I Z A Institute
of Labor Economics
Initiated by Deutsche Post Foundation

DISCUSSION PAPER SERIES

IZA DP No. 12027

Teaching, Gender and Labour Market Incentives

David Carroll
Jaai Parasnis
Massimiliano Tani

DECEMBER 2018

I Z A Institute
of Labor Economics

Initiated by Deutsche Post Foundation

DISCUSSION PAPER SERIES

IZA DP No. 12027

Teaching, Gender and Labour Market Incentives

David Carroll
Monash University

Jaai Parasnis
Monash University

Massimiliano Tani
University of New South Wales Canberra and IZA

DECEMBER 2018

IZA – Institute of Labor Economics

Schaumburg-Lippe-Straße 5–9
53113 Bonn, Germany

Phone: +49-228-3894-0
Email: publications@iza.org

www.iza.org

ABSTRACT

Teaching, Gender and Labour Market Incentives*

The concentration of women in the teaching profession is widely noted and generally attributed to gender differences in preferences and social roles. Further, gender segregation exists within this profession – women make up almost all of the primary and pre-primary teaching cohorts, while men who choose to become teachers tend to specialise in secondary schooling and administrative roles. To what extent is this gender structure in teaching a response to economic incentives from the labour market? Our research addresses this question by studying the effects of wage structure on the decision to become a teacher. In particular, we ask what the most attractive choice is for a graduate given the wage structure of the previous graduate cohort. We show that the labour market, especially the relative returns to education across occupations for men and women, can explain these vocational choices in the Australian context. Women with bachelor qualifications receive higher returns as teachers, while men with bachelor qualifications receive higher returns in other occupations. In contrast, while both men and women with postgraduate qualifications earn higher returns in other occupations, the difference is consistently smaller for women than men. Women face a lower opportunity cost for becoming a teacher compared to men. A more balanced gender representation among teachers seems unlikely given the existing structure of returns to education, by gender, across professions.

JEL Classification: I26, J16, J24, J31

Keywords: occupational segregation, teachers, opportunity cost, decomposition

Corresponding author:
Massmiliano Tani
School of Business
University of New South Wales
Northcott Drive
Campbell, ACT 2612
Australia
E-mail: m.tani@adfa.edu.au

* The authors acknowledge funding support under Graduate Research Program research grants scheme from Graduate Careers Australia.

1. Introduction

Education is a popular field of qualification among university students. Over the past decade, 10% of all graduates in most OECD countries chose education as their field of study (OECD, 2018a). Correspondingly, teachers in primary and secondary schools represent a substantial share of those choosing education as a vocation (Santiago, 2004). The popularity of studying and working as an educator reflects the motivations at the core of teaching, including working with children and adolescents and contributing to society at large (Brockhart & Freeman, 1992; Pajares, 1992; Kyriacou & Coulthard, 2002; Watt & Richardson, 2007), as well as the positive characteristics of the job, like flexible working hours and independent work structure (Hackman & Oldham, 1976; Lester, 1987; Barnabe & Burns, 1994; Bogler, 2002).

As a profession, teaching presents a particularly interesting and important case for studying gendered vocational choices. Among OECD members, women represent more than 90% of the teaching workforce in pre-primary schooling, more than 80% in primary schools, and about 75% in secondary schools (OECD, 2018b). Despite major changes in the gender aspects of labour markets such as greater women's participation, this imbalanced occupational distribution has not narrowed; in fact, the share of women in the teaching profession has grown over time and with countries' economic development (OECD, 2018b).

This gender imbalance is generally seen as problematic, as it contributes to persistent gender wage inequality (Blau & Kahn, 2000, 2007; Mandel & Semyonov, 2014; Alskins et al., 2004; Strober & Tyack, 1980), and perpetuates differing career aspirations and trajectories between genders (Farmer, 1987; McWirther, 1997; Chevalier, 2003), including the difficulty attracting male education graduates to the profession (Apple, 2013; Mills et al., 2004; Roulston & Mills, 2000; Drudy, 2008). Some studies point out the wider implications of this gender imbalance. For example, an absence of male teachers seems to have substantive negative effects on boys'

school performance (Suryadarma et al., 2005; Carrington & McPhee, 2008; Majzub et al., 2010; Heibig, 2012; McGrath & Sinclair, 2013).

Notwithstanding the large body of work focusing on the consequences of the 'feminization' of teaching, there is comparatively less research exploring its possible causes. The strand of literature on teaching typically attributes gender segregation to social constructs and gender norms (Evans, 1982; Pajak & Blasé, 1989; Olsen, 2008) and to the job attributes of this occupation. However, there is substantive empirical evidence that economic incentives are a fundamental determinant of career choice (Manski, 1987; Murnane & Olsen, 1989, 1990; Ferguson, 1991; Card & Krueger, 1992; Figlio, 1997; Stinebrickner, 1998; Dolton & van der Klaauw, 1999; Hanushek et al., 2004; Imazeki, 2005; Chevalier & Dolton, 2004; Barbieri et al., 2007; Leigh & Ryan, 2008). Are women making choices to become teachers in line with or despite economic incentives? Do socio-cultural gender and job attributes dominate economic incentives or are these two aligned, and consequently give rise to the observed gender distribution in teaching? A third possibility is that economic incentives and social structures act as mutually reinforcing and concurrent factors.

We investigate this question by extending the traditional economic approach that analyses gender labour market outcomes by decomposing wage differences between men and women in the same profession. In the traditional approach, wage differences are analysed by gender within occupations, and hence the wage of a male teacher is compared with that of a female teacher. By contrast, we analyse wage differences across occupations for each gender separately, for given levels of education. This comparison of salary earned as a teacher with salaries in other occupations with the same level of education, enables us to capture the opportunity cost of becoming a teacher. An individual forgoes the salary in non-teaching occupations by choosing teaching as her occupation, which captures the monetary opportunity cost of becoming a teacher. In other words, we analyse whether teaching, for a

female graduate, is the occupation offering the highest returns to her education. We then carry out the corresponding analysis for those completing a graduate diploma and a masters' degree, and present comparable analysis for males. To do so, we use a large and informative dataset, the Graduate Destination Survey (GDS), covering individual and institutional characteristics of Australian graduates over the period 1999-2015. We explore the extent to which the observed distribution of teachers can be explained by wage structure within and across occupations. This approach provides complementary insights to the existing literature, as it can offer an understanding of the effect of changing wage structures on vocational choice by gender.

Our approach and findings complement the study by Leigh and Ryan (2008) focusing on the changing quality of teachers and its association with wage distribution. While they focus on the composition of the teacher workforce in terms of quality, we focus on gender composition. Our analytical approach is similar, focusing on the role of wages on occupational choice in teaching and non-teaching professions. However, our empirical methodologies differ - Leigh and Ryan (2008) employ regression analysis while we use decomposition analysis. Decomposition analysis enables us to investigate the extent to which observed wage differentials between teachers and non-teachers can be explained by observable characteristics, such as age, academic scores and employment sector. We concentrate on the determinants of the observed choices, by gender, at several distinct points of the wage distribution and for different levels of education. Further, we explore if the wage trends identified by Leigh and Ryan (2008) have continued into the current period, particularly in the aftermath of the Global Financial Crisis.

We find that for male and female graduates, the choice of teaching as a career reflects the returns in the labour market. This is true for those qualifying in the field of education as well as other fields of study. For women graduating with a bachelor degree, choosing to be a

primary or secondary teacher leads to better wages compared to other occupations. As wages in other occupations capture the opportunity cost of becoming a teacher (for the given working conditions), our results suggest that the 'package' of job characteristics *and* pay offered in teaching are more attractive than those available in any other job. There seems to be no trade-off between higher pay and lower job flexibility.

