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Conversations with an Eminent Labour Economist: Stephen Machin

Stephen Machin (SM) is Professor of Economics and Director of the Centre for Economic Performance (CEP) at the London School of Economics. He was an independent member of the Low Pay Commission in the UK and is a Fellow of the British Academy. He has been President of the European Association of Labour Economists and is a Fellow of the Society of Labour Economists. This interview, with Sholeh Maani (ShM) Professor of Economics at the University of Auckland, took place at the inaugural Asian and Australasian Society of Labour Economics (AASLE) meeting in Canberra.

ShM: What do you think are the key issues in labour economics?

SM: Well, there are quite a lot of them, and they have moved over time in various ways. particularly the big picture things.

If you go back, quite a way back, to the 1970s and the 1980s, unemployment was obviously a big issue, but with lower unemployment rates today it has a somewhat reduced research profile. Other contemporary labour market questions have come to the fore. For example, real wage stagnation has become a big deal in many countries as has the rise in inequality over the last 30 years, which has occurred differentially in different places. Certainly, big increases in inequality in America and Britain, and other countries have followed suit to a certain extent more recently. Inequality has gone up, and therefore, less of a fair sharing in rewards in the labour market.

ShM: You have contributed to education economics, in particular the academic performance of children across socio-economic backgrounds. The field has also grown significantly over the past decades. Are there still some questions that we haven't answered in education economics?

SM: Yes, there are a lot of questions about what actually works in education. My initial interest for studying the economics of education was the increased importance of education for labour market outcomes over time. And that's actually one of the drivers of inequality as well.

I'm interested in how and why education acquisition occurs. What sort of people acquire different sorts and levels of education, and why? And then, what the impact of that actually is. There are, in fact, many unanswered questions. For instance, we know something about what works in education – in schools, for example. But there are still many questions about why some children in the same schools do much worse or better than others. There are quite a lot of unanswered questions in economics of education.

ShM: How did you become interested in labour economics and when did you know that labour economics was your passion?

SM: It took a while I think. I started studying economics at university and I guess the reason why I first got into economics was because the subjects I was best at, at school, was maths. Economics requires some mathematical skills but also you can apply those methods to analysing social problems in some ways. I was interested in applying rigorous analysis to issues in society, and economics provides quite a good tool for that. Within economics I was first interested in macroeconomics because I'm interested in the big picture. But rapidly I realised that labour economics was probably for me in many ways. Part of the reason for this is because it's probably the most dominant area of applied empirical economics. Also, I'm very, very interested in the labour market of course. Not just the economics side, but on the policy side as well. Applying economics to real world questions was my impetus.

ShM: Do you think that as academic economists we are able to sufficiently prepare our students in the areas of econometrics for applied work, economic theory, and history? And do we need to prepare students in all of these areas?

SM: Well, I think one advantage economics has over other social science disciplines is that it has an actual framework for analysing questions. This is also one of its disadvantages! But, of course, that does give you some structure such that you can actually start to think about how to test key hypotheses based on first order economic principles. I think having that framework is important, but then people need to have the requisite technical skills to be able to apply those methods.

So, it proves important to have econometric skills, mathematical skills, but also other sorts of skills for applying common sense to economic questions and not getting lost in the abstraction that theory sometimes does. Testing first order economic principles is what we should be doing. Confronting first order economic principles with real, and as good data as you can get. I think if you can't get good data you should go and collect it yourself if you can.

The common sense factor is another skill. People seem to have it to varying degrees. Keeping your feet on the ground and trying to do things about the real world, and with good motivation, is an important aspect of doing economics well.

ShM: Yes. Labour economics keeps us honest because we have to look around and see if our theory is actually working or not, and whether or not there is supporting evidence! For young colleagues who may have started as a lecturer or assistant professor what advice would you give them to succeed in research?

SM: Well, to be serious about work. To try and be rigorous about what you do. And more controversially, actually try to have an impact on the real world as well.

ShM: So not to be afraid to be controversial?

SM: Yes. If you need to be.

ShM: What advice would you give to young scholars?

SM: Quite a lot of things. It depends on what level you're thinking. If you're thinking about people who are just starting PhDs, for example, it is trying to find a good subject to work on, but particularly something that you yourself are actually interested in! That is because, of course, you're going to do a much better job of studying something that you are interested in, and something that you think is important to apply economic tools to.

Also important is reading and looking at research widely, and not just confining yourself to economics. Depending on what questions you might be looking at, reading from other social sciences perhaps, can put different perspectives on the way in which you might want to examine questions.

ShM: What is the best way for economists to engage policymakers in a constructive debate? You have done that successfully on a number of occasions.

SM: I think I have done it successfully to some extent, but also unsuccessfully to a certain extent. This is because the role of economists, if you want to advise policymakers, government officials and practitioners, is to offer them what you know and then it's up to them to use it. This is rather than trying to manipulate them in some way. Part and parcel of the role is to have a skill (or to try and learn a skill) of being able to disseminate findings to people who may not have a particularly rigorous economic background. You need to be able to present rigorous empirical research to people, so they can understand it and actually use it in policies is quite important.

ShM: What do you think are some good channels to achieve that goal?

SM: A lot hinges on whoever the individuals are that you're interacting with. Some policymakers are more evidence based than others. It's not unreasonable to say that some people only want to listen to evidence that confirms their priors. Other people are more open minded. That's why I think you should give your findings to people and then they should use it how they wish.

ShM: Do you think there's a global community of economists and how can economists in Asia, Australia, and New Zealand connect and engage with that?

SM: Well, there sort of is, isn't there? I mean there's an academic economics profession that operates across countries, and so of course – the setting up of this Asian and Australasian Society of Labour Economics is a good thing in that respect. We can get closer to having that. I think there is going to be a meeting in 2020 when the other two big associations, The Society of Labour Economists from the US and the European Association of Labour Economics are going to have a joint event with the new Asian and Australasian Society of Labour Economists conference in Berlin in 2020. I think there was a certain number of slots being kept for this society.

So that strikes me as an excellent development because that's actually getting closer to a world labour economics association meeting. And learning about what happens in different settings and seeing different research from different settings will be a very good thing.

ShM: Which one of your studies is your favourite?!

SM: That's a pretty difficult question! I guess it changes. I may answer a different one on a different day. I obviously have some favourites but I'm not sure I can pinpoint a particular one.
Whatever, I think that doing economics should be fun as well!

ShM: That's right. It's a good way to end!

Sholeh A. Maani
The University of Auckland

Factors underlying the likelihood of being in business for Indigenous and non-Indigenous Australians

Siddharth Shirodkar and Boyd Hunter

Abstract

A significant difference exists between the rates of Indigenous and non-Indigenous business ownership in Australia. This paper attempts to understand the factors that may affect the likelihood of Indigenous Australians being in business compared to non-Indigenous Australians. We use a probit cross-sectional estimation on a close to 5 per cent sample of the Australian population from the 2016 Census to assess the factors that are associated with a higher probability of being in business for four groups: Indigenous men and women and non-Indigenous men and women. The results show that once accounting for other socioeconomic and demographic factors, identifying as Aboriginal and/or Torres Strait Islander in the Census explains a sizeable difference between the rates of business ownership. The results suggest a discriminatory barrier may affect the likelihood of being in business for many entrepreneurial Indigenous Australians. The paper also looks at the correlation between business ownership and education, home ownership, access to networks, age, disability, marital status and geography.

JEL Codes: J15, J78, L26
Keywords: Indigenous business, entrepreneurs, social policy, labour economics

Introduction

Recent success in the Indigenous business sector is fuelling interest in the economic development benefits of business ownership for Indigenous Australians. Shirodkar, Hunter and Foley (2018) show that growing numbers of Indigenous Australians are choosing a life in business. The literature suggests that socioeconomic structural barriers may limit Indigenous business ownership compared to non-Indigenous Australians. The barriers include external and internal discrimination, lack of education and training, lack of access to finance (and home ownership), lack of access to networks and difficult geography (Daly 1993, Dana 1996, Thomas and Mueller 2000, Foley 2000, Altman 2001, Lindsay 2005, Costa and Kahn 2003, Foley 2006, Schaper 2007, Paradies et al. 2008, Dockery 2010, Wood and Davidson 2011, Booth et al. 2012, Hunter et al. 2014, Hunter 2014, Biddle et al. 2013) . This paper examines data from the 2016 Australian Census Longitudinal Dataset (ACLD) to develop a quantitative model that identifies the factors that impact on the likelihood of a person going into business. The primary determinant tested is the Indigenous status variable in the Census, i.e. that a person identifies as Aboriginal and/or Torres Strait Islander in the 2016 Census.

This paper finds that when accounting for socioeconomic conditions, a specific racial or identity factor comes into play for both women and men, significantly reducing the likelihood of an Indigenous Australian going into business compared to non-Indigenous Australians. Socioeconomic differences such as this may reflect the impact of an external discriminatory environment that inhibits Indigenous aspiration (Costa and Kahn 2003, Foley 2000, Foley 2006, Schaper 2007, Paradies et al 2008, Booth et al 2012, Hunter et al 2014, Hunter 2014, Biddle et al 2013). It could also reflect factors internal to Indigenous communities (Daly 1993, Thomas and Mueller 2000, Altman 2001, Lindsay 2005, Shaper 2007, Dockery 2010, Moore 2014, Dana 2015). The limitation of this quantitative study is that it cannot discern between the two theories. It can only indicate if identifying as Indigenous affects the rate of business ownership in Australia. But it provides a starting point to begin to understand the effects of societal constructs such as our operating environment, which can be discriminatory. The study also highlights other key factors behind Indigenous and non-Indigenous Australians going into business, including geography, education, marital status, socioeconomic backgrounds, income, home ownership, mobility and disability.

Policy context

Shirodkar, Hunter and Foley (2018) highlights the rapid growth of Indigenous Australians in business. The recent growth is partially attributable to the growing acceptance of Indigenous Australians in business and the impact of initiatives such as the Indigenous Procurement Policy (IPP). Since the inception of the IPP in 2015-16, the Commonwealth has awarded over $2 billion in procurement contracts to well over 1,000 Indigenous-owned businesses. Further evidence from the Commonwealth Government shows that Supply Nation-registered Indigenous businesses generated more than $1 billion in revenue in 2014-15, and growing at an annual average rate of

around 12.5 per cent per year. Studies have also acknowledged the sector's potential to significantly boost Indigenous employment and broader economic development outcomes, with Indigenous businesses anywhere between 40 times (Supply Nation's unpublished estimates) and up to 100 times (Hunter 2014) more likely to hire Indigenous employees than compared to non-Indigenous businesses.

Previous research has focused on the concept of an Indigenous business (Foley 2013) and much of the wider policy discussion is centred around the legal entity of a business. Supply Nation's database of Indigenous businesses, the largest in the country, only has around 1800 businesses registered (has at least 50 per cent Indigenous ownership) or certified (has at least 51 per cent Indigenous ownership). Census data suggests this is but a fraction of the size of the Indigenous business sector, as measured through the count on Indigenous Australians who identify as owner-managers of businesses. The absence of a complete and consistent database of Indigenous-owned businesses hampers detailed study of such entities. Instead, focusing on the individual owner-manager behind the legal entity opens up areas of exploration that would otherwise remain closed. Recent Census data has emerged that enables econometric analysis of the determinants behind an individual deciding to enter into business. Using cross-sectional 2016 data from the ACLD, this paper attempts to determine the factors that are associated with a higher likelihood of Indigenous and non-Indigenous Australians being owner-managers. The approach is consistent with the concept of an Indigenous Australian entrepreneur, which has also emerged in the literature (Foley, 2003; Shaper, 2007; Wood and Davidson; 2011; Hunter, 2014).

The concepts of an Indigenous entrepreneur and an Indigenous owner-manager are treated the same for the purposes of this study (i.e. the term owner-manager is used synonymously with entrepreneur). The only qualification is that an individual identifies as an owner-manager of an incorporated or unincorporated enterprise in the Census. As such, the tech-start up entrepreneur and the local sole-trading plumber are both examples of owner-managers of businesses in this research.

