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Gender Differences in University Enrollment and STEM Major

The Role of Tuition Policy in Australia

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Research Summary

Why was the research done?

This research was undertaken to better understand the changing patterns of gender differences in higher education. While women's university participation has increased markedly, men's enrollment has declined, raising important questions about the drivers of this trend. At the same time, persistent differences in men's and women's choice of field of study continue to shape occupational trajectories and earnings, contributing to enduring gender gaps in the labor market. Examining these dynamics provides insight into how educational decisions reinforce broader inequalities in economic outcomes.

What were the key findings?

Over the past 30 years, women consistently enrolled in university at higher rates than men, with the gap widening from 10 to 16 percentage points. Women's enrollment also rose more strongly than men's when tuition increased. In field-of-study choices, both genders reduced participation in traditional STEM, though the gender gap narrows when Health is included, partly due to 2005 tuition discounts in nursing and teaching. Adding Business and Economics shows little overall change. Women's subject choices were generally more responsive to tuition than men's, especially after 2005, though effects vary by period. These patterns reflect differences in labor market opportunities, expected returns, and risk attitudes: men benefit from strong non-university options and higher STEM returns, while women are more sensitive to costs and risk. This helps explain why women outnumber men in university overall but remain underrepresented in STEM.

What does this mean for policy and practice?

The findings demonstrate that tuition policy is not gender neutral. Tuition policy interacts with structural labor market inequalities and behavioral differences to shape enrollment outcomes. For policymakers, this highlights the importance of considering gender-specific incentives when designing tuition structures and subsidies. These insights are particularly salient with respect to efforts to promote a more gendered balance with respect to the pursuit of STEM programs.

Citation

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Life Course Centre WORKING PAPER SERIES

We acknowledge the Traditional Custodians of the lands on which we work and live across Australia. We pay our respects to Elders past and present and recognise their continued connections to land, sea and community.

Gender Differences in University Enrollment and STEM Major: The Role of Tuition Policy in Australia

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Abstract

We analyze whether men and women respond differently to tuition variation for both university entry and STEM major choice, using a 30-year Australian individual-level administrative dataset. The Australian setting is unique: tuition fees are regulated, students can defer payment through income-contingent loans, and universities receive discipline-specific government subsidies. We find women consistently enrolled at higher rates than men, on average 14 percentage points between 1991 and 2020, with the gap widening over the period from 10 to 16 percentage points. By contrast, men were more likely to register in STEM fields. This STEM gap has remained stable in traditional STEM disciplines, but the gap has narrowed since 2005 when including Health in the definition of STEM. We find that women respond more positively than men to tuition increases in terms of overall enrollment. Effects on STEM participation, however, are less clear and vary across time. The STEM choice patterns suggest systematic gender differences in incentives and behavior, reflecting factors such as men's stronger engagement with higher-paying non-university jobs, higher expected returns to traditional STEM fields for men, narrower earnings dispersion for women across fields, and gender differences in cost sensitivity and risk aversion. Our findings highlight how tuition policy interacts with gender-specific incentives to shape both university enrollment and major choices.

Key Words: Post-secondary Education, University Enrollment, Gender, Tuition, STEM

JEL Classification: I23, J16, I28, I22

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1 Introduction

Gender differences in higher education enrollment and major choices remain a topic of considerable concern for policymakers and researchers. Across most OECD countries, the share of women attending university has increased dramatically while the share of men has declined (see, e.g., Card and Payne, 2015; Vincent-Lancrin, 2008; Machin and Mcnally, 2005; Goldin et al., 2006). This pattern has been particularly pronounced in the United States and Canada for cohorts born from the 1960s onward (Card and Payne, 2021). While the gains of women are understandable, less clear is what has driven the decline for men.

Despite more women attending university than men, persistent gender inequalities in the labor market continue to shape occupational outcomes and earnings prospects. A growing body of evidence suggests that these inequalities are closely linked to differences in the choice of university major, with important consequences for subsequent career paths (Altonji et al, 2016; Astorne-Figari and Speer, 2019; Sloane et al., 2020; Granato, 2023; Altonji et al., 2025).

This paper contributes to two strands of research: gender differences in university enrollment and gender disparities in pursuing STEM (Science, Technology, Engineering, and Mathematics) degrees. Despite decades of progress in educational attainment, the drivers of these persistent gaps remain poorly understood. We examine how changes in regulated tuition affect gender differences in both overall university enrollment and registration in STEM programs, using data from Australia.[1]

The Australian context offers a distinctive institutional setting: domestic tuition fees are regulated, and an income-contingent loan system allows students to defer payment, linking repayments to future earnings. Until 1997, a single tuition rate applied to all bachelor's programs. Thereafter, the federal government introduced multiple rates, varying by discipline and classified into three bands (Bands 1–3). In some years, tuition discounts were offered for fields deemed national priorities. Beyond tuition revenue, universities receive direct government subsidies per domestic student, which have evolved from negotiated "block grants" to discipline-specific per-student funding. We exploit a unique 30-year individual-level administrative dataset covering both students who accessed income-contingent loans and those who did not.[2] This allows us to analyze whether men and women respond differently to changes in tuition with respect to the likelihood of enrolling in university and the selection of a field of study or program.

Our first set of results examines gender gaps in university enrollment. Across the full thirty-year period, women consistently enrolled at higher rates than men, with an average gap of 14 percentage points. This gap widened over time, from 10 points in 1991–1997 to 16 points in

[1] Throughout this study, we use the term "overall" university enrollment, which does not correspond exactly to the *universal* population of bachelor's students commencing university. Our measure identifies enrollment based on the first year of income-contingent loan uptake for a bachelor's degree. Since over 80 percent of commencing students take out a student loan (Cuff, Gamarra, and Payne 2025), this proxy provides a close approximation of the full population of enrollees.

[2] Our data do not include students who pay tuition up front. As discussed in Cuff, Gamarra, and Payne (2025), most Australian students take up the students loans.

2012–2020. Regression estimates confirm heterogeneous responses to tuition: women's enrollment increased more strongly than men's when base tuition increased.

We then turn to field-of-study (major) choice. Registration shares in traditional STEM disciplines declined for both genders by 15–16 percentage points. When Health disciplines are included, the gender gap is smaller (14 percentage points before 1997) and has decreased by five percentage points over the period. The narrowing of the gap for the Health disciplines coincides with reforms that introduced national priority discounts introduced to encourage registration in nursing and teaching in 2005.[3] When disciplines tied to Business & Economics are added to the STEM classification, the overall reduction in the gender gap over the period is closer to two percentage points. Regression results suggest that women are more responsive than men to tuition changes in field selection if we study the entire thiry-year period. Analyses that study four specific periods, however, suggest that there is a limited effect of tuition on women's registration in STEM fields. If we focus on the period from 2005 onward, both men and women react positive to an increase in base tuition rates (women more than men) and increases in the additional tuition charged for most of the STEM programs.

Finally, we explore mechanisms that may explain the observed gender differences in enrollment and responsiveness to tuition. Our analysis highlights the role of differences in expected returns, labor market opportunities, and financial risk perceptions, which interact with the design of income-contingent loans and field-specific earnings patterns. Men's greater access to well-paid non-university pathways and higher returns in traditional STEM fields impact their responsiveness to tuition changes, while women's lower earnings dispersion, heightened sensitivity to costs, and stronger risk aversion shape distinct patterns of enrollment. These mechanisms shed light on why women dominate overall university participation but remain underrepresented in STEM fields, and why their enrollment decisions are more sensitive to tuition policies.

This paper contributes to the literature in three ways. First, it provides long-run evidence on the gendered effects of tuition changes using comprehensive administrative data. Second, it integrates the study of overall university enrollment with field-of-study choice, highlighting the link between gendered higher education decisions and subsequent labor market outcomes. Third, it sheds light on the interaction between income-contingent loan design and gender-specific responsiveness, with implications for the evaluation of higher education policies aimed at reducing gender gaps.

The remainder of the paper is organized as follows. Section 2 provides an overview of the Australian higher education system, including recent tuition reforms, and describes the dataset used in the analysis. Sections 3 and 4 present the empirical findings on university enrollment and field-of-study choice, respectively. Section 5 situates these results within the broader literature and explores the potential mechanisms driving the observed patterns. Section 6 concludes.

[3] Additional discounts were introduced for disciplines in the traditional STEM fields but these do not appear to have had an effect on reducing the gender gaps for registration into these fields.

2 Institutional Context and Data

This section provides a brief overview of the evolution of tuition fees, government funding and students' enrollment over the past 30 years in Australia. For a more in-depth review of the Australian university system, see Cuff, Gamarra, and Payne (2025).

2.1 Student Tuition and Government Subsidies

Australian public universities are funded and regulated by the federal government.[4] University revenue streams include tuition fees (domestic and international), government subsidies tied to domestic student enrollments and research funding, competitive research funding from public and private sources, and other income such as philanthropy and donations.[5] The federal government sets the maximum domestic tuition rates for Australian citizens and permanent residents (henceforth, "domestic students").[6] These regulated tuition rates apply uniformly across all public universities.[7]

Tuition was introduced in 1989, replacing the previous system of free higher education. At the same time, the government created the income-contingent loan scheme, which allowed students to defer repayment of the tuition until their income exceeded a legislated threshold. Between 1989 and 1996, a single tuition rate applied to all domestic undergraduates, regardless of their field of study. The government introduced three-tiered tuition rates (referred to as "Bands") as part of its 1997 reforms of the higher education system. Fields of study were allocated to Bands based on expected private economic returns. Band 1 (the lowest tuition) included disciplines such as creative arts, humanities, social sciences, education, and nursing. Band 2 covered disciplines such as agriculture and renewable resources, built environment and architecture, engineering and processing, business and economics, mathematics, statistics, natural and physical science, and other health sciences. Band 3 (the highest tuition) encompassed law, medicine, dentistry, and veterinary science.

Most fields have remained in the same tuition band over time, except for business and economics, which was reclassified from Band 2 to Band 3 in 2008. Between 2005 and 2012, the government also introduced tuition discounts for disciplines considered "national priorities". From 2005 to 2009, these discounts applied to education and nursing (Band 1), and from 2009 to 2012, they applied to mathematics, statistics, and science.

Universities receive direct subsidies from the government that are linked to programs of study and student enrollments in addition to student tuition. These subsidies are tied to domestic en-

[4]As of the latest available data, Australia has 42 universities, of which 36 are public institutions. Source: https://www.studyaustralia.gov.au/en/plan-your-studies/list-of-australian-universities?utm_source.

[5]Further details on university funding are available at https://universitiesaustralia.edu.au/policy-submissions/teaching-learning-funding/how-universities-are-funded/.

[6]Permanent residents have the same entitlements as citizens, including access to income-contingent loans. Accordingly, references to "citizenship" throughout this paper encompass both citizens and permanent residents.

[7]Universities may set the tuition rates for international students. The federal government, however, requires that the minimum international student rate must exceed the domestic tuition plus the associated government subsidy.

rollment caps.[8] Until 2005, subsidies were distributed through a block grant, negotiated bilaterally between universities and the government. Starting in 2005, the government allocated the subsidies based on domestic student enrollments. The level of the subsidy varied, determined by "funding clusters."[9] The subsidy for each cluster was designed to capture the difference between teaching cost and tuition received. Importantly, clusters did not map neatly onto tuition bands. For example, law and medicine are fields assigned to the highest tuition band, yet law is in the funding cluster with the lowest per-student subsidy rate and medicine is in the cluster with the highest enrollment subsidy. Similarly, two traditional STEM fields of study – biology and mathematics – are both in the same tuition band, yet biology is assigned to a funding cluster with a higher per-student subsidy than mathematics.

Prior to 2010, universities had some discretion over domestic student enrollment but were constrained by government-imposed caps on direct subsidies.[10] In 2010, the government relaxed these caps, providing subsidies for students above the cap up to a maximum of 10 percent, facilitating enrollment growth and paving the way for the 2012 demand-driven enrollment policy. The 2012 reform removed caps entirely, giving universities greater flexibility in admissions and aiming to expand access to higher education (see Norton, 2014). This demand-driven system remained in place until 2017, when the government imposed a two-year freeze on funding for domestic places. By maintaining allocations at 2017 nominal levels, the freeze halted automatic adjustments for inflation or student growth, effectively suspending demand-driven funding during this period.[11]

Table 1: Tuition and Government Subsidies, by Period

Period	Band 1 Tuition	Band 2 Tuition	Band 3 Tuition	Minimum Government Subsidy	Maximum Government Subsidy
	(1)	(2)	(3)	(4)	(5)
Before 1997	$2,296				
	(148.6)				
Before 2005	$2,991	$5,002	$5,854		
	(620.1)	(216.1)	(253.6)		
2005 Onward	$5,735	$8,173	$9,569	$1,867	$29,746
	(617.6)	(881.4)	(1032.6)	(233.8)	(3885.9)
2012 Onward	$6,223	$8,870	$10,386	$2,048	$32,741
	(314.4)	(448.5)	(525.2)	(102.3)	(1657.8)

Notes: Average and Standard Deviation (in parenthesis) for period. Nominal dollars.