We find similar results in the case of men graduating in education with a master's degree. In contrast, working as a teacher is not as highly paid as working in non-teaching occupations for male graduates at any level, or for female graduates holding a master's degree. At every level of education and wage distribution, the opportunity cost of becoming a teacher is less for women than men. While we cannot address the underlying causes of these salary differences, we can clearly identify their association with vocational choices that can explain the observed gender patterns in choosing teaching as an occupation and within the teaching profession itself.

The rest of the paper is organised as follows: Section 2 reviews the literature. Section 3 presents the data. Section 4 illustrates the methodology. Section 5 presents the results. Section 6 discusses the implications of this analysis and Section 7 concludes.

2. Literature

Existing literature suggests two main approaches towards analysing vocational choice in the context of gender. Cultural and learning theories suggest the importance of sociological and psychological factors in moulding vocational preferences. Many studies on teaching as a career choice are concerned with these motivations, supported by evidence from primary data collected in interviews with graduates and teachers (Doolittle et al., 1993; Kyriacou & Coulthard, 2000; Richardson & Watt, 2005).

In the second strand of studies, research has documented the institutional forces shaping the labour market for teachers (Acker, 1989; Santiago, 2004; Eide et al., 2004), highlighting that the public sector dominates both demand (being the main provider of schooling and buyer of teaching services) and supply (by operating teacher education programmes and setting the standards for teachers' qualifications). It is due to these constructs that it is possible to relate the shortages of teachers, which are common and persistent in several OECD countries, to an inadequate supply of the desired level of quality (Kershaw & McKean, 1962; Wilson & Pearson, 1993; Bourdon et al., 2010), and excessive exits from the profession (Ingersoll, 2001; Barnes et al., 2007; Boe et al., 2008).

A prevailing preoccupation of this stream of literature is in understanding the determinants of (good) teacher supply, and the policy initiatives that may enhance it. For example, some authors have studied the link between choice of the field of study and subsequent teaching career (Chevalier, 2003; Chevalier & Dolton, 2004; Mora et al., 2007; Rots et al., 2007). Others have investigated the role of regulations governing the entry into the teaching profession as a potential incentive or detractor (Hanusheck et al, 2004; Wiswall, 2013). A third group of studies focuses on the low retention rates of (good) teachers, apparently the principal cause of the reported shortages, and what may be done to reverse it (Rumberger, 1997; Ingersoll & Smith, 2003; OECD, 2005).

While these studies have different objectives and focus, they generally concur that higher salaries are the most effective policy lever to address teacher shortages, though the attractiveness of financial incentives for teachers is found to vary counter-cyclically with general economic conditions[1]. Understanding the role of gender in teaching is not the main

[1] For example, Figlio (1997) finds that a 1% pay rise in a US school district would raise the probability to attract a teacher by 1.58%. Chevalier and Dolton (2004) find that a 10% increase in relative pay for UK teachers raises on average by 9% the proportion of graduates choosing to become teachers; however, the corresponding increase is 13.1% for the cohort that graduated in 1990 and 6.4% for that which graduated only five years later in 1995.

objective of study in this literature. However, findings reveal that female teachers typically receive better average salaries than comparable women working in other occupations. They are also, on average, less likely to change jobs than male teachers to a non-teaching profession for a given salary rise at the average salary level.

Gender is the principal area of interest of a separate stream within the 'pecuniary' literature, focusing on occupational and pay differences between males and females with comparable characteristics (World Bank, 2012; Cortes & Pan, 2017). Although not drawing specifically on the labour market for teachers, this research stream finds that observed gender wage differences no longer reflect underlying differences in educational achievement, as has historically been common, but instead reflect different occupational choices and sectors of employment (Blau & Kahn, 2016).

Australian-based studies confirm the same prevalence of women in pre-primary and primary teaching found in other countries. Several government and professional association reports (Staff in Australian Schools – SiA, 2013; National Teaching Workforce Dataset - NTWD, 2014) document the disproportional share of males in leadership positions, pointing to gendered preferences with respect to job characteristics. As an example, 23.6% of male primary teachers intended to apply for either a deputy principal or principal position, compared to only 6.1% of females (SiA, 2013, p. 110). The most common reasons given were related to job demands[2], work-life balance and a desire amongst women to remain in the classroom (SiA, 2013, p. 112). Similar differences can be found among deputy principals

[2] The Why Choose Teaching report reveals a similar difference in gendered career aspirations, finding that 22.4% of male teachers described teaching as a step towards a leadership role in schools, compared to 17.6% of females. On the other hand, female teachers were slightly more likely to consider teaching as a lifelong career (Wyatt-Smith et al., 2017). Neidhart and Carlin (2003) also found a significant gender difference in leadership aspirations within Catholic Schools in Victoria, with 58% of female primary teachers surveyed indicating that they were unwilling to apply for principal positions, compared to only 12% of males. When the question was phrased positively, only 27% of females indicated that they were willing to apply, compared to almost 61% of males. The most common reason given for not wanting to apply for leadership was personal and family impact.

intending to apply for a principal position in the subsequent three years: only 20.1% of female deputies expressed this intention, compared to 42.9% among males (SiA, 2013, p 114).

The present study is situated at a point where an individual completes high school and is making a choice of field of further study and hence, of occupation. Wisht and Ludwig-Mayerhafer (2014) point out that differences in occupational aspirations are attributed to expected costs and benefits by rational choice approaches (posited by Becker, 1978) while cultural and learning theories point to social context, norms and culture as the main determinants.

As discussed above, studies have extensively analysed the gendered nature of the teaching occupation from the perspective of cultural and learning theories. The 'rational choice' approach considers the individual as making a comprehensive comparison of the monetised costs and benefits of available options. Thus, an individual makes his/her vocational choice based on comparing across different vocational paths.

In the context of our analysis, this approach offers a number of insights. First, since vocational choice involves comparisons across occupations, the choice to become a teacher is influenced by salary within this occupation as well as salaries in other occupations in the labour market. That is, relative returns in the labour market matter. Secondly, the observed gender gap in the labour market drives the occupational choices of men and women that give rise to occupational sorting. As a result, gender segregation across occupations is related to the gender pay gap. We explore the extent to which the observed distribution of teachers can be explained by wage structure within and across occupations. This approach furthers the insights from existing literature, as it can offer an understanding of the effect of changing wage structures on vocational choice by gender.

3. Data

The data used in the empirical analysis are sourced from the GDS, a national survey of recent higher education graduates, administered by Graduate Careers Australia (GCA) and its antecedents from 1972 to 2015. The GDS was conducted around four months after course completion. All graduates from participating higher education institutions were invited to respond to the GDS, which included all Australian universities and a number of non-university higher education providers. Respondents were asked a range of questions relating to their activities on a given reference date, with an emphasis on their labour market outcomes, including employment status, occupation, job sector and starting salary.

Our analysis employs data from the 1999 to 2015, as the GDS questionnaire and methodology is sufficiently consistent to permit valid time-series comparisons during this time period. The average response rate over these 17 annual rounds was 57% (GCA, 2016). Analysis of non-response to the survey (e.g. Guthrie & Johnson, 1997; Coates et al., 2006) indicated that the GDS is relatively free from non-response bias. It should be noted that the GDS measures starting wages only.

Descriptive Statistics

The labour market for graduate teachers is striking in terms of gender composition. Figure 1 compares the proportion of women across occupations.

INSERT FIGURE 1 HERE

The figure clearly shows that the workforce in teaching consists overwhelmingly of women. Compared to overall occupations with women constituting about 60% of the workforce, 97% of pre-primary teachers, 85% of primary teachers and 68% of secondary teachers are female. This gender differential shows no sign of improvement over time. In contrast, slightly less than 50% of managers are female, and the proportion of women in this occupational category has increased from 41% in 1999 to 48% in 2015.

Table 1 reports summary statistics, by gender, for those employed as teachers and those employed in other occupations shortly after graduation. The data are constructed after excluding observations with gross annual starting wages reported as less than $10,000 or more than $150,000.