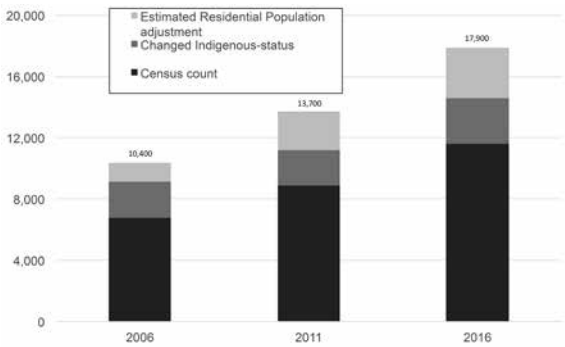
The historical exclusion of Indigenous Australians from mainstream economic life has led to a low accumulation of wealth across many Indigenous communities (Foley 2003, Booth et al 2012, Biddle et al 2013 and Hunter 2014). As such, only a relative few gained formal business experience prior to the last decade. The result is that the vast bulk of entrepreneurially inclined Indigenous Australians likely lack the key pre-conditions to start a business and prosper in our capitalist economy. In spite of the historically challenging environment, the number of Indigenous Australians in business has grown substantially over the last decade.

Hunter (2014) attempted to provide a broad-brush estimate of the growth in Indigenous self-employed, which he claims has been growing steadily since the 1991 Census, albeit from a low base. The major issue faced in earlier estimates of the Indigenous business sector is an element of confusion as to what constitutes self-employment, how it relates to businesses and methods of measurement. Recent Census data collects information on people who are owner-managers of enterprises.

Shirodkar, Hunter and Foley (2018) use the last three Censuses and the ACLD to develop a measure of the size of the Indigenous business sector. The estimates adjust for the increasing identification of Indigenous status between Censuses and inflating

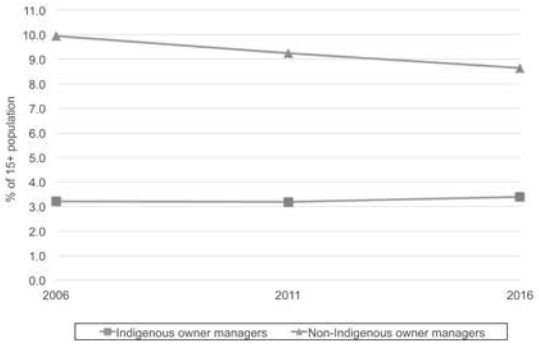
for the total Indigenous population, reflecting the difference between the Census count of the Indigenous population, which is around 18 per cent less than and the Indigenous estimated residential population for 2016. The paper demonstrates that the number of Indigenous owner managers has increased substantially, reaching between 17,000 to 18,000 owner-managers in 2016, growing by around 30 per cent from 2011 (see Chart 1). Despite this, the rate of Indigenous business ownership remains lower than the non-Indigenous rate (see Chart 2). Note though the Indigenous business sector grew during a time when the non-Indigenous business ownership rate stagnated and declined.

Chart 1: Growth in the number of Indigenous owner-managers in Australia, Census 2006-2016



Source: Shirodkar, Hunter and Foley (2018)

Chart 2: Rates of Indigenous and non-Indigenous business ownership, Censuses 2006–2016



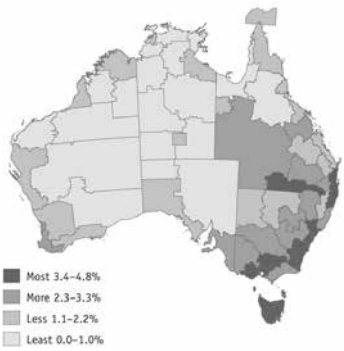
Source: Shirodkar, Hunter and Foley (2018)

Shirodkar, Hunter and Foley (2018) also show that men make up 67 per cent of Indigenous owner–managers and women 33 per cent, which is exactly the same gender split for non-Indigenous owner-managers. The uniform difference in rates of

business ownership between the genders may thereby reflect broader societal factors that inhibit all Australian women from going into business.

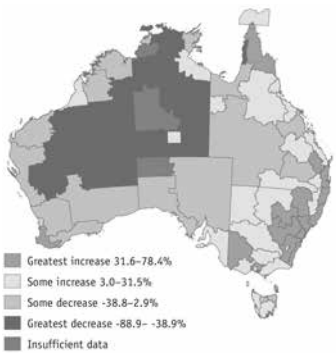
Map 1 shows that the highest proportions of Indigenous owner-managers in 2016 are concentrated in east coast urban areas where the labour and product markets are most developed, as well as regional parts of the eastern states of Queensland, New South Wales, Victoria and Tasmania. Indigenous owner-managers are more sparsely concentrated across the rest of the country and make up the lowest shares of the Indigenous population in large areas of remote Western Australia, Northern Territory and South Australia. Map 2 provides greater detail of the change in the number of Indigenous owner-managers between 2011 and 2016 across regions. While growth in the number of Indigenous owner-managers was relatively high in metropolitan areas, growth was weaker in areas where relatively few Indigenous owner-managers operated. The largest declines were in remote regions, generally from a relatively low base in 2011. The Northern Territory and very remote parts of Western Australian and the Northern Territory appear hardest hit. Overall, the change in the number of Indigenous owner managers reinforces the story that remote areas are underdeveloped in terms of access to markets. Clearly, the situation is becoming more challenging.

Map 1. Owner-managers (per cent 15-64), 2016



Source: Hunter B, Foley D and Arthur WS (2019)

Map 2. Growth in Indigenous Owner Managers (per cent change), 2011-16



Source: Hunter B, Foley D and Arthur WS (2019)

Literature review

Access to the Australian Census Longitudinal Dataset (ACLD) enables the exploration of critical questions around the drivers for Indigenous and non-Indigenous business ownership.

Chart 2 shows that a significant difference exists between the rate of Indigenous and non-Indigenous business ownership, albeit narrowing gradually. The purpose of this study is to determine quantitatively the factors that increase the likelihood of

business ownership for Indigenous and non-Indigenous men and women. The primary determinant tested is the impact of a person's Indigenous status (i.e. identifying as Aboriginal and/or Torres Strait Islander or non-Indigenous) on the likelihood of being in business, once accounting for other pertinent factors.

The literature on Australian Indigenous entrepreneurship is limited, with only a few authors whose extensive writing has formed the main body of work, all of which is qualitative (Foley 2000, 2003, 2013; Hunter 1999, 2014, 2015; Wood and Davidson 2011; Altman 2001; and Daly, 1993). To date, no published study has undertaken a quantitative approach to estimate the relative effects of various determinants on business ownership. Rather, qualitative research has identified broad themes that may have an impact on a person's reasons for going into business.

Using qualitative case study analysis, Foley (2000) identifies a number of socioeconomic factors that may affect a person's desire to enter into business and success when in business. The factors include education levels, industry experience and training (which he argues is closely linked to education), membership in industry associations (i.e. access to networks), having a business plan and initial financial capital. Foley is of the view that human capital is a key determinant of entry and success in business, in line with Theodore Schultz's first articulations of human capital theory in the 1960s. Dockery (2010), Schaper (2007), Dana (1996) and Daly (1993) also identify a lack of formal education and prior work experience as key barriers into business ownership for Indigenous peoples in Australia and overseas. Equipping people with greater amounts of human capital (in the form of education and training) increases capability and productivity, and thereby economic prospects, particularly in employment. Naturally, one would assume that higher levels of education and training would also translate into important factors for business ownership. Evidence from the US Census suggests that self-employed individuals have on average an extra year of schooling compared with wage and salary earners and that each extra year of schooling increased the probability of a person being self-employed by 0.8 per cent (Robinson and Sexton 1994). However, Robinson and Sexton (1994) do not necessarily identify the type of education (e.g. bachelors, post-graduate, certificate) that have the largest effect on the likelihood of going into business. Lazear (2004) puts forward an alternative view, arguing that entrepreneurs need to be multiskilled or have a 'balanced' range of skills. He argues that they can be characterised as 'jacks-of-all-trades', and thereby not necessarily be an expert in any single skill. Lechmann and Schnabel (2011) develop a testable proposition based on Lazear's assumption, using German data to observe if entrepreneurs display alternative human capital investment patterns to the employed, which they find only limited evidence to support. Lechmann and Schnabel argue that self-employed individuals not only need more basic but also more expert skills than employees.

Limited human capital cannot wholly explain the difference in rates of business ownership between Indigenous and non-Indigenous Australians. For instance, the US Department of Labor in the early 1990s articulated the concept of a 'glass ceiling' for women and minorities in American workplaces as "artificial barriers based on attitudinal or organizational bias that prevent qualified individuals from advancing upward in their organization into management-level positions." (Department of Labor

1991: 1). One must also ask the question, do such artificial barriers also affect the likelihood of an Indigenous Australian going into business?

Kenneth Arrow's work on the economics of discrimination provides some guidance around the effects of artificial barriers. Arrow (1998) argues that contrary to the low entry cost principle underpinning well-functioning markets, the nexus between one's social life and their life as a market participant may, in fact, reinforce and reward racially exclusive networks. He suggests that maintaining racially exclusive networks helps create social capital amongst the inside group. The insiders reap the benefits of that *social capital* by maintaining high barriers against outside competition. The market and non-market benefits of exclusively trading with insiders (e.g. accessing the local country club, finding a spouse amongst people of a similar background, exclusive access to market information and exploitable opportunities) can more than offset the higher costs of transacting exclusively with insider group peers. With social capital, "discrimination no longer has a cost to the discriminator; indeed, it has social rewards" (Arrow 1998: 98), thereby radically altering resource allocation decisions from an open market alternative.

Arrow's model is akin to a class barrier, separating different groups based on socioeconomic, cultural, ethnic and/or racial lines. In the Australian context, the resulting market failure could be reducing competition (potentially significantly in remote Australia where Indigenous Australians make up around 30 per cent of the population), thereby artificially increasing prices and ultimately reducing the prospects for Indigenous economic development. It also means that access to networks and successful mentors and role models is retained within the confines of the non-Indigenous *in-group*. Foley (2000), Schaper (2007), and Wood and Davidson (2011) argue that access to mentors and role models is essential to Indigenous business ownership. Foley argues the "socio-economic environment that Indigenous Australia has been forced into has not allowed these associations to exist in any great number." (Foley 2000: 14). The Socio Economic Index for Australia (SEIFA) provides an approximate indicator of access to networks, based on the socioeconomic status of the region in which the person resides (Edwards 2005). SEIFA uses the Index of Relative Socio-Economic Advantage and Disadvantage (IRSAD), which measures in deciles the most advantaged to most disadvantaged communities in Australia. As Arrow (1998) argues, the social capital residing within the in-group provides access to advantages and social rewards. One could therefore expect that living in more affluent areas, as measured through SEIFA, enables better access to networks and local demand for goods and services. Certain characteristics of a person or a family environment may also correlate higher rates of business ownership with the networks they may offer. Marriage can expand the number of networks that are available to an owner-manager. For instance, Wong (1986) finds a correlation between marriage and business success, showing that a spouse's education can significantly increase a partner's productivity within business families. Further, providing for one's family is a key motivator for starting a business (Foley, 2000). Foley suggests that having a family may push some into *necessity entrepreneurship.* Another possible indicator for *access to networks* is whether an individual lives in a 'mixed' household where both Indigenous and non-Indigenous people reside.

Foley (2000) writes about the two-fold impact of racism on the Indigenous Australian entrepreneur, "It is predominantly directed from the non-Indigenous population, and secondly, it is experienced to a lesser degree from within the Indigenous Australian community." (2000: 51). Discrimination from external sources can reflect *interpersonal* and *systemic* discrimination while that experienced within Indigenous communities could be characterised as *internal* discrimination (Paradies et al. 2008). However, the relative effects of each aspect of discrimination can become difficult to disentangle without some characteristic for differentiating the external and internal bias that may affect Indigenous people.

Schaper (2007) also contends that a lack of Indigenous entrepreneurs results from the historical exclusion of Indigenous Australians from the mainstream economy. Schaper also goes on to identify other factors including geography; a lack of successful role models; paucity of human capital such as education, skills development and training and a lack of access of finance, partially reflective of land titling issues and cultural differences. While most of Schaper's identified factors are discrete and can be paired with variables in the Census, land-titling is multifaceted and difficult to bifurcate. As such, we do not include this variable in the paper, however, we do include a variable associated with home ownership, which is described below.

