

Prepared for: Aviation Industry Association New Zealand

The value of the international pilot training market

October 2024



Executive summary

Context

The Aviation Industry Association of New Zealand have commissioned Scarlatti to undertake a study to quantify the economic value of international students undertaking pilot training in New Zealand. Amidst the ongoing recovery from the COVID-19 pandemic, the international education sector has faced significant challenges: findings from Education New Zealand Manapou ki te Ao have shown that the total Gross Domestic Product (GDP) contribution from the sector has fallen from \$3.7bn in 2019 to \$1.3bn in 2022. At the same time, the aviation industry is facing a severe shortage of pilots and flight instructors. This report, by providing an understanding of the size and potential of the international student pilot market, aims to serve as a resource for the aviation training sector and policymakers when considering how best to support the sector to recover to its pre-COVID-19 economic value.

While the contribution of international students to New Zealand's GDP has been the focus of several studies, these have tended to aggregate findings at the institution-type level (e.g. universities, private training establishments, and polytechnics), and have not addressed the pilot-training market specifically. A report by Knotridge Ltd. (2010), which was commissioned by New Zealand Trade and Enterprise Te Taurapa Tūhono to evaluate the size of aviation sector in New Zealand (including the pilot training market), remains the most relevant study to the scope of this work. However, the report is now 14 years old, and the scope was not specific to the international aviation student market. The aim of this work is to provide a nuanced estimation of both student numbers and spending patterns from 2010 to 2024, to more accurately represent the market's contribution over time.

Methodology

The study utilised a combination of qualitative and quantitative data. Qualitative data came from both desk research and from in-depth interviews with representatives from training providers. Interviews were conducted to collect information on the number of students enrolled each year, estimates on tuition fees and typical spending patterns, and an understanding of what students did after completing their studies – how many stayed on to work, and how many returned to their country of origin. Desk research was conducted to provide an understanding of the cost of completing pilot training in New Zealand, and a breakdown of the components involved.

Quantitative data to estimate student numbers were collected from a wide range of sources, including the Civil Aviation Authority (CAA), Statistics New Zealand, the Tertiary Education Commission, Ringa Hora, and the New Zealand Qualifications Authority. Each of these sources had strengths and limitations, but none provided a complete picture of international students by training provider by year. To address this, our methodology involved combining the available datasets to build an estimation of student numbers across flight schools between 2010-2024, which was then calibrated against licencing data provided by CAA. These student numbers were then multiplied by estimated spending patterns to calculate total revenue, and a GDP multiplier was applied to gauge the overall economic impact at both a national and regional level.

Findings

The findings of this report highlight the significant role that international students in the aviation sector play in contributing to New Zealand's economy and the potential impact of external factors on this

contribution. At its peak in 2019, we estimate that there were 620 international students enrolled in pilot training in New Zealand, and that they contributed between \$68.1m and \$106.3m, with a midpoint of \$86.3m. However, due to the COVID-19 pandemic and the closure of a major training provider, we estimate the number of students in 2023 to have been 186, with a GDP contribution of approximately \$30.7 million (within a range of \$24.2m - \$37.9m). We offer a range for the GDP contribution to account for variance in tuition fees by training provider, and the proportion of students who have friends and relatives visiting New Zealand.

Our findings also show that, before COVID-19, student numbers were relatively stable between 2010 and 2014, which was followed by a period of growth between 2014 and 2019. During this time, student numbers grew significantly, from 323 in 2014 to a peak of 620 in 2019, and GDP contribution in that period rose from \$42.6m to \$86.3m, respectively. The impact of COVID-19 shows a sharp fall in student numbers, and in 2022 we estimate only 173 international students undertook pilot training in New Zealand – the lowest number in our modelling.

Regionally, our model shows that international student pilots contribute widely throughout New Zealand. Overall, training providers based in Waikato were the leading contributors to New Zealand's GDP from 2010 to 2020, although this saw a notable decline in 2021, primarily due to the closure of L3 Harris. Since 2018, training providers in Otago have become increasing contributors to the GDP from international students and is among the few regions to have seen growth in their contribution over the COVID-19 period, rising from \$11.8 million in 2019 to \$14.7 million in 2023. Another region experiencing growth is Manawatū-Whanganui, which saw a 12% increase in its GDP contribution over the same period.

These findings suggest that the international pilot training industry has the capacity to contribute more to GDP than it currently does. International student pilots can contribute significant value to New Zealand, through strengthening flight schools, stimulating economic growth in the regions, and potentially addressing the flight-instructor workforce gap. The peak contribution of 2019 showed that there was clear demand amongst international students to study in New Zealand, and the market appeared to be growing: without the impact of COVID-19, the value today may have been even larger.

Introduction

Commissioned by the Aviation Industry of New Zealand (AIANZ), Scarlatti has undertaken a study to quantify the economic value of international students undertaking pilot training in New Zealand. Following the sudden shocks imposed by COVID-19, the international education sector, like many others, is still navigating its recovery. Recent data indicates a decline from a \$3.7bn contribution to New Zealand's Gross Domestic Product (GDP) in 2019, to \$1.3bn in 2022, according to reports by Ernst & Young (2022) and Education New Zealand Manapou ki te Ao (ENZ, 2023). This downturn was also reflected in pilot training sector, with our estimates indicating that the number of international students undertaking pilot training in New Zealand sharply decreased by 58% between 2020 to 2021, with estimates for 2022-23 even lower.

The downturn in pilot training comes at a poor time for New Zealand's aviation industry, which is already facing a severe shortage of pilots and flight instructors. Increasing numbers of international students engaged in pilot training could help address this shortage in several ways. If these international students remained to work in New Zealand as flight instructors for a period following their studies, it would alleviate some of the demand on training pathways. Indirectly, growth in international students would strengthen the capacity and capabilities of flying schools across the country, enhancing the overall quality of pilot training for both domestic and international students.

