

The Association Between Indigenous Australians' Labour Force Participation Rates and Access to Transport

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Abstract

This paper examines the factors associated with the labour force participation rates of Indigenous Australians. Emphasis is placed on the role that vehicle ownership, holding a valid driver's licence and having access to public transport has on Indigenous Australians' labour force participation decisions. Access to transportation has been widely regarded as a key barrier to employment for many minority groups, including the Indigenous population. The paper finds that Indigenous Australians who own a car or have a driver's licence have a higher probability of participating in the labour market. Indigenous Australians with cars or driver's licences also have a higher probability of being an active job seeker relative to those not in the labour force. The findings suggest that improved access to transportation for the Indigenous population should have a positive impact on their employment outcomes.

JEL Classification: C21, J00, J15

Keywords: Economics of minorities, Labour force participation, Transport access

1. Introduction

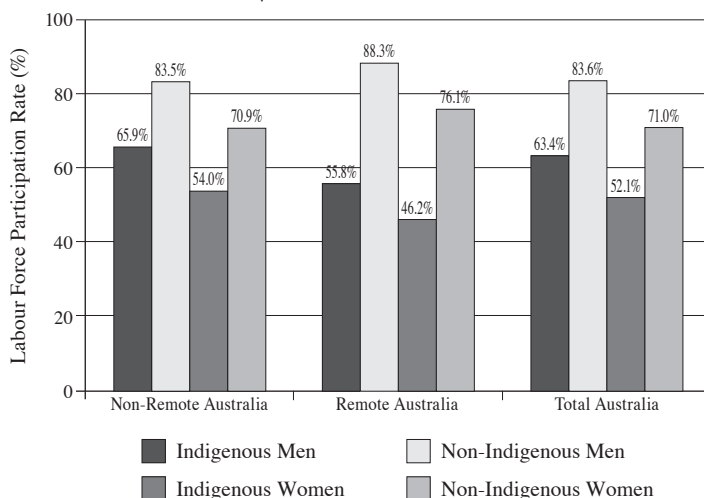
Indigenous Australians are widely established as being one of the most socioeconomically disadvantaged groups in Australia. A key aspect of this disadvantage is their limited engagement in the Australian labour market (Savvas *et al.*, 2011; and Kalb *et al.*, 2011). As shown in Figure 1, only two-thirds of Indigenous men and just over one-half of Indigenous women participate in the labour force. These rates are approximately 20 percentage points lower than the rates for non-Indigenous

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Australians. Figure 1 also shows that Indigenous men and women living in remote areas of Australia have considerably lower labour force participation rates than those living in non-remote areas.

Figure 1 Labour Force Participation Rates, 2011



Source: Australian Bureau of Statistics (ABS)(2011).

Improving the labour force participation rates of Indigenous Australians is essential to meet the Council of Australian Governments targets in 'Closing the Gap in Indigenous Disadvantage' which aims to half the gap in employment outcomes by 2018. Since 2008, this gap has actually widened, with mainstream Indigenous employment falling from 53.8 per cent to 47.5 per cent in 2012-13 (Commonwealth of Australia, 2016). The gap is even greater in very remote areas where only 30.4 per cent of Indigenous adults are employed. There are large social and financial benefits for closing the gap in employment outcomes. It has been estimated that if Indigenous Australians' employment rates matched those of the non-Indigenous population, the government would receive an additional \$762 million per year in tax revenue and save \$780 million per year on social security. Moreover, Indigenous Australians' earnings would increase by \$4,821 million per year (Gray *et al.*, 2014).

There have been a number of studies that have examined the factors associated with the labour force participation decisions of Indigenous Australians (see Savvas *et al.*, 2011; and Kalb *et al.*, 2011 for reviews). These studies have found that Indigenous Australians' participation in the labour force is associated with their education levels, health, geographic location and number of demographic, family and cultural characteristics. A limitation of this research is that there are few studies which have focussed on how access to transportation impacts on Indigenous Australians' labour force participation. Access to transport has been suggested as an important resource for providing individuals with the opportunity to pursue employment activities (Australian Institute of Health and Welfare, AIHW, 2011; and Dockery and Hampton, 2015).

