder (2014b), Reder (2014c) and Reder (2014d) examine the impacts of ABE on literacy improvements, GED results, engagement in further education and earnings respectively. The studies find that ABE improved literacy proficiency and increased earnings, but these gains took several years to eventuate since, rather than having direct effects, the positive effects were due to increased engagement in reading and writing practices.

In terms of methodological approaches, while RCTs are considered the 'gold standard' for identifying causation, most programmes do not involve random allocation to the treatment group. Therefore, the challenge is to identify causal effects using observational data. It is also difficult to find natural experiments that would allow the application of quasi-experimental approaches. A meta-analysis of over 200 ALMP evaluations finds that approximately 30 % of estimates come from RCTs, but this share has increased over time (Card, Kluve, and Weber, 2018). However, many ALMP evaluations continue to rely on matching methods.

There are long-standing concern over the reliability of non-experimental approaches, including matching methods, for evaluating ALMP programmes (Ashenfelter, 1978). However, Card, Kluve, and Weber (2018)'s meta-analysis notes that it is reassuring that the average programme effects from evaluations using experimental and non-experimental designs are similar. Moreover, Caliendo, Mahlstedt, and Mitnik (2017) uses a unique dataset that contains information on newly unemployed individuals that includes usually unobserved characteristics like personality traits, attitudes, expectations, social networks and intergenerational information. Analysis of these data suggest that these usually unobserved characteristics matter for selection into the programmes, but do not make a significant difference to estimates of the treatment effects on employment and wages. Caliendo, Mahlstedt, and Mitnik (2017)'s results suggest that the small impact of the usually unobserved variables on treatment effects is explained by the the inclusion of a comprehensive set of control variables in standard propensity score specifications, including labour market history. That is, the usually unobserved variables not only affect selection into ALMP programmes and future labour market outcomes, but are also correlated with past labour market performance. Thus, controlling for labour market histories implicitly captures a large part of the information contained in the usually unobserved variables. The results further suggest that any expected bias associated with unobserved

characteristics are likely to sufficiently small as to not fundamentally affect policy conclusions.

3 Policy context

This section outlines the policy context of the adult L+N interventions landscape in NZ. The interventions landscape is complex, and the following is a brief summary drawn from Furness, Hedges, and Piercy-Cameron (2021), which provides a detailed discussion.

There are four broad types of publicly-funded adult L+N programmes in NZ: Workplace Literacy and Numeracy programmes ('Workplace LN'), Intensive Literacy and Numeracy programmes ('Intensive LN'), Intensive Literacy and Numeracy - English for Speakers of Other Languages ('ILN English'), and Intensive Literacy and Numeracy – Refugee English ('ILN Refugee'). Within these broad categories, there is a wide range of specific programmes catering to a diverse range of learners. In 2023, the government allocated about NZ$21.5m in funding to Workplace LN, NZ$12.4 million to Intensive LN, NZ$16.8m to ILN English and NZ$1.1m to ILN Refugee programmes (Tertiary Education Commission, 2023a).

The majority of learners self-select into L+N programmes. Some are employed and undertake the programme in their workplace to, for example, enable them to access further training at (foundation) levels 1 and 2 in the New Zealand Qualifications Framework (NZQF), to meet regulatory requirements such as health and safety training, or to improve their skills and/or confidence in their workplace. Courses are also delivered through community programmes.

However, there are two groups of learners who may be compelled to participate in L+N programmes: beneficiaries as a condition of gaining or maintaining access to social services and some migrants as part of their particular immigration pathway. Generally, these courses are offered at no cost to participants, with funding coming from the government (via the Tertiary Education Commission) or, in the case of many Workplace LN programmes, a combination of the government and employers. The main exemption is that some new migrants must undertake ILN English programmes at their own expense as part of their visa requirements.

Thus, while L+N programmes in NZ fall under the umbrella of ALMP of training to improve employability and worker productivity, their goals are wider. For example, they not only include programmes such as those targeted at youth not in employment, education and training, for example, but also include the currently employed as well as those whose primary focus is not necessarily employment, but to improve their ability to participate in society.

Therefore, while we examine employment outcomes given that the goal of some of the programmes is to improve employability, we also examine earnings given the goal of workplace programmes for the currently employed is upskilling. We also examine further education and training outcomes as the L+N programmes may be a stepping stone to other qualifications. In addition, we examine workplace accident outcomes since Workplace LN programmes often have a goal of improving health and safety, with programmes often using health and safety documentation for practical, relatable learning material (Alkema, 2020). Given the richness of the data we use, future work could also be extended to additional outcomes, such as health (including mental health) and justice outcomes.

4 Data

We use data from the Integrated Data Infrastructure (IDI) managed by Stats NZ. The IDI is a large research database holding micro-data from various government agencies that can be linked at the individual level (Stats NZ, 2020). It includes information on participation in publicly-funded adult learning programmes. As explained earlier, these are categorised into Workplace LN, Intensive LN, ILN English and ILN Refugee programmes.[1]

Characteristics and outcomes of participants come from various IDI data sources. Age, sex, ethnicity, and region of residence is derived from the IDI central tables. Information on years in NZ for migrants comes from Stats NZ's administrative population census, which combines data from the census, birth registrations, visa applications and border movements (Stats NZ, 2021). The level of secondary school qualification comes from the 2013 census. Information on selected background characteristics such as education is missing for large shares of participants. Plausible explanations include that some learners were not in New Zealand at the time of the census (e.g. recent migrants), or did not complete the census because of deficiencies in their L+N skills.

Inland Revenue provides income tax data, which we use to measure employment (any earnings in a given year), annual earnings from wages and salaries, firm size, the industry of workers according to the Australian and New Zealand Standard Industrial Classification (ANZSIC) 2006, and the receipt of social welfare benefits. Throughout this paper, benefit payments include all types of main benefits. These are taxable payments to support the income of certain groups, including the unemployed, those with caring responsibilities and those unable to work because of illness. Information on workplace accidents and related costs comes from the Accident Compensation Corporation (ACC). This administrative source of data on workplace accidents and injuries operates within a compulsory universal, no-fault system, which should minimise and mitigate under- and/or mis-reporting of workplace accident claims. All monetary values are measured in 2021 New Zealand dollar using the consumer price index to adjust for inflation. Ministry of Education data from the Literacy and Numeracy for Adults Assessment Tool (LNAAT) is used to determine the literacy and numeracy competence of adults and monitor the progress of learners during programme participation. Ministry of Education data is also used to identify enrolment in further education and training programmes, including additional L+N programmes.

5 Characteristics of programme participants

This section describes the characteristics of participants in adult L+N programmes. It includes all programmes started between 2013 to 2021 inclusive, whereby one person can participate in multiple programmes. Time-varying characteristics are measured at the start of the programme. For comparison with the general population, participants are contrasted with a 5 % random sample of the New Zealand population aged 15 to 64 years in the same time period. This sample is derived from the estimated resident population, which identifies individuals who usually live in New Zealand using

[1] Until 2014, the data distinguishes between employer-led and tertiary education organisation-led Workplace LN programmes. We aggregate these into Workplace LN programmes for data consistency over time.

the IDI (Stats NZ, 2016). Their characteristics are measured at the reference date of 30 June each calendar year.

Tables 1 presents demographic characteristics separately for participants of each of the four programmes, relative to the general NZ resident population. Those who participate in Workplace LN have a similar average age to the NZ resident population, while those who participate in Intensive LN are somewhat younger, ILN Refugee participants are almost nine years younger on average, and ILN English participants are several years older. Women account for just over half of the general population, and participation in Workplace LN is reasonably aligned with this (49 %). Women are overrepresented among participants in Intensive LN, ILN English, ILN Refugee. This may partly reflect that women are somewhat more likely to have low skills than men (Meehan, Pacheco, and Schober, 2022a). In terms of ILN English, for migrants, depending on their visa type, principal visa applicants, as well as their spouses and dependent children aged 16 and over, are often required to meet minimum English language requirements. However, if the spouse and/or children do not meet the requirement, they can pre-pay for ILN English classes. Thus, the high percentage of female ILN English participants may reflect that about 60 % of principal work applicants are men,[2] whose spouses are therefore more likely to take ILN English classes as a requirement of their migration pathway.

As expected, virtually all participants in ILN English and ILN Refugee programmes were born overseas, and they tend to have arrived in NZ more recently than participants in the Workplace LN and ILN Refugee programmes. At almost 50 %, the share of those born in NZ among Workplace LN participants is also lower than the population average, while the share of those born in NZ among Intensive LN participants (67 %) is more similar to the population average.

Also as expected, most ILN Refugee participants live in Auckland, which is the largest city in New Zealand. This likely reflects that all refugees must complete a five-week reception programme in Auckland upon arriving, which typically includes an initial ILN Refugee programme, before being settled in various locations throughout the country. Note that the ILN Refugee participants are the smallest category of programme intervention - this likely reflects the low refugee quota that NZ has had over the sample timeframe. Most ILN English participants are also located in Auckland, likely reflecting that this is the most common place for recent migrants to live. Participants in Workplace LN programmes are somewhat overrepresented in regions with large urban populations (e.g. Auckland and Wellington), while in comparison, a somewhat higher share of those participating in Intensive LN programmes are in less populous areas (e.g. Gisborne, Hawke's Bay, Manawatu-Whanganui).

Table 2 provides education and labour market statistics for programme participants. First, we examine secondary school (i.e. high school) educational attainment. However, a caveat must be noted that these data come from the 2013 Census and, therefore, as shown in Table 2 and discussed in Section 4, the coverage of information for participants is not complete. It is particularly low for ILN English and ILN Refugee participants, likely reflecting that many arrived in NZ after March 2013, and therefore did not complete the census. As expected, participants across all four programmes have lower levels of secondary school education than the general population. Intensive LN participants have the lowest levels of attainment, with the majority having no qualifications. About 50 % of ILN

[2] According to Ministry of Business, Innovation and Employment's migration data explorer W1 Work Decisions https://mbienz.shinyapps.io/migration_data_explorer/, accessed on 12 March 2023.