Panel A in Table 1 includes the full sample of graduates in all fields. In order to offer a tighter comparison, we restrict the sample to those who hold a qualification in education only. We can think of this group as those with an *intention* to become teachers. The majority of these, 74%, work as teachers but the remaining 43,404 work in other occupations. Panel B in Table 1 reports descriptive statistics for this restricted group. The data in Table 1 highlights that while the majority of teachers are women, they earn less than their male counterparts.

INSERT TABLE 1 HERE

Comparison with the non-teachers provides an insight into possible underlying incentives in this choice. Focusing on Panel A in Table 1 first, while female teachers earn about $4,500 less than their male counterparts, their starting wage is about $600 higher than non-teachers. Men, on the other hand, earn a starting wage of $57,413 in other occupations and about $10,000 less as teachers. Note that the standard deviation for wages is higher for non-teachers, indicating higher variability of wages in the labour market. On average, recently graduated female teachers are younger than males but overall graduate teachers are older than graduates in other occupations.

The third row of Table 1 reports the average ATAR, which stands for the Australian Tertiary Admission Rank. This indicator ranks each Year 12 student relative to all students who started high school with them in Year 7. For example, an ATAR of 80.00 means that the student is in the 20th percentile below the highest score in his/her Year 7 group. Universities use the ATAR to help them select students for their courses and admission to most tertiary

courses is based on student's selection rank. While GCA does not provide data on individual ATAR, it provides cut-off ATARs for each course by educational institution. We employ these as proxies for an individual's ATAR to control for academic ability in a given university x field x year cohort. Although imprecise, this measure can control for varying ability among groups of students enrolled across different fields, which is otherwise a significant source of unobserved heterogeneity among students (Carroll, Heaton, & Tani, 2018). The average ATAR is comparable across men and women but varies between teachers and non-teachers. So, while non-teachers have a higher ATAR on average, there are no systemic gender differences in academic ability. Based on GDS data, only 2-3% of the education graduates have a previous Bachelor degree indicating education as first field of qualification.

Compared to men, women are less likely to have recently completed a postgraduate qualification. The majority of teachers are employed in the public sector, reflecting the broad provision of education services in Australia and more generally, across most countries. This is in contrast to the structure of other occupations, where the majority of graduates work in the private sector. This difference in public-private employment sectors for teachers and non-teachers could explain the lower variance of wages for teachers.

The differences discussed above remain consistent even after restricting the sample to individuals with qualifications in education (Table 1, Panel B). Education graduates working in other occupations receive higher salaries than teachers (which could offer an explanation for why they may not work as teachers even after qualifying in that field), but the difference is marginal for women[3]. On the other hand, male non-teachers earn $8,453 more, on average,

[3] Women, on average earned $5368 less than men in 2015. In female dominated occupations such as nursing and teaching the salary differential favours women, female nurses earned $4683 more and female secondary school teachers earned $2725 more, on average, than their male counterparts.

than male teachers. The average ATAR for degree holders in education is 77 [4]. Those who qualify in education but work in non-teaching occupations are significantly more likely to hold a postgraduate qualification.

INSERT FIGURE 2 HERE

Figure 2 shows the ratio of mean wage for teachers to mean wage for other occupations. On average, wages for female teachers are generally equivalent or better than wages in non-teaching occupations, as shown by the red line, which is consistently above the value of 1. For males, on the other hand, a wage as a teacher is less than wages in other occupations, though the gap has rapidly closed since the early 2000s. It is interesting to note that the gap in relative wages for males has particularly narrowed in the years since the Global Financial Crisis of 2008-9, which seriously affected the entry-level wages and employment across Australia. Teachers, however, are better protected from business cycles due to institutional features of this segment of the labour market.

4. Methodology

To test whether relative wages can explain the observed occupational choices of recent male and female graduates, we first obtain the difference in mean wages for those working as teachers versus those working in other professions (non-teachers) by gender. We then use the traditional Binder-Oaxaca method to decompose the mean difference in two components: one due to differences in the average values of the explanatory variables (composition effect) and the other due to differences in the estimated coefficients (price or wage structure effect), plus an interaction component. This approach is described in the Technical Appendix (Appendix 1).

[4] Full lists of courses and corresponding ATARs are available from https://www.uac.edu.au.

This decomposition is generally formulated from the viewpoint of women. In other words, the endowment effect typically measures the expected change in the women's average outcome assuming that they have the same characteristics (the $\bar{X}$'s) as men. Similarly, the coefficient effect measures the expected change in women's average outcome assuming that women have the same coefficients (the β's) as men. The application of this approach is straightforward and estimates are obtained using Ordinary Least Squares (OLS).

The Oaxaca-Blinder decomposition cannot be extended to other distributional statistics, as the linearity property does not hold. Since it is particularly relevant to understand the differences between male and female teachers over the entire wage distribution, we apply the unconditional quantile regression model (Firpo et al., 2009; Fortin et al., 2011). This approach is also presented in the Technical Appendix (Appendix 1).

Based on these two decomposition methodologies, the empirical analysis presents two sets of estimates. One focuses on group differences in means by implementing the Oaxaca-Blinder decomposition based on model (3) in Appendix 1. The second set of estimates measures group differences at various quantiles of the wage distribution (25^{th}, 50^{th}, and 75^{th}) by computing the Oaxaca-Blinder decomposition according to model (9) in Appendix 1.

For each regression, the dependent variable is the wage. Covariates include ATAR, age, year, state and employment type. The standard errors are computed by bootstrapping using 50 replications. The standard errors are clustered by university to account for similarities in teaching experience, academic programs and facilities within each institution. We report results by education levels (graduate, graduate diploma and master's degrees) separately. We first include graduates from all fields of education and then restrict the analysis for graduates qualifying in education to check the robustness.

5. Results

Table 2 presents the mean wages, difference in mean wages between teachers and non-teachers and decomposition results by gender. These results illustrate the difference in starting wage for female (first two columns) and male graduates (last two columns).

INSERT TABLE 2 HERE

Looking at the results for women first, the first row suggests that a woman with a bachelor degree receives an average starting wage of $38,440 in other occupations (first row) and $41,651 as a teacher (second row). The difference is -$3,211 (third row), the majority of which is explained by differences in coefficients (-$2,653 - fifth row) – namely differences in returns to characteristics of a female graduate working in teaching relative to other occupations. A smaller amount can be attributed to the difference in characteristics of graduates in teaching and other occupations.

These results clearly show that for graduates with a bachelor's degree, female teachers earn almost $3,000 more than their counterparts in non-teaching occupations. This difference is statistically significant, and supports the hypothesis that women have a higher incentive to join teaching for a given level of education. As teaching offers greater flexibility in hours than other jobs, the attractiveness of teaching over other occupations for women is striking. In contrast, the difference between teachers and non-teachers for men is $383 in favour of non-teachers.

The wage advantage for female teachers disappears at higher levels of qualifications. Like their male counterparts, women with graduate diplomas or master's earn higher wages in non-teaching occupations. Interestingly, for these groups, teachers earn less compared to others; but this wage differential in favour of non-teachers is much greater for men (and smaller for women). In the case of graduate diploma qualified persons, female teachers earn $7,184 less while male teachers earn $16,631 less than their counterparts in other occupations.

The wage differential narrows for a master's qualification, but again, female teachers have a much smaller wage disadvantage compared to males. Thus, men face a much higher opportunity cost for becoming teachers compared to women.

This evidence is consistent with the observed distribution of men and women in teaching. As discussed earlier in the context of Figure 1, the vast majority of teachers are women and within teaching, women are concentrated in pre-primary and primary schools. Pre-primary and primary school teaching requires the equivalent of a bachelor's degree in most jurisdictions in Australia while secondary teachers are increasingly required to hold a master's degree. Our analysis shows for women considering studying for a bachelor's degree, teaching is a very attractive occupational choice, due not only to more flexible working hours but also to higher returns compared to other occupations. However, this is not the case for men. Though overall returns to postgraduate qualifications are higher in non-teaching occupations for men and women, the opportunity cost of becoming a teacher is always higher for men.