Table 1 summarizes three major reforms to tuition and subsidies (1997, 2005, and 2012) into four policy periods: (1) 1991–1996, when a single tuition applied across all programs; (2) 1997–2004,

[8] Universities may admit students above their caps, but in such cases, they receive no subsidy, and students are charged the full cost of tuition plus subsidy.

[9] The number of funding clusters has ranged from four to nine since their introduction, and the allocation of fields across clusters has changed over time. For further details, see https://www.studyassist.gov.au/financial-and-study-support/commonwealth-supported-places-csps?utm_source=..

[10] Students enrolled above the caps were ineligible for income-contingent loans, and universities were allowed to charge higher tuition – up to the level of the government subsidy.

[11] In 2020, a new model was introduced, linking future funding growth to demographic trends and performance metrics (Norton, 2020).

following the introduction of the three-band tuition system; (3) 2005–2020 (2005 onward), characterized by per-student subsidies, national priority discounts, and post demand-driven; and (4) 2012–2020 (2012 onward), the demand-driven era.[12] The first three columns of Table 1 report average nominal tuition rates across the three bands in each period.[13] Average tuition increased steadily over time. Focusing on the lowest tuition rates, the average rates increased from $2,296 in 1991–1996 to $2,991 in 1997–2004, $5,735 for 2005 onward, and to $6,223 from 2012 onward. The average for the Band 2 tuition increased from $5,002 to $8,870, and the average for the Band 3 tuition increased from $5,854 to $10,386. The last two columns of Table 1 illustrate the average of the minimum and maximum government subsidies for the four periods. For the period 2005 onward, the average minimum subsidy is $1,867 and the average maximum subsidy is $29,746.

Since tuition and subsidies are set at the national level, their changes can be regarded as plausibly exogenous. We exploit these policy-driven shifts in our empirical analysis (Sections 3 and 4) to assess how tuition and subsidies influence gender differences in both overall university enrollment and registration in STEM fields.

2.2 Enrollment and Student Loan System

Access to higher education in Australia is governed by a state-level centralized admissions process. Applicants rank their preferred university and program and offers are made by matching student preferences with university entry requirements. In general, a student receives an acceptance to a single program and university. Before 2009, most states relied on their own entrance examinations. In 2009, the Australian Tertiary Admission Rank (ATAR) – a national ranking system – was introduced but adopted by states in different years.[14] The ATAR is a score between 0 and 100 that indicates a student's position relative to their peers.

Once admitted, domestic students may defer tuition payments through Australia's income-contingent loan system, introduced in 1989.[15] Repayment obligations depend solely on the student's individual earnings, independent of household circumstances. Repayments are calculated as a share of income once earnings exceed a specified threshold, and loans remain with the borrower until fully repaid or death.[16] During the period of our study, the government has adjusted the income thresholds and repayment rates on a regular basis. The presence of income-contingent debt may shape field-of-study choices differently across genders, depending on individuals' perceptions of risk and expected returns. We revisit this mechanism in Section 5 when examining gender gaps in

[12] The data are sourced from the Parliamentary Library (2021) and special requests to the Department of Education.

[13] All dollar amounts in this paper are expressed in Australian dollars.

[14] The ATAR was first adopted in 2009 in the Australian Capital Territory and New South Wales, extended to all other states and territories except Queensland in 2010, and finally adopted in Queensland in 2020. For more information, see https://www.uac.edu.au/future-applicants/atar. Today, the ATAR is the primary criterion for university admission.

[15] Australia was the first country to adopt such a scheme, designed to preserve access to higher education. Chapman (1997, 2006) and Chapman and Ryan (2005) provide comprehensive reviews of the history and development of the Australian income-contingent loan system.

[16] Prior to 2025, outstanding student loan balances were not considered in mortgage credit assessments.

STEM participation.

Loan take-up has been consistently high. From 1989 until 2012, around 75–78 percent of commencing domestic students relied on loans, rising to 87 percent thereafter (Cuff, Gamarra, and Payne, 2025). Between 1991 and 2017, the government also offered tuition discounts to students who paid upfront rather than deferring with a loan – 20 percent until 2011, and 10 percent between 2012 and 2017. Despite this incentive, only about one in five students paid all of their tuition upfront, a pattern that remained stable across 1991–2020 (Cuff, Gamarra, and Payne, 2025).

2.3 Data for Analyzing Tuition Effects on Enrollment

The income contingent loan system is administered by the Australian Tax Office (ATO). Given the high take-up rate of the loans, we used data from the ATO for the period 1991 to 2020 to study and gain new insights of gender differences in university enrollments, especially as they relate to differences in responses to tuition changes.

We use the ALife (ATO Longitudinal Information Files) dataset, a 10 percent random sample of individuals from the ATO client register with individuals longitudinally linked via their Tax File Number, a unique personal identifier.[17] This dataset captures domestic university enrollment, including students' take-up of income-contingent loans for undergraduate degrees and their field of study.[18] Additional variables include gender, birth year, region of residence, income, occupation, and the year in which an individual is first observed holding a health card. We use these additional variables in our analyses of student enrollment as well as to create region-specific measures on occupations, earnings by field of study, and income.

The core dataset includes all individuals born between 1974 and 2000 who could have enrolled in university. Since the tax data lack direct measures of citizenship, we use health card information to identify potential domestic students: only citizens and permanent residents are eligible for health cards. Specifically, we consider individuals (or their parents) who first received a health card number by the age of 20, approximating eligibility around expected high school completion. The resulting sample comprises 698,086 individuals, of whom 51 percent are men.

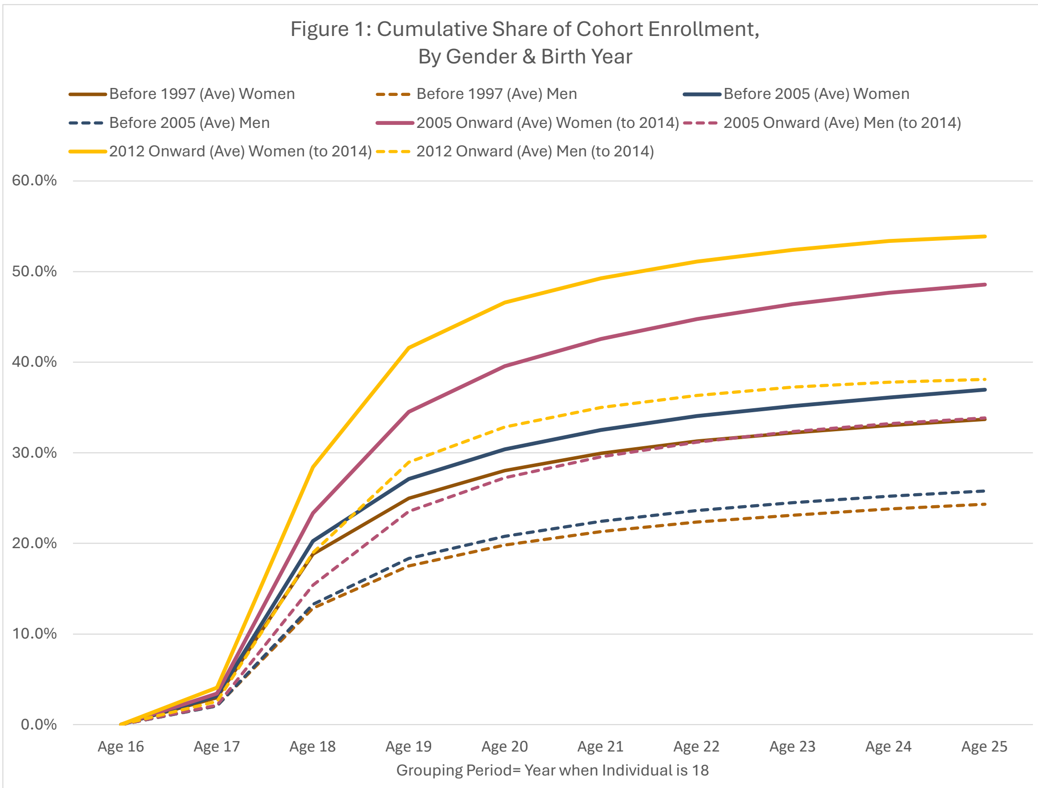
To examine gender differences in university enrollment, we separate observations by men and women. Enrollment rates by gender and birth year are defined as the number of individuals for a given gender (e.g., women) with an income-contingent loan divided by the number of individuals of that gender (e.g., women) in the birth year. The term *gender gap in enrollment* refers to differences in these enrollment shares by gender.[19] Our analysis includes all potential domestic

[17]For further details about the construction of the ALife dataset and its representativeness of the Australian population, see Polidano et al. (2020). Also see Cuff, Gamarra, and Payne (2020) for further details about the use of the ALife dataset for studying university participation.

[18]The tax year runs from July 1 to June 30. University terms operate on a calendar-year basis. We identify a tax year by its ending year – e.g., the 1995–96 tax year is labeled as 1996. Because most students begin university in the first half of the calendar year, a loan recorded in the 1996 tax year is interpreted as enrollment in 1996.

[19]One could study differences in enrollment by gender, but such a measure conditions on enrollment, and by

students, without conditioning on high school actions that could affect eligibility (e.g., dropping out or not taking university preparation courses). While differences in high school preparation and performance between men and women are documented in many countries (see, e.g., Card and Payne, 2021), this paper assumes that all individuals of a given birth year could undertake the relevant preparations for university enrollment.



Note: Statistics for birth years for which we can observe university enrollment up to age 25.

Figure 1 depicts the share of enrollment by age up to 25 for our sample, by gender and birth year. We group birth years based when the given cohort is 18 years old and for the four periods under study (before 1997, before 2005, 2005 onward, and 2012 onward). For example, for the period before 1997, we capture the enrollment rates for individuals born before 1979.

Across all period groupings, the share of eligible women enrolling in university is greater than the share of eligible men. On average, across all years and ages, 30 percent of women and 21 percent of men enrolled. Gender differences emerge around age 18 and widen with age: the female enrollment advantage averages 8 percentage points at age 18 and 13 percentage points by age 25. Moreover, the gap has grown over time. By age 18, the gap increased from 6 percentage points for pre-1997 cohorts to 9 percentage points for cohorts who are 18 from 2012 onward. The cumulative

definition would mean that the share for men and women would sum to one hundred percent.

effect by age 25 has also resulted in an increase in the gap, from 9 to 16 percent for these two periods.

The ALife tax data, combined with the high prevalence of income-contingent loan take-up, offer a comprehensive measure of domestic university enrollment and initial field of study. The analysis in Section 3 will focus on studying the effect of increasing tuition on enrollment for men and women. The tax data report the initial field of study for the registrants. Thus, the analysis in Section 4 will focus on differences, by gender, in the selection of fields of study that can be treated as STEM conditioning on university enrollment. By capturing both gender and STEM classifications across cohorts and ages, the dataset allows us to link observed enrollment patterns to key tuition and policy reforms.

3 Effect of Tuition on Gender Differences in University Enrollment

Cuff, Gamarra, and Payne (2025) examine the effects of tuition increases on university enrollment rates in Australia. Their theoretical framework highlights how both students and universities respond to exogenous government tuition changes, affecting overall and field-specific enrollment. While higher tuition may discourage individual students, universities may offset this by admitting more students when incentives align. Overall, they find that higher tuition is associated with increased university enrollment.

As demonstrated in Figure 1, more women enroll in university than men and that the difference in enrollment rates has increased over the past thirty years. We extend the work of Cuff, Gamarra and Payne (2025) to explore whether the increasing gap in university participation are attributable to are differential effects of tuition on enrollment by gender.

This section focuses on exploring the extent to which tuition plays a role for explaining this increasing gap. While there are many potential reasons for differential behavior, prior literature supports the notion that women and men differ in their risk preferences that relate to decisions made that affect the occupational choice and engagement with the labor market (see, e.g., Rai and Kimmel, 2015).

Table 2 reports summary statistics for enrollment and for key measures for the individuals in the sample, by gender. For each measure, we report the T-statistic which tests for equivalence between genders. Across the sample and for all observed ages, the average age of enrollment are, for the most part, equivalent for men and women. Significant differences arise for enrollment rates by gender. In Table 2, we report the enrollment shares for all ages as well as the shares observed enrolling between 17 and 19, the ages when most students enroll.