Ord and Mazzarol (2007) identify three primary structural barriers to greater Indigenous employment and economic participation including (i) lack of education qualifications and skills development; (ii) poor employment opportunities within Indigenous communities; and (iii) marginalisation and exclusion from mainstream society. Poor employment opportunities likely has an effect on local demand, which can limit business opportunities for entrepreneurially inclined Indigenous Australians.

Wood and Davidson (2011) provide a literature review of the existing research summarising a range of factors that impact on Indigenous business ownership. These include discrimination and prejudice (based on race and gender); alienation from their own community; lack of formal education and prior work experience; clash of cultural value sets; lack of Indigenous role models and mentors; language barriers; lack of access to finance; and exclusion from networks.

Limited access to finance is a common theme identified as a key barrier to Indigenous entrepreneurship in the various sources above. The broader international literature relates a lack of access to finance, and thereby limited collateral, to limited home ownership (Schmalz, Sraer and Thesmar 2013; Fairlie 2013). Analysis of the 2016 Census shows that the Indigenous home ownership rate is less than half the rate of non-Indigenous home ownership, and thereby likely to reduce access to the collateral channel for bank loans. As a home ownership variable is available in the Census, we will test the significance and the size of the effect on the rate of business ownership.

Geographic barriers (which Shaper 2007 identifies) could also present detrimental factors against business formation. One could make the claim that the greater transactions costs associated with operating in remote and regional Australia may reduce the likelihood of a person going into business. If that were the case, then we would expect to see reduced rates of business ownership for Indigenous and non-Indigenous Australians in remote Australia compared to urban and regional settings.

In addition, Wright (2011) identifies that some entrepreneurs display high

levels of geographic mobility, i.e. the willingness to move to opportunities within regions and across countries. An example is the archetypal immigrant entrepreneur or a returning entrepreneur from overseas. The Census contains a variable asking if a person has moved in the last 5 years, which we include in our estimation. Note, however, that Wright also identifies a certain class of entrepreneurs who display low geographic mobility, which implies this variable may be a weakly significant if not an insignificant determinant of business ownership.

In addition, the high rates of disability in the Indigenous community (Hunter, Gray and Crawford, 2016) can also hamper opportunities to start a business. Recent evidence from South Africa shows that having a disability can impact on a person's ability to start a business given a "lack of equipment and machinery, discrimination, business networking, hardships in obtaining start-up capital, knowledge of support centres for entrepreneurs living with physical disabilities, and lack of education and training." (Maziriri, Madinga and Lose 2017: 27).

Age could also affect the likelihood of a person being in business as a diversity of experiences is potentially associated with successful entrepreneurship (Lazear 2004). Indigenous Australians in business are generally a younger cohort than non-Indigenous counterparts (Shirodkar, Hunter and Foley 2018), which is consistent with the younger demographic in the Indigenous population. The median age for Indigenous owner-managers is around 40-44 years, and 44-49 years for non-Indigenous owner-managers. Further, Indigenous people may accumulate workforce experiences at a lower rate to the rest of the population because of historical exclusion from the labour market (Hunter et al. 2014). Such constraints on labour market participation could in turn affect the ability of Indigenous people to successfully conduct a business by limiting the number of valuable experiences and hence reduce the prevalence of owner-managers relative to the rest of the population.

While some of the literature pointed to English language skills as a barrier (Wood and Davidson 2011; Dockery 2010), interrogation of the ACLD found that the 'quality of spoken English at home' question was not a useful indicator for the purposes of determining the likelihood of becoming an owner-manager. That is because of the design of the Census, which only asked participants to answer the quality of spoken English question if English was not a participant's first language. Inadvertently, the exercise shows the vast majority of Indigenous Australians identified English as their first language in 2016, and thereby presumably did not face barriers associated with English language skills.

Methodology

The aim of the paper is to develop a probit model that determines the likelihood of a person being in business based on a range of socioeconomic and demographic indicators as identified in the literature and associated with variables found in the Australian Census Longitudinal Dataset (briefly described below). The primary variable being investigated is Indigenous status, and if identifying as Indigenous materially impacts the likelihood of being a business owner-manager once other relevant socioeconomic and demographic factors are identified.

Data

The ABS's ACLD provides an opportunity to analyse the characteristics of owner-managers (including household level information and regional information). The 2016 ACLD takes a slightly less than 5 per cent sample of Census records and links them across the 2011 and 2016 Censuses. The ACLD includes 14,000 Indigenous records forming one of the largest available datasets of Indigenous Australians (ABS 2013).[1]

Probit model

In order to provide a preliminary analysis that summarises the multivariate relationships we use a binary regression model to predict the marginal effect of various explanatory factors on the probability of being an owner-manager (between 0 and 1). A linear regression model (i.e., the linear probability model estimated using OLS) could be used but that is associated with heteroscedastic error variances. A probit regression specification can address the issue of heteroscedasticity and ensure that the errors are normally distributed. The probit model is easiest to think about in terms of a latent variable, Y^*:

$$Y^*_i = \beta X_i + \varepsilon_i, \varepsilon_i \sim \mathrm{N}(0,1) \quad (1)$$
$$\text{If } Y^*_i \geq 0, \mathrm{Y}_i = 1$$
$$\text{If } Y^*_i < 0, \mathrm{Y}_i = 0$$

Where:

- Y^*_i can be viewed as an indicator for whether this latent variable is positive
- Y_i is the dependent variable and takes on a value of 0 or 1. If a person is an observed owner-manager in 2016 it takes a value of 1.
- X_i is the matrix of independent variables that impact on the likelihood of becoming an owner-manager in 2016.

The model can estimate the probability (between 0 and 1) of being an owner-manager of an enterprise. The inverse probit transformation (i.e. standard normal cumulative distribution function) can predict the probability:

$$\hat{P}[Y_i = 1] = \Phi(\mathrm{X}_i, \cdot\hat{\beta}) \quad (2)$$

The coefficients of a probit model are difficult to interpret. As such, the paper reports the marginal effect of various explanatory factors on the probability of being an owner-manager. One can interpret the marginal effects for continuous variables as the change in probability associated with a change from the average (for income, it is the impact of a $1000 increase in weekly income; for SEIFA, it is the impact of a decile increase). For dummy variables, the change in probability is measured as a one-unit

1 The first iteration of the ACLD linked 2006 Census records to 2011 records, of which, around 14,802 were people who identified as Indigenous in 2006. Due to attrition in the sample, resulting from death and other factors, we guess that around 14,000 in the 2011-2016 sample identify as Indigenous.

change from the omitted category.

The explanatory variables are contemporaneous with the dependent variable and measured for 2016. As this is a cross-sectional analysis, we cannot associate causality between right-hand side variables and business ownership, merely correlation. As further iterations of the ACLD become available, researchers will have access to a longer timeseries of data necessary to make best use of the longitudinal aspects of the ACLD.

This paper's aim is primarily on the issue of Indigenous identity and its correlation with business ownership. It is not the central aim to explore the differences between the rates of male and female business ownership in detail. But given the uniformly lower rates of business ownership for women – exactly half the rate of men in both Indigenous and non-Indigenous populations – it is important to specify four separate probit estimations: Indigenous men, Indigenous women, non-Indigenous men and non-Indigenous women. The results provide some insights into the different factors associated with female and male business ownership in Australia.

Choice of variables

Based on the brief literature review above, a summary of the factors that affect Indigenous business ownership include human capital in the form of education; access to economic and financial assets; discrimination (external and internal); access to networks (living in high socioeconomic regions, living in mixed heritage households and marital status); geography; mobility; disability and age. Each of these elements is associated with a variable in the 2016 Census, as described in Table 1 and reported in the first column. The second column reports the most suitable variables in the ACLD associated with each. The third column indicates whether this census data is available as a *dummy* variable (i.e. taking the values of 0 or 1) or can be characterised as *continuous* data.

Most of the associations between the factor and the choice of variable are straightforward. Qualifying notes in relation to some variables are below.

- In this study, only one variable can relate back to the issue of discrimination – identifying as Aboriginal and/or Torres Strait Islander or non-Indigenous in the Census – and that variable cannot distinguish the effects of internal and external discrimination.
- The age variable is captured as a series of dummies for broad age groups to allow for non-linearity without imposing a particular functional form (e.g., a quadratic in age).
- The home ownership variable measures whether an individual owns a dwelling outright and offers a proxy for access to capital, on the basis that one's home often forms the collateral necessary for borrowing. The other proxy for access to capital is the equivalised household income, which adjusts household income using the modified Organisation for Economic Cooperation and Development (OECD) equivalence scales for analysis of financial stress (Breunig, Hasan and Hunter, 2019). The paper assumes that a higher level of income is associated with greater wealth, and therefore, offering an easier channel to access capital.

Table 1: The Census-based determinants of owner-managers in Australia and variables

Determinants	*Proxy variable in census data*	*Type of variable*
Human capital (formal education and prior work experience)	Level of education 2016	Dummy
Access to economic and financial assets	Home ownership 2016	Dummy
	Equivalised household Income 2016	Continuous
Discrimination (internal and external)	Indigenous status 2016	Dummy
	Gender 2016	Dummy
Access to networks (including role models, mentors)	Equalised household income 2016	Continuous
	Mixed heritage relationship 2016	Dummy
	SEIFA 2016	Continuous
Geographic location/remoteness status	Urban 2016	Omitted
	Regional 2016	Dummy
	Remote 2016	Dummy
Internet connection	Access to internet in household 2016	Dummy
Mobility	Previously moved within the last 5 years 2016	Dummy
Person with a disability	Disabled 2016	Dummy
Marital status	Marital status 2016	Dummy
Age	Age 15-34 2016	Omitted
	Age 35-44 2016	Dummy
	Age 45-54 2016	Dummy
	Age 55-64 2016	Dummy
	Age 65 and over 2016	Dummy
Local demand for goods and services	SEIFA 2016	Continuous

The omitted categories for the dummy variables are: a person identifies as non-Indigenous (for the models described in Appendix Table A2); a male (for the models described in Appendix Table A2); living in a major urban area; did not reside in a 'mixed' household; was single; aged 15 to 34 years in 2016; did not obtain a year 11/12 or post-school qualification; did not have a disability; did not own a home; and the respondent did not change address in the 5 years to 2016. Interpret the results as the difference in the rate of being in business compared to the omitted category reference group.

Table 2 reports the results based on Indigenous status and gender. Appendix Table A1 reports the descriptive statistics for the identified variables.

Results

Appendix Table A2 reports the regression modelling using the full selection of indicators. The table also reports a parsimonious version that removes SEIFA and mobility data as their inclusion omits between 5-9 per cent of the sample. We also leave out household income in the parsimonious model, which may be endogenous to the owner-manager dependent variable.

The preliminary analysis in Appendix Table A2 provides a robustness check of the final specification reported in Table 2 and in the text below. Note that no significant differences in marginal effects emerge as a result of using a full model compared to a more parsimonious specification. We report the results for the full model in the following discussion.

Table 2 below and Appendix Table A2 report the marginal effects for our defined explanatory factors. Note that the concordance statistic (or c-statistic) is a summary of the trade-off for the model between identifying true positives and false positives (model predicting an owner manager or other people to be an owner-manager). C-statistics with values over 0.7 is evidence that the model is adequate or even a good model, whereas values over 0.8 indicate a strong model (Hosmer and Lemeshow 2000: 162). According to this criteria the goodness of fit for all the reported models are adequate.