Results from the Oaxaca-Blinder decomposition reported in Table 2 indicate that the contribution of the explained part (due to differences in observable characteristics) and unexplained part varies by gender and across educational levels.

Only 17% of the wage advantage for female teachers with graduate qualifications is explained by differences in characteristics between non-teachers and teachers. Differences in returns to characteristics and the interaction terms contribute to the remaining 83% of the wage advantage of teachers, the unexplained part. For the group with a graduate diploma, the overall wage advantage for non-teachers comes mainly from better returns to their characteristics in the labour market (compared to teachers). For those with a master's qualification, non-teachers earn more. Overwhelmingly, the large positive and significant unexplained component shows that the wage structure in the labour market generates high

returns for postgraduate degrees in non-teaching occupations. The profile of labour market characteristics of teachers, compared to non-teachers, reduces the wage gap between these two groups. For men, non-teachers earn more regardless of the level of education. But the relative contribution of explained and unexplained terms is similar to that of female wage differentials.

Next, we examine the gap across the entire wage distribution using RIF decomposition. Results for women are reported in Table 3 and results for men are reported in Table 4. The level of education (bachelor, graduate diploma or master's degree) is included as an additional control variable.

INSERT TABLE 3 HERE

INSERT TABLE 4 HERE

Except for the top 20th percentile of the wage earners, women receive significantly higher wages as teachers than as non-teachers. In contrast, the wage advantage for male teachers is restricted to the lower percentiles of the distribution. Above the median wage, men earn significantly less as teachers than non-teachers. In terms of making an occupational choice to become a teacher, the opportunity cost for men is higher than that for women all along the wage distribution.

Except for the top 10th percentile, if female teachers had the same characteristics as non-teachers, they would still receive higher starting wages as teachers, but the wage advantage would be smaller. This difference decreases moving up along the wage distribution and becomes positive for 90th percentile. The wage structure/returns in the labour market (unexplained part) follows a similar pattern; the wage advantage for teachers due to this component decreases along the wage distribution and leads to higher overall wages for non-teachers for the top 20th percentile.

For men, the explained gap is negative and statistically significant at all points of the wage distribution, except at the very top. If male teachers had the same profile of characteristics as non-teachers, they would earn $2,214 less than the non-teachers at the median. The overall wage advantage for non-teachers for men comes from the wage structure/returns in the labour market (unexplained). Thus, for the same characteristics, men receive much better returns in occupations other than teaching. This would explain why few men make the vocational choice to become teachers.

If a higher level of pay broadly reflects a higher ability, the results summarised in Tables 3 and 4 suggest that high ability males and females alike find it always more attractive to choose non-teaching occupations, where wages are higher. Conversely, medium and low-pay teaching jobs are attractive for low ability males and females. This striking result, and its implications for teacher quality, closely reflect the findings of Leigh and Ryan (2008).

The above analysis compares teachers with all other occupations. There could be systematic differences between those choosing education as a qualification field and those choosing other fields underlying these results. We investigate the issue of comparability of two groups by restricting the analysis to individuals with education as the major field of qualification. Out of 167,930 persons in the sample who nominate education as their primary field of study, the majority (74%) work as teachers and 26% work in other occupations. We compare the wages for these two groups.

INSERT TABLE 5 HERE

For persons with a bachelor's degree in education, returns are higher if they work as teachers. Consistent with the match between qualification and occupation, this holds for both men and women. Women earn 20% more as teachers while men earn only 3% more. For graduate diploma holders in education, women continue to earn more as teachers, but men earn higher

wages when they work in non-teaching occupations. For master's qualifications in education, both men and women receive higher returns in non-teaching occupations despite the discrepancy between fields of their postgraduate study and occupation. The wage differential between teachers and non-teachers is still smaller for women compared to men. Women earn 7% more as non-teachers while men earn 10% more. Consistent with results reported so far, the opportunity cost of becoming a teacher is always lower for women. Our results are significant and consistent after restricting the analysis to narrowly defined, comparable groups.

We conduct several other robustness tests. We check the sensitivity of results by changing the definition of teachers to progressively include Special Education Teachers, Vocational Education Teachers and Education Officers. We also estimate the models by varying the sample restrictions: including all individuals, excluding individuals who report wages above $200,000, excluding the top and bottom 10^{th} percentile of the wage range and using hourly wages. The main results that (i) women earn more as teachers, while men earn more as non-teachers and (ii) when non-teachers earn more compared to teachers, the wage differential between non-teachers and teachers is smaller for women compared to men, are consistent across all specifications. In order to account for flexibility of occupations, we include the proportion of part-time workers within the occupation as an additional control variable. Except for the master's degree holders, women have lower opportunity costs for becoming a teacher. The specifications and results of these robustness tests are summarised in Table A1 in Appendix 2.

6. Discussion

Teachers, male or female, are paid comparable wages in line with their skills, experience, qualifications and school context. In the Australian context, consistent with the general setting across the world, wages for teachers are set institutionally and, on an average, female teachers earn less than their male counterparts. What then, prompts women to choose teaching as a vocation and what leads men to choose other vocations over teaching? We show that relative returns - wages in other occupations compared to wages in teaching - explain the gender distribution within teaching and across teachers and non-teachers.

The observed differentials in relative returns for male and female teachers are thus driven by the overall gender wage gap in the labour market. The opportunity cost of making a vocational choice to become a teacher is consistently high for men, as men have higher wages across other occupations. For women, on the other hand, wages are lower in other occupations and hence the choice to become a teacher comes at a lower opportunity cost. This result suggests that the wage structures in the labour market underpin vocational choices that lead to the observed skewed gender distribution in teaching. Women and men, deciding their vocational choices, face different trade-offs due to the overall gender wage gap and returns for skills in the labour market. In turn, the concentration of women in a few occupations, the *feminization* of occupations, tends to keep wages in these occupations low. This phenomenon has been particularly observed for caring or service jobs.

Extending on the analysis of returns to men and women within an occupation, we show the role of relative returns as teachers versus non-teachers. The focus on comparing the returns across occupations enables us to analyse the gendered nature of the teaching profession observed across income, and the cultural and political spectrum of countries. Even in the face of changing attitudes and despite a broader socio-economic change in other domains of gender equality, monetary incentives appear to still entrench gender segregation in

occupations. As noted by Leigh and Ryan (2008) economic incentives, particularly wages in non-teaching occupations act as a strong pull factor.

One important implication of our findings of the differential relative return for teaching for men and women is that these two groups are likely drawn from different portions of the skill distributions. On one hand, male teachers are more likely to hold master's degrees. On the other hand, better returns in teaching would act as an incentive for positive selection of women in this occupation. Increasing teachers' salaries to attract high quality teachers may have implications for gender balance in the occupation. Overall wages for women are lower than men and the gap between teachers and non-teachers is larger for men. Hence, increments in teachers' salaries may increase the relative returns for women while having small or negligible impact on relative returns for men. In such scenarios, the proportion of women in teaching is likely to increase further.

With reference to policy, the results suggest that trying to attract more male teachers would have limited success unless the underlying structural economic incentives are addressed. Higher wages in non-teachings jobs will always pull men away from teaching. It may not be feasible to raise average teaching wages selectively for males only to address the current imbalance in female/male teachers[5]. A possible solution, which we leave to future research, is to understand the component of wage in non-teaching jobs for given levels of education underpinning the dramatic fork in wages by gender.