Table 1: Characteristics of programme participants

	(1) Workplace LN	(2) Intensive LN	(3) ILN English	(4) ILN Refugee	(5) Population
Individual characteristics					
Age (years)	39.6	35.8	46.3	30.6	38.8
Female	48.9	57.4	65.5	57.6	50.0
Asian	27.3	19.1	65.8	38.5	16.4
NZ European	36.7	35.1	3.3	2.3	68.8
Maori	18.5	40.1	0.5		16.8
Pacific peoples	21.4	17.0	5.3	0.2	8.1
Other Ethnicity	5.9	6.4	25.8	62.7	4.2
N	40029	35562	25113	3729	1389387
Migration experience					
Born in NZ	49.8	66.5	0.8		69.2
Arrival 6+ years ago	36.3	19.3	37.1	25.6	22.6
Arrival 5 years ago	3.3	2.1	7.2	8.2	1.4
Arrival 4 years ago	3.1	2.2	8.6	11.7	1.5
Arrival 3 years ago	3.2	2.6	10.6	17.2	1.6
Arrival 2 years ago	2.8	2.7	13.6	20.1	1.9
Arrival 1 year ago	1.5	4.7	22.0	17.1	1.8
N	35361	31947	21966	3276	1309560
Region of residence					
Northland Region	3.3	6.2	0.3		3.3
Auckland Region	41.4	33.2	64.1	68.8	35.9
Waikato Region	8.5	12.4	4.7	7.2	9.1
Bay of Plenty Region	6.0	7.6	0.5		6.1
Gisborne Region	0.6	2.6	0.0		1.0
Hawke's Bay Region	2.9	7.9	2.0		3.4
Taranaki Region	1.5	1.0	0.3		2.4
Manawatu-Wanganui Region	4.9	8.2	4.8	3.6	4.8
Wellington Region	13.5	8.6	9.8	9.0	11.0
West Coast Region	0.6	0.7			0.7
Canterbury Region	9.9	6.4	11.4	8.1	12.6
Otago Region	3.1	2.0	0.4	0.4	4.7
Southland Region	1.6	2.2	0.1		2.1
Tasman Region	0.5	0.2	0.0		1.0
Nelson Region	1.1	0.6	1.3	2.7	1.1
Marlborough Region	0.7	0.3	0.1		0.9
N	36846	32478	22971	3396	1366203

Notes: This table compares average characteristics of those who, between 2013 and 2021 (inclusive), participated in the different literacy and numeracy programmes (columns 1 to 4) and a 5 % random sample of the NZ population (column 5). Unless otherwise indicated, the numbers represent percentages. Missing numbers indicate that the number of individuals in the cell was too small to report (in accordance with Stats NZ confidentiality rules).

Table 2: Education and labour market participation of programme participants

	(1) Workplace LN	(2) Intensive LN	(3) ILN English	(4) ILN Refugee	(5) Population
Level of secondary education attainment					
No qualification	33.2	58.2	50.4	31.2	20.3
Level 1 certificate	15.6	12.8	2.2	7.4	17.7
Level 2 certificate	12.7	6.2	0.9	3.8	20.4
Level 3 or 4 certificate	10.8	4.8	2.0	5.5	25.6
Overseas qualification	27.7	18.1	44.4	52.1	16.0
N	23364	14820	7545	1095	878223
Employment and income					
Any employment	85.5	36.1	22.1	40.0	72.5
Earnings ($)	39800.3	5647.5	3246.3	4466.6	39925.6
Earnings (cond. on emp., $)	46560.8	15631.7	14691.1	11186.0	55087.0
Any benefit payments	13.9	61.2	58.5	72.0	14.8
N	40029	35562	25113	3729	1389387
Industry					
Manufacturing	25.6	14.4	10.0	5.7	11.0
Health Care and Social Assistance	13.7	8.8	5.5	9.3	10.5
Retail Trade	11.3	9.1	9.5	16.6	9.9
Education and Training	3.8	4.0	2.8	5.3	9.0
Construction	6.1	4.3	4.2	1.2	7.9
Professional, Scientific, Technical	2.4	1.7	1.4	2.0	7.5
Accommodation and Food Services	5.6	13.2	23.2	19.4	6.8
Public Administration and Safety	4.8	2.6	0.4	2.4	6.4
Wholesale Trade	6.6	3.6	4.2	4.0	5.1
Administrative and Support Services	5.1	15.6	20.6	21.1	5.1
Agriculture, Forestry and Fishing	4.0	10.8	9.3	5.3	4.4
Transport, Postal and Warehousing	4.6	3.3	1.7	1.6	4.3
Other Services	2.7	3.3	4.9	3.2	3.3
Financial and Insurance Services	0.8	0.7	0.4		3.1
Arts and Recreation Services	0.8	1.3	0.7	1.6	1.6
Information Media, Telecom.	0.4	1.1	0.4	0.8	1.5
Rental, Hiring, Real Estate	0.7	1.5	0.6		1.4
Electricity, Gas, Water, Waste	0.6	0.7	0.5		0.9
Mining	0.3				0.3
N	32061	5607	2442	741	863157
Firmsize					
500 and more employees	29.6	23.7	15.3	24.8	29.7
50-499	44.1	31.7	25.2	38.8	28.2
10-49	17.9	25.7	28.0	21.2	24.0
less than 10	8.5	18.9	31.4	15.6	18.2

Notes: This table compares average characteristics of different literacy and numeracy programme participants (columns 1 to 4) and the NZ population (column 5). Unless otherwise indicated, the numbers represent percentages. Missing numbers indicate that the number of individuals in the cell was too small to report (in accordance with Stats NZ confidentiality rules).

English participants have no qualification, while 44 % have an overseas secondary school qualification. About a third of Workplace LN participants have no qualification, but about 11 % have a Level 3 or 4 qualification.[3]

In terms of employment, the share of Workplace LN participants who are employed in the year of the programme start is about 86 %, which is higher than than general population average of 73 %. Given they are participating in Workplace LN programmes, it may seem surprising that this share is not 100 %. However, there are two strands of Workplace LN programmes. The first strand is employer-led, whereby employers apply for contestable funding then generally contract an education provider to run programmes for their employees. The second strand funds tertiary education providers to market and deliver workplace programmes. While employment is generally a condition of the first strand, it is not necessarily a condition of the second. Unfortunately, we cannot differentiate between these two strands in the data for most of the period we are investigating.

All four types of programmes have lower average earnings conditional on employment than the general population. Participants in ILN Refugee programmes have the lowest average earnings and, consistent with this, the highest share receiving any social welfare benefit payments in the calendar year in which the programme starts (72 % versus 15 % for the general population). Note that the share of ILN Refugee participants who are employed (40 %) and the share who receive benefit payments (72 %) adds to more than 100 %. This is because employed individuals can still receive benefit payments if their income is low enough. For example, a reasonable share of those who are underemployed (i.e. are working part-time and both want and are available to work more hours) receive a main benefit payment (Stats NZ, 2022). Since we look at income over a whole year, it is also possible that people change from employment to receiving benefit payments (or vice versa) and therefore appear in both categories.

ILN English participants have the next lowest average earnings, with 59 % receiving a social welfare benefit. The share receiving a benefit among this group may seem surprisingly high given many are recent migrants who would presumably be on temporary visas (e.g. a work visa for the partner of a principal work visa holder) who would therefore not be eligible for government welfare payments. However, more than a third of participants in ILN English have been in NZ for six years or more, and would therefore likely qualify for benefit payments.

The average earnings of Intensive LN participants is not much higher than that of ILN English participants, and the share receiving a benefit is slightly higher (possibly reflecting that some in the ILN English are recent migrants who do not qualify for government social welfare payments). As expected, participants in the Workplace LN programmes have the highest average earnings and lowest share receiving a benefit.

Industry statistics are restricted to those who are in paid employment. The most interesting comparison is, therefore, between Workplace LN participants (as the majority of these participants are employed) and the general employed population. Manufacturing workers are over-represented among Workplace LN participants. While 11 % of the general population who are employed work in manufacturing, those employed in this industry account for almost a quarter of Workplace LN participants. Healthcare and social assistance workers, wholesale trade and retail trade workers are also

[3] The NZ Qualifications Framework has 10 levels. Levels 1-3 are senior secondary school qualifications and Level 4-6 are certificates and diplomas. Level 7 are bachelor's degrees and Level 10 are doctoral degrees.

over-represented among Workplace LN participants. Workers in professional, scientific and technical, and education and training industries are underrepresented among Workplace LN participants. This is as expected given workers in these industries tend to have high educational attainment and likely already have a high level of L+N skills.

Table 2 also shows the firm size for participants who were employed at the start of the programme. Interestingly, participants are disproportionately employed in companies with 50 to 499 employees. While 28 % of the general population work in firms of that size, this share is 44 % for Workplace LN participants. Participation in this programme tends to be lower in firms with less than 50 employees, while participants from large firms with 500+ employees match their share of the workforce (30 %).

Table 3 shows the share of L+N programme participants in 2013 to 2018 who went on to participate in further L+N programmes in the three years after the start of the first programme. About 15 % of Workplace LN participants go on to do further L+N programmes, which mostly involves additional Workplace LN programmes. About 23 % of Intensive LN participants do further programmes. The majority of these are additional Intensive LN programmes, although about 6 % go on to do an ILN English programme/s and about 2% go on to do a Workplace LN programmme/s. At more than 50 %, the share of ILN English and ILN Refugee participants who do further programmes is much higher. The majority of these go on to do further ILN English and ILN Refugee programmes, respectively. However, a reasonable share (8 %) of ILN English participants go on to do an Intensive LN programme/s.