The aim of this report is to deliver an analysis of the trends in international students undertaking pilot training in New Zealand, including their contribution to GDP at both a national and regional level. Our approach integrates qualitative insights from interviews and quantitative data from a range of sources. Combining these data to construct several key inputs, along with an economic multiplier to capture the broader economic impacts of student spending, we were able to estimate the economic value of international students undertaking pilot training in New Zealand. Our key findings indicate that in 2019, these students contributed within the range of \$68.1m - \$106.3m to New Zealand's GDP. For 2023, the most recent period for which data are available, we estimate that international students undertaking pilot training contributed between \$24.2m to \$37.9 – a strong indication that the pilot training sector for international students still has some way to go to recover to previous levels.

It is intended that the insights derived from this report will serve as a resource for the aviation training sector and policymakers. It provides a basis to understand the possible value that international students undertaking pilot training bring to New Zealand and gives evidence on the ongoing impact from COVID-19 on this sector in student numbers and economic contribution.

This report is structured as follows: first, we provide a brief review of existing economic valuations of international education in New Zealand, including the pilot training sector. Next, we detail our methodology, explaining the data sources and calculations used to estimate the GDP contribution. Finally, we present our findings and discuss their implications.

Review of economic valuations of international education in New Zealand

The GDP contribution of international students to New Zealand has been the focus of a number of studies. However, research specifically focusing on the impact of international students undertaking flight training remains scarce. This section briefly explores several studies that have undertaken a broader economic valuation of international education in New Zealand, before taking a closer look at the study that aligns most closely with the scope of this research.

Economic valuation of international education in New Zealand

ENZ aims to conduct a biennial economic valuation of international education in New Zealand. This review covers three recent studies, briefly summarised below, presented in chronological order. The calculation approach that we use in this work is similar to that taken in these studies.

The Economic Impact of International Education in New Zealand 2015/16 (Infometrics, 2016)

This study assessed the economic impact of onshore international education in New Zealand for the 2015/16 period, showing that the sector added \$4 billion to GDP. The economic contribution was calculated at an aggregate level, with findings detailed for various educational institutions, including Universities, Institutes of Technology and Polytechnics (ITP), Private Training Establishments (PTE), as well as Primary, Intermediate, Secondary schools, and English Language Schools (ELS). Notably, international aviation students primarily undertake their training at PTEs, which collectively contributed \$1.1 billion to GDP. However, detailed figures for this specific segment were not provided. A valuable part of the analysis was to differentiate student expenditure into imports and exports, thereby clarifying the share of spending that remained within New Zealand versus that which was spent offshore.

Economic Valuation of International Education in New Zealand (M.E Consulting, 2018)

Consistent with the findings from Infometrics (2016), the analysis by M.E Consulting (2018) also evaluated the economic contribution of international education in New Zealand at an aggregated level, without offering a breakdown by specific sectors. This study noted a departure from multiplier methodologies, opting instead to estimate the economic value of international education using a Multi-Regional Input-Output (MRIO) model. This model is designed to assess:

"the economic impacts of spending across different regions simultaneously" (M.E. Consulting, p. 2)

In 2018, international education was estimated to contribute \$4.8 billion to New Zealand's economy, with PTEs accounting for \$1.1 billion of this total.

Broader Benefits of International Education for New Zealanders (Ernst & Young, 2022)

The study by Ernst & Young (2022) took a comprehensive approach to assess the total value of New Zealand's international education sector. It considered a broad range of factors that contribute to the overall impact, including economic, social, cultural, and international aspects. This analysis calculated the sector's total value and delineated the immediate and prospective long-term benefits from New Zealand's international education sector. Furthermore, it forecasted the economic benefit up to 2030 across several scenarios that would affect international learner entry differently. Despite initial

estimations suggesting that the international education market would contribute \$0.8 billion to the GDP in 2022, primarily due to the impact of COVID-19, the actual figure realised was \$1.3 billion, exceeding prior forecasts.

Benefits and limitations of existing studies

Reviewing these studies proved beneficial in validating the inputs deemed essential for estimating the GDP contribution of international students enrolled in pilot training in New Zealand. These inputs included spending on education fees, living costs, tourism, and visits to friends and relatives (VFR), along with splits in onshore to offshore spending and multipliers to gauge the ripple effects of economic activities.

However, the key limitation of these studies was in their data presentation, particularly concerning the economic value of specific fields of study; the data were aggregated by type of education provider instead. Within the context of this research, a student can undertake pilot training at both a PTE and University (albeit only Massey University School of Aviation). Hence, when considering fields of study, economic value can span across multiple types of educational institutions.

Economic valuation of the New Zealand aviation sector (Knotridge Limited, 2010)

In 2010, New Zealand Trade and Enterprise Te Taurapa Tūhono (NZTE) commissioned a report by Knotridge Limited to evaluate the size of aviation sector in New Zealand and to identify future growth drivers and challenges facing the industry. While this review is now 14 years old, it remains the most relevant report to the scope of this work. Given this, it is possible that Knotridge (2010) will be compared to this report, and so it is useful to include a brief discussion of their approach here.

The Knotridge (2010) evaluation included a study by Hughes (2010) that specifically analysed the economic impact of a range of aviation activities, including pilot training in 2009. Using an economic impact model, Hughes (2010) estimated that pilot training, for both domestic and international students, contributed \$133m to New Zealand's GDP in 2009.

When comparing our research to the study by Hughes (2010), it's important to note several limitations:

- **Conflicting definitions of training.** In Knotridge (2010), training is defined as a sector consisting of airline, general aviation, and engineering, whereas in Hughes (2010), training was defined as pilot training. Although these definitions may be consistent within the context of each study, the training sector's total revenue of \$53.5m was quoted for both studies. It is therefore unclear whether total revenue for training refers to all aviation training or to pilot training only.
- **Limited data on the economic impact of domestic versus international students.** In Knotridge (2010), the economic impact of pilot training was estimated at an aggregated level, including both domestic and international students. Given the strong international student market in New Zealand, it would have been a valuable exercise to disaggregate the economic impact across the two groups. Interestingly, in Appendix D, the training sector's total revenue is split between domestic revenue of \$38.5m and export revenue of \$15m. Using this revenue split and applying the multiplier from Hughes (2010) of 4.44, we can (crudely) estimate that total revenue generated in 2009 by domestic students undertaking pilot training was approximately \$171m and approximately \$67m for international students. Applying this same domestic and international split to GDP contribution, and the multiplier from Hughes (2010) of 4.27, domestic

students undertaking pilot training contributed approximately \$96m to New Zealand's GDP and international students contributed approximately \$37m. The key drawback of these estimates is that there were no clear sources provided to support the split of total revenue, and in fact, Knottridge (2010, p.56) noted

“data and analysis is based on information obtained from a wide range of sources of varying degrees of accuracy.”