Similar stories on gender differences emerge for both age groups. Enrollment rates for women are significantly higher than enrollment rates for men. Focusing first on those observed enrolling at

Table 2: Mean Enrollment Shares, By Period and Gender

	Men (1)	Women (2)	T-Statistic (3)	P-Value (4)
Number of Observations	357,976	340,110		
Mean Age of Initial Enrollment (if Enrolled) (17 to 46)	19.5	19.5	3.16	(0.002)
Share Observed Enrolling (Any Age)				
All Years	32.1%	46.1%	-121.62	(0.000)
Before 1997	26.2%	36.4%	-39.10	(0.000)
Before 2005	27.8%	40.1%	-75.40	(0.000)
2005 Onward	35.8%	51.4%	-96.48	(0.000)
2012 Onward	37.9%	53.7%	-67.19	(0.000)
Share Observed Enrolled Age 17 to 19				
All Years	22.3%	32.7%	-98.04	(0.000)
Before 1997	17.8%	25.5%	-32.73	(0.000)
Before 2005	18.4%	27.3%	-60.70	(0.000)
2005 Onward	25.8%	37.5%	-77.60	(0.000)
2012 Onward	30.7%	43.9%	-58.16	(0.000)
Proxy for Citizenship Status & Known Residential Location When in High School				
Observed with Health Card # Between Birth and Age 10	94.1%	94.1%	-1.43	(0.152)
Observed with Health Card # Between Ages 11 to 16	4.3%	4.2%	2.35	(0.019)
Observe Residential Location When in High School (by age 19)	72.8%	73.3%	-4.18	(0.000)

Notes: Sample overs individuals born between 1974 and 2000 and classified as citizens or permanent residents by age 20. Individuals analysed for each period are those who have turned 18 between the start and end dates for each period.

any age, women consistently enrolled at higher rates than men by 14 percentage points. Although enrollment rates have increased for men and women, the rates for women have grown faster than men. From 2005 onward, the enrollment gap increased to approximately 16 percentage points. Restricting the enrollment measure on the enrollment age that falls between 17 and 19 yields a similar pattern in enrollment rates. Although enrollment rates are lower, the increase in the gender gap over time persists, rising from 8 percentage points (before 1997) to 13 percentage points (2012 onward).

The bottom panel of Table 2 presents statistics for measures regarding citizenship (age observed with a health card) and our ability to assign as a residential region one that is captured near the time the individual was likely attending high school (by age 19).[20] For both men and women, 94 percent are observed with a health card by the age of 10. Another four percent are observed with a health card between the age of 11 and 16, with the remainder (less than two percent) observed receiving a health card between 17 and 20. We were able to identify a residential location around the time of high school for over 70 percent of the individuals we study. This latter measure is relevant as our regressions will include measures captured at a regional level such as family income for the area, the share of adults observed by occupation classification, and the average salaries of young adults, by gender, by field of study in the region.

These trends in gender differences in enrollment provide important context for assessing how tuition changes may influence university participation which we turn to now. To explore the overall

[20] We use the first observed geographic location for each individual which is based on filing an income tax return.

effect of tuition increases on university enrollments, we adopt the following empirical specification:

$$Enroll_{ibrst} = \alpha_b + tuit_t\beta_1 + tuit_t * gender\beta_2 + \gamma indiv_{ibr} + region_{rt}\phi + policy_t\delta + state_{st}\mu + \epsilon_{ibrt} \quad (1)$$

For each year t, we capture individuals of birth year b and region r between the ages of 17 and 30 who have yet to be observed enrolling at a university. The dependent variable equals 1 if we observe the individual commencing studies in year t, 0 otherwise. Note that once an individual is observed enrolling, the individual is not included in the sample for the following year. For example, if an individual enrolls when she is 17, she is included in the sample in the year when she is 17 but excluded from the sample when she is 18.

We regress enrollment on tuition in year t, individual characteristics, regional economic and occupational measures, policy dummies capturing major policy changes, state time trends, and birth year fixed effects. We use nominal tuition rates as these reflect the tuition rates observed by students at the time of enrollment.[21] Specifically, the tuition measures included in $tuit_t$ are: (i) the tuition of Band 1, which is the base rate that serves as the "anchor" for all years, (ii) the tuition differential between Bands 2 and 1, available from 1997 onward (0, before 1997), (iii) the tuition differential between Bands 3 and 1, also available from 1997 onward (0, before 1997), and (iv) a dummy variable that is equal to one in the years for which the national priority discount is offered (2005 to 2012).[22] To test whether there are differential effects of tuition on enrollment by women, we interact the tuition measures with a dummy variable that equals 1 if the individual is a woman and 0 otherwise.

Eq.(1) controls for observable individual characteristics $indiv_{ibr}$, which includes a dummy for female, dummies for the age at which the individual first received a health card (0–10 or 11–16, with 17–20 as the omitted category), and a dummy variable for whether we observe the region of residence for the individual around the time she was in high school.

The measures reflected by $region_{rt}$ capture time-varying regional variation at the time an enrollment decision is made. These measures proxy the environment an individual faces that could support a decision to pursue a university degree. The measures capture: median household taxable income, the share of young adults (25-35) employed in each 1-digit occupation code, and the average earnings of young adults previously observed registering in the major fields of study. The earnings measures are computed for men and women separately. Individuals who are women are assigned the earnings measures for women and the individuals who are men are assigned the earnings measures for men, respectively.

The set of policy variables, $policy_t$, captures the time-varying policy changes that could affect

[21] The findings are consistent if instead we use real tuition rates and real government subsidies. Results of these specifications are reported in the Appendix.

[22] The actual tuition faced by a student is based on her enrolled courses and the assignment of these courses to fields of study. For instance, a student taking one education course and one economics course would face lower tuition than a student taking two economics courses. As a result, tuition depends not only on the band of a student's major field but also on cross-disciplinary course selection.

enrollment patterns as described in Section 2. This set contains dummy variables that identify (i) the years with multiple tuition bands (post 1997), (ii) the period when universities received an extra 10 percent coverage if they exceeded the enrollment cap (2010-2011), (iii) the post-demand-driven policy period (post 2012), (iv) the period of government funding being frozen (2017-2019), (v) the period when discounts were offered to students who pay their tuition fee upfront (1991-2017),[23] and (vi) the adoption of the standardized testing scores (ATAR) in the admission process (dates vary by region).

Finally, Eq.(1) includes *statexyear* trend measures to capture variation across the states and territories in Australia and birth year fixed effects (b) to control for time-invariant characteristics that could affect the likelihood of university enrollment across birth years.

To capture the 2005 policy reform introducing explicit per-student enrollment subsidies, we amend the empirical specification in Eq.(1) to include measures of the maximum and minimum per-student government subsidies provided to universities from 2005 onward.[24] We also interact this subsidy measure with the gender dummy variable to test whether there are differential effects by gender of changes in government enrollment subsidies.

In Table 3 we report results from Eq.(1) separately for three time periods: all years (1991-2020)(column 1), before 1997 (1991-1997) (column 2), and before 2005 (1991-2005) (column 3), respectively. For the latter two time periods, 2005 onward (column 4) and 2012 onward (column 5), we include the per student government subsidy measures.

For each specification, the results are presented in two columns (a) and (b). The coefficients reported in the (a) column capture the overall effect of the measure for all individuals. The coefficients in the (b) column capture the additional effect of the measure for women. As discussed, changes in tuition fees and government subsidies over these time periods are plausibly exogenous given that both are determined by the Australian government rather than by universities.

Starting with the results for the full sample period (Table 3, column 1), we find heterogeneous enrollment responses by gender to tuition changes. After controlling for other factors, women are less likely to enroll in university, on average of two percentage points within birth cohorts. The coefficients on the tuition measures further indicate that women react differently to tuition changes than men.

Focusing on our ”base” measure for tuition, Band 1 tuition, a one-hundred dollar increase in tuition is associated with an overall one percent increase in enrollment. There is a positive, although small (0.02 percent), additional effect on enrollment by women. The more noticeable

[23]To avoid collinearity with other policy controls, to control for discounts for tuition paid upfront, we limit the policy measure to the period 2011–2017 (i.e., 10 percent discount period).

[24]Note that all of our regression tables do not report coefficients for government subsidies prior to 2005 (see column 1 of Tables 3, 5, 6 and 7) since subsidies during that period were provided through “block grants” and therefore no per-student subsidy data are available. Assigning a value of zero would be misleading since, as discussed in Section 2, subsidies were not absent during this period. Accordingly, government subsidies are only included in the regressions from 2005 onward, when per-student subsidy data are available.

Table 3: Effect of Tuition on Enrollment by Gender

Dependent Variable: Observed Enrolling for Given Year	All Years		Before 1997		Before 2005		2005 Onward		2012 Onward	
	All Students	*Woman Interaction	All Students	*Woman Interaction	All Students	*Woman Interaction	All Students	*Woman Interaction	All Students	*Woman Interaction
	(1a)	(1b)	(2a)	(2b)	(3a)	(3b)	(4a)	(4b)	(5a)	(5b)
Tuition Band 1 (Minimum) ($100s)	0.011***	0.0002***	0.017***	0.008***	0.020***	0.004***	-0.955***	-0.231***	-3.707***	-0.257***
	(0.0003)	(0.00005)	(0.001)	(0.001)	(0.001)	(0.0004)	(0.045)	(0.032)	(0.541)	(0.071)
Tuition Band 2 Additional Tuition Above Band 1 ($100s)	-0.561***	0.361***			-1.353***	1.642***	0.861***	0.207**	0.964***	0.117**
	(0.034)	(0.052)			(0.113)	(0.138)	(0.073)	(0.091)	(0.110)	(0.056)
Tuition Band 3 Additional Tuition Above Band 1 ($100s)	0.341***	-0.230***			0.847***	-1.046***	0.936***	0.213**	-3.925***	
	(0.022)	(0.033)			(0.071)	(0.088)	(0.092)	(0.083)	(0.371)	
Period of National Priority Discount (0/1)	0.007***	-0.003***					0.022***	-0.013***		
	(0.0004)	(0.0004)					(0.002)	(0.001)		
Government Subsidies ($1000s)										
Maximum Government Subsidy Available for Any Field ()							0.713***	0.016	16.296***	
							(0.023)	(0.024)	(2.027)	
Minimum Government Subsidy Available for Any Field ()							-7.734***	-0.204	2.200	6.349***
							(0.253)	(0.263)	(2.467)	(1.884)
Individual & Period Controls										
Individual is a Woman	-0.023***		-0.215***		-0.115***		0.104***		-0.110**	
	(0.002)		(0.015)		(0.011)		(0.014)		(0.045)	
Observed with Health Card Between Birth and Age 10	0.023***		0.032***		0.017***		0.023***		0.024***	
	(0.0005)		(0.002)		(0.001)		(0.001)		(0.001)	
Observed with Health Card Between Ages 11 and 16	0.024***		0.042***		0.025***		0.020***		0.019***	
	(0.001)		(0.003)		(0.001)		(0.001)		(0.001)	
Observed Region of Residence Near Time When in High School	0.011***		-0.015***		-0.001***		0.018***		0.020***	
	(0.0002)		(0.001)		(0.0003)		(0.0002)		(0.0003)	
Regional Median Family Income (1000s)	0.0001***		0.001***		0.001***		0.0001***		0.0001***	
	(0.00002)		(0.0001)		(0.0004)		(0.00001)		(0.00002)	
Post Introduction of Multiple Tuition Rates (1997+)	0.266***				0.139***					
	(0.007)				(0.015)					
Period of Extra 10% Coverage of Domestic Students (2010-2011)	0.006***						0.016***			
	(0.0004)						(0.001)			
Post Demand Driven Enrolment Policy (2012+)	-0.003***						0.024***			
	(0.001)						(0.002)			
Post Freeze in Tuition (2017-2019)	0.010***						0.009***		-0.003*	
	(0.0004)						(0.0004)		(0.002)	
Period of 10% Discounts Given to Student for Paying Tuition Upfront	0.015***						-0.035***		0.007**	
(2012 to 2017)	(0.0004)						(0.001)		(0.004)	
ATAR Scores Used for Admission (Introduction Varies Across States)	0.004***						0.004***		0.002**	
	(0.0004)						(0.0005)		(0.001)	
Constant	-0.221***		-0.220***		-0.289***		-0.581***		0.141	
	(0.038)		(0.043)		(0.040)		(0.239)		(0.489)	
Fixed Effects	Birth Year									
Additional Controls	State Trends, Regional Measures for Occupation Shares (25-35), Returns to Education by Field and Gender (25-35)									
R-Squared	0.037		0.016		0.024		0.047		0.057	
# of observations	6,150,345		457,895		2,107,838		4,042,507		2,126,219	

Notes: Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.10

differences between men and women, however, come from increases in the differential tuition rates for Band 2 and Band 3 tuition. An increase in the tuition differential between Band 2 and Band 1 decreases the enrollment for both men and women, but the decrease is greater for men (-0.56) than for women (-0.20). An increase in the tuition differential between Band 3 and Band 1 increases enrollment overall but more so for men (0.34) than for women (0.11). Finally, national priority discounts increased the proportion of both men and women enrolling, but again, the percentage point increase is smaller for women than for men.

Over the entire time period, the coefficients on the other control variables suggest that enrollment is positively associated with living in Australia the longest, residing in higher-income regions, and most of the higher education policy changes.

In column 2, we report the results for the period when there was only a single tuition charged across all fields of study. Before any tuition differences by field of study, the results suggest there is a strong difference in the reaction to increased tuition by men and women. A $100 increase in Band 1 tuition led to a 1.7 percentage point increase in enrollment for men and a 2.5 percentage point increase for women. After controlling for the effect of tuition and other measures, we note the coefficient for the overall effect of being a woman on enrollment is negative and large.