Table 3: Further participation in literacy and numeracy programmes

	Any further	Further programme type			
	programme	Workplace LN	Intensive LN	ILN English	ILN Refugee
Workplace LN	14.6	13.2	1.5	0.5	
Intensive LN	23.1	2.2	16.7	5.9	0.6
ILN English	52.4	2.8	8.3	44.7	4.8
ILN Refugee	50.6	2.1	3.1	5.2	45.2

Notes: This table shows the share of participants (in %) in literacy and numeracy programmes in the years 2013-2018, who participate in another programme in the following 3 years. Missing numbers indicate that the number of individuals in the cell was too small to report (in accordance with Stats NZ confidentiality rules).

6 Change in skills

To assess the change in skills among programme participants, we examine data from the Literacy and Numeracy for Adults Assessment Tool (LNAAT). LNAAT is the primary method of diagnosing L+N needs for learners accessing L+N programmes and other education and training courses funded via the Teritary Education Commission's foundation funds (Tertiary Education Commission, 2023b). Reports of learners' performance can be quickly analysed to inform effective teaching and monitor of learners' progress (TEC, 2017). Many learners, therefore, take an initial test at the beginning of a programme and one or more further assessments to measure gains.

LNAAT provides a continuous scale score from 0 to 1000. These scores are divided into six steps, with Step 1 being the lowest proficiency and Step 6 being the highest. To get a sense of what level

of proficiency these steps entail, Ministry of Education analysis maps the LNAAT steps to the Adult Literacy and Life Skills (ALL) Survey (an earlier version of the Programme for the International Assessment of Adult Competencies' (PIAAC) Survey of Adult Skills) (Ministry of Education, 2014). Attaining Level 1 in ALL indicates that the participant can "Read simple documents, accomplish literal information-matching with no distracting information, and perform simple one-step calculations". Attaining Level 2 in ALL indicates that the participant can "Search a document and filter out some simple distracting information, make low-level inferences and execute one- or two-step calculations or estimations". For literacy, Step 1 in LNAAT is about equivalent to Level 1 in ALL, and Step 2 in LNAAT is about equivalent to Level 1 or the lower-end of Level 2 in ALL. For numeracy, Steps 1, 2 and 3 in LNAAT are equivalent to a low-, medium- and upper-end of Level 1 in ALLs, respectively.

Although many L+N programme participants take LNAAT, there is variation in the coverage and timing of LNAAT being administered. Table 4 shows that more than 91 % of Workplace LN participants have at least one assessment in the time period three weeks before programme start to three weeks after finish.[4] The shares for the other programmes are 88 % for Intensive LN, 81 % for ILN English, and 49 % for ILN Refugee. Typically, assessments are administered close to programme start and end. Figure 1 shows the share of learners where we observe skill assessments over time. About 30 % of all participants in all programmes have an assessment in the first week of a programme, 16 % in the second, and 12 % in the third week. A small share of participants also have assessments before the programmes start. Skill assessment also peaks at programme end, with 15 % of learners doing an assessment in the second to last week.

Table 4: Number of administered assessments

	(1) Workplace LN	(2) Intensive LN	(3) ILN English	(4) ILN Refugee
Any assessment	91.2	87.8	80.6	49.1
Assessment at end	50.5	45.2	45.5	23.8
Assessment at start	67.7	66.6	37.7	24.3
Both start and end	37.3	33.8	22.4	10.8
N	27051	23502	18966	2256

Notes: This table summarises the number of administered assessments per program participation. It only considers observations where the end date is not missing.

The high uptake of LNAAT but the inconsistency in the timing of when it is administered likely reflects that providers must administer the test to learners in order to access funding. However, the way it is used varies widely across providers, from those who use it to access funding versus those who integrate it into their practice to measure need, delivery and outcome (Furness, Hedges, and Piercy-Cameron, 2021). Moreover, anecdotally, providers sometimes make a conscious decision not to administer the test at the beginning of the programme as this could discourage participants who have often had bad past experiences of the education system and formalised tests, and/or because the L+N skills of some participants are too low for it to provide meaningful findings.

When we analyse the change in skills during programme participation below, we restrict the data to observations with an assessment at the start and the end of programmes. We allow for a three

[4] This section only uses data on programmes where the start and end dates are not missing. End dates are missing for the majority of observations starting in 2013 and 2014.

week time window around the start and end dates. Between 11 % (ILN Refugee) and 37 % (Workplace LN) of learners have assessments at the start and the end of programme participation.

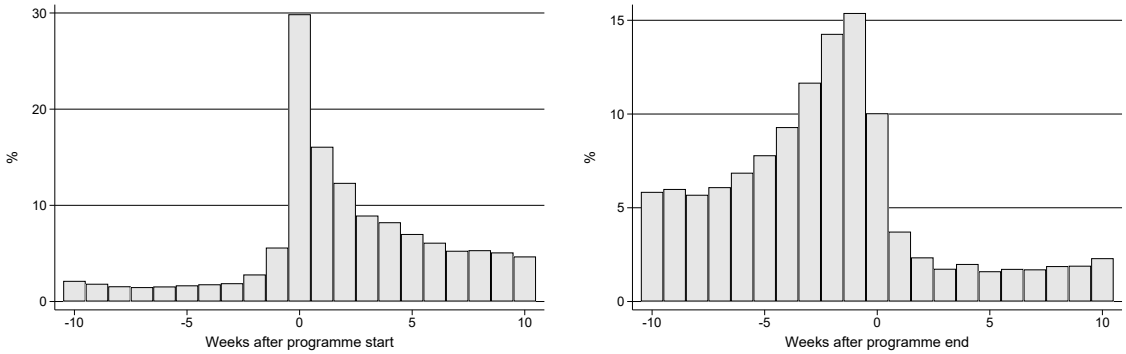

Figure 1: Share of participants with a skill assessment at programme start (left) and end (right)

Table 5 reports the results from paired t-tests on the equality of means of assessment scores at the start and the end of programme participation. To be comparable, we only pair assessments with the same characteristics (assessment type and assessed skill).[5] We find statistically significant improvements over time for all programmes, with the largest gains for participants in Workplace LN programmes. The increase of 67.9 points corresponds to 55 % of the standard deviation at the start. Similar increases are observed for participants in Intensive LN programmes (57.8 points or 51 % of the standard deviation) and ILN English programmes (57.1 points or 34 % of the standard deviation). Increase among ILN Refugee participants is lowest (11.8 points or 8 % of the standard deviation), however, the number of observed test results is also particularly low for this group.

Table 5: Changes in assessment scores

Programme	(1) Score (SD) at start	(2) Score (SD) at end	(3) Difference	(4) p-value	(5) N
Workplace LN	553.3 (123.4)	621.2 (115.0)	67.9	0.000	11421
Intensive LN	496.4 (112.7)	554.2 (110.6)	57.8	0.000	7686
ILN English	530.2 (169.1)	587.3 (164.8)	57.1	0.000	4044
ILN Refugee	571.4 (145.9)	583.3 (143.1)	11.8	0.040	189
Any program	530.7 (131.9)	592.9 (127.5)	62.2	0.000	23340

Notes: This table analyses the changes of scores from administered assessments during programme participation. Columns 1 and 2 show the mean score at the start and the end of a programme and the standard deviation in parentheses. Column 3 shows the difference, column 4 the p-value of a t-test on the equality of the two means, column 5 the number of observations.

As an aside, unsurprisingly, participants in Workplace LN programmes have a higher average starting score than Intensive LN and ILN English participants. Somewhat surprisingly, ILN Refugee participants have a higher average starting score than Workplace LN participants. However, this may reflect the low share of ILN Refugee participants who have both a start and end assessment score (and are therefore included in Table 5). In terms of the level of LNAATs, the average starting LNAAT score for Workplace LN programme participants of 553.3 is a proficiency level of Step 3 out

[5] Assessment type includes: online adaptive, online non-adaptive, paper, snapshot online (i.e. short-form assessment), snapshot paper. Assessed skill includes: general numeracy, number knowledge, number strategies and measurement, reading with understanding, reading comprehension, vocabulary, write to communicate, listen with understanding.

of 6 steps for reading and Step 4 for numeracy, and is equivalent to a high Level 1 or low Level 2 in ALL's five-level system. Similarly, an average of 496.4 for Intensive LN participants is LNAAT Step 2 for reading and Step 3 for numeracy, which is equivalent to Level 1 for ALLs (according to Ministry of Education, 2014). That is, for all four groups of L+N training programmes, the average starting score is Level 1 or a low Level 2 in ALLs, which involves the ability to read simple documents and perform simple one-step documents. Workplace LN participants have the highest average LNAAT score at the end of the programme of 621.2. According to the LNAAT scale, this is Step 4 for reading and Step 4 for numeracy, which is equivalent to Level 3 in ALLs for reading and Level 2 for numeracy.

Table 6 examines the change in assessment scores by participant characteristics. At the start of the programme, there is little difference between the LNAAT scores of participants by gender and age. Consistent with findings from PIAAC and PISA (Meehan, Pacheco, and Schober, 2022b; Meehan, Pacheco, and Schober, 2022a), NZ Europeans have higher average LNAAT scores than Asians, who in turn have higher scores than Māori, and Pacific peoples have the lowest scores. After programme participation, all demographic groups have higher LNAAT scores. There are some differences in score improvements by participant characteristics, but these are not large, with all groups improving by between 11% and 14%, or between 39% and 66% of the starting standard deviation. The two groups that experienced the largest increases are Māori and Pacific peoples.

Figure 2 illustrates the changes in LNAAT assessment scores graphically for each of the three main programme types (ILN Refugee is excluded due to a small number of observations). It shows the kernel density estimates for the distribution of scores at programme start and end, using the same set of paired assessment results as for the t-tests. During participation, the entire distribution shifts to the right for all three programmes, indicating that scores improve over the entire skill distribution.

Figure 3 presents the changes in assessment scores graphically by ethnic group. Once again, during participation, the entire distribution shifts to the right for European, Māori and Pacific participants, indicating that scores improve over the entire skill distribution.