There is a small body of international literature which has examined the impact of access to transportation on labour market outcomes (Raphael and Rice, 2002; Ong, 2001; Cervero *et al.*, 2002; Gurley and Bruce, 2005; Thompson, 2001; Avrillier *et al.*, 2010; Sanchez, 1999; and Kawabata, 2002). Most studies are based on minority groups and disadvantaged individuals and consider the impact of owning a car, driver's licence or having access to public transport on labour market outcomes. It has been found that individuals with access to vehicles have higher rates of employment than those who do not (Raphael and Rice, 2002; Ong, 2001; and Cervero *et al.*, 2002). It has also been reported that holding a driver's licence has a positive impact on employment (Avrillier *et al.*, 2010). Indeed, studies on remote Australia have found that having a driver's licence is very important for the mobility and employment of Indigenous people (Dockery and Hampton, 2015).

The relationship between access to public transport and labour market outcomes is less clear. On one hand, it has been reported that individuals with better access to public transport have higher rates of employment than those who do not (Sanchez, 1999; and Kawabata, 2002). On the other hand, studies have found that there is no significant relationship between access to public transport and labour market outcomes (Cervero *et al.*, 2002; and Thompson, 2001). The differences in findings across studies are potentially reflective of the measurement of access to public transport as well as the use of different data sets and samples analysed.

Access to transportation may be of importance to Indigenous Australians' labour market outcomes given the fact that the population faces relatively high levels of transport disadvantage in terms of accessing vehicles, public transport and obtaining driver's licences (Rosier and McDonald, 2011; and Skinner and Rumble, 2012). Only 51 per cent of Indigenous Australian households have access to a motor vehicle compared to 85 per cent of non-Indigenous households (AIHW, 2011). Likewise, less than half of eligible Indigenous Australians hold a driver's licence compared to 70 per cent of the non-Indigenous population (Audit Office of New South Wales, AONSW, 2013). Transport disadvantage is more apparent in remote areas of Australia, of which the Indigenous population is heavily represented (Rosier and McDonald, 2011). Only 43.7 per cent of Indigenous Australians living in remote communities have access to a working car compared to 58.7 per cent of Indigenous Australians living in non-remote communities (ABS, 2002). Almost three-quarters of Indigenous Australians living in remote Australia have no access to public transport as compared to only one-fifth of the Indigenous population living in non-remote Australia (ABS, 2010).

There are many reasons why Indigenous Australians may face transport disadvantage. Two key reasons relate to the costs of owning private vehicles and difficulties in obtaining a driver's licence. It has been suggested that transport disadvantage is a result of a lack of affordability in being able to maintain private transport, such as the purchase of a car and the costs of using a car (Currie and Senbergs, 2007). Individuals with lower incomes face greater difficulty in affording private transport (Rosier and McDonald, 2011). It has been widely established that Indigenous Australians have lower levels of income than their non-Indigenous counterparts (Hunter, 2012). Issues regarding the costs of maintaining private cars may be particularly relevant for Indigenous Australians in remote communities.

This is due to the fact that in remote areas cars have a shorter life span as they are highly used, often purchased second-hand and are driven on rough terrain (Currie and Senbergs, 2007). In addition, car maintenance is more expensive due to lack of resources and cars are often shared which can cause tensions over who has the rights to use shared vehicles.

Indigenous Australians face difficulties in obtaining driver's licences due to the financial costs of getting and renewing a driver's licence, difficulties in proof of identity and the difficulties in accessing vehicles and driving instructors to accumulate the required number of supervised driving hours to obtain a licence (Skinner and Rumble, 2012). Indigenous Australians also face difficulties in obtaining driver's licences due to having lower levels of literacy for driving tests and a fear of police (Skinner and Rumble, 2012). These difficulties could be more apparent in remote Australia due to the lack of resources in remote communities.