In column 3, we study the period before 2005. This period captures both the pre-1997 single tuition period and the switch to multiple tuition rates (1997 to 2004). The effect of an increase in the base tuition remains positive for both men and women, with the effect being bigger for women (2.4 v. 2 percent). An increase in the differential in tuition between Band 2 and Band 1, however, is negative for men (-1.35) but positive for women (0.29). In contrast, an increase in the Band 3 versus Band 1 differential, has a positive effect for men (0.85) and a negative effect for women (-0.20). After controlling for tuition and other measures, the overall effect of being a woman on enrollment remains negative, but the effect is smaller than the effect when we only study the period before 1997.

Moving on to column 4, the period capturing 2005 onward, our regression results now include the per-student government subsidy measures. From 2005 to 2012, government subsidies were introduced and national priority tuition discounts were in place. From 2012 onward, the government moved to a demand-driven system for supporting domestic student enrollments. With the exception of the measure to capture Band 1 tuition and national priority discounts, women react more positively to increases in tuition than men. An increase in the base tuition (Band 1) is associated with a decrease in enrollment for men (-0.96) and an even more negative decrease in enrollment for women (-1.18). Increases in the Band 2 and Band 3 tuition differentials (relative to Band 1), however, increase overall enrollment with the greatest increase being observed for women. Moreover, after controlling for tuition and other measures, women are more likely to enroll than men by an average of 10 percent.

Overall, increasing the maximum level of government subsidies leads to increased enrollment for both men and women. As government subsidies are paid directly to universities, they are likely not factored into an individual's decision to enroll in a university. These subsidies could, however, affect the activities universities undertake in marketing to and recruiting potential students, as well as making decisions around admission standards that might affect the likelihood of a person enrolling in a university. But unless these activities are targeted to a specific gender, it seems reasonable to think the effect on overall enrollment would not differ by gender, and this is consistent with what we are finding.

Our final set of results covers the period 2012–2020 (column 5). We treat these results cautiously for two reasons. First, since 2012, tuition has increased modestly relative to other periods.[25]. Second as our sample ends in 2020, we have truncated information for several of the cohorts for this period. The coefficients, however, are broadly supportive of the conclusion that men and women react differently to changes in tuition.

Across all specifications, the results support a conclusion that men and women react differently to tuition changes, with evidence that is broadly supportive of a conclusion that increases in tuition lead to increased enrollment by women.

4 Effect of Tuition on Gender Differences in STEM Enrollment

In the previous section, we established there are heterogeneous effects of tuition on enrollment by gender. The evidence points to the importance of exploring further the link between tuition and gender gaps in university enrollments.

A common phenomenon, however, is that even with more women attending university, registration in STEM programs is disproportionately by men, presenting a second puzzle that may be influenced by tuition. Conditional on university attendance, men comprise a higher share of STEM registrants (Card and Payne, 2021). Gender differences in major choice persist over time: while women have made gains in traditionally male-dominated fields such as business and the life sciences, areas such as engineering and information technology remain heavily male-dominated (Sloane et al., 2020).[26] Even without conditioning on enrollment, men are overrepresented in the set of high-achieving students entering STEM fields (Chan et al., 2021).

Several explanations have been proposed for the lower female enrollment in STEM fields. Academic preparedness is one factor: Card and Payne (2021 and 2015) and Chan et al. (2021) show that the number of STEM-related high school courses taken predicts subsequent STEM enrollment,

[25]Using the information in Table 1, we calculate the coefficient of variation, defined as the standard deviation divided by the mean. The coefficient of variation is relatively low from 2012 onward (approximately 5 percent) compared with earlier periods (above 10 percent)

[26]The composition of programs classified as STEM can also affect the observed gender gap. Using Irish data, Delaney and Devereux (2019) find no gender gap in science, but substantial gaps in engineering and technology, with smaller gaps when nursing is included. Italian evidence (Barone and Assirelli, 2020) shows that women are overrepresented in lower-return fields such as social sciences and humanities, and underrepresented in high-return fields such as engineering and IT.

while Delaney and Devereux (2019) find that subject choice matters more than grades, although a residual gender gap persists even among STEM-ready students.

Preferences and tastes also play an important role. Kugler et al. (2021) document that of those students who receive low grades in STEM fields women are more likely than men to switch majors. Zafar (2013) demonstrates that enrollment differences are driven more by tastes than by beliefs about ability, and Kaganovich (2025) presents a theoretical model that suggests females with greater risk aversion reduces the likelihood of choosing majors with high grade variance, such as STEM. Using Swiss data, Combet (2023) finds that gendered preferences for reasoning styles and work-task affinities explain much of the difference in major choice.

Structural models also highlight the importance of costs: Gemici and Wiswall (2014) develop a dynamic overlapping generations model of human capital investments and show that tuition changes, even when uniform across fields, significantly shape gender differences. They find that men are more responsive to tuition increases, reflecting differences in tastes and field-specific skills: men are more likely to prefer lower levels of education, to have skills that are less specialized across fields, and to hold relatively higher endowments in lower-education occupations.

Finally, learning environments and role models matter. Calkins et al. (2023) emphasize the role of coeducational experiences, while Porter and Serra (2020) show that female faculty role models influence women's field choices. Other characteristics, such as cognitive abilities and socioeconomic background, may also contribute, although these are not directly observed in our data.

In line with the existing literature, the share of university women in Australia who enroll in a STEM program is less than the share of university men. We compare field of study registrations for enrolled students in Table 4. Although STEM technically refers to science, technology, engineering, and mathematics, there is debate over what fields should be treated as STEM. For this reason, for our analysis we have defined STEM using three categories:

STEM Science (Category 1): Natural & Physical Sciences (e.g., biology, physics, chemistry, earth sciences, forensic science, pharmacology), Engineering, Computing and Built Environment, Health Related Science (e.g., epidemiology, radiography, audiology), Agriculture (e.g., forestry sciences, horticulture, environmental studies), Mathematics & Statistics;

STEM Science + Health (Category 2): Adds to the previous category Medical Science and disciplines related to all facets of medicine, e.g., dental studies, veterinary studies, and nursing; and

STEM Science + Health + Business & Economics (Category 3): Adds to the previous category management, accounting, marketing, economics, and similar disciplines.

Using the sample of university registrants, Table 4 presents the share of women and men enrolled in each of the three STEM categories. The registration share of men (women) is defined as the number of men (women) registered in a specific STEM category divided by the total number of men (women) enrolled at the university. Across all years, regardless of the STEM category, a higher proportion of men enroll in STEM fields than women.

Table 4: Mean Share of Enrollment into STEM Fields,
By Period and Gender

	Men (1)	Women (2)	T-Statistic (3)	P-Value (4)
Stem Science (Band 2 only Fields)				
All Years	42.3%	20.7%	121.95	(0.00)
Before 1997	54.8%	33.1%	36.08	(0.00)
Before 2005	51.0%	28.4%	69.51	(0.00)
2005 Onward	37.9%	16.7%	101.81	(0.00)
2012 Onward	38.6%	18.0%	74.57	(0.00)
Stem Science + Health				
All Years	50.8%	39.4%	57.79	(0.00)
Before 1997	59.2%	45.7%	21.86	(0.00)
Before 2005	56.0%	41.4%	43.00	(0.00)
2005 Onward	48.1%	38.4%	40.35	(0.00)
2012 Onward	49.4%	40.9%	26.85	(0.00)
Stem Science + Health + Business & Economics				
All Years	71.3%	54.9%	85.68	(0.00)
Before 1997	78.6%	61.9%	29.55	(0.00)
Before 2005	76.9%	58.8%	56.85	(0.00)
2005 Onward	68.5%	53.0%	65.15	(0.00)
2012 Onward	69.0%	54.6%	46.59	(0.00)

Notes: Sample Period Covers Individuals Classified as Citizens by Age 20. Birth Years: 1974 to 2000. **Stem Science (Band 2 Only Fields)**:Natural & Physical Sciences (e.g. Biology, Physics, Chemistry, Earth Sciences, Forensic Science, Pharmacology), Engineering, Computing and Built Environment, Health Related Science (e.g. Epidemiology, Radiography, Audiology), Agriculture (e.g. Forestry Sciences, Horticulture, Environmental Studies), Mathematics & Statistics; **STEM Science + Health**: Adds Medical Science and disciplines related to all facets of medicine, Dental Studies, Veterinary Studies, and Nursing; STEM **Science + Health + Business & Economics:** Adds Management, Accounting, Marketing, Economics, and similar disciplines.

The gender gap in registration is 22 percentage points for STEM Science. This gap narrows to 11 percentage points when health disciplines are included as part of STEM, largely due to the inclusion of nursing. By contrast, the gap widens to 16 percentage points when Business & Economics are also included in the STEM grouping.

For each STEM category, we report the shares of registrants for the four periods used in our analysis. Enrollment shares for both men and women across all STEM categories have declined over the period. In the most recent period (2012 onward), there has been a modest increase in registration rates. Looking at the gender gap in registrations, there has been a modest decline in the gender gap for the STEM Science and STEM Science + Health + Business & Economics categories. The largest drop in the gender gap is for the STEM Science + Health category, a drop of five to six percentage points.

To what extent are the gender STEM registration gaps attributable to tuition increases? While discussed in more detail in the next section, if women are more likely to enroll in university when tuition increases, it stands to reason that we may also observe increases in STEM program enrollment with increases in tuition by women.

Table 5: Effect of Tuition on Enrollment in STEM Science (Band 2) Fields

Dependent Variable: Observed Enrolling in STEM in Given Year	All Years		Before 1997		Before 2005		2005 Onward		2012 Onward	
	All Students	*Woman Interaction	All Students	*Woman Interaction	All Students	*Woman Interaction	All Students	*Woman Interaction	All Students	*Woman Interaction
	(1a)	(1b)	(2a)	(2b)	(3a)	(3b)	(4a)	(4b)	(5a)	(5b)
Tuition Band 1 (Minimum) ($100s)	-0.023***	0.004***	0.009	-0.008	-0.007	-0.009	0.979***	-0.357*	0.299	0.059
	(0.006)	(0.001)	(0.012)	(0.009)	(0.010)	(0.006)	(0.346)	(0.208)	(0.526)	(0.162)
Tuition Band 2 Additional Tuition Above Band 1 ($100s)	0.961*	1.978***			0.733	-0.162	2.014***	-0.463	-0.334	-0.124
	(0.517)	(0.553)			(1.741)	(1.816)	(0.733)	(0.672)	(0.807)	(0.380)
Tuition Band 3 Additional Tuition Above Band 1 ($100s)	-0.581*	-1.261***			-0.452	0.106	-2.706***	0.836	-0.266	
	(0.329)	(0.352)			(1.104)	(1.157)	(0.792)	(0.573)	(1.050)	
Period of National Priority Discount (0/1)	-0.037***	-0.011***					0.022*	0.014		
	(0.005)	(0.004)					(0.013)	(0.012)		
Government Subsidies ($1000s)										
Maximum Government Subsidy Available for Any Field							-0.004***	0.004***	-0.005***	0.002***
							(0.0003)	(0.0004)	(0.0004)	(0.0004)
Minimum Government Subsidy Available for Any Field							0.064***	-0.028***	0.061***	-0.024***
							(0.0003)	(0.0004)	(0.0003)	(0.0005)
Student & Period Controls										
Enrollee is a Woman	-0.249***		0.090		0.068		-0.295***		-0.376***	
	(0.018)		(0.213)		(0.149)		(0.104)		(0.065)	
Observed with Health Card Between Birth and Age 10	-0.109***		-0.088***		-0.100***		-0.089***		-0.086***	
	(0.009)		(0.031)		(0.016)		(0.009)		(0.011)	
Observed with Health Card Between Ages 11 and 16	-0.029***		-0.028		-0.022		-0.020**		-0.022*	
	(0.010)		(0.032)		(0.017)		(0.010)		(0.013)	
Observed Region of Residence Near Time When in High School	-0.013***		-0.020***		-0.020***		-0.008***		-0.006**	
	(0.002)		(0.006)		(0.003)		(0.002)		(0.003)	
Regional Median Family Income (1000s)	-0.001***		-0.002**		-0.002***		-0.001***		-0.001***	
	(0.0001)		(0.001)		(0.0004)		(0.0001)		(0.0001)	
Post Introduction of Multiple Tuition Rates (1997+)	-0.469***				-0.233					
	(0.128)				(0.201)					
Period of Extra 10% Coverage of Domestic Students (2010-2011)	0.026***						-0.002			
	(0.006)						(0.006)			
Post Demand Driven Enrolment Policy (2012+)	0.096***						0.028**			
	(0.010)						(0.013)			
Post Freeze in Tuition (2017-2019)	0.019***						0.027***		-0.0001	
	(0.005)						(0.004)		(0.006)	
Period of 10% Discounts Given to Student for Paying Tuition Upfront	-0.049***						-0.035***		-0.003	
(2012 to 2017)	(0.005)						(0.008)		(0.010)	
ATAR Scores Used for Admission (Introduction Varies Across States)	-0.013**						0.016***		-0.046***	
	(0.005)						(0.005)		(0.016)	
Constant	-0.375***		-0.221***		-0.581***		-0.375***		-0.221***	
	(0.038)		(0.038)		(0.239)		(0.038)		(0.038)	
Fixed Effects	Birth Year									
Additional Controls	State Trends, Regional Measures for Occupation Shares (25-35), Returns to Education by Field and Gender (25-35)									
R-Squared	0.086		0.059		0.071		0.35		0.358	
# of observations	256443		25899		86393		170050		98864	

Notes: Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.10
Stem Science (Band 2 Only Fields): Natural & Physical Sciences (e.g. Biology, Physics, Chemistry, Earth Sciences, Forensic Science, Pharmacology), Engineering, Computing and Built Environment, Health Related Science (e.g. Epidemiology, Radiography, Audiology), Agriculture (e.g. Forestry Sciences, Horticulture, Environmental Studies), Mathematics & Statistics;

To investigate potential heterogeneous effects of tuition changes on STEM enrollment, Tables 5–7 report the results of regressions that mirror Eq.(1), and its modification in the post-2005 period to include the per student government subsidies.[27] These results differ from the previous section in three ways: (i) the sample is limited to university registrants, (ii) the dependent variable is a dummy equal to one if a student has initially registered in the STEM category under consideration and zero otherwise, and (iii) for later periods, the government subsidies variables correspond to the field in which the student registers.