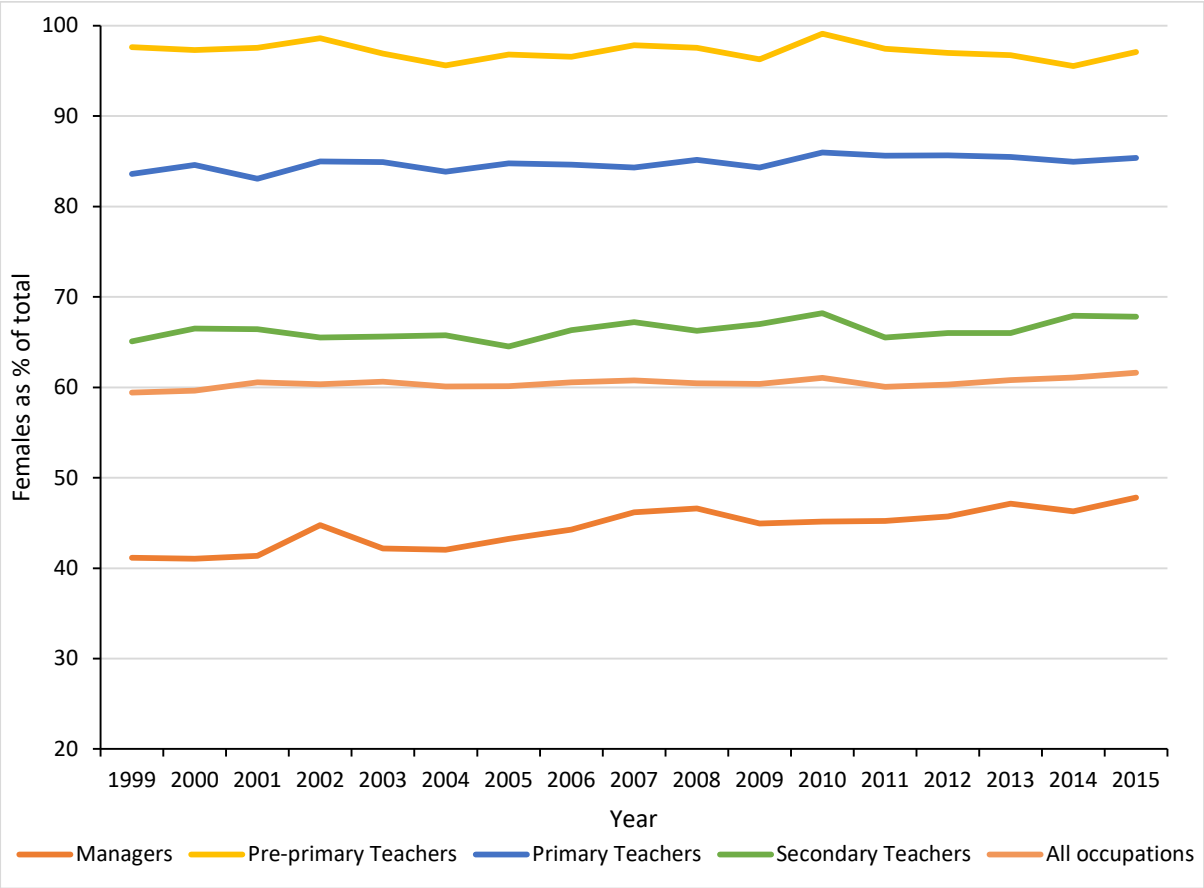
7. Conclusion

We show that the labour market, in terms of relative returns to education across occupations for men and women, can help explain the vocational choices in the Australian context. Women with bachelor qualifications receive higher returns as teachers, while men with

[5] As suggested by Leigh and Ryan (2008), it may nevertheless be possible to reallocate the wage bill for teachers to retain high ability males *and* females currently attracted by higher wages in non-teaching occupations.

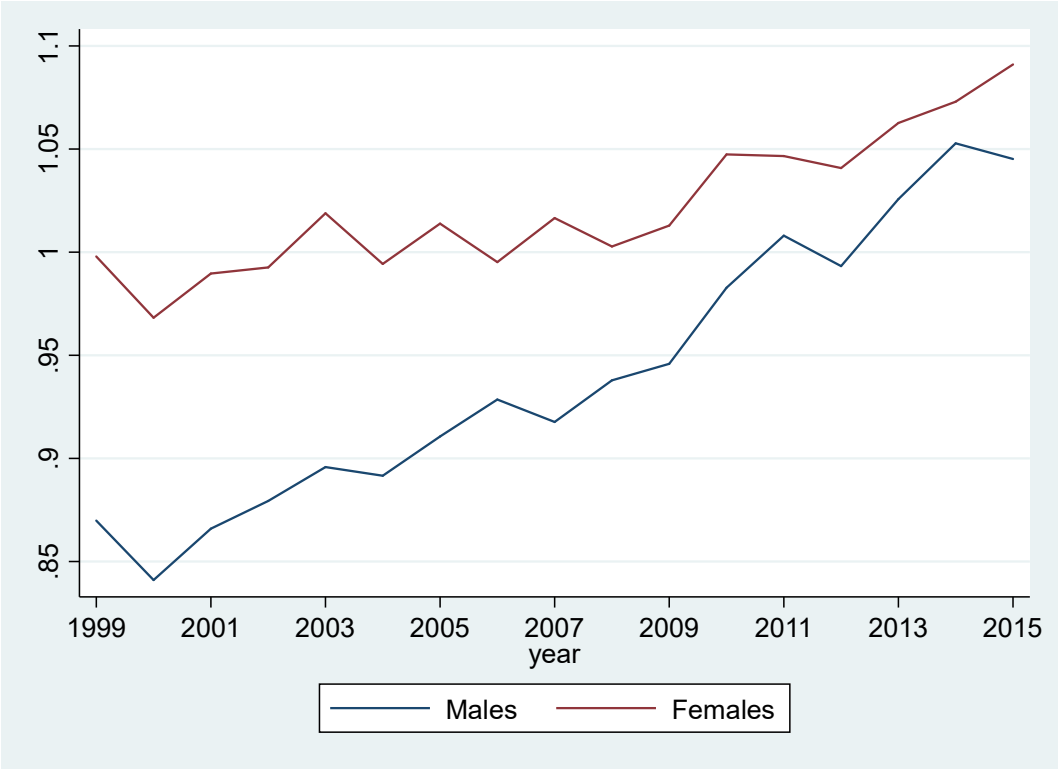
bachelor qualifications earn higher returns in other occupations. In contrast, both, men and women with postgraduate qualifications earn higher returns in other occupations. However, the difference is consistently smaller for women than men. Women face a lower opportunity cost for becoming a teacher compared to men. Thus, the gender distribution observed in teaching occupation is consistent with returns to education across occupations.

Figure 1: Proportion of women across occupations 1999-2015



Source: Authors calculations using GDS data.

Figure 2: Average Wage for Teachers compared to Non-Teachers, 1999-2015



Notes: Source: Authors calculations using the GDS data. The figure plots the ratio of average wage for teachers to average wage for non-teachers for males and females.

Table 1: Descriptive Statistics

		Teachers		Non-Teachers	
		Men	**Women**	**Men**	**Women**
Panel A: All qualifications					
Wage ($)	Mean	47,558	43,034	57,413	42,395
	(Std dev)	(27,688)	(35,354)	(49,289)	(47,269)
Age (years)	Mean	32	30	29	29
	(Std dev)	(9.8)	(9.8)	(8.9)	(9.1)
ATAR	Mean	77.7	77.7	82.5	81.6
	(Std dev)	(6.5)	(6.1)	(8.6)	(8.5)
Qualification Level					
Bachelors & Honours Degree	(%)	44	54	59	65
Graduate Certificate/ Diploma	(%)	32	26	12	13
Masters Degree	(%)	16	13	22	16
Employer Sector					
Public\Govt	(%)	63	63	29	38
Private	(%)	35	35	67	55
Not-for-profit	(%)	1	2	4	7
Observations		32,051	111,435	508,249	711,112
Panel B: Education qualifications					
Wage ($)	Mean	47,688	42,980	56,141	43,026
	(Std dev)	(27,713)	(36,462)	(47,237)	(45,646)
Age (years)	Mean	31	30	37	34
	(Std dev)	(9.3)	(9.6)	(11.1)	(11.1)
ATAR	Mean	76.9	77.1	77.2	77.4
	(Std dev)	(5.87)	(5.67)	(6.1)	(6.04)
Qualification Level					
Bachelors & Honours Degree	(%)	43	54	30	39
Graduate Certificate/ Diploma	(%)	35	26	33	30
Masters Degree	(%)	15	12	28	23
Employer Sector					
Public\Govt	(%)	65	64	38	39
Private	(%)	34	34	53	51
Not-for-profit	(%)	1	2	8	11
Observations		26,378	97,864	11,413	31,991

Source: GDS, 1999-2015.