The purpose of this paper is to examine the impact of transportation disadvantage on Indigenous Australians' labour force participation decisions. Specifically, the paper focusses on the links between having a driver's licence, access to public transport and vehicle ownership on Indigenous Australians' labour force participations rates. The paper is structured as follows. Section 2 examines the data and method. Section 3 presents the empirical results and a conclusion and policy discussion is given in Section 4.

2. Data and Method

Data for this study is from the 2008 National Aboriginal and Torres Strait Islander Social Survey (NATSISS) conducted by the ABS. The NATSISS contains detailed information on Indigenous Australians' socioeconomic characteristics for those living in remote and non-remote areas of Australia. The data sample is restricted to Indigenous Australians aged 18 to 64 years and excludes missing information on the transport variables considered in the analysis.¹ It also excludes approximately 1 per cent of the sample who reported that they have a vehicle provided by their employers. This is because having a vehicle provided by an employer perfectly predicts labour force status. The data sample is comprised of 6,444 individuals of which 2,183 live in remote areas and 4,261 live in non-remote areas.

The framework to examine the impact of access to transportation on labour force participation decisions is based on the standard labour supply theory outlined in Killingsworth (1983), whereby an individual's decision to participate in the labour market ($LFPN$) is a function of their potential earnings (w), the value they place on not working (reservation wage, r) and their non-wage income (V). Hence, the probability that the i^{th} person participates in the labour force can be written as:

$$\Pr(LFPN_i) = \Pr(\beta_{w_0} + \beta_{w_1} A_{w_i} + \varepsilon_{w_i} > \beta_{r_0} + \beta_{r_1} V_i + \beta_{r_2} A_{r_i} + \varepsilon_{r_i}).$$

¹ There were 141 individuals in the sample (roughly 2 per cent) who did not report information on transport characteristics. This sample had a very similar labour force participation rate as the full sample.

Where A_{w_i} is a vector of observable characteristics affecting potential earnings, A_{r_i} is a vector of observable characteristics affecting the reservation wage, A_i represents the individual's non-wage income and ε_{w_i} and ε_{r_i} are mean-zero random error terms.

When specified in their reduced-form, potential earnings, the reservation wage and non-wage income can be proxied by the individual's demographics (*Demo*), educational attainment (*Edu*), the characteristics of their household (*Household*), behavioural traits (*Behaviour*) and transportation characteristics (*Transport*).² Hence, Equation (1) can be specified as:

$$LFPN_i = f(Demo_i, Edu_i, Household_i, Behaviour_i, Transport_i), i = 1, \dots, n. \quad (2)$$

Equation (2) is estimated using a probit model. The analysis considers the impact of three transportation characteristics on Indigenous Australians' labour force participation rates. These are: (i) whether the individual has a valid driver's licence, (ii) the number of working vehicles owned by the household and (iii) whether the individual has access to public transport in the area which they live.

As shown in Table 1, over one-third of the sample does not hold a driver's licence or have access to public transport and approximately one-quarter of the sample live in households without a car. Table 1 also shows that there are significant differences in the proportion of Indigenous Australians with these characteristics across remote and non-remote communities, with those living in remote areas being less likely to own a car, hold a licence or have access to public transport. There is also a high correlation between the number of vehicles owned by the household and whether the individual has a driver's licence in the sample. Approximately 76.9 per cent of Indigenous Australians who do not have a car do not have a licence. In comparison, only 18.6 per cent of Indigenous Australians who have three or more cars in their household do not have a driver's licence.