4.1 STEM Science Regressions (Table 5)

Table 5 reports the results for the category we call STEM Science. One feature of this category is that the tuition for all of the fields treated as STEM is Band 2, noting discounts were provided for most of these fields between 2008 and 2012. In column 1 we report the results for the regressions that includes all years in the analysis. An increase in the base tuition (Band 1) results in a decreased STEM registration rate that is slightly less for women. There is, a noticeable increase in STEM registration for both genders as the Band 2 differential tuition increases. The average within birth cohort increase is 0.96 for men and 2.94 for women. These positive coefficients, however, are offset by negative coefficients for the Band 3 differential tuition rates (more for women) and during the period of national priority discounts.

Separating the analyses by period suggests that for most periods, there have been limited gender differences tied to tuition increases. Before 1997 (column 2) and before 2005 (column 3), the coefficients are not statistically significant for either gender. From 2005 onward (column 4), increases in Band 1 tuition have, on average, a positive effect on the proportion of STEM registration for both men and women, but a relatively smaller impact on STEM registration by women. Registrations by women show no additional response to changes in the Band 2 or Band 3 differentials, nor to the national priority discount, suggesting the effects of tuition on STEM registration are similar for both genders.

The coefficients on the government subsidies vary by gender. On average, an increase in the maximum subsidy rate has a negative effect for men and a zero effect for women. An increase in the minimum subsidy rate is positive for both genders but about fifty percent more positive for men (0.06) than for women (0.03). Given minimum subsidy rates are quite low these positive effects on STEM registration are very small.

4.2 STEM Science + Health Regressions (Table 6)

In Table 6 we report the results from the regressions whose dependent variable is based on the category of STEM we refer to as STEM Science + Health. As we observed in Table 4, participation in this STEM category by women is much higher than what we observe for the STEM Science

[27] As in Table 3, nominal tuition measures are used; results using real tuition measures are reported in the Appendix.

Table 6: Effect of Tuition on Enrollment in STEM Science (Band 2) + Health Fields

	All Years		Before 1997		Before 2005		2005 Onward		2012 Onward	
Dependent Variable: Observed Enrolling in STEM in Given Year	All Students	*Woman Interaction	All Students	*Woman Interaction	All Students	*Woman Interaction	All Students	*Woman Interaction	All Students	*Woman Interaction
	(1a)	(1b)	(2a)	(2b)	(3a)	(3b)	(4a)	(4b)	(5a)	(5b)
Tuition Band 1 (Minimum) ($100s)	-0.003	0.006***	-0.027**	0.019**	-0.018*	0.005	1.253***	0.096	0.820*	0.160
	(0.006)	(0.001)	(0.012)	(0.009)	(0.010)	(0.006)	(0.309)	(0.182)	(0.460)	(0.141)
Tuition Band 2 Additional Tuition Above Band 1 ($100s)	0.519	2.638***			-1.726	2.598	1.438**	0.283	0.331	-0.376
	(0.545)	(0.607)			(1.764)	(1.867)	(0.645)	(0.590)	(0.687)	(0.330)
Tuition Band 3 Additional Tuition Above Band 1 ($100s)	-0.328	-1.681***			1.074	-1.657	-2.768***	-0.325	-1.481	
	(0.347)	(0.386)			(1.119)	(1.190)	(0.701)	(0.502)	(0.908)	
Period of National Priority Discount (0/1)	-0.031***	-0.010**					0.033***	-0.002		
	(0.006)	(0.005)					(0.011)	(0.010)		
Government Subsidies ($1000s)										
Maximum Government Subsidy Available for Any Field							0.037***	0.020***	0.035***	0.018***
							(0.0002)	(0.0003)	(0.0003)	(0.0004)
Minimum Government Subsidy Available for Any Field							0.039***	-0.019***	0.037***	-0.016***
							(0.0003)	(0.0004)	(0.0004)	(0.0005)
Student & Period Controls										
Enrollee is a Woman	-0.239***		-0.561***		-0.235		-0.159*		-0.239***	
	(0.019)		(0.214)		(0.152)		(0.091)		(0.057)	
Observed with Health Card Between Birth and Age 10	-0.112***		-0.089***		-0.094***		-0.098***		-0.089***	
	(0.010)		(0.031)		(0.016)		(0.007)		(0.009)	
Observed with Health Card Between Ages 11 and 16	-0.032***		-0.031		-0.025		-0.020**		-0.016	
	(0.011)		(0.032)		(0.018)		(0.008)		(0.010)	
Observed Region of Residence Near Time When in High School	0.001		-0.017***		-0.017***		0.015***		0.016***	
	(0.002)		(0.006)		(0.004)		(0.002)		(0.003)	
Regional Median Family Income (1000s)	-0.0003**		-0.004***		-0.002***		-0.001***		-0.001***	
	(0.0001)		(0.001)		(0.0004)		(0.0001)		(0.0001)	
Post Introduction of Multiple Tuition Rates (1997+)	-0.023				0.684***					
	(0.133)				(0.211)					
Period of Extra 10% Coverage of Domestic Students (2010-2011)	0.038***						-0.003			
	(0.007)						(0.005)			
Post Demand Driven Enrolment Policy (2012+)	0.092***						0.028**			
	(0.011)						(0.012)			
Post Freeze in Tuition (2017-2019)	0.010*						0.024***		0.00001	
	(0.006)						(0.004)		(0.005)	
Period of 10% Discounts Given to Student for Paying Tuition Upfront	-0.036***						-0.019**		0.008	
(2012 to 2017)	(0.006)						(0.007)		(0.009)	
ATAR Scores Used for Admission (Introduction Varies Across States)	-0.042***						0.0005		-0.053***	
	(0.006)						(0.004)		(0.014)	
Constant	-0.375***		-0.221***		-0.581***		-0.375***		-0.221***	
	(0.038)		(0.038)		(0.239)		(0.038)		(0.038)	
Fixed Effects	Birth Year									
Additional Controls	State Trends, Regional Measures for Occupation Shares (25-35), Returns to Education by Field and Gender (25-35)									
R-Squared	0.027		0.026		0.033		0.61		0.627	
# of observations	256443		25899		86393		170050		98864	

Notes: Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.10
Stem Science + Health: Natural & Physical Sciences (e.g. Biology, Physics, Chemistry, Earth Sciences, Forensic Science, Pharmacology), Engineering, Computing and Built Environment, Health Related Science (e.g. Epidemiology, Radiography, Audiology), Agriculture (e.g. Forestry Sciences, Horticulture, Environmental Studies), Mathematics & Statistics;Medical Science and disciplines related to all facets of medicine, Dental Studies, Veterinary Studies, and Nursing;

category, by approximately 19 percentage points. Focusing first on the analysis for the entire period (column 1), the effect of tuition on registration for women is significantly different from the effect for men. Overall, however, the effect of an increase in the base tuition (Band 1) on STEM registration is very modest. Any positive effect of tuition on STEM registration is driven by the Band 2 tuition differential but this effect is mitigated by a negative coefficient on the Band 3 tuition differential. The positive effect of an increase in the Band 2 tuition differential on registration is more positive for women (2.6 v. 1.0) but an increase in the Band 3 tuition differential is more negative for women (-1.7 v. -0.7).

For the two periods before 2005, an increase in Band 1 tuition reduced STEM registration for both men and women. Before 1997, the reduction was smaller for women, as indicated by the positive and significant coefficient on the interaction term (column 2b). Before 2005, there was no differential effect for women, yielding an equal decrease for enrollments by both genders (column 3b). After 2005 (column 4), increases in Band 1 tuition, the Band 2 differential, and the national priority discount increased STEM registration for both men and women, with no significant differential effect for women (column 4b). Conversely, increases in the Band 3 differential reduced registration for both genders, again without gender differences. Responses to government subsidies remain heterogeneous: STEM registration by men is positive and stronger for minimum subsidies, whereas the registration by women is positive and more strongly to maximum subsidies. These patterns persist beyond 2012.

4.3 STEM Science + Health + Business & Economics (Table 7)

In Table 7 we report the results from the regressions whose dependent variable is based on the category of STEM we refer to as STEM Science + Health + Business Economics. As reported in Table 4, adding registrations in business and economics fields widens the gender registration gap, relative to the STEM Science + Health. The results reported in Column 1 (all years) are more closely aligned with the results reported for the specifications in Table 5, STEM Science. Overall, there are differential reactions to increases in tuition and tuition differentials by gender, with evidence that increasing the Band 2 tuition differential is associated with a greater increase in registration by women. This result is tempered by the negative coefficient for the Band 3 tuition differential measure.

Across the periods (columns 2 to 5) the coefficients for the interaction terms for women on the tuition measures are mostly imprecisely measured, suggesting that for this broadest group of STEM fields, there has been a limited effect on reducing the gender gap in STEM registrations. The responses to government subsidies remain heterogeneous: women's registrations respond positively to maximum subsidies, while men's registrations respond negatively. Registrations by both genders respond positively to minimum subsidies.

Taken together, Tables 5–7 reveal a consistent pattern: women respond more strongly to tuition increases in STEM registration than men, if we focus on the thirty year period. An increase in

Table 7: Effect of Tuition on Enrollment in STEM Science (Band 2) + Health + Business & Economics Fields

Dependent Variable: Observed Enrolling in STEM in Given Year	All Years		Before 1997		Before 2005		2005 Onward		2012 Onward	
	All Students (1a)	*Woman Interaction (1b)	All Students (2a)	*Woman Interaction (2b)	All Students (3a)	*Woman Interaction (3b)	All Students (4a)	*Woman Interaction (4b)	All Students (5a)	*Woman Interaction (5b)
Tuition Band 1 (Minimum) ($100s)	-0.005	0.006***	-0.021**	0.014*	-0.009	-0.0001	0.779*	0.456*	1.259*	0.216
	(0.005)	(0.001)	(0.011)	(0.008)	(0.009)	(0.006)	(0.447)	(0.265)	(0.700)	(0.209)
Tuition Band 2 Additional Tuition Above Band 1 ($100s)	1.045**	1.552***			-2.796*	0.607	2.018**	0.505	1.515	-0.508
	(0.508)	(0.581)			(1.561)	(1.709)	(0.917)	(0.874)	(0.999)	(0.489)
Tuition Band 3 Additional Tuition Above Band 1 ($100s)	-0.660**	-0.991***			1.764*	-0.388	-2.420**	-1.002	-2.872**	
	(0.323)	(0.370)			(0.989)	(1.089)	(1.011)	(0.741)	(1.368)	
Period of National Priority Discount (0/1)	-0.024***	-0.014***					0.016	0.009		
	(0.005)	(0.004)					(0.016)	(0.015)		
Government Subsidies ($1000s)										
Maximum Government Subsidy Available for Any Field							-0.016***	0.031***	-0.013***	0.028***
							(0.0004)	(0.001)	(0.0004)	(0.001)
Minimum Government Subsidy Available for Any Field							0.034***	-0.020***	0.031***	-0.016***
							(0.0004)	(0.001)	(0.001)	(0.001)
Student & Period Controls										
Enrollee is a Woman	-0.328***		-0.507***		-0.170		-0.426***		-0.373***	
	(0.018)		(0.191)		(0.138)		(0.133)		(0.085)	
Observed with Health Card Between Birth and Age 10	-0.170***		-0.158***		-0.175***		-0.154***		-0.130***	
	(0.008)		(0.024)		(0.013)		(0.010)		(0.013)	
Observed with Health Card Between Ages 11 and 16	-0.044***		-0.077***		-0.062***		-0.027**		-0.018	
	(0.009)		(0.025)		(0.014)		(0.011)		(0.014)	
Observed Region of Residence Near Time When in High School	0.027***		0.009		0.015***		0.035***		0.035***	
	(0.002)		(0.006)		(0.003)		(0.003)		(0.004)	
Regional Median Family Income (1000s)	-0.001***		-0.003***		-0.002***		-0.001***		-0.001***	
	(0.0001)		(0.001)		(0.0004)		(0.0001)		(0.0002)	
Post Introduction of Multiple Tuition Rates (1997+)	-0.069				0.414**					
	(0.123)				(0.198)					
Period of Extra 10% Coverage of Domestic Students (2010-2011)	0.020***						0.001			
	(0.007)						(0.008)			
Post Demand Driven Enrolment Policy (2012+)	0.081***						0.035**			
	(0.011)						(0.018)			
Post Freeze in Tuition (2017-2019)	0.009						0.014***		-0.00004	
	(0.006)						(0.006)		(0.007)	
Period of 10% Discounts Given to Student for Paying Tuition Upfront	-0.038***						-0.018*		0.007	
(2012 to 2017)	(0.006)						(0.011)		(0.013)	
ATAR Scores Used for Admission (Introduction Varies Across States)	-0.031***						-0.001		-0.054**	
	(0.006)						(0.007)		(0.021)	
Constant	-0.375***		-0.221***		-0.581***		-0.375***		-0.221***	
	(0.038)		(0.038)		(0.239)		(0.038)		(0.038)	
Fixed Effects	Birth Year									
Additional Controls	State Trends, Regional Measures for Occupation Shares (25-35), Returns to Education by Field and Gender (25-35)									
R-Squared	0.043		0.045		0.051		0.109		0.116	
# of observations	256443		25899		86393		170050		98864	