TABLE 2: Blinder Oaxaca decomposition of the wage differential between teachers and non-teachers by gender.

	Women		Men	
Average Wage	**Coefficient ($)**	**P>z**	**Coefficient ($)**	**P>z**
With Bachelors qualification				
Non-teachers	38440	0.000	44360	0.000
Teachers	41651	0.000	43977	0.000
Difference	-3211	0.000	383	0.027
Explained	-558	0.000	-1320	0.000
Unexplained	-2653	0.000	1703	0.000
With Graduate Diploma qualification				
Non-teachers	50719	0.000	62885	0.000
Teachers	43535	0.000	46254	0.000
Difference	7184	0.000	16631	0.000
Explained	618	0.000	2786	0.000
Unexplained	6565	0.000	13846	0.000
With Masters qualification				
Non-teachers	59608	0.000	68091	0.000
Teachers	57162	0.000	64142	0.000
Difference	2446	0.000	3949	0.000
Explained	-1851	0.000	-3044	0.000
Unexplained	4296	0.000	6993	0.000

Notes: Figures in A$. Estimations includes controls for ATAR, age, year, state and employer sector (Public/Government, Private or Not for Profit). Sample restricted to wage range of $10,000 to $150,000.

TABLE 3: RIF decomposition of wage differential between teachers and non-teachers for Women.

Percentile	**10**	**20**	**30**	**40**	**50**	**60**	**70**	**80**	**90**
Non Teachers ($)	20392	27264	32947	37533	41240	46399	52077	60542	72898
(p-value)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Teachers ($)	24563	32516	37539	41388	44535	48505	53003	57068	63153
(p-value)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Difference ($)	-4171	-5252	-4592	-3855	-3295	-2106	-926	3475	9745
(p-value)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Explained ($)	-753	-1788	-1285	-997	-533	-647	-419	-118	26
(p-value)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.090	0.879
Unexplained ($)	-3419	-3464	-3307	-2857	-2762	-1458	-507	3592	9720
(p-value)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Notes: Figures in A$ apart from p-values. Estimations includes controls for ATAR, age, level of education, year, state and employer sector (Public/Government, Private or Not for Profit). Sample restricted to wage range of $10,000 to $150,000.

TABLE 4: RIF decomposition of wage differential between teachers and non-teachers for Men

Percentile	**10**	**20**	**30**	**40**	**50**	**60**	**70**	**80**	**90**
Non Teachers ($)	22590	32026	37296	42621	48901	55023	62632	72386	92798
(p-value)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Teachers ($)	31469	36907	41306	44102	48203	51283	55973	60691	70390
(p-value)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Difference ($)	-8879	-4881	-4010	-1481	698	3741	6659	11695	22408
(p-value)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Explained ($)	-1158	-2037	-2609	-2555	-2214	-2695	-2067	-2750	125
(p-value)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Unexplained ($)	-7720	-2844	-1401	1074	2912	6436	8726	14445	22283
(p-value)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Notes: Figures in A$ apart from p-values. Estimations includes controls for ATAR, age, level of education, year, state and employer sector (Public/Government, Private or Not for Profit). Sample restricted to wage range of $10,000 to $150,000.

TABLE 5: Blinder Oaxaca decomposition of wage differential: Education qualification only.

	Women		Men	
Mean Wage	**Coefficient ($)**	**P>z**	**Coefficient ($)**	**P>z**
With Bachelors qualification in Education				
Non-teachers	34848	0.000	42680	0.000
Teachers	41629	0.000	44179	0.000
Difference	-6781	0.000	-1499	0.005
Explained	648	0.000	1988	0.000
Unexplained	-7429	0.000	-3487	0.000
With Graduate Diploma qualification in Education				
Non-teachers	41595	0.000	48280	0.000
Teachers	43064	0.000	45824	0.000
Difference	-1469	0.000	2457	0.001
Explained	31	0.824	1231	0.000
Unexplained	-1500	0.000	1226	0.069
With Masters qualification in Education				
Non-teachers	61648	0.000	70800	0.000
Teachers	56997	0.000	64097	0.000
Difference	4651	0.000	6703	0.000
Explained	1094	0.000	872	0.036
Unexplained	3557	0.000	5831	0.000

Notes: Figures in A$ apart from p-values. Sample restricted to persons with education as major field of qualification. Estimations includes controls for ATAR, age, year, state and employer sector (Public/Government, Private or Not for Profit). Sample restricted to wage range of $10,000 to $150,000.

References

Acker, S. (1989). *Teachers, gender and careers*. London: Falmer Press.

Apple, M. (2013). *Teachers and texts: A political economy of class and gender relations in education*. Routledge.

Asadullah, M. (2006). Pay differences between teachers and other occupations: Some empirical evidence from Bangladesh. *Journal of Asian Economics*, *17*(6), 1044-1065.

Barnabé, C., & Burns, M. (1994). Teachers' job characteristics and motivation. *Educational Research*, *36*(2), 171-185.

Barnes, G., Crowe, E., & Schaefer, B. (2007). The cost of teacher turnover in five school districts: A pilot study. *National Commission on Teaching and America's Future*.

Blau, F., & Kahn, L. (2000). Gender differences in pay. *Journal of Economic Perspectives*, *14*(4), 75-99.

Blau, F., & Kahn, L. (2007). The gender pay gap. *The Economists' Voice*, *4*(4).

Boe, E., Cook, L., & Sunderland, R. (2008). Teacher turnover: Examining exit attrition, teaching area transfer, and school migration. *Exceptional Children*, *75*(1), 7-31.

Bogler, R. (2002). Two profiles of schoolteachers: A discriminant analysis of job satisfaction. *Teaching and Teacher Education*, *18*(6), 665-673.

Bourdon, J., Frölich, M., & Michaelowa, K. (2010). Teacher shortages, teacher contracts and their effect on education in Africa. *Journal of the Royal Statistical Society: Series A (Statistics in Society)*, *173*(1), 93-116.

Card, D., & Krueger, A. (1992). Does school quality matter? Returns to education and the characteristics of public schools in the United States. *Journal of Political Economy*, *100*(1), 1-40.

Carrington, B., & McPhee, A. (2008). Boys' 'underachievement' and the feminization of teaching. *Journal of Education for Teaching*, *34*(2), 109-120.

Carroll, D., Heaton, C., & Tani, M. (2018). *Does it pay to graduate from an 'Elite' University in Australia?* IZA Discussion Paper No. 11477.

Chevalier, A. (2007). Education, occupation and career expectations: Determinants of the gender pay gap for UK graduates. *Oxford Bulletin of Economics and Statistics*, *69*(6), 819-842.

Cortes, P., & Pan, J. (2017). *Occupation and Gender.* IZA Discussion Paper No. 10672.

Cruikshank, V. (2012). *Why men choose to become primary teachers*. Conference Paper presented at the Joint AARE/APERA Conference, Sydney 2012.

Cushman, P. (2010). Male primary school teachers: Helping or hindering a move to gender equity. *Teaching and Teacher Education*, *26,* 1211 – 1218.

Dohmen, T., & Falk, A. (2010). You get what you pay for: Incentives and selection in the education system. *The Economic Journal*, *120* (546), F256-F271.

Dolton, P., & van der Klaauw, W. (1999). The turnover of teachers: A competing risks explanation. *Review of Economics and Statistics*, *81*(3), 543-550.