- **Results are not reproducible.** The results presented by Hughes (2010) were based on a previously constructed 112-sector economic model, and the study excluded some key data points to aid in reproducing the results. Hughes (2010) presents four economic impacts of pilot training to New Zealand's economy,¹ including total revenue, net household income, employment, and value added (or GDP contribution). However, no supporting data or material was provided to understand how these figures were calculated. Hughes (2010) noted that the GDP value-add includes net after-tax wages and salaries, net after-tax operating surpluses, capital replacement of equipment, and taxes paid to central government but provided no supporting data or calculations.

Methodology

This section describes the methodology used to assess the economic impact of international students in New Zealand's pilot training sector. Our approach integrates qualitative data from correspondence with several training providers and quantitative data from various sources. A description of data sources is provided, along with the methods for combining these data into key measures essential for estimating the GDP impact of international students undertaking pilot training in New Zealand.

Qualitative Data

Interviews with training providers

To better understand the pilot training sector in New Zealand, we interviewed several pilot training representatives to collect information on:

- The number of international students enrolled each year, and how this has changed pre-and-post COVID-19
- Estimates on tuition fees
- Estimates of students' typical spending outside of their education
- Estimates on the proportion of students employed during study
- How often friends or relatives visit from abroad (VFR)
- Estimates of how many students return home after completing their studies, and how many stay in New Zealand.

¹ See Table 11 (p.16) in Hughes (2010).

Each training provider was initially contacted via email, and provided with a brief overview of the study, what information we were interested to collect, and a request for interview. Where interviews were confirmed, a Microsoft Teams invite was sent, including an information sheet containing a more detailed overview of the study, information regarding what the interview will involve and what Scarlatti will do with interview responses, as well as processes to follow in the event that an interviewee changed their mind during or after the interview (including contact details of the Research Manager and Associate undertaking the study). The interview plan was reviewed and approved by an internal Scarlatti ethics committee. Data from interviews were aggregated and anonymised to protect the privacy of the interviewee and organisation they are representing.

Overall, there were:

- 8 individuals contacted (representing 7 flight training providers)
- 4 interviews conducted (representing 4 flight training providers)
- 1 request for interview declined
- 4 email responses received following additional information requested by Scarlatti.

PTE websites

We examined the websites of various PTEs that offer pilot training to international students. Many of these websites provided estimates for living expenses, allowing us to calculate average costs for accommodation, food, transport, when this data was combined with insights from interviews.

Conversely, detailed information on tuition fees was scarce on these websites, with most suggesting that prospective students contact their enrolment teams for precise figures. This approach likely reflects the variability in the cost of pilot training across different PTEs in New Zealand due to tuition fees also being influenced by the specific qualification undertaken and the student's previous flight experience and existing licensing.

Quantitative Data

We obtained qualitative data from a range of sources. None of these sources provides a complete set of breakdowns of training numbers by provider, and only CAA data for pilot licenses issued provides a complete time series. We used these multiple sources to piece together an overall picture.

CAA licensing data

We obtained pilot licensing data from the CAA through an Official Information Act request. These data provided a breakdown of pilot licenses issued by:

- **License type** including Airline Pilot Transport License (ATPL) and CPLs for aeroplane, helicopter, glider, and balloon pilots
- **Nationality** recorded by country name
- **Age** at time of license issue

- **Year of license issue** covering 1950 to 2023. Our interest was in data covering licenses issued from 2010 to 2023, enabling us to capture more recent trends that reflect the evolving dynamics of the aviation training sector.

Stats NZ Integrated Data Infrastructure

Stats NZ Integrated Data Infrastructure is a comprehensive research database that combines a range of administrative data from government and non-government agencies, along with survey data from Stats NZ. We queried the tertiary education data to examine the breakdown of enrolments and completions by year, and the visa data to distinguish those counts by domestic and international student split. Within the context of pilot training, the IDI is limited in its ability to pull a clean sample of students undertaking pilot training for several reasons:

- There have been many qualifications for pilot training created and discontinued since 2000. In reviewing these qualifications, it was unclear which would be directly relevant to international students undertaking pilot training in New Zealand.
- Among the six active pilot training qualifications, Massey University School of Aviation offers four. There were also instances of qualifications only offered by Ardmore Flying School and Waikato Aero Club. Because Stats NZ prohibits data release relevant to a single education provider, relying on IDI data for enrolment and completion estimates would result in an undercount of total students in pilot training in New Zealand.
- Concordance between the data on visas / international arrivals, and education data tables, is often poor within the IDI.

Ringa Hora

Ringa Hora, the workforce development council (WDC) for New Zealand's services sector (including aviation) provided a data extract detailing the number of learners by qualification. However, this data only represented six training providers from 2020 to 2023, offering an incomplete data series.

Ngā Kete

Ngā Kete, a secure portal hosted by the Tertiary Education Commission (TEC), enables tertiary training organisations (TEO) and other stakeholders to access a range of education data. While this data was also utilised in this research, it too presented limitations in the scope of training providers represented. Only eight flight schools were represented over the period from 2011 to 2020, and amongst these, the availability of the data was irregular.

NZQA external evaluation and review

The New Zealand Qualifications Authority (NZQA) undertake periodic external evaluation and reviews (EER) of tertiary education organisations. Every EER produces a report on the training organisation, which is publicly available and published on the NZQA website. These reports contain:

- Student numbers at the time of assessment
- A breakdown of domestic to international students, although this did not consistently feature across all reports.

Similar to other data sources, EER reports only represented a select number of training providers, a total of 10 during the period 2010 to 2024.

Educational performance indicator reports

The TEC releases comprehensive reports and interactive charts detailing the educational performance of Tertiary Education Organisations (TEOs) based on specific educational performance indicators (EPIs). Several metrics from these EPI reports were utilised in this research, including the number of students completing their qualification and median qualification completion rates. However, this data was limited by its coverage of training providers, with information only available for six.