As mentioned, a limitation of the assessment scores is that they are only available for a subset of all programme participants. Missing data could be related to learners' achievement. For example, a learner may drop out of a programme because of lacking progress, and therefore, not participate in a scheduled assessment at programme end. A second issue is that there is no control group of people who participate in assessments but do not participate in any programme. The scores may also improve over time because people get more used to getting tested and the feedback following previous assessments. It is therefore unclear to what extent the observed improvement in scores can be attributed to programme participation. However, it is still reassuring that there does appear to be a first-order effect of gains in L+N skills among participants for whom we have data.

Table 6: Changes in assessment scores by participant characteristics

Programme	(1) Score (SD) at start	(2) Score (SD) at end	(3) Difference	(4) p-value	(5) N
Gender					
Female	534.4 (130.8)	593.1 (128.5)	58.8	0.000	12888
Male	526.2 (133.2)	592.7 (126.4)	66.5	0.000	10452
Ethnicity					
European	544.6 (119.0)	607.3 (118.3)	62.6	0.000	6894
Māori	507.3 (102.9)	574.8 (102.6)	67.6	0.000	5670
Pacific people	496.1 (113.1)	566.3 (114.0)	70.2	0.000	4500
Asian	540.3 (150.9)	599.0 (143.7)	58.7	0.000	7146
Age					
Older than 38	529.0 (141.0)	591.3 (135.5)	62.3	0.000	11214
Young	532.3 (123.0)	594.5 (119.7)	62.2	0.000	12117
Birth place					
Born in NZ	523.5 (110.5)	589.5 (111.1)	66.0	0.000	10077
Born overseas	538.3 (146.9)	597.1 (139.3)	58.8	0.000	11397

Notes: This table analyses the changes of scores from administered assessments during programme participation. Columns 1 and 2 show the mean score at the start and the end of a programme and the standard deviation in parentheses. Column 3 shows the difference, column 4 the p-value of a t-test on the equality of the two means, column 5 the number of observations.

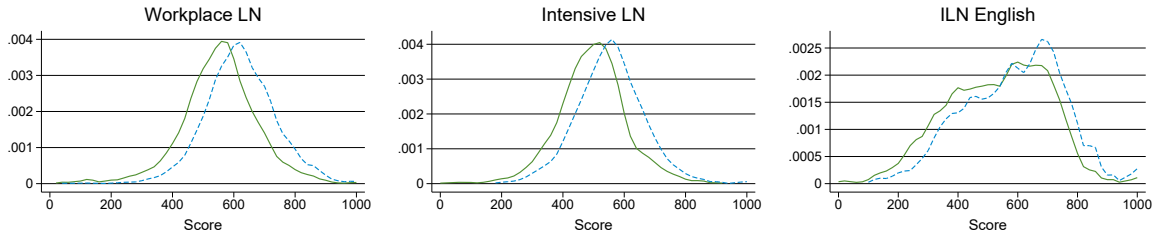

Figure 2: Kernel density estimates (Epanechnikov kernel) on the distribution of assessment scores at programme start (——) and end (– – –) by programme type

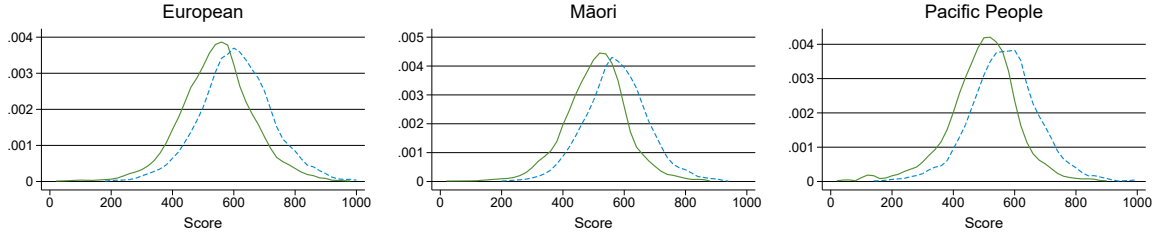

Figure 3: Kernel density estimates (Epanechnikov kernel) on the distribution of assessment scores at programme start (——) and end (– – –) by ethnicity

7 Empirical strategy

For estimates of programme effects, we need counterfactual outcomes of what would have happened to learners if they had not participated in L+N training. As discussed above, the criteria to participate in the available programmes are not very restrictive, so that there is a large group of people who is principally eligible to enrol. This fact raises the concern that those who choose to participate may systematically differ from non-participants in important (unobservable) characteristics. For example, they may have lower skills in general, which has a negative impact on their labour market outcomes. On the other hand, they might be more motivated, which could be positively correlated with both a desire to learn and improve their skills and, thus, programme participation, as well as better future labour market outcomes. This could lead to selection biases when comparing participants and non-participants and an over- or underestimation of the programme's impact.

To address this concern, we combine matching methods with difference-in-differences (DiD) regressions. This method has been applied to the evaluation of ALMP in numerous previous studies, such as Heckman and Navarro-Lozano (2004), L. Centeno, M. Centeno, and Novo (2009) and Caliendo and Künn (2011) among many others. Our treatment group are first-time participants in an L+N programme between 2015 and 2018 inclusive. Our potential control group is large, consisting of all NZ residents who did not participate in any L+N programme. This allows us to construct a control group that is very similar to the treatment group via nearest neighbour (1:1) matching using Mahalanobis distance. We use exact matching for region, gender, ethnicity and employment status in the three preceding years, and the closest match available for age in months, years in the country, annual wages in the last five years, main benefit receipt in the last three years, and indicators for the type of social welfare benefits received.[6] As discussed, evidence suggests that the inclusion of a comprehensive set of controls, in particular, labour market history, mitigates concerns about unobservable characteristics (Caliendo, Mahlstedt, and Mitnik, 2017). Thus we include employment, wage and benefit receipt histories on the basis that past labour market outcomes are related to unobservable characteristics. Also reassuringly, Card, Kluve, and Weber (2018) finds that the average programme effects from randomised experiments are not very different from the average effects from non-experimental design.

We apply a dynamic DiD model to estimate average treatment effects of the programme:

$$y_{it} = \alpha\, treated_i + \sum_{\substack{r=-3 \\ r\neq -1}}^{3} \beta_r D_{it}^r + \sum_{\substack{r=-3 \\ r\neq -1}}^{3} \gamma_r (D_{it}^r \times treated_i) + \delta X_{it} + \epsilon_{it} \tag{1}$$

where y_{it} is the outcome of individual i in year t. $treated_i$ is equal to 1 if the individual is in the treatment group. D_{it}^r are indicators for event time. X_{it} is a vector of covariates, including dummies for the year of the programme started, participant's gender, age and ethnicity.

We estimate Equation 1 separately for each type of L+N programme, because, as discussed above, they are targeted at different people with different background characteristics. We exclude ILN Refugee programmes from the analysis due to the small number of participants.

[6] We categorised benefits into those related to unemployment, caring responsibilities, health and disability, and other main benefits.

8 Results

This section presents the results from the analysis of the effects of L+N programmes on future outcomes. Since a key motive for the government funding of these programmes is to enhance adults' labour market prospects, we focus on employment and earnings outcomes. An improvement in skills should help those who seek employment, and lead to more productive, better paid and sustainable employment of those who are already in the workforce (Ministry of Education, 2017). We also examine subsequent participation in education and training, as this can be an intermediate step to improving future labour market outcomes. Improvements in L+N may also contribute to health and safety in the workplace. Lacking basic skills, employees may have difficulty following health and safety policies and fail to report corresponding issues. In a workplace settings, programmes can be tailored to the needs of companies to help employees in to understand standard operating procedures and form filling (Alkema, 2020). We therefore also examine the effect on workplace accidents.

8.1 Employment and earnings

Figure 4 displays descriptive trends over time on a monthly basis in employment before and after programme participation for the treated group, with month 0 being the month the LN programme starts. For Workplace LN programme participants, the employment rate is high before the programme, and increases leading up to programme participation then decreases gradually after participation. This is as expected given most of the programmes funded via the workplace funding stream are workplace based and, therefore, undertaken by employed individuals. We would, therefore, expect employment among this group to peak at the time the programme starts. This also highlights the importance of using employment history as one of the matching criteria.

For Intensive LN and ILN English programme participants, employment rates are much lower than for Workplace LN participants. Before programme participation, employment rates are less than 20% for Intensive LN participants and less than 10% for ILN English participants. For Intensive LN participants, employment rates are relatively flat in the months before programme participation, but with a slight dip immediately before month zero, when the programme starts. This could be related to the fact that some people accessing these programmes will be doing so as part of a requirement to receive an unemployment benefit. Employment rates then increase over time after programme participation. Similarly for ILN English participants, employment rates are quite flat leading up to programme participation, and increase after participation.

Figures 5, 6, 7 present regression results of Equation 1 for employment (any earnings in a given year), earnings and earnings conditional on employment (in the same year) respectively, for the Workplace LN, Intensive LN and ILN English programmes separately.

Due to exact matching on employment status, there are no differences between the employment rates of the treatment and control groups before programme participation. For Workplace LN, employment rates increase in the year that the programme starts by approximately five percentage points, and remains at this higher level for the subsequent three years but with a very small decrease in employment rates in years 2 and 3. To put this five percentage points in context, the mean employment rate in the estimation sample is 80 %, thus it represents an economic significant increase

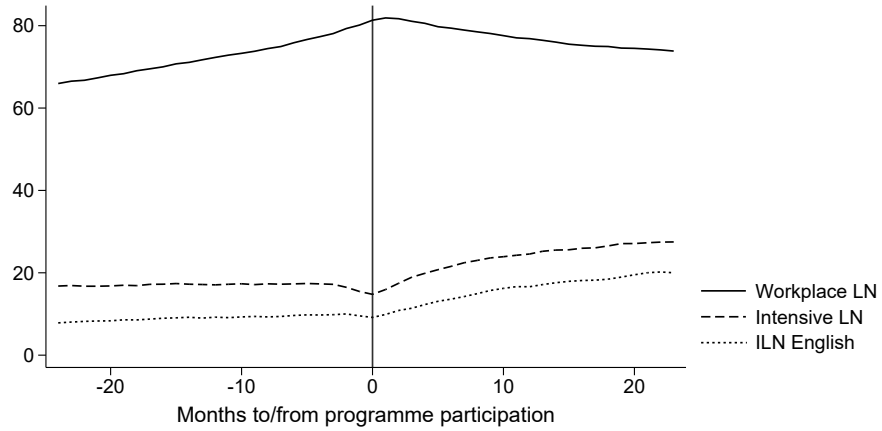

Figure 4: Employment rate (%) before and after programme participation by programme type

of about 6 %.