Doolittle, S., Dodds, P., & Placek, J. (1993). Persistence of beliefs about teaching during formal training of preservice teachers. *Journal of Teaching in Physical Education*, *12*(4), 355-365.

Drudy, S. (2008) Gender balance/gender bias: The teaching profession and the impact of feminisation, *Gender and Education*, *20*, 309-323.

Eide, E., Goldhaber, D., & Brewer, D. (2004). The teacher labour market and teacher quality. *Oxford Review of Economic Policy 20*, (2), 230-244.

Evans, T. D. (1982). Being and Becoming: Teachers' perceptions of sex‐roles and actions toward their male and female pupils. *British Journal of Sociology of Education*, *3*(2), 127-143.

Farmer, H. (1987). A multivariate model for explaining gender differences in career and achievement motivation. *Educational Researcher*, *16*(2), 5-9.

Ferguson, R. (1991). Paying for public education: New evidence on how and why money matters. *Harvard Journal on Legislation*, *28*, 465.

Fortin, N. (2005). Gender role attitudes and the labour-market outcomes of women across OECD countries. *Oxford Review of Economic Policy*, *21*(3), 416-438.

Fouarge, D., Kriechel, B., & Dohmen, T. (2014). Occupational sorting of school graduates: The role of economic preferences. *Journal of Economic Behavior & Organization 106*, 335-351.

Gore, J., Holmes, K., Smith, M., & Fray, L. (2015). *Investigating the factors that influence the choice of teaching as a first career.* Report commissioned by the Queensland College of Teachers.

Hackman, J., & Oldham, G. (1976). Motivation through the design of work: Test of a theory. *Organizational Behavior and Human Performance*, *16*(2), 250-279.

Hanushek, E., Kain, J., & Rivkin, S. (2004). Why public schools lose teachers. *Journal of Human Resources*, *39*(2), 326-354.

Hanushek, E., Rivkin, S., Rothstein, R., & Podgursky, M. (2004). How to improve the supply of high-quality teachers. *Brookings Papers on Education Policy*, *7*, 7-44.

Hanushek, E., & Rivkin. S. (2007). Pay, working conditions, and teacher quality. *The Future of Children,* 69-86.

Imazeki, J. (2005). Teacher salaries and teacher attrition. *Economics of Education Review*, *24*(4), 431-449.

Ingersoll, R., & Smith, T. (2003). The wrong solution to the teacher shortage. *Educational Leadership*, *60*(8), 30-33.

Ingersoll, R. (2001). Teacher turnover and teacher shortages: An organizational analysis. *American Educational Research Journal*, *38*(3), 499-534.

Johnson, S., & Birkeland. S. (2003). Pursuing a "sense of success": New teachers explain their career decisions. *American Educational Research Journal 40*(3), 581-617.

Kershaw, J., & McKean, R. (1962). *Teacher shortages and salary schedules*. Santa Monica, CA: RAND Corporation.

Kyriacou, C., & Coulthard, M. (2000). Undergraduates' views of teaching as a career choice. *Journal of Education for Teaching: International Research and Pedagogy*, *26*(2), 117-126.

Lai, K., Chan, K., Ko, K., & So, K. (2005) Teaching as a career: A perspective from Hong Kong senior secondary students. *Journal of Education for Teaching*, *31*, 153-168.

Leigh, A., & Ryan, C. (2008). How and why has teacher quality changed in Australia? *Australian Economic Review*, *41*(2), 141-159.

Lester, P. (1987). Development and factor analysis of the teacher job satisfaction questionnaire (TJSQ). *Educational and Psychological Measurement*, *47*(1), 223-233.

Majzub, R., & Rais, M. (2010). Boys' underachievement: Male versus female teachers. *Procedia-Social and Behavioral Sciences*, *7*, 685-690.

Mandel, H., & Semyonov, M. (2014). Gender pay gap and employment sector: Sources of earnings disparities in the United States, 1970–2010. *Demography*, *51*(5), 1597-1618.

McGrath, K., & Sinclair, M. (2013). More male primary-school teachers? Social benefits for boys and girls, *Gender and Education*, *25*, 531-547.

McGrath, K., & Van Bergen, P. (2017). Are male teachers headed for extinction? The 50 year decline of male teachers in Australia. *Economics of Education Review*, *60*, 159-167.

McKenzie, P., Weldon, P., Rowley, G., Murphy, M., & McMillan, J. (2014). *Staff in Australia's Schools 2013: Main report on the survey*. Australian Council of Educational Research.

McWhirter, E. (1997). Perceived barriers to education and career: Ethnic and gender differences. *Journal of Vocational Behavior*, *50*(1), 124-140.

Mills, M., Martino, W., & Lingard, B. (2004). Attracting, recruiting and retaining male teachers: Policy issues in the male teacher debate. *British Journal of Sociology of Education*, *25*, p 355-369.

Mora, J., García-Aracil, A., and Vila, L. (2007). Job satisfaction among young European higher education graduates. *Higher Education*, *53*(1), pp.29-59.

Neidhart, H. and Carlin, P. (2003). *Pathways, incentives and barriers for women aspiring to principalship in Australian Catholic Schools*. Conference paper presented at the Joint AARE/NZARE Conference, Auckland.

OECD (2005). http://www.oecd.org/education/school/34990905.pdf (Accessed on 13 December 2018).

OECD (2018a), http://stats.oecd.org/Index.aspx?DatasetCode=RGRADSTY#, (Accessed on 13 December 2018).

OECD (2018b), Women teachers (indicator). doi: 10.1787/ee964f55-en (Accessed on 13 December 2018).Olsen, B. (2008). How reasons for entry into the profession illuminate teacher identity development. *Teacher Education Quarterly*, *35*, p23-40.

Pajak, E. and Blase, J. (1989). The impact of teachers' personal lives on professional role enactment: A qualitative analysis. *American Educational Research Journal*, *26*(2), 283-310.

Pajares, M. (1992). Teachers' beliefs and educational research: Cleaning up a messy construct. *Review of Educational Research*, *62*(3), 307-332.

Richardson, P., & Watt, H. (2006). Who chooses teaching and why? Profiling characteristics and motivations across three Australian universities. *Asia-Pacific Journal of Teacher Education*, *34*, 27-56.

Richardson, P., & Watt, H. (2005). "I've decided to become a teacher": Influences on career change. *Teaching and Teacher Education*, *21*, 475-489.

Rivkin, S., Hanushek, E., & Kain, J. (2005). Teachers, schools, and academic achievement. *Econometrica, 73*(2), 417-458.

Rots, I., Aelterman, A., Vlerick, P., & Vermeulen, K. (2007). Teacher education, graduates' teaching commitment and entrance into the teaching profession. *Teaching and Teacher Education*, *23*(5), 543-556.

Roulston, K., & Mills, M. (2000). Male teachers in feminised teaching areas: Marching to the beat of the men's movement drums?. *Oxford Review of Education*, *26*(2), 221-237.

Rumberger, R. (1987). The impact of salary differentials on teacher shortages and turnover: The case of mathematics and science teachers. *Economics of Education Review*, *6*(4), 389-399.

Stinebrickner, T. (1998). An empirical investigation of teacher attrition. *Economics of Education Review*, *17*(2), 127-136.

Strober, M., & Tyack, D. (1980). Why do women teach and men manage? A report on research on schools. *Signs: Journal of Women in Culture and Society*, *5*(3), 494-503.

Suryadarma, D., Suryahadi, A., Sumarto, S., & Rogers, H. (2005). *The determinants of student performance in Indonesian public primary schools: the role of teachers and schools*. SMERU Research Institute.

Watt, H., & Richardson, P. (2012). An introduction to teaching motivations in different countries: Comparisons using the FIT-Choice scale. *Asia-Pacific Journal of Teacher Education*, *40*, 185-197.