Key measures

The following section details our estimations of each component of our final calculation, including:

- The cost of education, including the proportion that remains in New Zealand (i.e. onshore spending)
- Living costs
- The contribution of visiting friends and relatives (VFR)
- The total number of international students enrolled in pilot training in New Zealand
- A GDP multiplier that captures the additional contribution to GDP resulting from the initial spending.

Costs of education

There is a limited amount of public information available on the tuition fees associated with pilot training. This is, in part, because programs are tailored individually for students, based on previous experience, goals, and aptitude. Based on the range of tuition fees charged by the flight training providers we interviewed (anywhere between \$90k to \$150k), we used a mid-point of \$120k to represent the tuition fees for international students undertaking pilot training in New Zealand over the course of two years' study.² Because we are calculating the *annual GDP contribution* of international students undertaking flight training in New Zealand, we have assumed tuition fees of \$60k per year – see Table 1 for the full range of annual tuition fees utilised in our calculations:

Table 1: Assumptions on the range of annual tuition fees used in calculating GDP contribution

Category	Student fees over two years	Annual tuition fees
Lower bound	\$90k	\$45k
Mid-point	\$120k	\$60k
Upper bound	\$150k	\$75k

² Apart from the Bachelor of Aviation, only offered by the Massey University School of Aviation over a three-year period, all other qualifications relevant to this research generally covers a two-year period of study.

In addition, not all the money that a student spends on tuition remains onshore. These 'imports' need to be removed from tuition fees to generate an input for calculating the GDP contribution of international students enrolled in pilot training in New Zealand. For example:

- Fuel is a key operational cost and is assumed to be a direct import
- Airplane maintenance may also include direct imports (e.g., spare parts)
- Training equipment and resources may include direct imports (e.g., flight simulators).

Table 2 shows the breakdowns of costs per year associated with flight training, including the percentage and dollars we estimate as remaining onshore. Based on the breakdown presented, we estimate that approximately 70% of a student's tuition fees stay onshore.

Table 2: An indicative breakdown of costs of providing flight training, including onshore contributions towards GDP

Category	Category breakdown	\$ annual	% of tuition	% remaining onshore	\$ remaining onshore
Operating costs	Aircraft maintenance, aircraft repairs, fuel, insurance	\$22.5k	38%	40%	\$9k
Facilities	Hanger space, office space, utilities	\$10.5k	18%	100%	\$10.5k
Training equipment and resources	Flight simulators, training materials	\$9k	15%	50%	\$4.5k
Personnel	Salaries and other personnel costs for flight instructors, administrators, managers	\$12k	20%	100%	\$12k
Certification and licenses	CAA and other examinations (theoretical / practical)	\$3k	5%	100%	\$3k
Other corporate costs	Insurance (non-aircraft), marketing and advertising	\$3k	5%	100%	\$3k
Totals		\$60k	100%	70%	\$42k

Living costs

While living costs vary amongst education providers and regions, estimates for average student costs can be found on many tertiary provider and government websites. These calculations tend to include accommodation, food, transport, phone, internet, and entertainment.

Importantly, international students require to provide Immigration New Zealand with proof of funds to cover living costs of at least \$20k per year (Immigration New Zealand, n.d.). Other estimates can be found on the websites of the tertiary providers listed in Table 3.

Table 3: Estimates of yearly living costs

Source	Estimates of yearly living costs
Immigration New Zealand	\$20,000 (minimum)
Flight training providers	\$20,000 - \$24,000
Victoria University	\$20,000 - \$27,000
University of Auckland	\$20,000 - \$27,000
University of Otago	\$18,000 - \$21,000

Note. Estimates for living costs were sourced from ENZ (n.d.) and Immigration New Zealand (n.d.) and data from a subset of flight training providers.

When interview participants were asked if the typical living cost expenditure of international student pilots matched these estimates, all agreed. Based on this, we compiled a list of expenses that totalled approximately \$22.5k per year (see Table 4).

Table 4: Annual living costs broken down by category

Category	% of annual living costs	Total amount
Accommodation	42%	\$9.3k
Food	30%	\$6.8k
Transport	5%	\$1.2k
Other	23%	\$5.2k
Total	100%	\$22.5k

Part-time jobs

Earnings from part-time employment is an important consideration when calculating the economic value of the international student education market in New Zealand. The studies commissioned by ENZ subtract part-time earnings from their overall contribution as their earnings is already considered as circulating the economy, and therefore risks double counting. In the main, those international students undertaking pilot training are not eligible for in-study work rights, unless undertaking a programme of study that leads to a qualification (such as a Diploma or Degree).

Tourism and visiting friends and relatives

When asked about tourism and VFR patterns of students, interviewees gave a wide range of answers, ranging from all students to no students having visitors. These inconsistent responses were not surprising given tourism and VFRs generally occur outside of the routine flight training activities, so training provider representatives will have less visibility of these activities.

Given our interviewees were unable to provide clear direction as input to this category, we examined the existing research on economic valuations of international education in New Zealand. Using survey responses from 5,800 international students, M.E Consulting (2018) estimated that between 20-60% of international students had VFRs. In addition, they determined the contribution of VFR for students

at PTEs was \$110m out of a total \$1.09b (10%), and \$460m out of a total \$4.8bn for students overall (9.5%).³ Similarly, the study by EY (2022) estimated VFR contributed \$300m out of a total \$3.7bn contribution (8%). Combining these findings, we adopted a mid-point multiplier for tourism spending from VFRs, setting it at 9% of the total expenditure by international students.

Number of international students enrolled in flight training

Given the previously outlined data limitations, no single source of data was adequate by itself to estimate the annual number of international students undertaking pilot training in New Zealand. To address this, our approach included the following steps:

1. Estimate the number of students, split by domestic and international, undertaking pilot training in New Zealand by training provider by year by combining all available data sources
2. Estimate the number of students completing pilot training by training provider by year by using the estimated student numbers along with completion rate data from EPI reports
3. Calibrate completion estimates against CAA licensing data to determine the accuracy of the enrolment estimates.