Table 2. Marginal effects of being an owner-manager by gender and Indigenous status, aged 20-64 years, 2016

	Females		*Males*	
	Indigenous only	*Non-Indigenous only*	*Indigenous only*	*Non-Indigenous only*
Mixed household	0.008**	-0.016***	0.013**	-0.03***
Married	0.017***	0.033***	0.015**	0.076***
Age 35 to 44 years	0.014**	0.041***	0.036***	0.070***
Age 45 to 54 years	0.009	0.047***	0.049***	0.089***
Age 55 to 64 years	0.003	0.030***	0.036**	0.074***
Highest qualification is Degree	-0.00004	0.005***	-0.00006	-0.008***
Highest qualification is Diploma	0.016**	0.020***	0.011	0.005
Highest qualification is Certificate	0.011*	0.020***	0.041***	0.073***
Highest qualification is Year 11 or 12	0.004	0.004**	-0.017**	-0.0002
Person with a disability	-0.014***	-0.048***	-0.033***	-0.122***
Lives in regional area	0.003	0.029***	-0.0008	0.033***
Lives in remote area	0.0009	0.062***	-0.007	0.059***
Own home	0.015***	0.014***	0.025***	0.030***
Mobility in previous 5 years	0.004	-0.004***	0.002	-0.006***
Equivalised household income§	0.02	0.50***	0.01	0.24***
Deciles of SES of local area§	0.003***	0.006***	0.007***	0.013***
Pseudo R^2	0.115	0.0476	0.117	0.064
Probability of reference person	0.018	0.066	0.043	0.145
Concordance statistic	0.778	0.662	0.765	0.679
Number of observations	5,619	253,546	4,613	234,683

Notes: *** denotes significance at the 1 per cent level. ** denotes significance at the 5 per cent level. * denotes significance at the 10 per cent level. No star denotes insignificance at the 10 per cent level. Marginal effects of dummy variable are the change in probability of being an owner-manager associated with a change in the variable from 0 to 1, while marginal effects for continuous variables (denoted with a §) are reported as the change in probability associated with a one unit increase of the respective explanatory factor. In the case of Equivalised household income, the value presented in the table above reflects the percentage point increase in the likelihood of being an owner-manager associated with a $1000 increase in equalised household weekly income. For the Deciles of SES of the local area, the coefficient explains the impact on the likelihood of going into business associated with a 1 decile increase in the SEIFA index. The reference person is defined by the omitted category (i.e., setting the dummies to zero) and assuming continuous data is set to the sample average.

Indigenous status

All else being equal, identifying as Indigenous in 2016 is associated with a sizeable 4-5 percentage point lower likelihood of being an owner-manager compared to the baseline non-Indigenous person (Appendix A2). Note that the difference in the rates

of business ownership between Indigenous and non-Indigenous Australians (15 years and over) was around 6 percentage points (chart 2). Clearly, while controlling for other observable characteristics is associated with some reduction in the raw gap between the rates of business ownership, identifying as Indigenous remains a substantial explanatory factor behind whether or not a person is an owner-manager. The result confirms that racial and/or identity-related factors are associated with a lower likelihood of Indigenous Australians being in business. It means policy makers cannot ignore the possible effects of a discriminatory operating environment in Australia on Indigenous business growth.

Table 2 reports regression results separately for Indigenous and non-Indigenous females and males. Systematic differences in the explanatory factors for the two populations exist. In general, the marginal effects for the Indigenous population (male and female) are lower than for the non-Indigenous population (male and female). It accords with the finding that Indigenous Australians are around 4-5 percentage points less likely to be owner-managers than non-Indigenous people. Also, marginal effects associated with women are generally smaller than that of men amongst both the Indigenous and non-Indigenous groups. The results are unsurprising given that women make up almost exactly one-third of owner-managers amongst both Indigenous and non-Indigenous Australians.

Age

A person aged between 45 and 54 was generally more likely to be in business in 2016 than in any other age cohort. The exception are Indigenous women, who were marginally more likely to be in business if aged between 35 to 44 years.

Education

At odds with much of the literature around the importance of human capital for entrepreneurship, having 'higher' levels of human capital is not necessarily associated with an increased probability of being an owner-manager. Indeed, having a Certificate level qualification was associated with the largest increase in the likelihood of being in business for Indigenous men (4.1 percentage point increase) compared to their base case. And non-Indigenous men who had a Certificate qualification were 7.3 percentage points more likely to be in business compared to their base case. For Indigenous women, having a diploma was associated with higher rates of business ownership while for non-Indigenous women, having either a diploma or Certificate were equally associated with a 2 percentage point higher likelihood of being in business. In contrast having a degree was not associated with a higher likelihood of an Indigenous person being in business, and for non-Indigenous people, having a degree only increased the likelihood of business ownership by less than 1 percent compared to the base case. The results are more in keeping with Lazear's (2004) view of entrepreneurs being jacks-of-all-trades, showing that many owner-managers do not necessarily need a 'high-level' qualification such as a degree to go into business. Rather, a practical qualification – such as a Certificate or Diploma, may deliver skills that are more appropriate for business ownership.

Geography

For non-Indigenous people, living in a remote or regional area was associated with a statistically higher probability of being an owner-manager. But the chance of a remote or regionally-based Indigenous Australian being in business were not significantly different to the chances of an urban-based Indigenous Australian being in business. The result implies that non-Indigenous hands may control much of the economic and viable business opportunities in regional and remote Australia. This is despite Indigenous people making up around 30 per cent of the remote population, and having a claim to over 40 per cent of the Australian landmass, much of it in regional and remote Australia, through Native Title and other Indigenous land rights regimes.

Home ownership

Owning one's home statistically significantly increased the likelihood of going into business across all four groups in 2016 by around 1½ percentage points for women and around 2½-3 percentage points for men. The interpretation of this result is important. Given that home ownership only increases the likelihood of business ownership by a relatively small margin, it implies that having this financial asset is not a necessary but perhaps a sufficient pre-condition for starting a business. Further research is required to investigate the importance of home ownership and its link to business ownership in Australia.

Incomes, socioeconomic status, marriage and access to networks

The coefficients for household equalised incomes are very small and are not statistically significant for Indigenous Australians. The coefficients for non-Indigenous men and women are very small positives but statistically significant. One can interpret the results in the following way. Every $1000 weekly increase in income is associated with a 0.5 percentage point increase in the probability of being in business for non-Indigenous women and a 0.24 percentage point increase for non-Indigenous men. Note that reverse causation may also be in effect, meaning higher rates of business ownership could lead to higher incomes.

A one-decile increase in socioeconomic status under SEIFA is associated with a 0.3 percentage point increase in business ownership for Indigenous women, a 0.6 percentage point increase for non-Indigenous women and a 0.7 percentage point increase for Indigenous men. But the largest effect was for non-Indigenous men, for whom a one decile increase in the SEIFA index is associated with a 1.3 percentage point increase in business ownership. For example, a non-Indigenous man from Seven Hills/Toongabbie (6th decile) is on average 1.3 percentage points more likely to be an owner-manager than a non-Indigenous man in the nearby suburb of Kings Park in Blacktown (5th decile). The results imply that while all groups can benefit from greater access to higher socioeconomic status environments, non-Indigenous men are arguably better able to leverage social capital from their immediate vicinity. Note that on average, Indigenous men and women are in the 4th decile for socioeconomic advantage, while non-Indigenous men and women are on average in the 6th decile.

Married people were more likely to be in business across all four groups,

but in particular for non-Indigenous men, where marriage was associated with a 7.6 percentage point increase in the rate of business ownership. Being in a mixed household was associated with a slightly higher rate of business ownership for Indigenous men and women. But being in a mixed household was associated with a statistically lower likelihood of business ownership for non-Indigenous men and women. It implies that Indigenous people who marry non-Indigenous partners may have access to a larger pool of economic options, thereby increasing their likelihood of owning a business.

Disability

Having a disability was a major inhibitor to business ownership for all groups. But the impact was most pronounced for non-Indigenous men, for whom having a disability was associated with a 12.2 percentage point decrease in business ownership.

Mobility

Mobility in the previous five years to the 2016 Census is generally not an important determinant of business ownership for any group identified in Table 2. We note that for non-Indigenous Australians, mobility in the last five years had a small and negative but statistically significant correlation with business ownership (less than 1 percentage point reduction). It implies that if a non-Indigenous person is to go into business, they may look for opportunities locally while for Indigenous people, moving locations was not associated with a higher or lower likelihood of being in business. The small size of the coefficients attached to this variable in each equation could reflect Wright's (2011) observation that mobility was an ambiguous indicator of business ownership.

Further observations

Overall, the marginal effects for Indigenous men and women are significantly lower than for non-Indigenous Australians. For example, the returns to higher education in terms of ability to own and manage a business are significantly lower for Indigenous men and women compared to non-Indigenous men and women. The lower marginal effects for Indigenous people could reflect their historical and ongoing exclusion from aspects of Australian society, and as a by-product, exclusion from business and economic opportunities. In future analysis we anticipate conducting a decomposition of the non-linear (probit) model of Indigenous and non-Indigenous owner-managers following the method articulated in Bauer and Sinning (2008). Such techniques allow claims to be made about the explained and unexplained components of the gap between average prevalence of owner-managers for Indigenous and non-Indigenous males and females. The unexplained component may correlate with discrimination (internal or external) whilst the explained component is associated with differences in initial endowments, which could also reflect the long-term effects of a discriminatory environment facing Indigenous Australians.

Conclusions

This paper seeks to redress the limited understanding of the factors that drive Indigenous business vis-à-vis other Australian businesses. The relatively low rates of Indigenous

business ownership suggest structural social and economic barriers exist that are limiting a large proportion of Indigenous Australians from entering into business.

The size and significance of the 'Indigenous status' indicator implies a racial identity related effect is reducing the likelihood of an Indigenous person being an owner-manager of a business, all other things being equal (see Appendix Table A2). However, as stated previously, the data does not imply if the effect is associated with external systemic discrimination or factors internal to the Indigenous community. But some other Australian research provides guidance as to the likely cause. For instance, Booth et al. (2012) show Anglo-Saxon names had a 35 per cent higher chance of receiving a call back for an interview compared to job applicants with an 'Indigenous-sounding' name. This provides evidence of discriminatory behaviour from employers. Further, Biddle et al. (2013) suggest that to avoid potential discrimination some Indigenous Australians may decrease their labour supply. This, at times, is referred to as the adjustment effect of discrimination on labour supply.[2]

The above examples illustrate that discriminatory labour market conditions exist for Indigenous Australians. It is not a significant leap to think that those conditions extend to Indigenous entrepreneurs or Indigenous people seeking to enter into business. Indigenous owner-managers may suffer discrimination from suppliers, from customers and from potential lenders; any of which could adversely affect the prospect of starting a business or impede the ongoing likelihood of success. The findings warrant further investigation around the economic impacts of discrimination. A comparison study of recently immigrated persons and Indigenous Australians could shed further light on the challenges Indigenous entrepreneurs face, but is speculative and beyond the scope of this paper.

In addition to Indigenous status, the probit results pose interesting findings about the differing factors associated with business ownership based on gender, but is only reported on and not fully analysed in this paper. For example having a higher income and higher socioeconomic status as measured through SEIFA was associated with higher rates of business ownership across all groups, but non-Indigenous men benefited at double the rate, implying that an 'old-boys network' may limit opportunities for perceived outsiders. Future research should further explore the differences based on gender.

Interestingly, having very high levels of education was not necessarily an important determinant of business ownership. Indeed, it seems having a Certificate level qualification is more than sufficient to enter into business, particularly for non-Indigenous men but also for Indigenous men.

Finally, and at odds with conventional wisdom, living in a remote area increased the likelihood of a non-Indigenous men and women owning a business in 2016. But remote-based Indigenous men and women were statistically no more or less likely to be in business compared to their urban counterparts once other factors were

2 Alternatively, Goldsmith et al. (2004) identify a resume effect, whereby an individual who anticipates discrimination, increases their labour supply to demonstrate a higher level of productivity for relatively low paying work. The resume effect is an attempt to restore psychological balance from a state of imbalance that arise from experiences in the labour market and the expectation of employer discrimination (i.e., avoid cognitive dissonance).

considered. It implies that, despite Indigenous Australians have at least some say over more than 40 per cent of the Australian continent (through Land Rights and Native Title laws, much of it in remote Australia) control of *bankable* economic opportunities in remote areas remain largely in non Indigenous hands. Further work is required to improve prospects for Indigenous Australians in remote areas to leverage their economic assets.

As the study is cross-sectional, we can only prove correlation – not causation. Nevertheless, these findings should encourage policy makers to think beyond just enhancing the capabilities of Indigenous Australians through education and training, which has previously been a primary focus of Indigenous economic policy across Australian Governments. Governments should consider the impact of a biased operating environment that Indigenous Australians may face when attempting to access economic and business opportunities in mainstream Australian society. Policies such as the Indigenous Procurement Policy have the potential to reshape and open up the business and economic operating environment for Indigenous Australians when implemented effectively.