Notes: Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.10
Stem Science + Health + Business & Economics: Natural & Physical Sciences (e.g. Biology, Physics, Chemistry, Earth Sciences, Forensic Science, Pharmacology), Engineering, Computing and Built Environment, Health Related Science (e.g. Epidemiology, Radiography, Audiology), Agriculture (e.g. Forestry Sciences, Horticulture, Environmental Studies), Mathematics & Statistics;Medical Science and disciplines related to all facets of medicine, Dental Studies, Veterinary Studies, and Nursing; Management, Accounting, Marketing, Economics, and similar disciplines.

the Band 2 tuition differential is associated with a increased STEM registrations by both men and women but it the average increase is greater for women. These effects are tempered by the negative coefficients on the Band 3 tuition differential measures. Our finding that women's STEM program enrollments are more responsive than men's using national Australian individual-level administrative data generalizes results from prior research for Australia focused on a single state..[28]

More importantly, however, the results are not robust for the specifications that separte the observations into the four periods. Many of the coefficients on the tuition measures are imprecisely measured and any differential effect on women is more muted. If one focuses on the analyses that study the period 2005 onward, increasing tuition has an overall positive effect on STEM registrations. The effect of an increase on STEM registions for women, however, is negative for STEM Science, not precisely measured for the STEM Science + Health, and marginally more positive (p-value ¡0.10) for STEM Science + Health + Business & Economics.

5 Potential Mechanisms Behind Gendered Tuition Responses

We have shown that over the past 30 years, women in Australia have enrolled in university at higher rates than men. Conditional on enrolling, registration rates for women in STEM programs continue to lag behind the registration rates for men. Moreover, university enrollment is tied to changing tuition but tuition has a more positive effect on enrollment for women. The relationship between tuition and registration into STEM programs is weaker, especially as it relates to explaining the differential between women and men in choosing a STEM program.

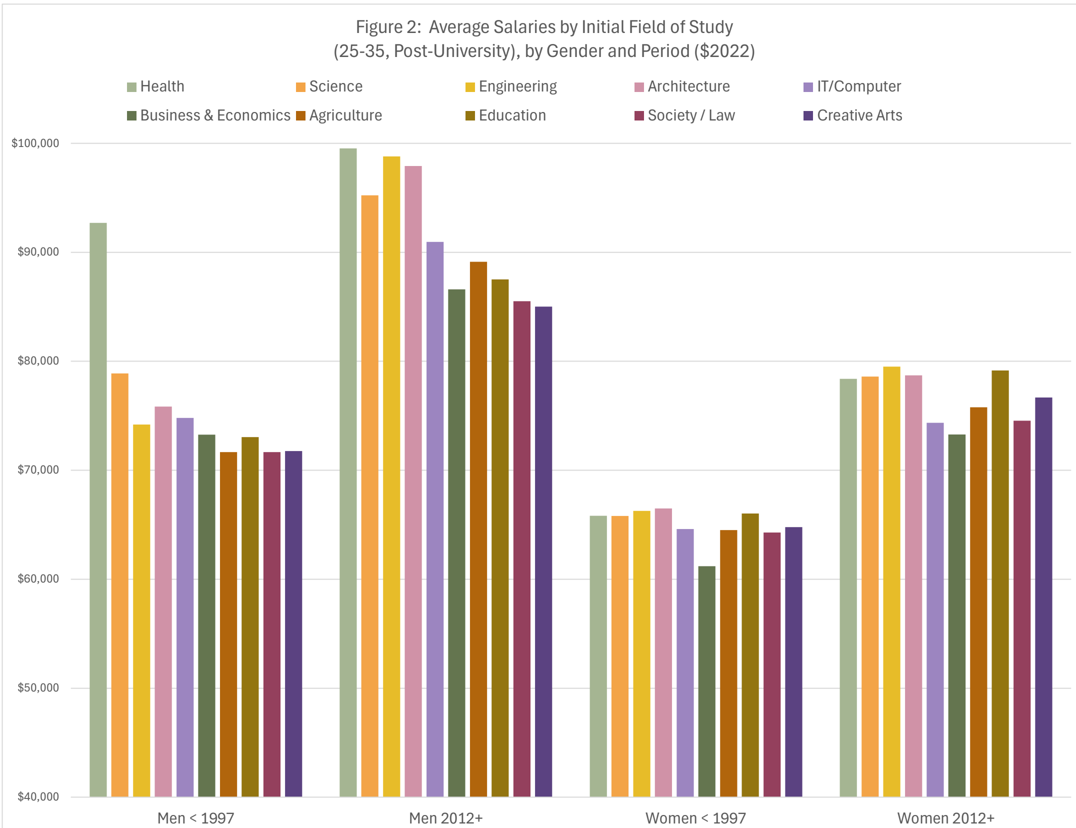
The differences in the relationship between gendered responses for enrollment and for STEM registration to tuition changes likely reflect a complex interplay of factors, including underlying skills and preferences, expectations of returns, institutional and policy design, and heterogeneous risk attitudes. In this section, we posit potential explanations for our results.

One potential explanation for these gendered enrollment responses lies in differences in expected returns to education. If women and men hold distinct beliefs about future earnings or career trajectories, tuition may affect them asymmetrically by altering perceived costs and benefits. Tuition may also signal expected labor market returns, further amplifying gender-specific responses. Prior research highlights these mechanisms, including Arcidiacono (2004), who examines self-selection across majors based on expected wages, and Wiswall and Zafar (2015), who document gender differences in beliefs about returns to college majors. Galos and Strauss (2023) document that a rising female motivation to earn high incomes increased women's participation in female-atypical fields between 1984 and 2015 in Germany.

To explore this potential driver of heterogeneous enrollment responses by gender, Figure 2

[28] Using state-level administrative data from one Australian state, Yong et al. (2023) show that women's enrollment is roughly twice as responsive to tuition changes as men's, and suggest that women's decisions may be particularly influenced by institutional marketing and pricing strategies.

depicts average regional salaries (real $2022) for individuals aged 25–35, disaggregated by gender and field of study and for the period before 1997 and for the period after 2012. The chosen age range corresponds to the years shortly after completing a bachelor's degree, as most Australian students begin university between ages 17 and 19 (see Figure 1), and programs typically last three to four years.[29] The fields are ordered first by their classification within the three STEM categories, followed by the non-STEM fields: Education, Society/Law, and Creative Arts.



We group salaries by gender to highlight differences across fields within each gender. Prior to 1997, average regional salaries for men in the STEM science fields exceeded $70,000, while those in the health field earned over $90,000. In contrast, average salaries in non-STEM fields were closer to $70,000. Post 2012, there are clear differences in the average salaries for most of the STEM fields relative to the non-STEM fields. Moreover for many of the STEM fields, the real salary growth between the two periods is well over 20 percent. Thus, for men, Figure 2 provides suggestive evidence that there may be a bigger premium for men to enroll in most STEM fields compared with non-STEM fields.

Figure 2 suggests a different story for women. For both periods, there is much less variation in

[29] Salaries are calculated by identifying the top occupations for each field of study and weighting the observed average salaries. They represent annual salaries and are not adjusted for hours worked. To approximate full-time earnings, the sample is restricted to individuals earning above the annual minimum wage.

salaries across the STEM and non-STEM fields. Moreover, the growth in real salaries between the two periods is more modest, at less than 20 percent. Within each field, men consistently earn more than women, with the gender earnings gap widening over time: over \$10,000 for most STEM fields before 1997 and between \$15,000 and \$20,000 for most STEM fields after 2012.

It is important to note that Figure 2 is based on reported annual earnings. While we restrict the analysis of earnings exceeding the annual earnings if working at minimum wage, we cannot restrict the analysis to full time wage earners. If women are more likely to work part time than men (even in high earning jobs), the differences in earnings depicted in Figure 2 would reflect this difference. Even if women are more likely to work part time, however, if women expect to work part time, there may be less of an incentive to enroll in a STEM program.

A second explanation for the differential responses of men and women to changes in tuition is that men in Australia face a broader set of educational and labor market alternatives than women. Blue-collar occupations, particularly in construction, mining, and technical trades, remain relatively well-paid and largely male-dominated. To explore this explanation we obtained data on enrollment in government funded vocational education and training programs Vocational education programs in Australia. The format of the data is such that we only observe the enrollment statistics for these vocational programs by year and age range. For individuals under the age of 25, across the sample period, the share of males enrolled in the vocational programs ranges between approximately 55 and 62 percent, suggesting we are more likely to observe men in a vocational program than in a university.[30] Thus, a reason for men not to pursue a university degree could be attributable to believes that vocational programs offer a viable and financially attractive alternative to university. Historically, these pathways have been less accessible to women due to cultural norms, occupational segregation, and lower female representation in these sectors that employ graduates of vocational programs (see, e.g., Dumbrell et al. 2000; Long and Shah, 2008; Norton, 2019).

To better understand those not observed in university and potential gender differences in the labor market attachment, selected occupations and earnings by age 23, we use the ALife data to capture tax filers not observed enrolled in university by age 23. We further refine this sample using our measure of citizenship or permanent residency, namely possessing a health card by age 20.

In Table 8 we provide a series of statistics and test for significant differences by gender for the four periods we use to study university enrollment. We start first with Panel A, statistics are reported for individuals aged between 19 and 23. We group the individuals based on a proxy for working full time, working part time, or reporting no earnings. We classify an individual as working full time if earnings exceed expected annual earnings if receiving a minimum wage for at least one year.

If we observe positive earnings below the minimum wage, we classify the individual as having worked part-time. Individuals with no observed earnings are classified as “not observed with labor

[30] Statistics are calculated using the *Historical Time Series of Government-Funded Vocational Education and Training in Australia, 1981–2023* (National Centre for Vocational Education Research, NCVER).