Estimating the number of students undertaking pilot training in New Zealand

Here we constructed a table that presents the annual number of students in pilot training programs, segmented by provider. The NZQA EER reports offered a reasonable starting point due to its coverage of 10 training providers and availability of reports across time. To fill data gaps, we included information gathered from interviews, and subsequently added in any other available data from the remaining sources. In instances where data gaps remained after utilising all available sources, we employed two strategies for imputation. First, we utilised any data specific to a training provider to fill gaps, and second, we analysed the annual trends of CAA licensing data.⁴

The table consisted of 17 training providers across 14 years (2010 to 2023), requiring a total of 185 data points when adjusting for years where training providers were operating (e.g., L3 Harris operated between 2017 to 2021). Of the data points, approximately:

- 57% were informed by data taken from the NZQA EER reports
- 10% were informed by interview responses
- 2% were taken from remaining data sources
- 31% were imputed using the available data in combination with annual trends in CAA licensing data.

³ Primary and secondary students are at the higher end of spending in this category, as parents of children and teenagers are more likely to visit than parents of a university student (M.E Consulting, 2018).

⁴ These imputed data points primarily addressed scenarios where a training provider had data available for two years (e.g., 2012 and 2016) but had gaps for years in between. CAA licensing data supported imputation where data was available for a specific year, but no data available before or after that year (e.g., data available for 2013, but nothing for the preceding years).

Estimating the number of students completing pilot training

Here we assumed that in a particular year there would be a mixture of students with respect to their progression through training. There may be students starting their training, while others partway through and the remaining cohort close to completion. To enable calibration with CAA licensing data, which acts as a strong proxy for completions, these *active students* needed to be converted into estimates of completions by year.

This conversion assumed:

- Of the students undertaking pilot training in (for example) 2010, half would complete in 2011 and the others in 2012.
- Not all students would complete their training. To account for this, we utilised data on qualification completion rates by training provider, as reported in the EPI reports. In instances where specific annual completion rate data were unavailable for a training provider, we applied that provider's average completion rate across all years for which data were available. For training providers with no qualification completion rate data, we used the median completion rates were taken, as reported in the EPI reports.

Calibrating student completion numbers against CAA licensing data

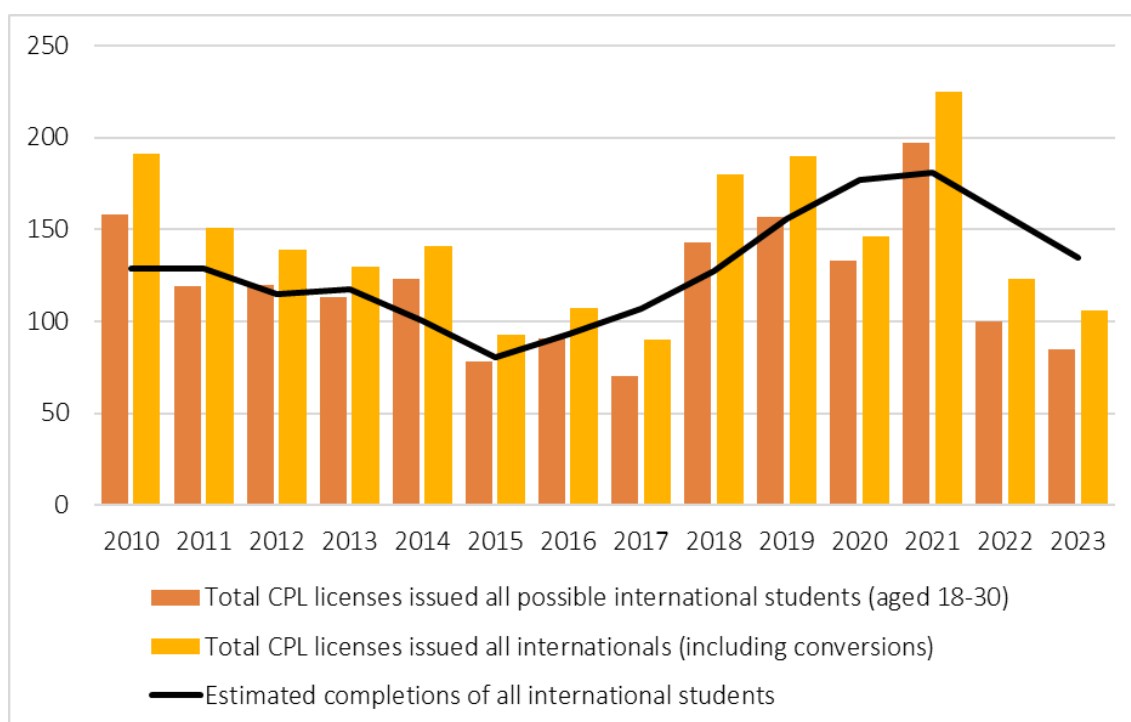
Having converted *active students* to those who have completed their training provided a basis for comparison against CAA licensing data, which acted as a strong proxy for total completions. We calibrated our completion estimates by:

- Comparing against the period 2010 to 2023.
- Excluding CTC Aviation Training (NZ) Ltd and L3 Harris from the calibration exercise. Although international students from their training providers were included as part of calculating the GDP contribution of international students undertaking pilot training in New Zealand, these students did not receive New Zealand CPLs, and therefore including them would inflate our completions estimates for the purpose of calibration.
- Comparing against CAA licensing data that excludes licenses issued to New Zealand nationals. This approach intended to create a calibration sample comprising only international individuals who have been issued a CPL in New Zealand. It is important to note, however, that this sample may include pilots who obtained their CPL overseas and are converting their license to a New Zealand CPL. Unfortunately, no data were available to clearly filter out such conversions.
- Comparing against CAA licensing data that excludes licenses issued to New Zealand nationals and those above the age of 30. This approach intended to create a calibration sample of all possible international students who have been issued with a CPL in New Zealand. In this instance we assume that international students would likely fall within the age bracket of 18 to 30.

Between 2012 and 2023, our estimates of completions were observed to be roughly 10% lower than the number of CAA licenses issued to non-New Zealand nationals. However, when comparing our estimates to CAA licenses issued to non-New Zealand nationals who are also under the age of 30, our figures were about 7% higher. This comparison suggests that our completion estimates fall within a reasonable mid-point of the two calibration data series, while accounting for the uncertainties on CPLs

issued to international students versus international conversions. The calibration results are presented in Figure 1.