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Appendix Table A1. Summary statistics for regressions by gender

	Females				*Males*			
	Indigenous only		*Non-Indigenous only*		*Indigenous only*		*Non-Indigenous only*	
	Mean	*Standard deviation*	*Mean*	*Standard deviation*	*Mean*	*Standard deviation*	*Mean*	*Standard deviation*
Owner-manager	0.027	0.162	0.075	0.263	0.055	0.228	0.159	0.365
Mixed household	0.413	0.492	0.015	0.121	0.480	0.500	0.013	0.113
Married	0.456	0.498	0.702	0.457	0.431	0.495	0.648	0.478
Age 35 to 44 years	0.226	0.418	0.231	0.422	0.216	0.412	0.224	0.417
Age 45 to 54 years	0.226	0.418	0.252	0.434	0.200	0.400	0.245	0.430
Age 55 to 60 years	0.156	0.362	0.231	0.421	0.152	0.359	0.228	0.419
Highest qualification is degree	0.111	0.314	0.321	0.467	0.070	0.256	0.258	0.437
Highest qualification is diploma	0.105	0.306	0.134	0.341	0.056	0.229	0.098	0.297
Highest qualification is Certificate	0.206	0.405	0.139	0.346	0.280	0.449	0.282	0.450
Highest qualification is Year 11/12	0.165	0.371	0.187	0.390	0.167	0.373	0.178	0.383
Person with a disability	0.063	0.243	0.033	0.178	0.074	0.262	0.033	0.179
Lives in regional area in 2016	0.438	0.496	0.260	0.438	0.415	0.493	0.258	0.437
Lives in remote area in 2016	0.185	0.388	0.013	0.115	0.184	0.387	0.015	0.123
Own home	0.354	0.478	0.709	0.454	0.396	0.489	0.704	0.456
Individual mobile in last 5 years	0.503	0.500	0.455	0.498	0.465	0.499	0.456	0.498
Equivalised household income[§]	1,595	1,214	2,237	1,509	1,798	1,295	2,379	1,520
SEIFA of local area deciles in 2016[§]	3.334	2.509	5.673	2.826	3.592	2.634	5.683	2.821
Number of observations	6,978		283,016		5,933		265,244	

Notes: See note for Table 2.

Appendix Table A2. Marginal effects of probability of being an owner manager, ACLD 2011-16, all aged 20-64, 2016

	All ACLD		*Indigenous only*		*Non-Indigenous only*	
	Full	*Parsimonious*	*Full*	*Parsimonious*	*Full*	*Parsimonious*
Indigenous person	-0.042***	-0.048***				
Mixed household	-0.010***	-0.012***	0.010**	0.014***	-0.022***	-0.028***
Female	-0.077***	-0.077***	-0.022***	-0.022***	-0.078***	-0.078***
Married	0.051***	0.053***	0.016***	0.018***	0.052***	0.054***
Age 35 to 44 years	0.054***	0.057***	0.024***	0.025***	0.055***	0.058***
Age 45 to 54 years	0.066***	0.072***	0.025***	0.025***	0.067***	0.074***
Age 55 to 64 years	0.050***	0.053***	0.016**	0.016**	0.050***	0.054***
Highest qualification is degree	0.002	0.026***	-0.0002	0.011*	0.002	0.026***
Highest qualification is diploma	0.016***	0.031***	0.016**	0.026***	0.016***	0.031***
Highest qualification is Certificate	0.051***	0.058***	0.024***	0.030***	0.051***	0.058***
Highest qualification is Year 11 or 12	0.003**	0.014***	-0.004	-0.004	0.003**	0.014***
Person with a disability	-0.078***	-0.082***	-0.022***	-0.022***	-0.080***	-0.083***
Lives in regional area	0.030***	0.011***	0.002	-0.004	0.031***	0.011***
Lives in remote area	0.051***	0.026***	0.002	-0.012***	0.060***	0.034***
Own home	0.021***	0.030***	0.019***	0.020***	0.021***	0.030***
Individual mobile in previous 5 years	-0.005***		0.003		-0.005***	
Equivalised household income	0.039***		0.000		0.040***	
SEIFA of local area deciles	0.009***		0.005***		0.009***	
Pseudo R^2	0.082	0.072	0.127	0.113	0.080	0.071
Baseline P(OM)	0.096	0.097	0.028	0.028	0.098	0.099
Concordance statistic	0.710	0.698	0.782	0.771	0.708	0.6954
Number of observations	498,461	533,972	10,232	11,529	488,229	522,443

Notes: See note for Table 2.

The gender wage gap in Bangladesh: an application of Olsen and Walby simulation method

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Abstract

This article examines the gender wage gap in the formal public and private sectors in Bangladesh. The traditional Oaxaca method focuses on the explained and unexplained part of the wage gap; in this paper we use the Olsen and Walby (2004) simulation method which emphasises only the explained part of the wage gap. Using the Bangladesh Labour Force Survey 2005-2006, Bangladesh Bureau of Statistics data show formal-sector female employees earned about 32.1 per cent less than their male counterparts (2008). Using the Olsen and Walby (2004) simulation method for the first time in the Bangladeshi context, the results reported here show that age and educational differences and industrial and occupational segregation played important roles in explaining the gender pay gap in Bangladesh. However, 'being female' was also an important determinant of lower female earnings. These results show the importance of policies to boost female education and training in Bangladesh. They also indicate the need for policies to promote female participation in the formal-sector workforce, including improvements in childcare and transport availability.

JEL Codes: J310, J450, J710
Keywords: wage differentials, public sector labour market, discrimination

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1. Introduction

There have been significant improvements in the Human Development Index of Bangladesh since the 1990s, with life expectancy at birth rising from 58.4 years in 1990 to 72.8 years in 2017. Mean years of schooling increased over the same period from 2.8 years to 5.8 years, and Gross National Income more than doubled from $1,320 to $2,641 (2011 PPP$) (United Nations Development Programme 2018). Bangladeshi women have participated in these improvements, including increased educational achievement and labour force participation (Hossain and Tisdell, 2005). However, these achievements have not ensured equality in earnings and employment or female participation in decision-making in the economic and political sectors.

The aim of this paper is to investigate the causes of the gender wage gap in the private and public sector formal economy in Bangladesh. The formal sector covers a relatively small part of female labour force participation in Bangladesh (see Table 1). Nevertheless, it might be expected to play a significant role in promoting economic opportunities among Bangladeshi women. One reason is the affirmative action policies of the Bangladeshi government in favour of women. Since 1976, the Government of Bangladesh has reserved a 10 per cent quota for female employees in the public sector. However, it took about 25 years to meet this quota target in 2002 (Asian Development Bank (ADB), 2004). In addition, there are several programs to promote the participation of girls in education. Compulsory primary education was supported by the Cash for Education program which encouraged parents to send their children to school, and stipends for girls promoted participation in secondary education (Government of Bangladesh, 1999).

Table 1: Percentage of labour force participation in the formal and informal sector during 1995-96 to 2005-06

	Year 1995-96			*Year 2005-06*		
	Total	*Male*	*Female*	*Total*	*Male*	*Female*
Total ('000)	49,071	30,419	18,651	47,357	36,080	11,277
Formal sector (%)	13.0	17.2	6.2	13.9	14.7	11.5
Public (%)	4.2	5.7	1.7	4.5	4.9	3.2
Private (%)	8.8	11.5	4.5	9.4	9.8	8.3
Informal sector (%)	87.0	82.8	93.8	78.4	76.2	85.7
Others (%)	-	-	-	7.6	9.2	2.8

There are few studies that have examined the sources of the gender pay gap in Bangladesh. Specifically, there is no known study on the gender wage gap of Bangladesh using the Olsen and Walby (2004) simulation method. This method focuses on differences between males and females in their human capital and other endowments, and their contribution to the wage gap. It enables the identification of the individual endowment differences which can form the focus of policy aimed at reducing the gap; for example, levels of education and hours of work. The method has been promoted

as a means of overcoming the difficulties in identifying the contribution of individual factors to the gap using the standard decomposition methods as developed by Oaxaca (1973), Blinder (1973) and others (to be further discussed below).

This study is divided into five sections. Following this introductory section, Section 2 provides the background. Section 3 describes the methodology and dataset that is used in the wage equation estimations and the decomposition method to analyse the gender wage gap in Bangladesh. Section 4 describes the empirical results. Finally, Section 5 presents the conclusion and summarises the results for the gender wage gap in Bangladesh for formal private and public-sector employees.

2. Background

Why do females earn less than males? For more than five decades economists have tried to answer this question. According to human capital theory developed by Becker, earnings differentials between individuals occur because of productivity differences (1964). Even with the same level of human capital, female employees may earn less than their male counterparts because of different rewards for these endowments arising for a range of reasons, including direct and indirect discrimination (Olsen and Walby, 2004). The literature shows that the major factors which directly or indirectly account for the raw wage gap are: the stock of human capital including education, work experience, general and firm specific on-the-job training and career interruption; institutional factors such as working in the public or private sector; and occupational and industrial segregation, cultural factors and discrimination in the labour market (Ashraf and Ashraf, 1993; Altonji and Blank, 1999; Beblo et al., 2003; Blau et al., 2006; Al-Samarrai, 2007; Kapsos, 2008; Watson, 2010; Blau and Kahn, 2010; Cassells et al., 2010; Olsen et al., 2010). These factors individually and collectively account for substantial portions of the explained part of the wage gap.

There are different methodologies for comparing the wage differences between two groups, such as between males and females. A common and basic approach is to include a dummy variable in the pooled wage equation (Gregory and Borland, 1999). For example, sex (1 for male and 0 for female or vice-versa) is generally included as a dummy variable in the wage equation for pooled data (e.g. Walby and Olsen, 2002; Olsen and Walby, 2004; Kapsos, 2008; Watson, 2010; Cassells et al., 2010). This dummy variable approach estimates the effects on the raw wage gap between males and females as an intercept effect. It allows no differences in the coefficients on other variables in the model.

There are other methodologies described in the literature that use a separate wage equation for males and females to measure and to decompose the observed wage gap depending on race, gender and ethnicity. A method for the decomposition of the overall gender wage gap due to human capital and other work-related variables or endowment differences (the explained part of the gender wage gap) and differences due to returns to those factors (the unexplained part of the gender wage gap, sometimes known as discrimination) and its decomposition was independently developed by Oaxaca (1973) and Blinder (1973).

This Oaxaca (1973) decomposition method is based on mean differences between two groups (e.g. race, gender). It is assumed that in the absence of discrimination, males and females would receive the same returns for the same endowments. It is necessary to choose a non-discriminatory wage structure to evaluate the effect of endowment differences between males and females, and the choice of this structure has significant implications for the results. Oaxaca used the male wage structure as the non-discriminatory wage that would prevail in the absence of labour market discrimination (1973). He decomposed the wage gap into two parts. The first is the difference in human capital endowments and job-related characteristics or an individual's personal characteristics or other endowment difference (characteristics effect) which is the explained part of the gender wage gap that is also known as the 'endowment effect'. The second part is the difference in estimated coefficients, sometimes represented as discrimination (Blinder, 1973; Oaxaca, 1973) or the 'unexplained part' of the wage gap. This is also named the 'treatment effect' (Fortin et al., 2010), 'remuneration effects' (Beblo et al., 2003), 'coefficient effect' (Yun, 2008) or 'returns to endowment' (Cassells et al., 2010). This unexplained part of the gender wage gap may also reflect the impact of model misspecification, mismeasurement or error of calculation (Reiman, 2000; Oaxaca, 1973; Blinder, 1973).

The Oaxaca–Blinder method uses a specific wage equation as the non-discriminatory wage, which leads to an index number problem (Oaxaca and Ransom, 1994; Yun, 2005). Researchers have argued that using a specific wage equation (male or female) leads to undervaluation of one group and overvaluation of the other group. A number of alternative methodologies have been introduced to overcome this problem (Cotton, 1988; Neumark, 1988; Oaxaca and Ransom, 1994; Olsen and Walby, 2004). Oaxaca and Ransom (1994) summarised other methods and provided a matrix of combinations of both male and female wages in the wage decomposition method. The Olsen and Walby (2004) method used here will be explained further below.