For Intensive LN participants, their employment rates decrease in the year that the programme starts but recover over time to their pre-programme level. That is, it appears that the programmes have a negative effect in the short-run and no effect in the medium-run. However, this may reflect a correlation between programme participation and employment that is unrelated to effect of the programme. As mentioned, Intensive LN participants are often referred to, and even required to undertake, the programmes when they access social welfare benefits (e.g. due to job loss). This could account for the lower employment rates of the treatment group in year 0 and led to an apparently negative effect of the programmes on employment. Although our control group was matched to the treatment group on the basis of previous employment histories, it may be that the matching algorithm is not refined enough to pick up this nuance, particularly as the issue appears in year 0 employment rather than pre-programme participation employment.

For ILN English participants, there is a similar pattern of falling employment in year zero. However, unlike Intensive LN participants, the employment rate does not recover in later years (although the difference is not always statistically significant, with the confidence intervals being wider than for the other two programme types reflecting a smaller number of participants). This could also reflect issues with the matching that created the control group. Some of those who take ILN English courses do so as an immigration requirement. As mentioned, while principal visa applicants must meet certain English language standards, their family members (i.e. 'non-principal' visa applicants) who do not meet the English requirements are able to instead participate in ILN English programmes. We cannot control for initial English proficiency as we cannot measure L+N for the control group (and indeed, as described in Section 6, we only have LNAAT information for a subset of the treatment group). So, it is plausible that the treatment group have lower English proficiency levels than the control group since it is likely that some of those in the treatment group have been required to take the programme due to their lack of English language skills.

Turning to earnings, for Workplace LN the patterns are similar to employment, with earnings increasing in year 0, and continuing to remain higher in the subsequent years, but with a slight downwards pattern over time. The magnitude of the increase amounts to about $2,000 higher earnings a year, in the context of average earnings for this sample of approximately $38,000. For

Intensive LN, as with employment, earnings fall in year 0. However, unlike employment, they do not recover to their previous level. For ILN English, there is also a drop in earnings in year 0, and earnings remain lower in subsequent years. The pattern is clearer than in the case of employment for ILN English as the negative difference is statistically significant in all post-programme years.

Looking at earnings conditional on employment gives further information about whether the earnings results are due to changes in employment or changes in earnings for those who are employed. For Workplace LN, there is a very small post-programme decrease in earnings, although this is not statistically significant until year 3 at the 5% level. This suggests that the positive earnings effect seen in Figure 6 is due to higher post-programme employment rates. For Intensive LN participants, the earnings conditional on employment results are very similar to the unconditional earnings results, except the magnitude of the conditional results are larger. Similarly for ILN English.

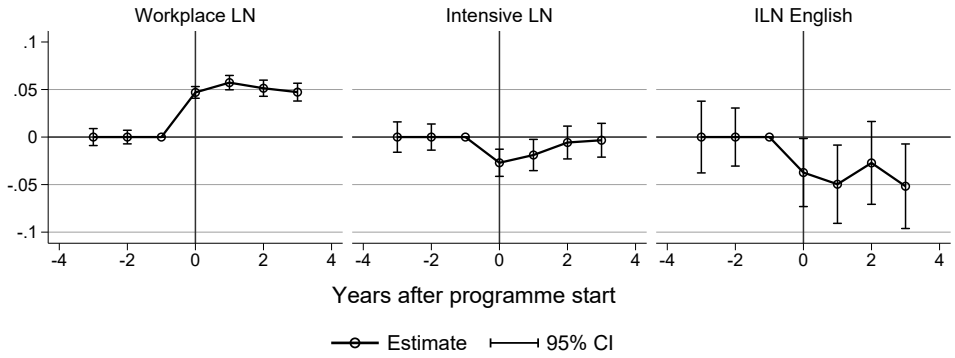

Figure 5: Effect of participation on employment within a calendar year for different programmes (percentage points)

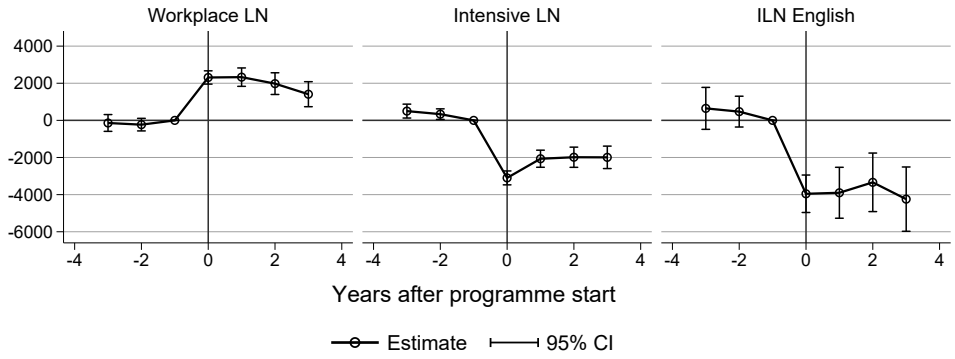

Figure 6: Effect of participation on earnings within a calendar year for different programmes ($)

8.2 Benefit receipt

We now examine social welfare benefit receipt. This is defined as the receipt of any main benefit (e.g. JobSeekers, Solo Parent benefit etc. as opposed to supplementary benefits such as accommodation supplement) during any point in the relevant year. Figure 8 shows the benefit receipt trends over time. Note that, as previously mentioned, being employed and receiving a benefit are not mutually exclusive categories. Individuals are allowed to earn a certain amount before their benefit

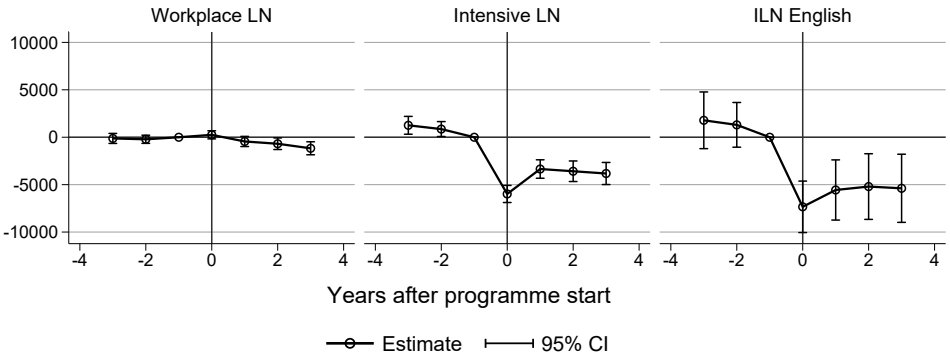

Figure 7: Effect of participation on earnings conditional on employment within a calendar year for different programmes ($)

entitlement is affected, and beyond this threshold, benefit entitlements are abated. They may also have consecutive periods of employment and benefit receipt within one calendar year.

Unsurprisingly, the share of Workplace LN participants receiving a benefit is much lower than ILN Intensive. As mentioned previously, employment is generally a requirement of participation in Workplace LN, thus this low share of participants receiving a benefit is as expected. Moreover, in line with the employment trends, before participation in the programme, this trend decreases over time. It continues to decrease in the months immediately after programme participation before increasing again in the later months. Compared to Workplace LN participants, a much higher share of Intensive LN participants are receiving a benefit. Benefit receipt among this group increases over time up until the month that programme participation starts. It then decreases over time after programme participation. Similarly to the Intensive LN participants, in the pre-participation period, the ILN English participants' benefit receipt rate increases. It also decreases after programme participation, but to a lesser extent than for Intensive LN participants.

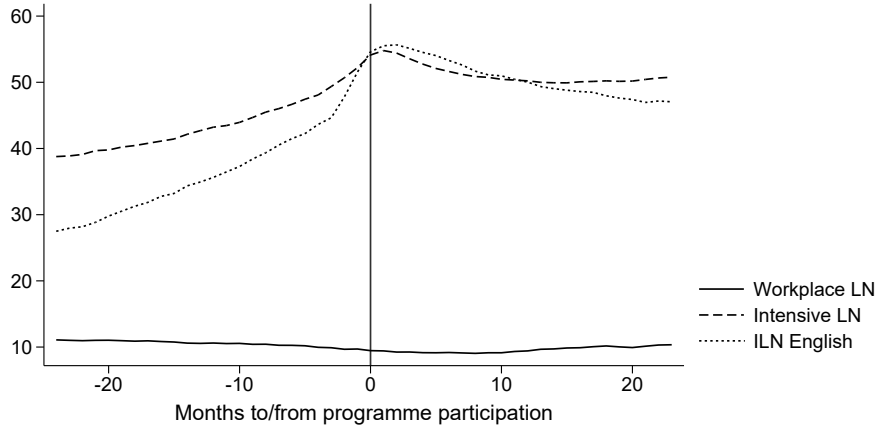

Figure 8: Percentage receiving a main benefit before and after programme participation by programme type

Figures 9 and 10 present DiD results for benefit receipt and the amount received respectively. For Workplace LN, the share receiving a benefit decreases by about two percentage points in the year of programme participation, and remains lower over the next three years, although it trends slightly upwards over time. Given an average benefit receipt rate of 16 % in the estimation sample, this

two percentage point decrease is economically significant. In line with this, the amount of benefit payments received also decrease in the year of programme participation for this group, and remains lower over the next three years, although it trends upwards slightly over time. The average reduction in annual benefit receipt payment is about $250, which is substantial relative to the average benefit payment of $1700 in this group.