Figure 1: Calibrating estimated completion counts against CAA licenses issued



Our analysis reveals that the trend in estimated completions for international students generally aligns with the trends observed in the calibration data, though there are exceptions. Specifically, the decline in CPL licenses issued in 2017 stands out as an unusual blip, deviating from the expected pattern observed in 2015-2016 and 2018. Additionally, COVID-19 appears to have introduced some irregularities to the licensing data, with a significant decrease in licenses issued in 2020, which aligns with expectations considering the extensive COVID-19 policy measures. However, there was a sharp increase between 2020 and 2021, averaging 51% across the two calibration samples, which would suggest a possible lag in reporting and/or issuance of CPL licenses. This hypothesis is further supported by the downward trend from 2022, which arguably better reflects the enduring impacts from COVID-19.

Given the limitations present in all data utilised in estimated students undertaking and completing pilot training in New Zealand, along with the limitations of the CAA licensing data, the calibration results suggest that we can have confidence in our estimates of students by training provider for subsequent use in the analyses.

Economic multiplier

An economic multiplier was required to measure the broader economic value generated by spending by international students while undertaking pilot training in New Zealand. The report by Hughes (2010) used economic modelling to create a bespoke multiplier designed specifically for the aviation sector. For pilot training, the resulting multiplier was 4.27, comparatively higher than other multipliers used in the economic valuation reports summarised above. We believe that this multiplier is appropriate for their approach but is not one that can be applied to the data that we have gathered for this work.

As an alternative, we utilised a value-added type II multiplier presented by Infometrics (2016), which aligned more closely with our method, offers greater transparency in its calculation and is consistent with that use in other reports prepared for ENZ. This multiplier considers both upstream (or indirect) effects, as well as downstream (or induced) effects. Infometrics (2016) calculated a multiplier for each category of education provider; for PTEs, this value was 1.98.

For our main calculation, we used a mid-point of 1.98 as our economic multiplier. We also re-estimated the total contribution of spending by international students using a lower (1.90) and upper (2.06) bound multiplier. This allowed us to present a range within which the total GDP contribution may fall.

Findings and discussion

Using the key measures outlined above, we calculated the annual GDP contribution of international students undertaking pilot training in New Zealand. We offer two results: first, the annual GDP contribution of international students undertaking pilot training in New Zealand in 2019, as this year saw the highest number of international students over the sample period, and hence provides a strong reference point to the possible value of the market. Second, we provide the results for 2023, being the most recent year with available data, as a reference point of the value of the market as it recovers from the impacts of COVID-19.

For 2019, we estimate that international students undertaking pilot training contributed approximately **\$86.3m to New Zealand's GDP** – see Table 5 for a summary of the calculation, and for a full breakdown, Table 6 in the Appendix.⁵ More recently, in 2023, the contribution of these students was estimated to be around **\$30.7m to New Zealand's GDP**.

Table 5: Estimated GDP contribution by international students undertaking pilot training in New Zealand for 2019

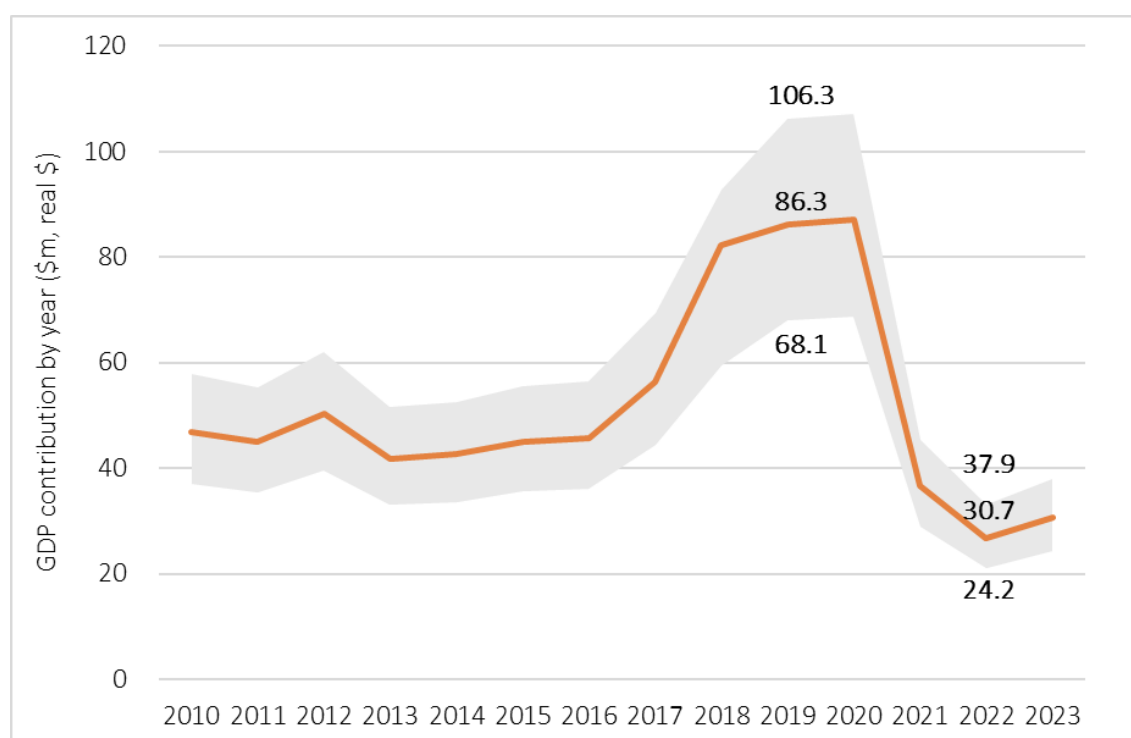
Category	Spend by category	Percentage retained onshore	Spend by category retained onshore
Education	\$60,000	70%	\$42,000
Living costs	\$22,516	100%	\$22,516
Tourism / VFR	\$5,806	100%	\$5,806
Total spend per student			\$70,322
Number of students			620
Total spend by all students			\$43.6m
Multiplier			1.98
GDP contribution			\$86.3m

Note: All figures were adjusted for inflation using the CPI (March 2019 index) and represent values in 2019 dollars.