Studies covering the gender wage gap in Bangladesh are limited, but there are a few examples (Al-Samarrai, 2007; Kapsos, 2008; Ahmed and Maitra, 2011; Anjum, 2016). Al-Samarrai (2007), using the unit record information for salaried workers from the Household Income and Expenditure Survey (HIES), conducted by the Bangladesh Bureau of Statistics (BBS) in 2000 and 2005, estimated the gender wage gap as well as major factors that contribute to reducing the wage gap in Bangladesh. In this research, the Oaxaca decomposition method was applied, with the male wage used as the non-discriminatory wage structure. The variables used were age, years of education, working in the public sector, marital status and residential location. During this period, according to this study, the gender wage gap in Bangladesh decreased from 73.4 per cent in 2000 to 45.2 per cent in 2005, and between 0 per cent and 31 per cent of the earning gap between males and females was explained by identifiable human capital and other job-related endowments. The remaining 69 per cent to 100 per cent of the total wage gap was the result of the unexplained, or discrimination, (coefficient) component.

Using the BBS Occupational Wage Survey 2007, Kapsos (2008) estimated the gender wage gap for the non-agricultural workforce in Bangladesh by using the Oaxaca–Blinder methodology and used Cotton's (1988) method for the non-discriminatory wage

structure, which is a weighted average of the male and female coefficients. Variables used in this study were age, education level, occupation and industry dummies, and geographic location. The results found that females earned 22.5 per cent less than males. Female employees in this study had higher human capital endowments than males and, on this basis, should have been better paid than males by 18.8 per cent. This result may be due to omitted variables, measurement errors and other factors.

Another study conducted by Ahmed and Maitra (2011) used the unit record information of paid employees from the Bangladesh Labour Force Survey 2005-2006 (BLFS 2005-2006) conducted by the BBS during 1999 and 2005. Ahmed and Maitra estimated the gender wage gap across different quantiles as well as major factors that contributed to the increase in the wage gap in Bangladesh during this period. In this research, the Oaxaca decomposition method and the Wellington (1993) extended method for two periods were used. Male and female wage structures were used separately as the non-discriminatory wage, and the variables used were dummy variables for the age groups, education, marital status, industry and occupation of employment and residential location. The results showed that the gender wage gap increased during this period from 45.4 per cent in 1999 to 64.9 per cent in 2005, and the adjusted wage gap decreased from 93 per cent to 81 per cent. After the selection correction[1] for male and female employees, the major part of the wage gap was attributed to the selection effect and the unexplained, or coefficient, part of the wage gap. Female employees received lower wages than males over the entire distribution, but the wage gap was lower and the discrimination effect was larger for the high wage earners than for the low wage earners.

Anjum (2016) used data from the BLFS 2005-2006 to compare results for the decomposition of the gender wage gap using the different methods outlined above. She found that, in the absence of a selection correction for labour force participation, the part attributed to measured endowment effects varied substantially according to the chosen method – between 21 and 46 per cent of the total wage gap. Over half of the gap was attributed to unexplained factors, including coefficient differences – between 54 and 79 per cent. Differences in age, education, industrial segregation and family-related variables were important components of the explained wage gap. A double selection correction in an additional set of regressions, firstly for participation in the labour force and secondly for employment in the public sector, played an important part in explaining the gender pay gap in Bangladesh.

In summary, the literature on the gender wage gap in Bangladesh shows that only a small portion of the total wage gap is explained by productivity-related characteristics and a larger portion is the 'rewards' to those endowments (the unexplained part). These results could be due to discrimination and unobserved effects. Other reasons which have been argued to account for low female wages in Bangladesh are the rapid growth in female labour force participation, a high female unemployment rate and female under-employment, a high poverty rate among female wage workers, low bargaining power and job segregation (Rahman and Islam, 2003).

1 If samples are not selected randomly for Ordinary Least Square estimation, then the sample selection problem arises and this problem can be solved by including the Heckman correction (1979).

In Bangladesh, different datasets have been used to decompose the gender wage gap including the BLFS 2005-2006 (Ahmed and Maitra, 2011), the Household Income and Expenditure Survey (Al-Samarrai, 2007) and the Occupational Wage Survey (Kapsos, 2008). This study uses the same data source as Ahmed and Maitra (2011) and the Olsen and Walby (2004) methodology to address the following questions for public and private sector employees in the Bangladeshi context:

- Are there any wage differences between males and females in the formal sector?
- If there are, how much do employees lose in monetary terms?
- What are the important individual endowment differences between males and females in generating the gender pay gap?

3. Research methodology and data

Methodology

The Olsen and Walby (2004) method, based on the original Oaxaca method, was used to investigate the gender wage gap in the UK. It used a single equation to identify the portion of the gender wage gap associated with different factors. The most interesting point of this method is that it allows visualisation of the gender wage gap in monetary terms for each factor that affects the wage gap. In addition, it identifies the effect of being female and enables policy formulation to reduce the wage gap. The focus on possible policy responses to the gender wage gap means that Olsen and Walby emphasise those endowments where women fall behind men.

This method allows decomposition of the total endowment effect and it does not consider the unexplained part of the wage gap measured in the Oaxaca–Blinder methodology. Olsen and Walby used the pooled wage equation with a female dummy variable in the wage equation to capture the direct effect of being female. The equation used as the simulation effect is:

$$R = (\bar{X}^m - \bar{X}^f)\beta^* \qquad \text{----------1}$$

where R equals the raw wage gap between males and females, $\bar{X}^m$ and $\bar{X}^f$ are the mean values of endowments for males and females, and β^* are the coefficients of the pooled wage equation that includes a female dummy to capture any direct discrimination. The simulation effect is distributed among different factors according to their weight. $(\bar{X}^m - \bar{X}^f) = \Delta X$ which indicates the characteristic differences between males and females. This 'change factor' (Watson, 2010) is multiplied by the pooled β to get the simulation effect ($\Delta X^*\beta$), which is expressed in terms of the percentage of the wage gap. Each factor's simulation effect is used to generate the individual factor's contribution to the total monetary value of the wage gap.

The Olsen and Walby (2004) simulation method measures the total wage gap justified by the overall male and female endowment differences. In addition, this method allows us to estimate how much women's endowments need to change to equalise men's endowments, and how much the wage gap may be reduced if female

endowment levels equalled that of males. For example, one can examine the percentage of the pay gap accounted for by a particular endowment difference (e.g. the years of education) and the monetary value of any differences. Olsen and Walby (2004) modelled the gender wage gap for the UK and found that education accounted for eight per cent of the gross wages gap of 0.23. This variable can then be given a monetary value; 18 pence per hour (eight per cent of the £2.28 wages gap). These results can then be used for policy formulation to reduce wage inequality. The method excludes the effects of factors which are 'female-advantaging' or reduce the wage gap, as they are not relevant for policy formulation to reduce the gap (Cassells et al., 2010) . One of the most interesting aspects of this method is that it can be applied to all of the variables in the regression, or to just a subset that is relevant to a particular policy (Watson, 2010). Cassells et al. (2010) provide a detailed review of the Olsen and Walby decomposition method and they summarised the advantage of this method as follows (p. 12):

> "• The gender component is visible enabling the effect of direct discrimination or other aspects related to being a woman to be measured.
> • There is the option to bring all of the 'policy relevant' variables into the forefront, and to treat all other variables as controls or irrelevant.
> • Offsetting 'female advantaging' aspects are removed.
> • The tug-of-war about what component is due to 'rewards' and what is due to 'endowments' is removed.
> • Feedback effects (pre-labour market discrimination) are to some extent addressed by giving women the 'best average situation among men'."

The Olsen and Walby (2004) simulation method is not widely used. This method has been used to estimate the gender wage gap in the UK and in Australia (Walby and Olsen, 2002; Olsen and Walby, 2004; Watson, 2010; Cassells et al., 2010; Olsen et al., 2010). Olsen and Walby (2004) used a British Household Panel Survey sample consisting of 10,000 adults to explore how much of the gender gap is related to different factors. The findings of the research showed that the gender wage gap was £2.28 per hour in 2002 and that this can be segregated into the following main factors: lifetime working patterns (consisting of years of full-time employment, years of part-time work and work interruption due to family care) accounted for 36 per cent of the pay difference; rigidities in the labour market (such as occupational segregation, size of firm) accounted for 18 per cent of the pay gap; eight per cent was due to the lower education attainment of females; and 38 per cent was accounted for by 'being female'. This 'being female' measures any direct discrimination because of different labour market preferences of females compared with males. Olsen and Walby estimated the selection correction term as another single factor but did not include it in the simulation procedure.

Two other studies using this method were conducted by Cassells and her colleagues (2010) and Watson (2010) to estimate the gender wage gap for Australia.

Watson (2010) estimated the gender wage gap for managerial employees using seven waves of the Household, Income and Labour Dynamics in Australia (HILDA) Survey data. As a selection effect was not statistically significant, Watson did not include it in the wage equation. Cassells et al. (2010) used Wave 7 of HILDA data and their sample consisted of wage earners aged between 21 and 65 years. Those who were still in school or self-employed were excluded from the sample. This means their sample suffers from a sample selection problem, but Cassells et al. argued against adjusting the non-random sampling error in their gender wage gap estimation. Following this study, the present study did not correct for sample selection.

Data

In this study, the BLFS 2005-2006 by the BBS dataset covering all of Bangladesh has been used to provide individual-level information on labour force status, demographic variables, working status (full-time or part-time) and employment characteristics. It estimated the wages for the formal sector employees, which includes the public and private sectors, but excludes the non-formal sector, which is mostly agricultural and subsistence-level jobs and the self-employed. This decision was made because in the non-formal sector, no formal wage structure exists and workers are mostly unpaid family helpers. Those who worked in the army were also excluded. If the wage gap had been calculated for all employees, it might be much higher. The sample was restricted to those who were aged between 15 and 65 years. In the formal sector, employees receive a monthly income in Bangladesh so employed persons who worked on a full-time or part-time basis and received a monthly income are in the sample. The total sample size was 6,351, where 80.6 per cent were male and 19.4 per cent were female employees.

The main intention of this study was to investigate the gender wage gap in Bangladesh, and so the most important variable of this study is the income variable. In the BLFS 2005-2006 dataset, income information is provided in three ways: i) income in cash, ii) income in kind, and iii) total income in cash and kind. In this analysis, total income is calculated by adding income in cash (i) and income in kind (ii). In some cases, separate information on cash and kind income was not provided, but total income was provided;

The choice of explanatory variables was based on human capital theory but limited by data availability. In this analysis, instead of the preferred variable of actual labour market experience, age and age-squared variables were used to capture all the effects of age on income. The educational achievement is given as a categorical variable, and four dummy variables were generated to capture educational achievement (Appendix Table A1 provides a detailed list of variables).

The work-related variables are crucial to estimate the gender wage gap. Working hours, working full-time or part-time, and working in either the private

or public sector were included in the earning equation. Occupation[2] and industry[3] dummies were included to cover gender-based segregation in the workplace.

Job interruption has also been shown to affect wages and career progression. Family and childcare responsibilities, marital status, number of children less than five years of age, number of children between 6 and 14 years in the household and number of household members aged between 19 and 24 years were therefore also included in the wage equation.

To cover regional local price differences, Reimers (1983) made an adjustment for the local price level. He also argued this could be accounted for by including regional dummy variables in the regression model, which also capture any differences in how the labour market operates in different regions. In this present study, it was not possible to collect regional price differences or a regional cost of living index, so the regional dummy variables control for regional differences. To capture locational effects for employed persons, an urban dummy (1 for that group, otherwise 0 for rural areas) was included, and regional location was captured by introducing six divisional dummy variables.

4. Results and discussion

Average characteristics difference between male and female employees

Descriptive statistics on different characteristics between males and females are presented in Table 2. In this sample, the average hourly wage rate for male employees was 22.12 Taka (Tk) compared to 16.2 Tk for female employees. This indicates that the average male employees earn 6.07 Tk more per hour than female employees, which means females earned, on average, 73 per cent of male earnings.

Gender differences exist in human capital acquisition. In this sample, age is used as a proxy for work experience and, on average, male employees were six years older than female employees (37.9 years and 31.9 years for the male and female employees respectively).