Table 8: Activities, Occupations, and Earnings for Non-University Students, 19-23, By Gender

	Pre 1997			Pre 2005			2005 Onward			2012 Onward		
	Men	Women	Significance of Difference	Men	Women	Significance of Difference	Men	Women	Significance of Difference	Men	Women	Significance of Difference
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Panel A: Individuals not in University by Age 23, by Earnings Group												
Working (~Full Time): Salary Exceeds Annual Salary at Minimum Wage for at Least 1 Year Between 19 and 23	50.6%	47.6%	***	47.5%	43.0%	***	41.3%	35.2%	***	38.1%	31.7%	***
Working (Part-Time): Between 19 and 23	21.0%	21.5%	***	21.5%	21.0%	***	21.1%	18.4%	***	20.7%	18.0%	***
Not Observed with Labor Earnings: Between 19 and 23	5.9%	5.5%	***	6.8%	5.0%	***	5.5%	2.5%	***	4.9%	1.6%	***
Average Salary for Workers (excludes part-time)	$55,076	$49,233	***	$57,181	$50,880	***	$65,509	$55,397	***	$67,221	$56,379	***
Number of Observations for Non-Students	32,281	24,310		151,179	110,496		277,483	170,463		162,921	93,670	
Panel B: Share of those Working (~Full Time) by Last Known Occupation												
Technicians / Trades	23.6%	4.5%	***	30.7%	6.0%	***	38.4%	8.5%	***	40.3%	9.0%	***
Machinery / Drivers	1.4%	0.1%	***	5.1%	0.5%	***	9.2%	1.5%	***	9.3%	1.9%	***
Laborers	4.7%	1.6%	***	10.7%	3.3%	***	17.9%	4.9%	***	17.9%	5.4%	***
Sales	0.9%	1.7%	***	5.2%	9.5%	***	8.0%	16.4%	***	7.8%	17.0%	***
Community / Personal Services	1.4%	3.4%	***	3.6%	9.1%	***	7.9%	20.1%	***	8.9%	22.6%	***
Clerical / Administrative	1.5%	5.7%	***	3.5%	21.1%	***	5.9%	28.8%	***	5.3%	25.7%	***
Managers	3.3%	1.4%	***	4.8%	3.7%	***	6.1%	9.1%	***	5.1%	9.3%	***
Professional	2.3%	4.8%	***	4.1%	7.3%	***	4.9%	8.8%	***	4.2%	8.0%	***
Unknown	60.9%	76.8%	***	32.2%	39.5%	***	1.7%	1.8%	***	1.1%	1.0%	***
Panel C: Average Highest Salary for Working (~Full Time) by Last Known Occupation												
Technicians / Trades	$55,959	$45,635	***	$58,260	$48,049	***	$68,882	$53,731	***	$70,837	$55,339	***
Machinery / Drivers	$62,159	$51,071	*	$60,192	$54,863	***	$70,943	$69,269	*	$72,780	$71,288	
Laborers	$53,315	$46,265	***	$56,141	$48,441	***	$63,215	$54,495	***	$64,860	$56,347	***
Sales	$53,633	$45,997	***	$54,385	$48,737	***	$56,172	$51,744	***	$56,267	$52,707	***
Community / Personal Services	$61,803	$49,507	***	$57,845	$48,980	***	$63,523	$52,381	***	$65,076	$53,174	***
Clerical / Administrative	$54,704	$50,643	***	$55,771	$52,591	***	$58,711	$56,169	***	$60,087	$57,571	***
Managers	$63,138	$57,612	***	$63,697	$57,920	***	$65,596	$59,216	***	$66,294	$59,375	***
Professional	$57,798	$56,946		$62,204	$57,946	***	$67,128	$61,873	***	$68,430	$63,039	***
Unknown	$54,029	$48,826	***	$54,934	$49,537	***	$55,647	$57,475	***	$55,627	$60,528	***

Notes: The sample covers individuals born between 1972 and 1997 who are in possession of a health card by the age of 19. This sample covers those who we can observe between the ages of 19 and 23. Individuals are classified based on enrolling in university by age 23. If the individual has not enrolled then we group the students based on the maximum earnings observed and the most recent occupation observed. The analysis year reflects the year when the individual is 23. Thus, given the first year of study is 1991, the first cohort we can study are those who are 23 in 1995. The test of equality between men and women are as follows *** p<0.001; ** p<0.01; * p<0.1.

earnings." This classification differs from a NEET (not in employment, education or training) rate, as some may be enrolled in educational or training programs. Among these groups, men are more likely than women to work full-time. The omitted category in Panel A are individuals observed in a university for at least one year. Across the four periods, the share of men classified as working full-time rises by three to six percentage points. Conditional on working full-time for at least one year, average maximum earnings are greatest for men. The gap between men and women in average earnings has increased over the sample period. Men earn more than women with an average gender earnings gap of $8,275 over all years. This gap has widened over time, from $5,843 before 1997 to $10,842 in the years after 2012, indicating that men continue to earn more than women regardless of university participation.

Panel B presents the occupational distribution for those individuals working full-time who have not been observed attending university.[31] Men in this group are disproportionately employed in trade and technical professions, which account for an average of 33.3 percent across all years, while women are primarily employed in clerical and administrative roles, averaging 20.3 percent across all years.

Panel C reports the average highest salary from the last known occupation for full-time non-university attending individuals. Comparing these salaries to those of university attendees entering the labor market (ages 25–35) and non-attendees (ages 19–23) reveals notable differences. The lowest salary (depicted in Figure 2) for a university attendee is approximately $64,565 for men and $59,540 for women, while the highest salary for a non-university attending individual is around $67,640 for men and $64,028 for women.[32] These findings support the hypothesis that VET in Australia represents a financially attractive alternative to university, particularly for men.

A third explanation for gender gaps in enrollment and heterogeneous responsiveness to tuition changes by gender is the structure of the Australian higher education financing system. The income-contingent loan design interacts with gendered labor market outcomes, producing heterogeneous enrollment effects. Using census data, Chapman and Khemka (2022) show that perceived tuition burdens diverge from actual economic costs, as repayments are income-based. Given that expected returns to men are higher, particularly in core STEM areas, men may have a stronger financial incentive to pursue these fields. Given there is less variation in women's earnings, if women are more sensitive to perceived costs associated with attending university, while they are more likely to enroll, they may be more likely to select a lower tuition field of study.

Gendered differences in preferences and framing further shape responses to income-contingent loans. Abraham et al. (2020) conduct a survey experiment in which students decide whether to take up an income-contingent loan under two framings: one emphasizing cost, the other emphasizing insurance. The insurance frame increases take-up substantially, particularly among women and

[31]The occupation codes in the ALife dataset have more missing values in earlier periods, which explains the higher share of "unknown" occupations during those years. These statistics should therefore be interpreted with caution.

[32]We compare the lowest salary of university attendees with the highest salary of non-university attending individuals as proxies for individuals at the margin of the decision to attend university.

students expecting lower earnings, whereas effects are smaller for STEM students. This suggests that perceptions of financial risk and security influence enrollment decisions in systematic, gendered ways. Further differences in risk preferences by gender could also play a role. Murto (2024) develops a theoretical model of income-contingent loans in the U.S., showing that with non-constant relative risk aversion, tuition levels can affect field-of-study choices. Gender differences in risk aversion could therefore translate into differentiated enrollment responses. Supporting this conjecture that the form of the student loan system could impact enrollment responses by gender, Hampole (2024) finds that replacing loans with grants at 22 U.S. universities changes students' major choices, with effects varying by gender.

In sum, gender gaps in university enrollment and gender differences in enrollment responsiveness to tuition reflect a combination of factors. Differences in expected returns, labor market opportunities, and perceptions of financial risk interact with field-specific earnings patterns and the design of income-contingent loans to produce systematically different incentives for men and women. Men's greater access to well-paid non-university pathways and higher expected returns in STEM fields impacts their responsiveness to tuition changes, while women's comparatively lower earnings dispersion, stronger sensitivity to perceived costs, and higher risk aversion shape distinct enrollment patterns. Together, these mechanisms may explain why women dominate overall university participation but remain underrepresented in certain fields, particularly STEM, and why their enrollment decisions are more sensitive to financial considerations.

6 Concluding Remarks

This paper examines the effect of changes in regulated tuition on the gender gap for university enrollment (more women than men) and the gender gap in STEM registration in university (more men than women). Leveraging a unique individual-level administrative dataset spanning three decades, we documented persistent yet evolving gender gaps in participation and responsiveness in university participation to tuition reforms. Women consistently enrolled at higher rates than men, with the gender gap widening over time. Regression results highlight that women are more likely to enroll in university than men when tuition increases.

Our analysis shows that men continue to dominate registration in STEM programs, though the extent of the gender gap depends on which fields are included in the definition of STEM. Including health fields decreases the gap, whereas greater gaps are observed in science and business-oriented fields.

Our exploration of mechanisms suggests that these gender differences reflect a combination of labor market incentives and behavioral responses. Men's higher expected returns in STEM and greater access to well-paid non-university pathways contribute to their patterns of enrollment, while women's heightened sensitivity to costs, lower earnings dispersion, and greater risk aversion amplify their responsiveness to tuition policy.

Overall, the findings demonstrate that tuition policy is not gender neutral. Tuition policy interacts with structural labor market inequalities and behavioral differences to shape enrollment outcomes. For policymakers, this highlights the importance of considering gender-specific incentives when designing tuition structures and subsidies. These insights are particularly salient with respect to efforts to promote a more gendered balance with respect to the pursuit of STEM programs.

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Appendix Tables

Appendix Table 1: Effect of Real Tuition on Enrollment by Gender

	All Years		Before 1997		Before 2005		2005 Onward		2012 Onward	
	All Students	*Woman Interaction	All Students	*Woman Interaction	All Students	*Woman Interaction	All Students	*Woman Interaction	All Students	*Woman Interaction
Dependent Variable: Observed Enrolling for Given Year	(1a)	(1b)	(2a)	(2b)	(3a)	(3b)	(4a)	(4b)	(5a)	(5b)
Tuition Band 1 (Minimum) ($100s)	0.008***	0.001***	0.005***	0.003***	0.008***	0.002***	0.074***	-0.071***	-3.441***	-0.142***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.023)	(0.018)	(0.383)	(0.027)
Tuition Band 2 Additional Tuition Above Band 1 ($100s)	-0.353***	0.242***			-0.150***	0.090	0.879***	0.179**	0.582***	0.137***
	(0.023)	(0.035)			(0.055)	(0.068)	(0.064)	(0.074)	(0.081)	(0.049)
Tuition Band 3 Additional Tuition Above Band 1 ($100s)	0.213***	-0.154***			0.086**	-0.058	-0.678***	-0.009	-3.408***	
	(0.015)	(0.022)			(0.035)	(0.043)	(0.064)	(0.055)	(0.270)	
Period of National Priority Discount (0/1)	0.009***	-0.006***					-0.019***	-0.009***		
	(0.000)	(0.000)					(0.001)	(0.002)		
Government Subsidies ($1000s)										
Maximum Government Subsidy Available for Any Field ()							0.113***	-0.079***	14.948***	
							(0.013)	(0.017)	(1.330)	
Minimum Government Subsidy Available for Any Field ()							-1.257***	0.833***	3.132	2.707***
							(0.141)	(0.178)	(2.237)	(0.312)
Student & Period Controls										
Individual is a Woman	-0.064***		-0.157***		-0.095***		0.126***		-0.373***	
	(0.003)		(0.022)		(0.014)		(0.046)		(0.061)	
Observed with Health Card Between Birth and Age 10	0.023***		0.033***		0.017***		0.023***		0.024***	
	(0.000)		(0.002)		(0.001)		(0.001)		(0.001)	
Observed with Health Card Between Ages 11 and 16	0.024***		0.042***		0.025***		0.020***		0.019***	
	(0.001)		(0.003)		(0.001)		(0.001)		(0.001)	
Observed Region of Residence Near Time When in High School	0.011***		-0.015***		-0.001***		0.018***		0.020***	
	(0.000)		(0.001)		(0.000)		(0.000)		(0.000)	
Regional Median Family Income (1000s)	0.000***		0.001***		0.001***		0.000***		0.000***	
	(0.000)		(0.000)		(0.000)		(0.000)		(0.000)	
Post Introduction of Multiple Tuition Rates (1997+)	0.372***				0.266***					
	(0.011)				(0.017)					
Period of Extra 10% Coverage of Domestic Students (2010-2011)	0.006***						0.012***			
	(0.000)						(0.001)			
Post Demand Driven Enrolment Policy (2012+)	-0.003***						0.042***			
	(0.001)						(0.002)			
Post Freeze in Tuition (2017-2019)	0.009***						0.008***		-0.004***	
	(0.000)						(0.000)		(0.002)	
Period of 10% Discounts Given to Student for Paying Tuition Upfront	0.016***						-0.003***		0.008***	
(2012 to 2017)	(0.000)						(0.001)		(0.003)	
ATAR Scores Used for Admission (Introduction Varies Across States)	0.004***						0.004***		0.002**	
	(0.000)						(0.000)		(0.001)	
Constant	-0.221***		-0.220***		-0.289***		-0.581***		0.141	
	(0.038)		(0.043)		(0.040)		(0.239)		(0.489)	
Fixed Effects	Birth Year									
Additional Controls	State Trends, Regional Measures for Occupation Shares (25-35), Returns to Education by Field and Gender (25-35)									
R-Squared	0.037		0.016		0.024		0.047		0.057	
# of observations	6,150,345		457,895		2,107,838		4,042,507		2,126,219	

Notes: Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.10

Appendix Table 2: Effect of Real Tuition on Enrollment in STEM Science (Band 2) Fields