⁵ Due to inflation adjustments, the GDP contribution of 2020 is marginally higher than 2019 (\$87.0m) despite lower student numbers.

The contribution to GDP from international students undertaking pilot training in New Zealand was also estimated for each year from 2010 to 2023 (Figure 2). The orange line represents the GDP contribution calculated using the mid-point multiplier. The potential range of GDP contribution, calculated using the lower and upper bound inputs, is represented by the grey shaded area. For 2019, we estimate that the GDP contribution of international students undertaking pilot training could fall within the range of \$68.1m to \$106.3m, and for 2023, between \$24.2m and \$37.9m.

Figure 2: Estimated GDP contribution of international students undertaking pilot training in New Zealand by year



Note: All figures were adjusted for inflation using the CPI (March 2019 index) and represent values in 2019 dollars.

A key feature of Figure 2 is the sudden increase in the GDP contribution starting from 2016 to 2020. This increase coincides with CTC Aviation Training (NZ) Ltd changing ownership to L3 Harris (L3 Airline Academy) in 2017, becoming the largest pilot training provider in New Zealand. Each year, L3 Harris was reported to have trained around 500 students (Mather, 2020), with most being international students. Unfortunately, limited administrative data were available to support this figure.⁶

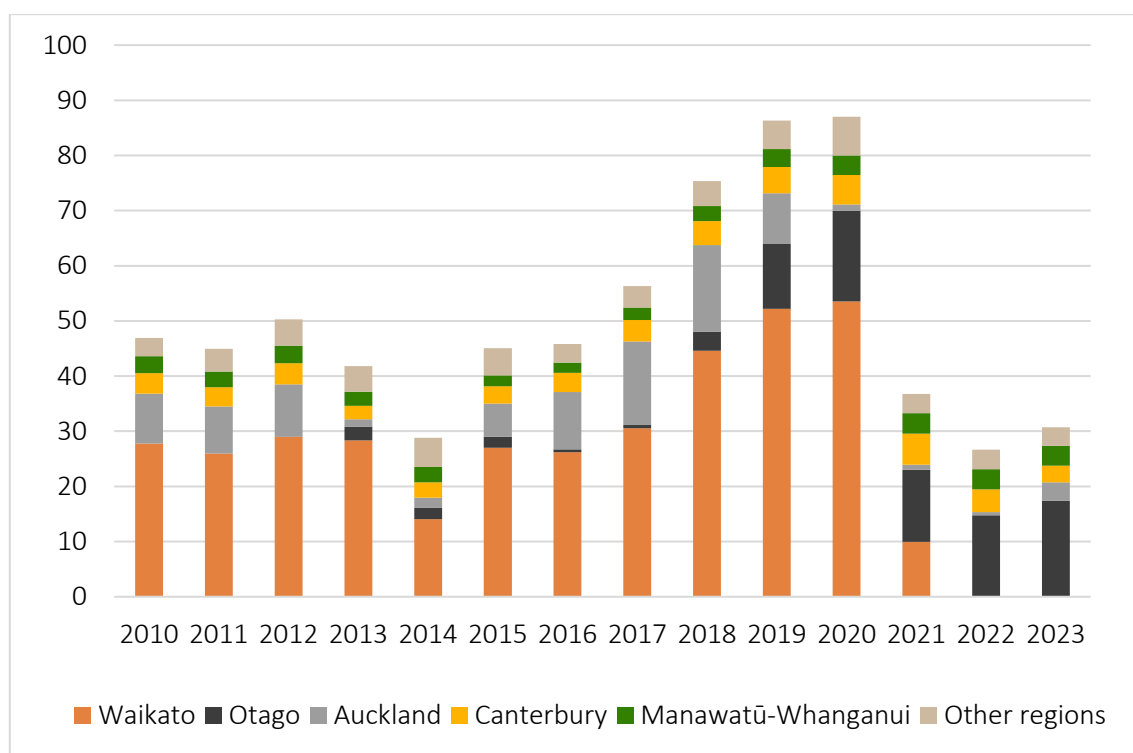
Figure 2 also highlights the significant downturn in GDP contributions from international students in pilot training in New Zealand between 2020 and 2021. This period saw a 58% decline and could largely be due to the shock of COVID-19. The closure of L3 Harris' operations in New Zealand in 2021 further intensified this decline, removing a key player in the training of international pilot students. Although new training providers have emerged since, the gap left by L3 Harris remains notable, with no existing or new training providers matching its scale in attracting international students.

⁶ Calibration with several other training providers suggested this figure may be more in the region of 400 students per year.

Regional contributions

To calculate the regional distribution of GDP contributions from international students in pilot training across New Zealand, we first mapped training providers to their respective region according to their physical location. Using this mapping, we then aggregated the number of international students from each training provider within each region. These aggregated student numbers by region were then used as a basis to estimate the GDP contributions from international students undertaking pilot training by region. The top five regions, which account for just under 95% of the total GDP contributions from international students undertaking pilot training is presented Figure 3⁷ – see Table 7 in the Appendix for a full breakdown of the estimated GDP contribution by region by year.

Figure 3: Estimated GDP contribution of international students undertaking pilot training by top five regions



Note: All figures were adjusted for inflation using the CPI (March 2019 index) and represent values in 2019 dollars.

Overall, training providers based in Waikato were the leading contributors to New Zealand's GDP from international student pilot training from 2010 to 2020, with an average annual contribution of approximately \$33 million. However, the contribution from Waikato saw a notable decline in 2021, primarily due to the closure of L3 Harris.

Since 2018, training providers in Otago have become increasing contributors to the GDP from international students undertaking pilot training. During this time, New Zealand Airline Academy Ltd commenced operations, which focuses exclusively on international students. Notably, Otago is among

⁷ Overall, there were six regions with no pilot training provider: Bay of Plenty, Marlborough, Northland, Taranaki, Wellington, West Coast.

the few regions to have seen growth in their contribution to GDP from international students undertaking pilot training over the COVID-19 period, rising from \$11.8 million in 2019 to \$14.7 million in 2023. Another region experiencing growth is Manawatū-Whanganui, which saw a 12% increase in its GDP contribution over the same period.