² A full description of the variables used in the analysis is presented in Table A1 of the Appendix. Many of the variables included in the analysis are consistent with those used in previous studies on Indigenous labour supply (particularly Savvas *et al.*, 2011) and the inclusion of variables relating to demographics, education and household characteristics are standard in labour supply models (see Killingsworth, 1983). Behavioural characteristics such as cultural factors (i.e. whether the individual recognises an area as their homelands, identifies with a clan or was removed from their family), physical and mental health (measured by self-assessed health status and being of psychological distress) and risky health behaviour (i.e. cigarette, alcohol and illicit drug use) are included in the analysis to capture the individual's ability to participate in the labour market and the potential impact on their reservation wage.

Table 1 - Proportion of Indigenous Australians by Selected Transportation Characteristics^(a)

	Full Sample	Remote Communities	Non-Remote Communities
<i>Driver's licence:</i>			
No licence	35.74	49.52	28.68
Has a licence	64.26	50.48	71.32
	100.00	100.00	100.00
<i>Vehicle Ownership:</i>			
No cars	24.66	36.92	18.38
One car	38.69	40.68	37.68
Two cars	25.81	16.77	30.44
Three or more cars	10.85	5.63	13.52
	100.00	100.00	100.00
<i>Public Transport:</i>			
No access to public transport	33.77	72.79	13.78
Access to public transport	66.23	27.21	86.22
	100.00	100.00	100.00

Note:^(a) There are statistically significant differences the proportion of Indigenous Australians with specific transport characteristics by remote and non-remote Australia.

Two specifications of the transportation characteristics are considered in the analyses. First, the model is estimated with controls for the number of cars in the household (*1 car, 2 cars, 3+ cars*), whether the individual holds a valid driver's licence (*Licence*) and whether they live in an area with public transport (*Public transport*) (and various other characteristics specified in Equation (2) (known as model (i)). The second specification accounts for the interaction between household vehicles and having a driver's licence. This is important because there is a strong correlation between having a licence and owning a car and the interaction between the two presents a stronger proxy for mobility since using a car requires both access and a licence. The model is also estimated with variables controlling for whether the individual has a licence and one car (*Licence & 1 car*), a licence and two cars (*Licence & 2 cars*), a licence and three or more cars (*Licence & 3+ cars*), a licence and no cars (*Licence & No Cars*), at least one car but no licence (*No Licence & 1 car*) as well as access to public transport and the other control variables described above (known as model (ii)). Under this specification, the reference group is those without a car or a driver's licence.

A limitation of the study is that it cannot fully account for the issue of reverse causality. There is potentially a high degree of reverse causality in estimating the impact of access to transportation on labour force participation. Labour force participants include individuals who are employed as well as those who are looking for work. Individuals who are employed are more likely to have the financial means to purchase a car or obtain a licence than those who are not working. In addition, those who are actively involved in the labour market may choose to live in areas closer to public transport.

There have only been a few studies on transportation access and employment outcomes which have addressed the issue of reverse causation (Gurley and Bruce, 2005; Cervero *et al.*, 2002; and Avrillier *et al.*, 2010). The studies by Gurley and Bruce (2005) and Cervero *et al.*, (2002) are based on panel data and therefore are able to observe changes in employment outcomes before and after receiving access to transport. This cannot be achieved using the NATSISS as the data is cross-sectional. Panel data on Indigenous Australians is very limited. Whilst some Indigenous Australians are surveyed in the Household, Income and Labour Dynamics Australia survey (HILDA), they are heavily under-represented in the survey. Moreover, HILDA only has information on driver's licences for one wave of data which limits the ability to examine the impact of before and after obtaining a driver's licence on labour force participation decisions.