Dependent Variable: Observed Enrolling in STEM in Given Year	All Years		Before 1997		Before 2005		2005 Onward		2012 Onward	
	All Students	*Woman Interaction	All Students	*Woman Interaction	All Students	*Woman Interaction	All Students	*Woman Interaction	All Students	*Woman Interaction
	(1a)	(1b)	(2a)	(2b)	(3a)	(3b)	(4a)	(4b)	(5a)	(5b)
Tuition Band 1 (Minimum) ($100s)	-0.004	0.005***	-0.006	0.005	-0.005	0.004	0.565***	-0.144	0.033	-0.121
	(0.004)	(0.001)	(0.005)	(0.007)	(0.004)	(0.004)	(0.213)	(0.102)	(0.384)	(0.126)
Tuition Band 2 Additional Tuition Above Band 1 ($100s)	0.689*	1.308***			-0.880	1.008	0.420	-0.212	-0.278	0.281
	(0.367)	(0.397)			(0.851)	(0.855)	(0.628)	(0.539)	(0.653)	(0.294)
Tuition Band 3 Additional Tuition Above Band 1 ($100s)	-0.437*	-0.834***			0.566	-0.643	-1.088*	0.338	0.102	
	(0.233)	(0.252)			(0.542)	(0.543)	(0.629)	(0.424)	(0.915)	
Period of National Priority Discount (0/1)	-0.030***	-0.020***					0.031***	-0.020**		
	(0.005)	(0.005)					(0.009)	(0.010)		
Government Subsidies ($1000s)										
Maximum Government Subsidy Available for Any Field							-0.003***	0.003***	-0.004***	0.002***
							(0.000)	(0.000)	(0.000)	(0.000)
Minimum Government Subsidy Available for Any Field							0.052***	-0.023***	0.053***	-0.021***
							(0.000)	(0.000)	(0.000)	(0.000)
Student & Period Controls										
Enrollee is a Woman	-0.371***		-0.327		-0.322*		0.539**		0.093	
	(0.040)		(0.305)		(0.172)		(0.213)		(0.369)	
Observed with Health Card Between Birth and Age 10	-0.109***		-0.088***		-0.100***		-0.089***		-0.086***	
	(0.009)		(0.031)		(0.016)		(0.009)		(0.011)	
Observed with Health Card Between Ages 11 and 16	-0.029***		-0.027		-0.021		-0.020**		-0.023*	
	(0.010)		(0.032)		(0.017)		(0.010)		(0.013)	
Observed Region of Residence Near Time When in High School	-0.012***		-0.020***		-0.020***		-0.008***		-0.007**	
	(0.002)		(0.006)		(0.003)		(0.002)		(0.003)	
Regional Median Family Income (1000s)	-0.001***		-0.002**		-0.002***		-0.001***		-0.001***	
	(0.000)		(0.001)		(0.000)		(0.000)		(0.000)	
Post Introduction of Multiple Tuition Rates (1997+)	-0.012				-0.172					
	(0.174)				(0.229)					
Period of Extra 10% Coverage of Domestic Students (2010-2011)	0.026***						0.003			
	(0.006)						(0.006)			
Post Demand Driven Enrolment Policy (2012+)	0.096***						0.016			
	(0.009)						(0.014)			
Post Freeze in Tuition (2017-2019)	0.021***						0.016***		-0.006	
	(0.005)						(0.004)		(0.006)	
Period of 10% Discounts Given to Student for Paying Tuition Upfront	-0.048***						-0.019***		-0.005	
(2012 to 2017)	(0.005)						(0.006)		(0.007)	
ATAR Scores Used for Admission (Introduction Varies Across States)	-0.013**						0.017***		-0.048***	
	(0.005)						(0.005)		(0.016)	
Constant	-0.375***		-0.221***		-0.581***		-0.375***		-0.221***	
	(0.038)		(0.038)		(0.239)		(0.038)		(0.038)	
Fixed Effects	Birth Year									
Additional Controls	State Trends, Regional Measures for Occupation Shares (25-35), Returns to Education by Field and Gender (25-35)									
R-Squared	0.086		0.059		0.071		0.351		0.358	
# of observations	256443		25899		86393		170050		98864	

Notes: Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.10
Stem Science (Band 2 Only Fields): Natural & Physical Sciences (e.g. Biology, Physics, Chemistry, Earth Sciences, Forensic Science, Pharmacology), Engineering, Computing and Built Environment, Health Related Science (e.g. Epidemiology, Radiography, Audiology), Agriculture (e.g. Forestry Sciences, Horticulture, Environmental Studies), Mathematics & Statistics;

Appendix Table 3: Effect of Real Tuition on Enrollment in STEM Science (Band 2) + Health Fields

Dependent Variable: Observed Enrolling in STEM in Given Year	All Years		Before 1997		Before 2005		2005 Onward		2012 Onward	
	All Students	*Woman Interaction	All Students	*Woman Interaction	All Students	*Woman Interaction	All Students	*Woman Interaction	All Students	*Woman Interaction
	(1a)	(1b)	(2a)	(2b)	(3a)	(3b)	(4a)	(4b)	(5a)	(5b)
Tuition Band 1 (Minimum) ($100s)	0.006	0.008***	-0.003	0.019***	0.006	0.008**	0.349*	0.137	0.360	-0.003
	(0.004)	(0.001)	(0.005)	(0.007)	(0.004)	(0.004)	(0.187)	(0.090)	(0.329)	(0.108)
Tuition Band 2 Additional Tuition Above Band 1 ($100s)	0.686*	1.480***			1.094	-0.166	-0.459	0.430	0.475	0.004
	(0.384)	(0.426)			(0.866)	(0.884)	(0.546)	(0.471)	(0.558)	(0.253)
Tuition Band 3 Additional Tuition Above Band 1 ($100s)	-0.450*	-0.944***			-0.698	0.102	-0.203	-0.487	-0.878	
	(0.244)	(0.271)			(0.551)	(0.561)	(0.548)	(0.374)	(0.781)	
Period of National Priority Discount (0/1)	-0.021***	-0.026***					0.046***	-0.018**		
	(0.006)	(0.005)					(0.008)	(0.008)		
Government Subsidies ($1000s)										
Maximum Government Subsidy Available for Any Field							0.031***	0.016***	0.030***	0.015***
							(0.000)	(0.000)	(0.000)	(0.000)
Minimum Government Subsidy Available for Any Field							0.031***	-0.015***	0.031***	-0.014***
							(0.000)	(0.000)	(0.000)	(0.000)
Student & Period Controls										
Enrollee is a Woman	-0.471***		-1.007***		-0.473***		0.152		-0.167	
	(0.043)		(0.309)		(0.177)		(0.188)		(0.323)	
Observed with Health Card Between Birth and Age 10	-0.112***		-0.091***		-0.094***		-0.098***		-0.089***	
	(0.010)		(0.031)		(0.016)		(0.007)		(0.009)	
Observed with Health Card Between Ages 11 and 16	-0.032***		-0.033		-0.025		-0.019**		-0.016	
	(0.011)		(0.032)		(0.018)		(0.008)		(0.010)	
Observed Region of Residence Near Time When in High School	0.001		-0.017***		-0.017***		0.015***		0.016***	
	(0.002)		(0.006)		(0.004)		(0.002)		(0.003)	
Regional Median Family Income (1000s)	-0.000**		-0.005***		-0.002***		-0.001***		-0.001***	
	(0.000)		(0.001)		(0.000)		(0.000)		(0.000)	
Post Introduction of Multiple Tuition Rates (1997+)	0.436**				-0.000					
	(0.178)				(0.238)					
Period of Extra 10% Coverage of Domestic Students (2010-2011)	0.039***						0.003			
	(0.007)						(0.005)			
Post Demand Driven Enrolment Policy (2012+)	0.089***						-0.003			
	(0.011)						(0.012)			
Post Freeze in Tuition (2017-2019)	0.010*						0.014***		-0.005	
	(0.006)						(0.004)		(0.005)	
Period of 10% Discounts Given to Student for Paying Tuition Upfront	-0.034***						-0.013**		0.002	
(2012 to 2017)	(0.006)						(0.005)		(0.006)	
ATAR Scores Used for Admission (Introduction Varies Across States)	-0.043***						0.003		-0.053***	
	(0.006)						(0.004)		(0.014)	
Constant	-0.375***		-0.221***		-0.581***		-0.375***		-0.221***	
	(0.038)		(0.038)		(0.239)		(0.038)		(0.038)	
Fixed Effects	Birth Year									
Additional Controls	State Trends, Regional Measures for Occupation Shares (25-35), Returns to Education by Field and Gender (25-35)									
R-Squared	0.027		0.026		0.034		0.618		0.627	
# of observations	256443		25899		86393		170050		98864	

Notes: Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.10
Stem Science + Health: Natural & Physical Sciences (e.g. Biology, Physics, Chemistry, Earth Sciences, Forensic Science, Pharmacology), Engineering, Computing and Built Environment, Health Related Science (e.g. Epidemiology, Radiography, Audiology), Agriculture (e.g. Forestry Sciences, Horticulture, Environmental Studies), Mathematics & Statistics;Medical Science and disciplines related to all facets of medicine, Dental Studies, Veterinary Studies, and Nursing;

Appendix Table 4: Effect of Real Tuition on Enrollment in STEM Science (Band 2) + Health + Business & Economics Fields

	All Years		Before 1997		Before 2005		2005 Onward		2012 Onward	
Dependent Variable: Observed Enrolling in STEM in Given Year	All Students	*Woman Interaction	All Students	*Woman Interaction	All Students	*Woman Interaction	All Students	*Woman Interaction	All Students	*Woman Interaction
	(1a)	(1b)	(2a)	(2b)	(3a)	(3b)	(4a)	(4b)	(5a)	(5b)
Tuition Band 1 (Minimum) ($100s)	0.004	0.008***	-0.004	0.016***	0.003	0.009***	0.808***	0.139	0.850*	-0.017
	(0.003)	(0.001)	(0.004)	(0.006)	(0.004)	(0.003)	(0.279)	(0.135)	(0.490)	(0.160)
Tuition Band 2 Additional Tuition Above Band 1 ($100s)	0.952***	0.755*			-0.359	-0.736	0.892	0.786	1.365*	0.043
	(0.354)	(0.402)			(0.771)	(0.810)	(0.786)	(0.701)	(0.824)	(0.375)
Tuition Band 3 Additional Tuition Above Band 1 ($100s)	-0.616***	-0.483*			0.227	0.464	-1.767**	-0.716	-2.162*	
	(0.225)	(0.256)			(0.491)	(0.514)	(0.802)	(0.557)	(1.165)	
Period of National Priority Discount (0/1)	-0.013**	-0.030***					0.022*	-0.024*		
	(0.006)	(0.005)					(0.012)	(0.013)		
Government Subsidies ($1000s)										
Maximum Government Subsidy Available for Any Field							-0.013***	0.026***	-0.011***	0.024***
							(0.000)	(0.000)	(0.000)	(0.001)
Minimum Government Subsidy Available for Any Field							0.028***	-0.016***	0.027***	-0.014***
							(0.000)	(0.000)	(0.000)	(0.001)
Student & Period Controls										
Enrollee is a Woman	-0.548***		-0.887***		-0.605***		0.027		-0.461	
	(0.041)		(0.278)		(0.160)		(0.279)		(0.484)	
Observed with Health Card Between Birth and Age 10	-0.170***		-0.159***		-0.175***		-0.154***		-0.130***	
	(0.008)		(0.024)		(0.013)		(0.010)		(0.013)	
Observed with Health Card Between Ages 11 and 16	-0.044***		-0.078***		-0.063***		-0.027**		-0.018	
	(0.009)		(0.025)		(0.014)		(0.011)		(0.014)	
Observed Region of Residence Near Time When in High School	0.027***		0.009		0.015***		0.035***		0.035***	
	(0.002)		(0.006)		(0.003)		(0.003)		(0.004)	
Regional Median Family Income (1000s)	-0.001***		-0.003***		-0.002***		-0.001***		-0.001***	
	(0.000)		(0.001)		(0.000)		(0.000)		(0.000)	
Post Introduction of Multiple Tuition Rates (1997+)	0.342**				0.034					
	(0.164)				(0.221)					
Period of Extra 10% Coverage of Domestic Students (2010-2011)	0.020***						0.002			
	(0.007)						(0.008)			
Post Demand Driven Enrolment Policy (2012+)	0.078***						0.036**			
	(0.011)						(0.018)			
Post Freeze in Tuition (2017-2019)	0.009						0.008		-0.005	
	(0.006)						(0.005)		(0.008)	
Period when Discounts Given to Student for Paying Tuition Upfront	-0.036***						-0.007		0.002	
	(0.006)						(0.008)		(0.009)	
ATAR Scores Used for Admission (Introduction Varies Across States)	-0.031***						0.000		-0.055**	
	(0.006)						(0.007)		(0.022)	
Constant	-0.375***		-0.221***		-0.581***		-0.375***		-0.221***	
	(0.038)		(0.038)		(0.239)		(0.038)		(0.038)	
Fixed Effects	Birth Year									
Additional Controls	State Trends, Regional Measures for Occupation Shares (25-35), Returns to Education by Field and Gender (25-35)									
R-Squared	0.043		0.045		0.051		0.109		0.116	
# of observations	256443		25899		86393		170050		98864	

Notes: Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.10
Stem Science + Health + Business & Economics: Natural & Physical Sciences (e.g. Biology, Physics, Chemistry, Earth Sciences, Forensic Science, Pharmacology), Engineering, Computing and Built Environment, Health Related Science (e.g. Epidemiology, Radiography, Audiology), Agriculture (e.g. Forestry Sciences, Horticulture, Environmental Studies), Mathematics & Statistics;Medical Science and disciplines related to all facets of medicine, Dental Studies, Veterinary Studies, and Nursing; Management, Accounting, Marketing, Economics, and similar disciplines.