These results do indicate that there are a small number of regions that cater to most international students undertaking pilot training in New Zealand. These regions typically have 1-2 training providers, which poses a risk in situations where a specific training provider is unable to continue operations: a prime example being the impact of L3 Harris closing down its operation in Waikato.

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Appendix

Table 6: Detailed calculation of the GDP contribution of international students undertaking pilot training in 2019

Category	Annual cost	% of tuition	% remaining in New Zealand	\$ remaining in New Zealand
Education				
Operating costs	\$22,500	38%	40%	\$9,000
Facilities	\$10,500	18%	100%	\$10,500
Training equipment and resources	\$9,000	15%	50%	\$4,500
Personnel	\$12,000	20%	100%	\$12,000
Certification and licenses	\$3,000	5%	100%	\$3,000
Other corporate costs	\$3,000	5%	100%	\$3,000
Total spend on education	\$60,000	100%	72%	\$42,000
Living costs				
Accommodation	\$9,360	n/a	100%	\$9,360
Food	\$6,760	n/a	100%	\$6,760
Transport	\$1,196	n/a	100%	\$1,196
Other	\$5,200	n/a	100%	\$5,200
Total spend on living costs	\$22,516	n/a	100%	\$22,516
Tourism and VFR				
Tourism and VFR multiplier				9%
Total tourism and VFR	n/a	n/a	100%	\$5,806
Total spend per student				\$70,322
Number of students				620
Overall spend				\$43.6m
Economic multiplier				1.98
Total GDP contribution				\$86.3m

Table 7: Estimated GDP contribution of international students undertaking pilot training in New Zealand by region and year (\$m)

Training provider	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Waikato	27.7	26.0	29.0	28.3	14.1	27.0	26.2	30.5	44.6	52.2	53.5	9.9	0.0	0.0
Otago	0.0	0.0	0.0	2.5	2.0	2.0	0.5	0.6	3.4	11.8	16.4	13.1	14.7	17.4
Auckland	9.1	8.5	9.5	1.3	1.8	6.0	10.4	15.1	15.8	9.1	1.2	0.9	0.6	3.4
Canterbury	3.7	3.5	3.9	2.5	2.8	3.1	3.5	3.9	4.3	4.8	5.3	5.7	4.1	3.0
Manawatū-Whanganui	3.0	2.8	3.2	2.5	2.8	2.0	1.9	2.3	2.7	3.2	3.5	3.7	3.6	3.6
Hawke's Bay	2.5	2.3	2.6	2.1	2.3	1.6	0.3	1.0	1.9	2.7	3.6	3.2	3.1	2.9
Gisborne	0.9	1.8	2.2	2.6	2.9	3.3	3.1	2.8	2.6	2.4	3.3	0.0	0.0	0.0
Southland	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.2	0.3	0.2
Nelson/Tasman	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.3
Bay of Plenty	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Marlborough	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Northland	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Taranaki	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Wellington	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
West Coast	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total contribution across all regions	46.9	44.9	50.3	41.8	28.8	45.1	45.8	56.3	75.3	86.3	87.0	36.7	26.6	30.7

Note: All figures were adjusted for inflation using the CPI (March 2019 index) and represent values in 2019 dollars.

Table 8: CAA Licencing Data for all countries outside of New Zealand

Country	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	Total
Andorra												1			1
Australia	16	17	15	14	15	11	21	22	16	17	11	16	18	15	224
Austria													1		1
Bahrain		3	3						1						7
Bangladesh					1					1			1		3
Belgium					2		1								3
Bermuda													1		1
Bhutan								1	1		5		1		8
Brazil		1							3			1			5
Brunei								1	1		1				3
Canada	2	1				1	1		1	2		1		2	11
China	2	2	2	2	4	2	6	2	5	10	7	2	6	1	53
Colombia					1					1	1				3
Cook Islands		2	1							1					4
Czech Republic	1								1			1			3
Ethiopia												1			1
Fiji	1	1	2	4	4	2	1	2	2	3		2			24
Finland		1												1	2
France			3		1	2	1	1		2	1	1	2		14
French Polynesia				1											1
Germany	4	4	1	3		3	1	1	3	1			1	2	24
Hong Kong				2			1		1	1			1		6
India	86	60	50	40	49	19	16	18	87	79	69	146	35	55	809
Indonesia	2		1		4	3	4	5		10	5	6	5		45

Iran		1	1		1										3
Ireland		3			1										4
Israel												1			1
Italy			1					1	1		1		1		5
Japan	5	8	11	20	16	15	28	1	5	1	1	2	2		115
Kenya									1						1
Laos					1	1									2
Malaysia	8	2	5	3	2	2	2	1	3	5	2	1	2	3	41
Maldives	1						1			1					3
Mauritius							1								1
Mexico												1			1
Myanmar					1										1
Nepal			3		1										4
Netherlands	2	2	1	1		1		1		1				1	10
Nigeria						1								1	2
Oman	19	7	5	6	3	4	2		1	1					48
Pakistan				1											1
Papua New Guinea	1	1	1	4	7	5	2	2	3	1	2	1	2	1	33
Philippines	1			1	1	2	1				2	1	2	2	13
Portugal			1												1
Russia												1	1		2
Samoa	1								1		1			1	4
Saudi Arabia							1		1						2
Singapore	4	5	6	3	3	5	1	2	1	3		2	2	1	38
South Africa	4	7	8	4	1	2	4	2	5	5	5	1	4	3	55
South Korea	2	1		2	3	2	1	1			4	1	1	2	20
Sri Lanka	1		1	1	1	1					2				7

Sweden			1							1					2
Switzerland			1		1	1	1	1	2					1	8
Taiwan		2		1	2			2							7
Tanzania				1											1
Thailand		2	2		4		2	2		3	1		1		17
Tonga	2							1		1					4
Turkey								1	1						2
Ukraine				1		1						1			3
United Kingdom	18	15	10	8	10	3	3	8	6	10	5	4	6	5	111
USA	1	2	1	1	1	2	2	2	3	5	2	2		3	27
Vanuatu	3	1	1	1				2	2	1					11
Vietnam	3			5		2	2	7	21	23	18	28	27	6	142
Zimbabwe	1		1						1						3
Grand Total	191	151	139	130	141	93	107	90	180	190	146	225	123	106	2012