2 BLFS 2005-2006 used International Standard Classification of Occupation (ISCO-88) for occupational category. However, this present study used the restricted sample, so representative data were not available for each group. Regrouping generated five occupational groups for this study.

3 BLFS 2005-2006 used Bangladesh Standard Industrial Classification (BSIC, Rev-3) for industrial category consisting of 15 categories. Due to the lack of a reliable representative sample size, this study regrouped them and generated seven industrial categories.

Table 2: Descriptive statistics for public and private sector employees

	Male		*Female*		*Mean difference (male-female)*
	Mean	*Sd*	*Mean*	*Sd*	
WAGE (Tk†)	22.12	0.22	16.05	0.38	6.07
LNWAGE‡ (ln)	3.096	0.01	2.776	0.02	0.321
AGE	37.87	0.16	31.9	0.29	6.0
AGE2	1568.67	12.58	1121.33	20.15	447.3
Primary*	11.85	0.01	14.73	0.01	-2.9
Secondary*	52.87	0.01	45.08	0.01	7.8
Tertiary*	28.74	0.01	26.20	0.01	2.5
PUBLIC*	42.03	0.01	40.28	0.01	1.8
TOTHOURS	50.66	0.17	47.35	0.37	3.3
Full_time*	98.50	0.00	94.96	0.01	3.5
Professional_Tech*	30.89	0.01	44.43	0.01	-13.5
Clerical*	17.49	0.01	14.48	0.01	3.0
Agricul_trans*	20.30	0.01	21.72	0.01	-1.4
Others_Occ*	14.39	0.01	14.40	0.01	0.0
Manufacturing*	24.25	0.01	27.10	0.01	-2.8
Electricity_gas*	9.41	0.00	2.20	0.00	7.2
Financial_Business*	9.18	0.00	9.03	0.01	0.1
Public_Defence*	19.72	0.01	12.86	0.01	6.9
Educations*	22.06	0.01	34.58	0.01	-12.5
Others_Indus*	11.93	0.01	3.99	0.01	7.9
URBAN*	61.25	0.01	72.74	0.01	-11.5
Chittagong*	18.49	0.01	16.35	0.01	2.1
Dhaka*	34.56	0.01	42.47	0.01	-7.9
Khulna*	14.49	0.01	11.23	0.01	3.3
Rajshahi*	18.39	0.01	16.19	0.01	2.2
Sylhet*	4.26	0.00	4.96	0.01	-0.7
MARRIED*	79.62	0.01	71.44	0.01	8.2
PREMARRIED*	0.41	0.00	10.09	0.01	-9.7
CHILD005	0.35	0.01	0.29	0.02	0.1
CHILD0614	0.89	0.01	0.72	0.03	0.2
TERAGE1924	0.71	0.01	0.55	0.02	0.2

† Taka (Tk) means Bangladeshi local currency. The exchange rate for US$1 = 67.08 Tk for year 2005-06. Source: Bangladesh Bank, http://www.bangladesh-bank.org/econdata/index.php downloaded on 01.05.2012.

‡ Raw wage gap = $\ln\bar{Y}^m - \ln\bar{Y}^f$ where $\ln\bar{Y}^m$ is the logarithm mean hourly wage for male employees and $\ln\bar{Y}^f$ for females. The raw wage gap interpreted as [exp (Raw wage gap)-1]*100 in percentage terms as per hour wage provided in log form (Oaxaca, R.L. and Ransom, M.R. (1994), but most of the study of the gender wage gap used just equivalent to percentage, which slightly differs with from previous one, Reimers (1983).

Notes:

a) *provided in percentage terms, as they are dummy variables. Education group: others, Occupation: Sales and service worker, Industries: Health and social worker, Division: Barishal and Marital status: Single used as base category.

b) Taka (Tk) means Bangladeshi local currency. The exchange rate US$1 = 67.08 Tk for year 2005-06.

Source: Bangladesh Bank, http://www.bangladesh-bank.org/econdata/index.php downloaded on 01.05.2012.

A large proportion of males were in the more highly educated category: 11.8 per cent of male employees have primary education compared to 14.7 per cent of females; 52.9 per cent of males had secondary and higher-secondary education and 28.7 per cent had tertiary qualifications compared to 45.1 per cent and 26.2 per cent of the female employees for the corresponding category. The 'Others' educational level,[4] used as the base category, is higher for females (it accounts for 14.0 per cent of female employees compared to 6.5 per cent of males).

Among the job-related factors, the gender difference in public sector employment was not large in this sample. According to this sample, 42.0 per cent of male employees worked in the public sector compared to 40.1 per cent of female employees.

Gender differences were also found in working status. Working status captures working either full-time or part-time. On average, male employees work 3.3 hours more than females per week, (males work on average 50.7 hours per week compared to 47.4 hours for females). Both male and female employees in the formal sector worked more than the weekly full-time requirement (37.5 hours). Almost 99 per cent of the male employees worked on a full-time basis. However, part-time employment was higher for female employees (five per cent of female employment). This could be because the societal norm of the country is for the male to be the main 'breadwinner' of the family.

Other work-related variables such as occupation segregation affect wages. Due to occupational segregation, females tend to work in low-paid jobs and males in the high-paid jobs. So, gender differences in occupation are one of the critical factors in explaining the gender wage gap (Baron and Cobb-Clark, 2010). The gender difference in occupation was also present in this sample. Female employment was more highly concentrated in administration, managerial, professional and technical jobs (44.4 per cent compared to 30.9 per cent for males). There were no large differences in the distribution of employment across other occupational categories.

Another important variable is employment in different industries. Male employees were more concentrated in manufacturing (24.3 per cent of total male employees), public administration and defence (19.7 per cent), electricity, gas, water supply, construction and transport storage (9.4 per cent) and the education sector (22.1 per cent). On the other hand, females were mostly concentrated in the manufacturing (27.1 per cent of total female employment) and education industries (34.6 per cent). Employment in education was relatively more important for females. There is no significant difference in the remaining industries.

4 In this sample, 'Others' education category considers 'technical and others education' levels based on BLFS 2005-2006 questionnaire.

Male and female employment varied with regional location. The percentage of total male employees located in the urban area was 61.3 per cent compared with 72.7 per cent for female employees. To address the regional variation in detail, geographic location dummies for six divisions were included in the wage equation. The share of female employment was higher in Dhaka compared to males, but in all other divisions, males had a higher representation. This may reflect different social norms in the major urban centres compared with other areas and to differences in industry mix. For example, the practice of purdah which prevents women from interacting with men who are not part of their immediate family, is more important outside the major urban areas.

In this sample, more males were married (79.6 per cent of male employees) than females (71.4 per cent of female employees). However, the percentage of previously married women, which includes widows, divorced and separated, was higher than for males.

Research results

This section presents decomposition results using the Olsen and Walby (2004) decomposition approach to quantify the key determinants of the gender wage gap and to quantify the wage gap in monetary terms. The regression results used for the decomposition are presented in Appendix Table A2. Full detailed decomposition results are provided in Appendix tables A3 and A4. The emphasis is given to simulated change and those factors positively contributing to the gender wage gap which may be amenable to policy interventions.

The unadjusted wage gap shows males earn, on average, 6.07 Tk more per hour than females, with males earning 22.12 Tk per hour on average and females 16.05 Tk per hour – 73 per cent of the male wage. Table 3 demonstrates the simulation effect for formal-sector employees in Bangladesh to bring female endowment levels equal to the average male situation. A graphical representation is provided in Figure 1. The largest effect found is for work experience measured by age, followed by being female, education, occupation and industry segregation, work-related variables and family-related variables.

Age differences were responsible for 48 per cent of the total wage gap. If females had the same level of the proxy of work experience (age) as males, this would increase their average age by six years. The gender wage gap would then fall by 32 per cent, other things remaining equal. From another point of view, females could increase their weekly income by 108 Tk weekly or 5,621.5 Tk yearly. The proxy for work experience (age) may overestimate actual experience for females where their actual work experience was below their potential experience, and so the part of the wage gap explained by differences in working experience might be even larger.

Table 3: The gender wage gap for the Olsen and Walby (2004) method

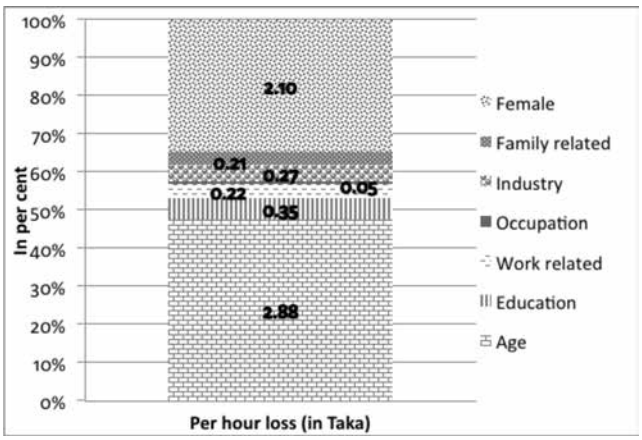
	Simulation effect ($\square^*\Delta X$)	*Simulation as % of the wage gap*	*Wage lost in monetary value (in Tk)*		
			Per hour	*Weekly*[a]	*Yearly*
Age	0.32	0.48	2.88	108.11	5621.49
Education	0.04	0.06	0.35	13.00	676.26
Work-related	0.02	0.04	0.22	8.08	420.16
Occupation	0.01	0.01	0.05	1.71	88.68
Industry	0.03	0.04	0.27	10.10	525.39
Family-related	0.02	0.03	0.21	7.79	405.10
Female	0.23	0.35	2.10	78.75	4095.26
Total	0.67	1.00	6.07	227.55	11832.35

Note: Only positive values are considered. [a] Weekly hours 37.5 hours is considered.

This method allows quantification of the direct discriminatory effect of being female. If the negative effects of being female were removed, then the gender wage gap would decrease by 23 per cent – the equivalent of 2.10 Tk per hour. If a woman worked an average of 37.5 hours per week, then she would lose 78.8 Tk per week and 4,095.2 Tk yearly, just by being female, keeping all other variables constant. Figure 1 also shows that the effects of work experience and being a woman clearly dominate the gender wage gap.

If the female education level rose to male levels, there would be a four per cent reduction in the gender wage gap, and in the formal-sector female employees could earn an extra 13 Tk per week, where male and female working hours are 37.5 hours per week. The final important factor that affects the gender wage gap is the work-related variables, which include dummy variables for employment in the public sector and working full-time. If the representation of females in the public sector and full-time employment increased to the same proportion as males, the gender wage gap would decline by two per cent.

Figure 1: Per hour wage loss in monetary terms (in Taka)



Occupation and industrial segregation contribute to the wage gap. If females and males were represented equally within occupations and industries, the gender wage gap would reduce by four per cent and could increase the female wage to an extra 11.8 Tk per week.

Female employees earn less due to labour market interruptions associated with childcare and family care responsibility. This is not the general case for males. The female hourly wage would increase by 0.21 Tk per hour (three per cent of the wage gap), if their level of labour market interruption was equivalent to that of males. Here, labour market interruption is measured by marital status, number of children in different age groups, and household members aged less than five years and between 6 years and 14 years and account for three per cent of the total wage gap.

A summary of results is provided below, using Olsen and Walby's (2004) simulation method:

- The unadjusted wage gap shows males earn, on average 6.07 Tk more per hour than females; males earn 22.12 Tk per hour on average and females 16.05 Tk; and formal-sector female employees earn about 32.1 per cent less than their male counterparts.
- Age differences between male and female formal-sector employees accounted for 48 per cent of the total gap.
- Direct discrimination is significant: 'being female' reduced wages by 23.0 per cent compared to males, which is equal to 35 per cent of the total wage gap. If a woman worked an average of 37.5 hours per week, then she would lose 78.8 Tk per week and 4,095.2 Tk yearly, all other variables remaining constant.
- Another type of discrimination is measured by occupation and industry segregation, which contributes only five per cent to the total wage gap.

The results using the Olsen and Walby method showing that age, education and occupational and industry segregation were important determinants of the gender pay gap confirm the results of other studies for Bangladesh using the Oaxaca–Blinder decomposition. The effect of 'being female', measured by the intercept term in the Olsen and Walby method and the unexplained component of the Oaxaca–Blinder decomposition, was also an important element in all these results.