For Intensive LN participants, in line with the employment results, the share receiving benefits actually increases from the year of programme participation onwards. The increase is about seven percentage points relative to a average share of 62 % receiving benefits in this group. The dollar amount of benefit received also increases in the year the programme starts and remains higher than the pre-programme amount in all three subsequent years, but does decrease somewhat over time.

For ILN English participants, the share receiving benefits also goes up from the year of programme participation by almost 10 percentage points relative to a average benefit receipt rate of 49 % in this group. The average amount of benefit received also goes up in the year of programme participation and the subsequent three years.

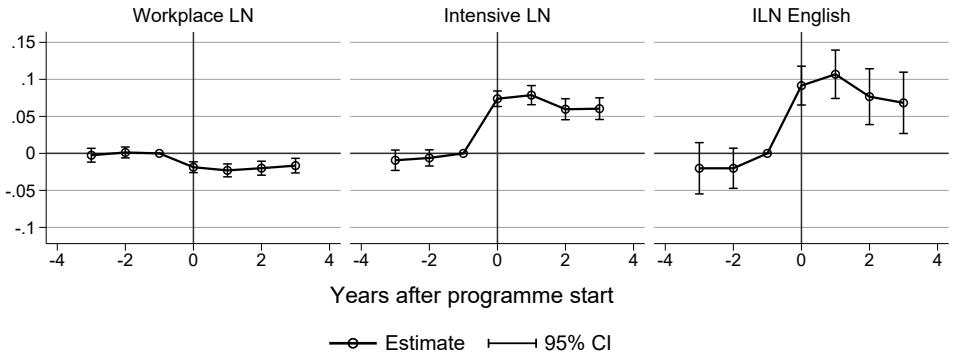

Figure 9: Effect of participation on benefit receipt within a calendar year for different programmes (percentage points)

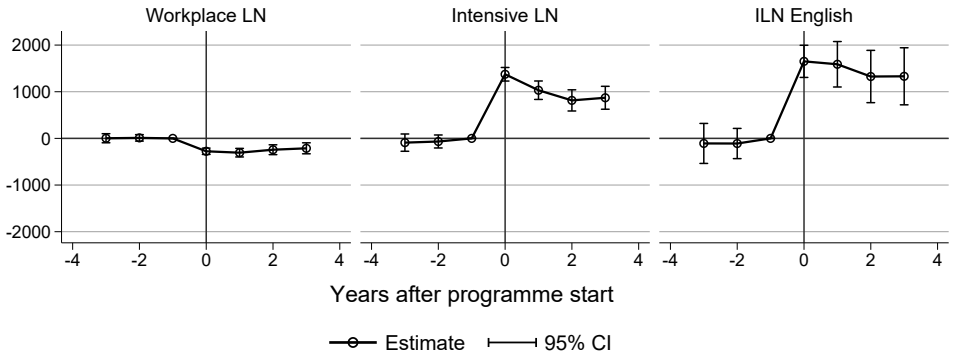

Figure 10: Effect of participation on benefit receipt amount within a calendar year for different programmes ($)

8.3 Further education and training

One of the positive effects of L+N programmes could be an increase in participation of other education and training. Figures 11 and 12 present DiD results for enrolment in further L+N programmes

and any form of further education or training, respectively.

By design, all of the treatment group participate in an L+N programme in year 0, and none of the control group participate, leading to a 100 percentage point difference in participation rates between the two groups in year 0. For Workplace LN, enrolment in L+N programmes remains higher in all three subsequent years. While the difference decreases over time, there is still a 9 percentage point difference in year 3. For Intensive LN, participation remains 7 percentage points higher in year 3, and for ILN English, 17 percentage points higher. Thus, those who participate in any of these three types of L+N programmes are more likely to go on to enrol in further L+N programmes.

The results for enrolment in any form of further education or training (excluding L+N programmes) are also positive. This education and training can involve anything from short, vocational and/or workplace training to longer, higher-level qualifications. For Workplace LN participants, the likelihood of enrolment in any education or training is higher in the year of participation in the Workplace LN programme, as well as in the first and second year after programme participation, although the difference decreases over time. However, there is no statistically significant difference in the third year. This positive result could be because participation in the LN programme builds the skills, confidence and/or motivation that allow the learners to participate in other education and training activities. However, it could also reflect that these individuals work for organisations that have a higher propensity to offer training courses to their staff, or that the individuals who participate in the L+N course have been identified as individuals who their employer wants to invest in, and they, therefore, are more likely to do subsequent training.

There is a similar pattern for Intensive LN participants - their enrolment in any form of further education or training also increases in the year they participate in the L+N programme and, while the difference decreases over time, it remains higher for the subsequent two years. The magnitude of the increase is, however, higher among this group than the Workplace LN participants. Moreover, the possible reason for the increase of being employed by an organisation which has a high propensity to offer training courses to their staff is less likely to be part of the explanation as in the case of the Workplace LN results, due to the lower average employment rate in this group. However, despite the matching method, it may also be that those who were looking at doing more education or training undertook an Intensive LN programme in order to prepare for (or even to meet the pre-requisites) of their desired education/training programme.

There is also a similar pattern for ILN English, but the effect is larger and remains significant in the third year after programme participation.

8.4 Employment, education or training

For Intensive LN and ILN English participants, the estimates in the above sections show mixed results. The programmes tend to increase participation in (further) education, but reduce employment. Given that participation in education and employment may in part be mutually exclusive, it is natural to ask how participation in L+N programmes affects a general activity indicator showing whether a person is in education, employment or training in a given calendar year.

Figure 13 presents the DiD results and shows positive effects for all three L+N programmes. In the year of the programme start, the increase in education, employment or training is substantially

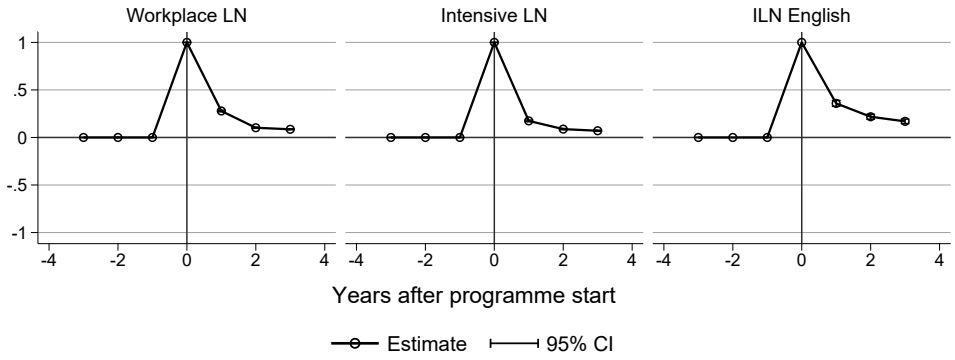

Figure 11: Effect of participation on enrolment in L+N programmes within a calendar year for different programmes (percentage points)

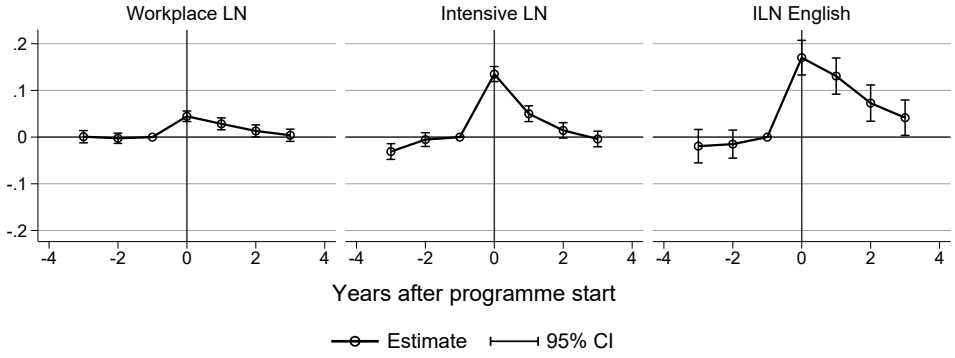

Figure 12: Effect of participation on further education or training within a calendar year for different programmes (percentage points)

larger for Intensive LN and ILN English participants. Conversely, this means that in the corresponding matched control group of non-participants there is a much larger share of people not in education, employment or training (NEET). The estimated effects decrease over time but remain statistically significant in the observation period. In year 3, the share of people in education, employment or training is still 5 (Workplace LN), 3 (Intensive LN) , and 9 (ILN English) percentage points higher for participants of L+N programmes.

8.5 Workplace accidents

As discussed, improving health and safety is often a goal of L+N programmes, particularly Workplace LN programmes, with some programmes using health and safety documentation for practical, relatable learning material (Alkema, 2020). Figures 14 and 15 show the DiD results for the rate of workplace accidents and the cost of workplace accidents before and after programme participation respectively.

For Workplace LN, workplace accidents increase in the year after programme participation, and there are no other statistically significant differences in the other time periods. This may be due to an actual increase in accidents. However, it is more likely that this is due to an increase in awareness resulting in an increase in the reporting of workplace accidents. There is no statistically significant differences in terms of the cost of workplace accidents (which includes both medical treatment and

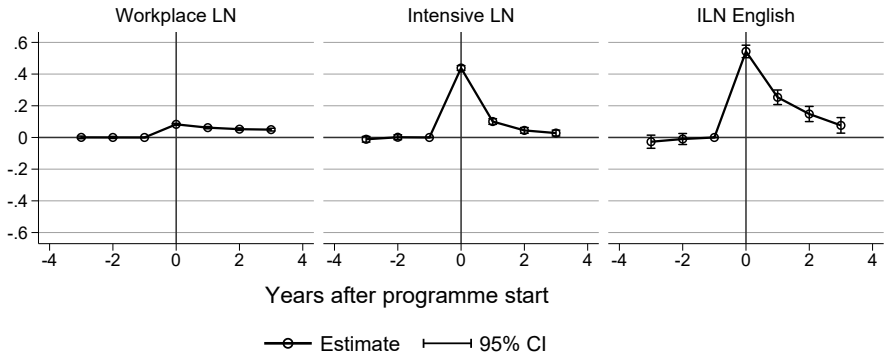

Figure 13: Effect of participation on being in education, employment or training

income compensation costs).