Watt, H., & Richardson, P. (2007). Motivational factors influencing teaching as a career choice: Development and validation of the FIT-Choice Scale. *The Journal of Experimental Education*, *75*(3), 167-202.

Watt, H., Richardson, P., Klusmann, U., Kunter, M., Beyer, B., Trautwein, U., & Baumert, J. (2012). Motivations for choosing teaching as a career: An international comparison using the FIT-Choice scale. *Teaching and Teacher Education*, *28*(6), 791-805.

Wilson, A., & Pearson, R. (1993). The problem of teacher shortages. *Education Economics*, *1*(1),.69-75.

Wiswall, M. (2013). The dynamics of teacher quality. *Journal of Public Economics*, *100*, 61-78.

World Bank (2012). World Development Report http://siteresources.worldbank.org/INTWDR2012/Resources/7778105-1299699968583/7786210-1315936222006/chapter-5.pdf (Accessed on 13 December 2018).

Wyatt-Smith, C., Du Plessis, A., Wang, J., Hand, K., Alexander, C., & Colbert, P. (2017) *Why choose teaching? A matter of choice: evidence from the field.* Report prepared by the Learning Sciences Institute Australia on behalf of the Queensland College of Teachers.

Appendix 1

Technical Appendix

The Oaxaca-Blinder decomposition

For the conditional mean decomposition, the logarithms of the hourly wage equations for males (M) and for females (F) are modelled as.

$$W_{Mit} = X_{Mit}\beta_{Mit} + \varepsilon_{Mit} \qquad (1)$$

$$W_{Fit} = X_{Fit}\beta_{Fit} + \varepsilon_{Fit} \qquad (2)$$

respectively, where t refers to the graduation year. These equations can be estimated separately or in a pooled regression by adding a gender indicator. Using the assumption of linearity (and separability) of wages as a function of observable and unobservable characteristics, it is possible to write the difference in the mean wages $\Delta_t = \overline{W}_{Mt} - \overline{W}_{Ft}$ into the three components:

$$\Delta_t = \overline{W}_{Mt} - \overline{W}_{Ft} = (\bar{X}_{Mt} - \bar{X}_{Ft})\beta_{Ft} + (\beta_{Mt} - \beta_{Ft})\bar{X}_{Ft} + (\bar{X}_{Mt} - \bar{X}_{Ft})(\beta_{Mt} - \beta_{Ft}) \qquad (3)$$

where:

(i) $(\bar{X}_{Mt} - \bar{X}_{Ft})\beta_{Ft}$ is the explained component due to observed group differences in the $\bar{X}$'s (also known as endowment effect);

(ii) $\beta_{Mt} - \beta_{Ft})\bar{X}_{Ft}$ is the unexplained component due to differences in the coefficients (the β's); and

(iii) the interaction term $(\bar{X}_{Mt} - \bar{X}_{Ft})(\beta_{Mt} - \beta_{Ft})$ reflects that differences in endowments and coefficients between the two groups exist simultaneously.

Under the assumption that the conditional expectation of wages given a set of covariates is linear, it is possible to further subdivide composition and wage structure effects into the contribution of each covariate.

The Firpo, Fortin and Lemieux decomposition

This consists of two steps: the first is to perform a regression of the probability of the wage observation being above a quantile of interest (or other statistic such as variance or Gini coefficient). In the second, the Oaxaca-Blinder decomposition is applied.

Hence, the wage gap at quantile $q(\tau)$ can be written as the difference between female and male quantiles:

$$\Delta_t(\tau) = q_{Mt}(\tau) - q_{Ft}(\tau) \qquad (5)$$

The unconditional quantile regression approach first replaces the dependent variable of models (1) and (2) with the 'recentered influence function' (RIF) of the wages W_{Mt} and W_{Ft} for the quantile of interest, which is defined as:

$$RIF_{it}(W_{it}, q) = q(\tau) + \frac{I(W_{it} \geq q) - (1-\tau)}{f_W(q(\tau))} \qquad (6)$$

where the expression $\frac{I(W_{it} \geq q) - (1-\tau)}{f_W(q(\tau))}$ is the influence function[6]. The RIF functions for males and females are therefore:

$$RIF_{Mit} = X_{Mit}\delta_{Mit} + \mu_{Mit} \qquad (7)$$

and

$$RIF_{Fit} = X_{Fit}\delta_{Fit} + \mu_{Fit} \qquad (8)$$

respectively. The quantile wage gap is obtained as the difference in conditional expected value of the RIF between the two groups. This can be decomposed using the Oaxaca-Blinder decomposition as:

$$\Delta_t(\tau) = q_{It}(\tau) - q_{Nt}(\tau) = (\bar{X}_{It} - \bar{X}_{Nt})\delta_{Nt,\tau} + (\delta_{It,\tau} - \delta_{Nt,\tau})\bar{X}_{It} \qquad (9)$$

[6] This represents the influence of an individual observation on quantile $q(\tau)$ and includes the wage density function $f_W(.)$ and the indicator function $I(.)$ - a dummy variable equals 1 if the wage observation is above the quantile $q(\tau)$ and zero otherwise.

where the term $(\bar{X}_{Mt} - \bar{X}_{Ft})\delta_{Ft,\tau}$ explains the effect of the covariates on the unconditional quantile and the term $(\delta_{Mt,\tau} - \delta_{Ft,\tau})\bar{X}_{Mt}$ captures unexplained differences between males and females.

A RIF regression[7] is therefore analogous to performing a linear regression model on the probability of the wage observation being above the quantile of interest. The only difference with a simple linear probability model is that in the RIF case the coefficients are normalized by the density function evaluated at the quantile $q(\tau)$. As shown in Firpo, Fortin and Lemieux (2009), instead of decomposing the quantile gap $\Delta_t(\tau)$,this methodology uses the corresponding gap in the probability, on which it then applies the Oaxaca-Blinder decomposition. The main advantage of this approach is to allow one to separate the overall components of the decomposition into the contribution of each single variable.

[7] In its simplest form, the conditional expectation of the $RIF_{it}(W_{it}, q)$ is modeled as a linear function of the explanatory variables, so that $E(RIF_{it}(W_{it}, q)|X_{it}) = X_{it}\gamma$ where the parameters γ can be estimated by OLS.

Appendix 2
Table A1: Summary of results from alternative specifications

Specification	Education level	Women	Men
1. Definition of teachers: include special education, vocational education and education officers as teachers	Graduates	✓	Difference between teachers and non-teachers not significant
	Graduate Diploma	✓	✓
	Masters	✓	✓
2. Definition of teachers: include special education and vocational education as teachers, education officers as non-teachers	Graduates	✓	Difference between teachers and non-teachers not significant
	Graduate Diploma	✓	✓
	Masters	✓	✓
3. Log Hourly wages instead of annual wages	Graduates	✓	Teachers earn more; differential in favour of teachers greater for females than males.
	Graduate Diploma	✓	✓
	Masters	Teachers earn more	✓
4. Including full wage range (Sample not restricted to $10,000-<$150,000)	Graduates	✓	✓
	Graduate Diploma	✓	✓
	Masters	✓	✓
5. Sample restricted to wage < $200,000	Graduates	✓	Teachers earn more; differential in favour of teachers greater for females than males.
	Graduate Diploma	✓	✓
	Masters	✓	✓
6. Excluding ATAR as a control variable	Graduates	✓	✓
	Graduate Diploma	✓	✓
	Masters	✓	✓
7. Excluding ATAR as a control variable and restricting sample to education qualifications only.	Graduates	✓	✓
	Graduate Diploma	✓	✓
	Masters	✓	✓
8. Controlling for proportion of part time workers in the occupation	Graduates	Teachers earn more, differential in favour of teachers greater for females than males.	
	Graduate Diploma	✓	✓
	Masters	Teachers earn more, differential in favour of teachers greater for males than females.	

Notes: Symbol ✓ denotes that results are consistent with the results reported in Table 2 and Table 5.