The main feature of the Olsen and Walby (2004) simulation method is that it allows quantification of the gender wage gap in monetary terms and enables direct policy targeting. However, this method is not beyond criticism, as problems such as omitted variable bias and other unobserved effects remain. Accepting the limitation, this method provides useful results for policy formulation to reduce the gender wage gap (Cassells et al., 2010).

5. Conclusion

Bangladeshi women have made noticeable progress in the labour market and the gender gap in educational achievement has narrowed (Anjum, 2016). Despite this progress, a significant wage gap remains and females are disadvantaged compared to males. The Constitution of Bangladesh grants equal rights to males and females in all spheres of public life; however, discrimination against women exists (ADB, 2004). Social norms such as 'purdah', limit active labour force participation of females and their participation in politics and other forms of decision-making. The social norms affect their lives and leave many of them living in poverty. There are other factors that might constrain female labour force participation including lack of suitable transport to the workplace, lack of appropriate housing and lack of childcare facilities (Rahman, 2005).

The existing literature and this present study have identified several factors that contribute to the gender wage gap in Bangladesh. These factors are the level of human capital stock (e.g. the level of education and proxy working experience), working in the public sector, industry and occupational segregation, regional location, and career interruption due to motherhood or family-related responsibilities. Direct and indirect public policy intervention can help to reduce the gender difference in human capital and occupational segregation, and to remove direct and indirect discrimination in society. Pre-labour market discriminatory behaviour is affected by societal norms as families invest less in their daughters, which leads to less-educated, and fewer skilled workers for the job market compared to males (Altonji and Blank, 1999). In addition, due to direct or indirect discrimination in the labour market, female employees earn less.

There needs to be broader change and more opportunities for women in the formal sector. The government should introduce more positive initiatives leading towards gender development; i.e. more childcare facilities close to workplaces, training and improved flexible working hours. Stronger anti-discrimination policies may assist female labour force participation. In addition, social awareness policies should be adopted to increase labour force participation and to change social attitudes towards women working outside the home and family. Based on the results reported here, policies such as these directed at promoting longer-term attachment to the formal labour market for women could be expected to reduce the gender pay gap in Bangladesh.

'When mothers live in poverty, so do their children' (Olsen and Walby, 2004; p. 34). Policies to promote female employment outside the home are likely to improve the position of women in the workforce. Any reduction of the gender wage gap will not only increase national income, but also reduce child poverty and lead to improvements for future generations. Improving the level of education for women may increase competition for formal-sector jobs in the short term and lead to a reduction in wages; however, in the long term, more educated workers could be expected to make the economy more competitive and to reduce poverty.

The results presented here have focused on the small formal sector in Bangladesh where workers are relatively highly educated. They provide a basis for further research on changes in the gender pay gap over time, using more recent data. Outcomes in the informal sector are relevant and have important implications for the welfare of women in Bangladesh and therefore should be subject to further research.

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Appendix

Table A1: Variables used in this study

Variables	*Description*
LNWAGE	Natural log of per hour wage
AGE	Age
AGE2	Age square
Primary	Education dummy for Primary schooling which is equivalent to year 1 to year 5, 1 for this category otherwise 0
Secondary	Secondary and Higher schooling education which is equivalent to year 6 to year 12, 1 for this category otherwise 0
Tertiary	Tertiary education such as Bachelor, Masters, Medical and Engineering, 1 for this category otherwise 0
Others*	Other, 1 for this category otherwise 0 (working as a base category)
FEMALE	Dummy Variable for female, 1 for female and 0 for male
PUBLIC	Public sector dummy, 1 for this category otherwise 0
TOTHOURS	How many hours work per week for the main job
Full_time	Dummy variable for Working status full-time, 1 for this category otherwise 0 for part-time
Professional_Tech	Dummy variable for occupation Administrative and Managerial and Professional and Technical category, 1 for this category otherwise 0
Clerical	Occupation Clerical Workers, 1 for this category otherwise 0
Sales_Service*	Occupation Service and Sales workers, 1 for this category otherwise 0 (working as a base category)
Agricul_trans	Occupation Agriculture, forestry, fisheries and Production and Transport labours, 1 for this category otherwise 0
Others_Occ	Occupation Others, 1 for this category otherwise 0
Manufacturing	Dummy variable for Industry Manufacturing, 1 for this category otherwise 0
Electricity_gas	Electricity gas Water supply, construction and Transport storage, 1 for this category otherwise 0
Financial_Business	Financial Intermediation and Real estate and renting business, 1 for this category otherwise 0
Public_Defence	Public Administration and defence, 1 for this category otherwise 0
Educations	Education, 1 for this category otherwise 0
Health_social*	Health and social worker, 1 for this category otherwise 0 (This one working as a base category)
Others_Indus	Others Industry, 1 for this category otherwise 0
Urban	Dummy variable for location, 1 for urban area and 0 for rural
Chittagong	Dummy variable for the District Chittagong, 1 for this category otherwise 0
Dhaka	Dhaka, 1 for this category otherwise 0
Khulna	Khulna District, 1 for this category otherwise 0
Rajshahi	Rajshahi District, 1 for this category otherwise 0
Barishazila*	Barishazila, 1 for this category otherwise 0 (working as a base category)
Sylhet	Sylhet District, 1 for this category otherwise 0
SINGLE*	Marital status dummy, not married, 1 for this category otherwise 0
MARRIED	Married dummy, 1 for this category otherwise 0
PREMARRIED	Previously married dummy, 1 for this category otherwise 0
CHILD005	No. of children aged between 0 and 5 years
CHILD0614	No. of children aged between 6 and 14 years
TERAGE1924	No. of household member tertiary age group where age between 19 and 24 years

Note: * dummy variables omitted from the regression equation.

Table A2: Regression results for the pooled wage equation

LNWAGE	*Coef.*	*Std. Err.*
FEMALE	-0.23	0.02**
AGE	0.05	0.00**
AGE2	0.00	0.00**
Primary	0.09	0.03*
Secondary	0.28	0.03**
Tertiary	0.65	0.03**
PUBLIC	0.29	0.02**
TOTHOURS	-0.01	0.00**
Full_time	0.53	0.05**
Professional_Tech	0.20	0.03**
Clerical	0.15	0.03**
Agricul_trans	-0.03	0.03
Others_Occ	-0.09	0.03**
Manufacturing	0.05	0.04
Electricity_gas	0.13	0.04**
Financial_Business	0.13	0.04**
Public_Defence	0.01	0.04
Educations	-0.15	0.03**
Others_Indus	-0.04	0.04
URBAN	0.13	0.01**
Chittagong	0.04	0.03
Dhaka	0.10	0.02**
Khulna	-0.10	0.03**
Rajshahi	-0.11	0.03**
Sylhet	0.16	0.04**
MARRIED	0.03	0.02
PREMARRIED	-0.17	0.05**
CHILD005	0.01	0.01
CHILD0614	0.00	0.01
TERAGE1924	0.02	0.01*
_cons	1.44	0.11**

*indicates significant at the 5% level and ** at the 1% level.

Table A3: The gender wage gap based on the Olsen and Walby simulation method

LNWAGE	*Male*	*Female*	*Change Xs*	*Pooled β*	β*ΔX	*Simulation*	*Simulation effect in Tk**
AGE	37.87	31.90	5.97	0.05	0.32	0.99	6.02
AGE2	1568.67	1121.33	447.34	0.00	-0.24	-0.75	-4.54
Primary	0.12	0.15	-0.03	0.09	0.00	-0.01	-0.05
Secondary	0.53	0.45	0.08	0.28	0.02	0.07	0.41
Tertiary	0.29	0.26	0.03	0.65	0.02	0.05	0.31
PUBLIC	0.42	0.40	0.02	0.29	0.01	0.02	0.10
TOTHOURS	50.66	47.35	3.30	-0.01	-0.05	-0.14	-0.88
Full_time	0.98	0.95	0.04	0.53	0.02	0.06	0.35
Professional_Tech	0.31	0.44	-0.14	0.20	-0.03	-0.08	-0.50
Clerical	0.17	0.14	0.03	0.15	0.00	0.01	0.09
Agricul_trans	0.20	0.22	-0.01	-0.03	0.00	0.00	0.01
Others_Occ	0.14	0.14	0.00	-0.09	0.00	0.00	0.00
Manufacturing	0.24	0.27	-0.03	0.05	0.00	0.00	-0.03
Electricity_gas	0.09	0.02	0.07	0.13	0.01	0.03	0.18
Financial_Business	0.09	0.09	0.00	0.13	0.00	0.00	0.00
Public_Defence	0.20	0.13	0.07	0.01	0.00	0.00	0.01
Educations	0.22	0.35	-0.13	-0.15	0.02	0.06	0.36
Others_Indus	0.12	0.04	0.08	-0.04	0.00	-0.01	-0.06
URBAN	0.61	0.73	-0.12	0.13	-0.01	-0.05	-0.28
Chittagong	0.18	0.16	0.02	0.04	0.00	0.00	0.02
Dhaka	0.35	0.42	-0.08	0.10	-0.01	-0.02	-0.14
Khulna	0.14	0.11	0.03	-0.10	0.00	-0.01	-0.06
Rajshahi	0.18	0.16	0.02	-0.11	0.00	-0.01	-0.04
Sylhet	0.04	0.05	-0.01	0.16	0.00	0.00	-0.02
MARRIED	0.80	0.71	0.08	0.03	0.00	0.01	0.05
PREMARRIED	0.00	0.10	-0.10	-0.17	0.02	0.05	0.31
CHILD005	0.35	0.29	0.07	0.01	0.00	0.00	0.01
CHILD0614	0.89	0.72	0.16	0.00	0.00	0.00	0.00
TERAGE1924	0.71	0.55	0.16	0.02	0.00	0.01	0.06
FEMALE	0.00	1.00	-1.00	-0.23	0.23	0.72	4.38
_cons	1.00	1.00	0.00	1.44	0.00	0.00	0.00
Sum					0.32	1.00	6.07

*indicates significant at the 5% level and ** at the 1% level.

Table A4: The gender wage gap considering only positive values[a]

LNWAGE	*Male (mean)*	*Female (mean)*	*Change factor*	*Pooled coefficient β*	*Simulation effect* (β*ΔX)	*Simulation as % of the wage gap*	*Per hour loss*	*Weekly loss*
Age (Proxy to work experience)								
AGE	37.87	31.90	5.97	0.05	0.32	0.48	2.88	108.11
Education								
Secondary	0.53	0.45	0.08	0.28	0.02	0.03	0.20	7.42
Tertiary	0.29	0.26	0.03	0.65	0.02	0.02	0.15	5.59
Work-related variables								
PUBLIC	0.42	0.40	0.02	0.29	0.01	0.01	0.05	1.73
Full_time	0.98	0.95	0.04	0.53	0.02	0.03	0.17	6.35
Occupation								
Clerical	0.17	0.14	0.03	0.15	0.00	0.01	0.04	1.56
Agricul_trans	0.20	0.22	-0.01	-0.03	0.00	0.00	0.00	0.14
Others_Occ	0.14	0.14	0.00	-0.09	0.00	0.00	0.00	0.00
Industry								
Electricity_gas	0.09	0.02	0.07	0.13	0.01	0.01	0.09	3.30
Financial_Business	0.09	0.09	0.00	0.13	0.00	0.00	0.00	0.06
Public_Defence	0.20	0.13	0.07	0.01	0.00	0.00	0.01	0.23
Educations	0.22	0.35	-0.13	-0.15	0.02	0.03	0.17	6.51
Family-related								
MARRIED	0.80	0.71	0.08	0.03	0.00	0.00	0.02	0.87
PREMARRIED	0.00	0.10	-0.10	-0.17	0.02	0.02	0.15	5.56
CHILD005	0.35	0.29	0.07	0.01	0.00	0.00	0.01	0.25
TERAGE1924	0.71	0.55	0.16	0.02	0.00	0.00	0.03	1.11
Female								
FEMALE	0.00	1.00	-1.00	-0.23	0.23	0.35	2.10	78.75
Sum					0.67	1.00	6.07	227.55

[a]regional dummy excluded.

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It is the policy of the editors to send submitted papers to two referees. The names of authors are not disclosed to referees.

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