For Intensive LN, the share of participants who have a workplace accident decreases in the year of the programme but there are no other statistically significant differences. Moreover, this decrease could be an artefact of the lower employment rates among this group in year 0 shown above. There are no statistically significant differences in the cost of workplace accidents in any time periods.

For ILN English, there are no statistically significant differences in either workplace accident rates or costs.

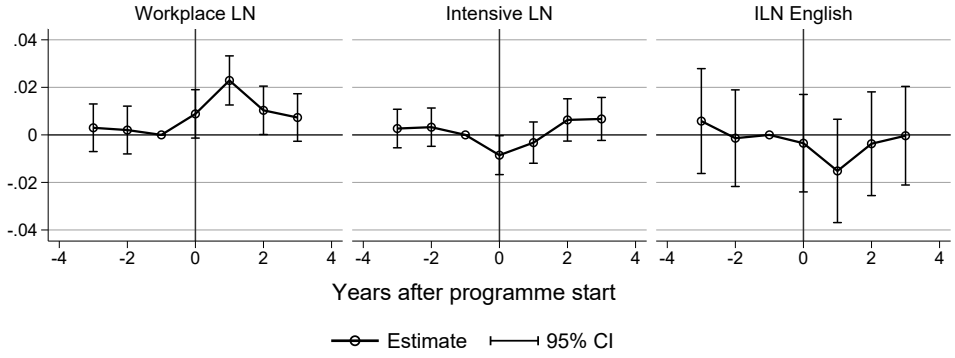

Figure 14: Effect of participation on workplace accidents within a calendar year for different programmes (percentage points)

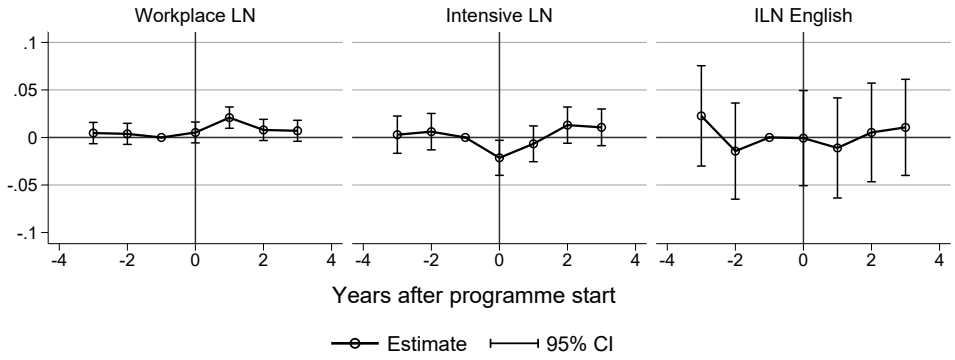

Figure 15: Effect of participation on workplace accidents conditional on employment within a calendar year for different programmes (percentage points)

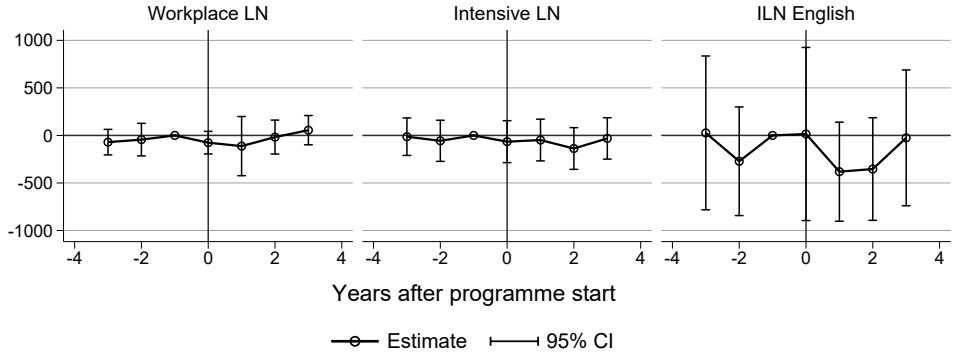

Figure 16: Effect of participation on workplace accidents costs within a calendar year for different programmes ($)

8.6 Heterogeneity analysis

We now examine whether the effect of participating in L+N programmes differs by ethnicity. Since we focus on Europeans, Māori and Pacific peoples, we focus on Workplace LN and Intensive LN programmes only (given the small numbers of Māori and Pacific participants in ILN English programmes).

Figure 17 examines the employment effect of participation by ethnicity. For presentation reasons, rather than showing error bars on the graphs, as with the previous results, a filled marker symbol indicates that the point estimate is statistically significant at the 5% level, while a unfilled marker indicates insignificance.

Recall that in aggregate, employment increased after Workplace LN programme participation but decreased after Intensive LN participation. For Workplace LN participants, these aggregate results hold across all three ethnicities, with each experiencing a statistically significant increase in employment after programme participation. The effect is somewhat larger for European and Māori than Pacific peoples. For Intensive LN, employment is lower after programme participation for European participants, although the result is only statistically significant up to one year after participation. Employment is also lower for Māori participants, but the difference is only statistically significant in the year of programme participation. For Pacific peoples, employment is higher after programme participation, but the difference is not statistically significant in any year.

Figure 18 shows that earnings are higher for all three ethnic groups after participating in a Workplace LN programme. The effect is statistically significant for all ethnic groups and in all post-programme

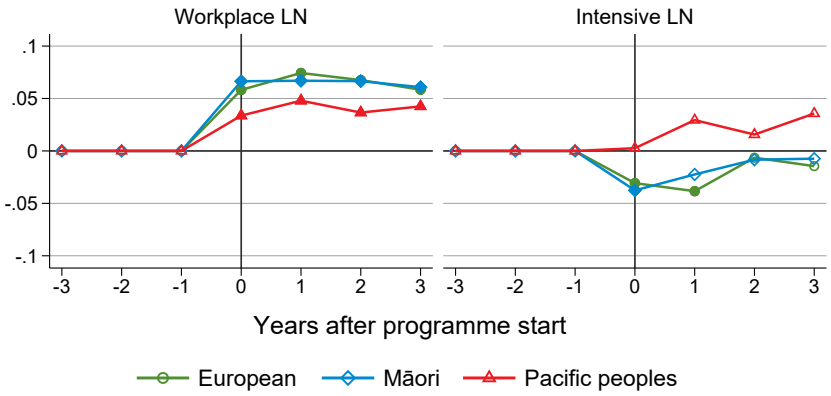

Figure 17: Effect of participation on employment within a calendar year for different programmes and ethnicities (percentage points). A filled marker symbol indicates that the point estimate is statistically significant at the 5 % level.

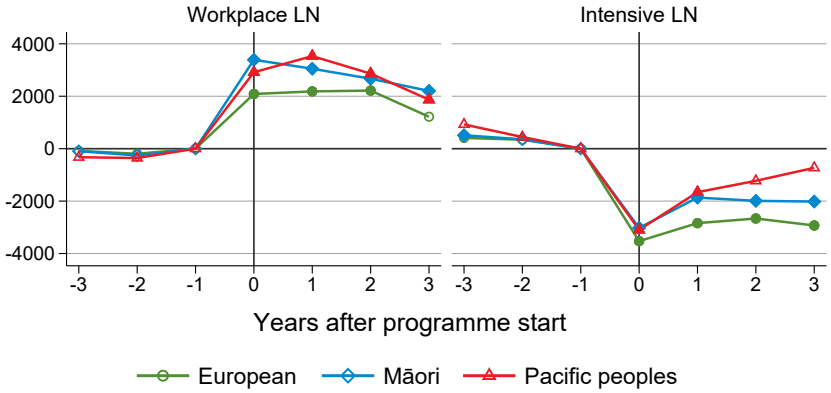

Figure 18: Effect of participation on earnings within a calendar year for different programmes and ethnicities ($). A filled marker symbol indicates that the point estimate is statistically significant at the 5 % level.

years except year 3 for Europeans. In contrast, for Intensive LN, earnings are lower for all three ethnic groups after programme participation, with the effect being statistically significant except for Pacific peoples in years 2 and 3.

In line with the employment and earnings results, Figure 19 shows that the share of participants receiving a benefit decreased after Workplace LN programme participation for all three ethnic groups. The decrease is statistically significant for all groups and all post-programme years except for Pacific peoples in years 2 and 3. The amount of benefit payments received also decreases for all three ethnic groups (Figure 20). Also consistent with the employment and earnings results, benefit receipt increased after participation in a Intensive LN programme for all three ethnic groups, with the increase being statistically significant for all groups and post-programme years except for People peoples in year 2. The amount of benefit payments received also increased for all three ethnic groups.

The effect of participation on enrolment in further L+N programmes for both Workplace LN and Intensive LN participation is positive and very similar across the three ethnic groups (Figure 21). For any form of further education and training (Figure 22), the positive effect is stronger for Pacific peoples. However, similar to the other two ethnic groups, the positive effect is only statistically significant in the short-term, and is insignificant by year 2 after programme participation.

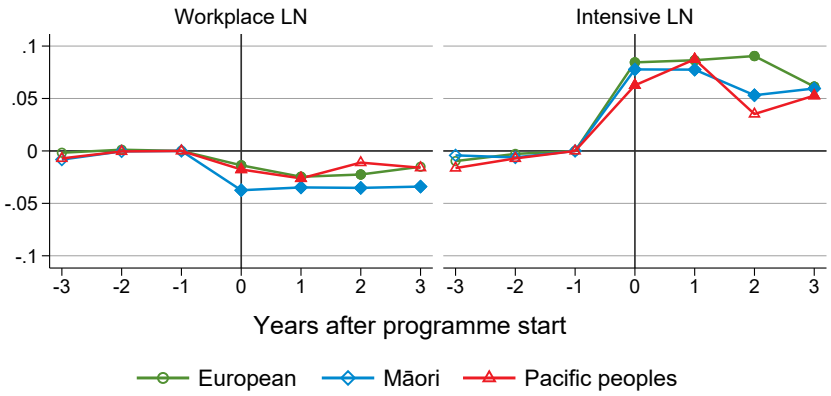

Figure 19: Effect of participation on benefit receipt within a calendar year for different programmes and ethnicities (percentage points). A filled marker symbol indicates that the point estimate is statistically significant at the 5 % level.

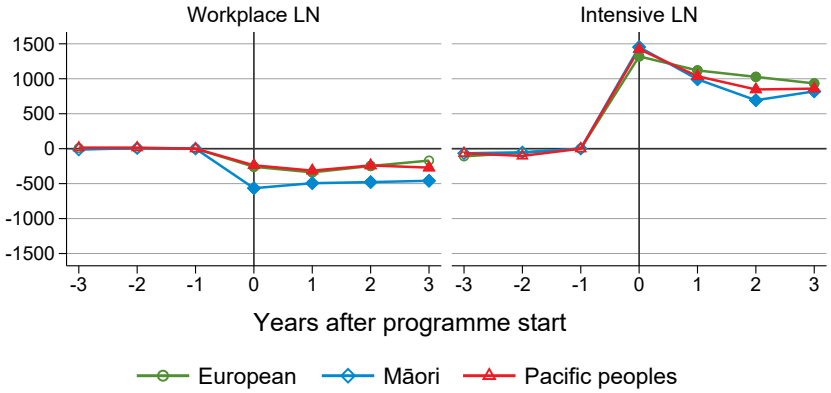

Figure 20: Effect of participation on benefit receipt amount within a calendar year for different programmes and ethnicities ($). A filled marker symbol indicates that the point estimate is statistically significant at the 5 % level.

As discussed above, lower employment rates could reflect higher participation in education and training. Therefore, we also examine a general activity indicator which measures whether individuals were employed or enrolled in education and training. For Workplace LN, the effect is positive for all three ethnic groups, and the magnitude and pattern is similar for all three ethnic groups. Likewise, for Intensive LN participation, the effect on any employment, education or training is positive for all three ethnic groups, and the pattern of a large effect in year 0 that decreases over time is evident for all three ethnic groups.

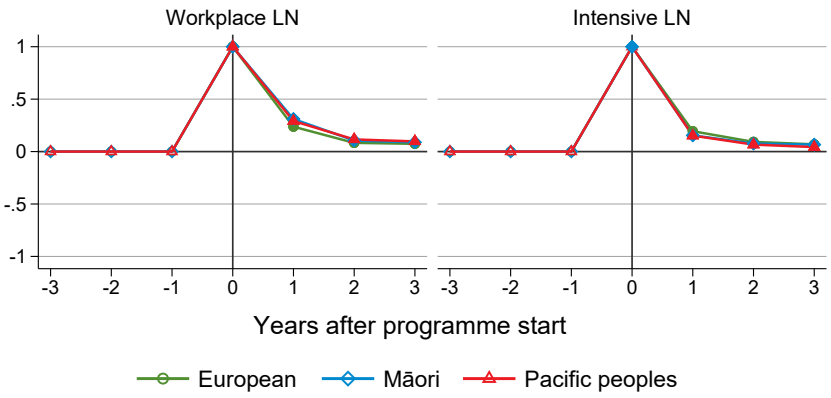

Figure 21: Effect of participation on enrolment in L+N programmes within a calendar year for different programmes and ethnicities (percentage points). A filled marker symbol indicates that the point estimate is statistically significant at the 5 % level.

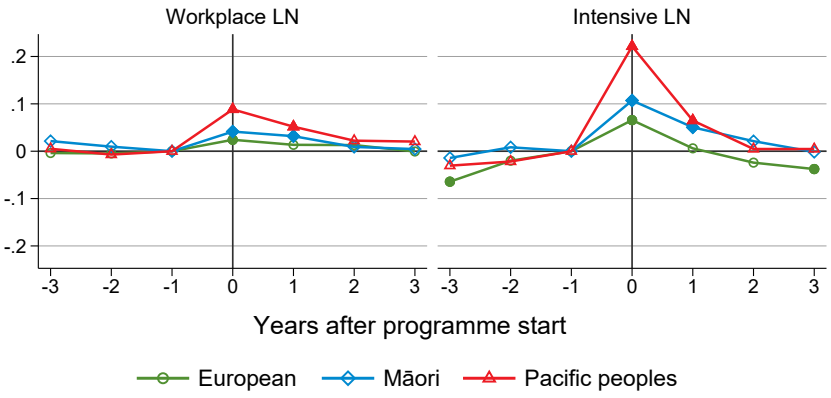

Figure 22: Effect of participation on further education or training within a calendar year for different programmes and ethnicities (percentage points). A filled marker symbol indicates that the point estimate is statistically significant at the 5 % level.

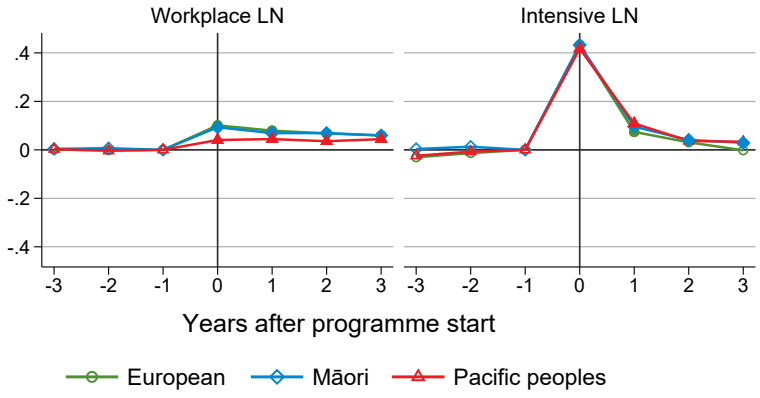

Figure 23: Effect of participation on being in education, employment or training for different programmes and ethnicities. A filled marker symbol indicates that the point estimate is statistically significant at the 5 % level.

9 Conclusion and future work

We evaluate the labour market outcomes of adults who participate in adult literacy and numeracy (L+N)intervention programmes in NZ. These programmes are supply-side ALMPs where the objective is generally to improve the L+N skills of adults, such that this positively impacts labour market outcomes, as well as general wellbeing effects. We use rich microdata on four types of L+N intervention programmes in NZ, linked (at the individual-level) with administrative sources of employment, income, education and training, and accident information. We use matching methods to create a suitable comparison group of those who did not participate in L+N skills. The matching variables include labour market histories, which previous research has highlighted as acting as proxies for unobservable characteristics and thus mitigate a common criticism of this non-experimental method. The treatment and control groups are compared using dynamic difference-in-differences estimations.

We first undertake descriptive analysis of whether the L+N programmes improve measured skills. Although not all participants took L+N assessments both before and after programme participation, for those who did, their assessment scores increased. This finding was consistent across all four of the programme types investigated, and was largest for Workplace LN, followed by Intensive LN and ILN English, and smallest for ILN Refugee participants (although it is worth noting that there was a small number of participants with assessment scores for the ILN Refugee programme). L+N assessment scores also increased among all demographic groups investigated. Although there were few differences across demographic groups, the increase in assessment scores was greatest among Māori and Pacific participants. While these results are descriptive and did not compare participants and non-participants and may suffer from selection issues given not all participants had both before- and after-programme participation assessments, they do provide some reassurance that there does appear to be a first-order effect of gains in L+N skills among participants for whom we had data.

We then present our main results. We limit attention to the three main programme types (Workplace LN, Intensive LN and ILN English) as there are few ILN Refugee programme participants.

In terms of labour market outcomes, both employment and earnings increase after programme participation for those undertaking Workplace LN programmes. These effects are both statistically and economically significant, with employment increasing by about five percentage points and earnings by about $2,000 a month. However, employment and earnings decrease after programme participation in the case of both Intensive LN and ILN English programmes.

In line with the employment and earnings results, the share of Workplace LN participants who are receiving social welfare benefits and the average amount received decrease after programme participation. However, both the share receiving a benefit and the amount received increases for Intensive LN and ILN English participants.

Further education and training results are positive across all three programme types. Subsequent participation in further L+N programmes, as well as participation in any form of education and training increase. The increase is largest among ILN English participants.

The results for Intensive LN and ILN English participants show mixed results as the programmes tend to increase participation in further education but reduce employment. Since participation in employment and education are not mutually exclusive, we also examine whether participation in L+N programmes affects a general activity indicator of whether a person is in employment, education

or training. This indicators shows a positive effect for all three L+N programme types. The effects are particularly large for Intensive LN and ILN English participants.

Since L+N programmes, particularly workplace L+N programmes, often aim to improve workplace safety, we also examine workplace accident rates. For workplace accidents, programme participation may have a negative short-term effect for Workplace LN participants. However, this may reflect that the programmes increased awareness of workplace health and safety issues, thus increasing reporting rates, even in the absence of actual increases in workplace accidents. For the most part though, there was no effect on workplace accident rates nor on the associated costs of workplace accidents.

In terms of heterogeneity, most of the results are quite similar across ethnic groups. The main difference is that Pacific people who participate in an Intensive LN programme have positive employment outcomes, although the effect is not statistically significant.

Overall, participation in a Workplace LN programme has a positive effect on employment, earnings and further education and training. The results for Intensive LN and ILN English are more mixed. Participation in these programmes has a negative effect on employment and earnings but a positive effect on participation in further education or training. The negative effect on earnings could be because of the increased participation in further education since the results for the general activity indicator of involvement in employment, education or training provides positive results.

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