The study by Avrillier *et al.* (2010) used instrumental variable (IV) methods to address the issue of reverse causation, where the impact of access to transport on employment was instrumented with other variables so that access to transport could be treated as exogenous in the employment model. In this study, holding a driver's licence was instrumented by a variable controlling for policy reforms which impacted on the ability of the sample to obtain a licence for free. Avrillier *et al.* (2010) reports that the findings using the IV approach are limited, largely due to a lack of suitable instruments for access to transport. For IV methods to be effective, it requires the instrument for the variables associated with access to transport to be correlated with the transport characteristics but uncorrelated with factors which impact on labour force participation decisions. Hence, the instrument cannot directly determine labour force participation decisions. Potential instruments for holding a driver's licence may include whether the individual's parents had a licence or own a car. Access to transport could potentially be instrumented by detailed information about home location or the population of the home neighbourhood and car ownership could potentially be instrumented by whether the individual has a garage or car park at their house. Unfortunately, the NATSISS does not have appropriate information on these potential instruments. Moreover, most IV approaches (such as two-stage least squares) are more suitable to when the independent variable and instrument are continuous variables rather than dichotomous (such as the decision to participate in the labour force). It would be possible to estimate the labour force participation decision using a predicted value of the instrument. However, as the NATSISS is only accessible from the ABS's Remote Access Data Library (RADL) and RADL only has early versions of econometric software. As such, testing the validity of the predicted instrument (which could be achieved using more recent versions of the software) is limited.

Given these complications, the issue of reverse causation has not been accounted for in the empirical results. As a result, this study, at best, seeks to establish the association between access to transportation and labour force participation decisions. There is a real need for future data sets on Indigenous Australians to be of a panel nature so the issues discussed above can be addressed. To reduce the potential of reverse causality this paper focusses on the impact of transportation on labour force participation decisions rather than just employment. In addition, the models

are estimated on samples of Indigenous men and women by various labour force participation categories. The study considers the impact of transport characteristics on being an active job seeker relative to those who are not in the labour force.³ It also considers the impact of transportation characteristics on the amount of time that the individual has been looking for employment (i.e. length of time being an active job seeker) relative to those not in the labour force.

3. Empirical Results

The results from the estimation of the probability of participating in the labour market are consistent with previous research on the labour market outcomes of Indigenous Australians.⁴ The probability of participating in the labour market is positively associated with Indigenous Australians' level of education and health. It is generally negatively associated with the number of children living in the household and having spent time in jail.⁵ Indigenous women who are married have a lower probability of participating in the labour market whereas Indigenous men who are married have higher labour force participation rates than those who are not married. The probability of participating in the labour market increases with Indigenous Australians' age, albeit at a diminishing rate.

Of central importance to this study is the impact of access to transport on Indigenous Australian's labour force participation rates. These results are presented in Table 2.⁶ The table presents results for the full sample of Indigenous men and women as well as for those living in remote and non-remote communities.

³ Active job seekers are defined as labour force participants who are unemployed, hence looking for employment. Whilst there may be some conjecture as to whether all individuals who are unemployed actively look for employment, the NATSISS does not have other data which could capture active job seekers.

⁴ The full-set of the results are available from the authors.

⁵ It is noted that some of the independent variables included in the analysis could be highly correlated; such as being arrested and jailed. Models were estimated with the inclusion of just being arrested or incarcerated. The results from these models did not have a substantial impact on the findings associated with the transportation variables. The variable for being arrested (in models without controls for jailed) did not change. Hence it was still insignificant in most of the labour force participation models, with the exception of Indigenous females living in remote areas.

⁶ The models were estimated with different groups of control variables to test the robustness of the links between transport access and labour force participation. For example, the model was estimated using 'cars per adult' in the household as an indicator of access to vehicles. These results were very comparable with those in the paper. The model was also estimated with the inclusion of household income to assess the potential reverse causality in examining the link between access to transport and labour force participation. Household income was significantly positively associated with labour force participation (as expected) and the inclusion this variable had minimal impact on the magnitude and statistical significance of the link between the transport characteristics and labour force participation. In other words, when holding household income constant, access to transport still has a significant impact on labour force participation. Whilst this cannot rule of the impact of reverse causality, it does suggest some degree of robustness in the results.

Table 2 - Results from Models to Estimate the Probability of Participating in the Labour Market: Estimated Impacts for Transport Characteristics^(a)

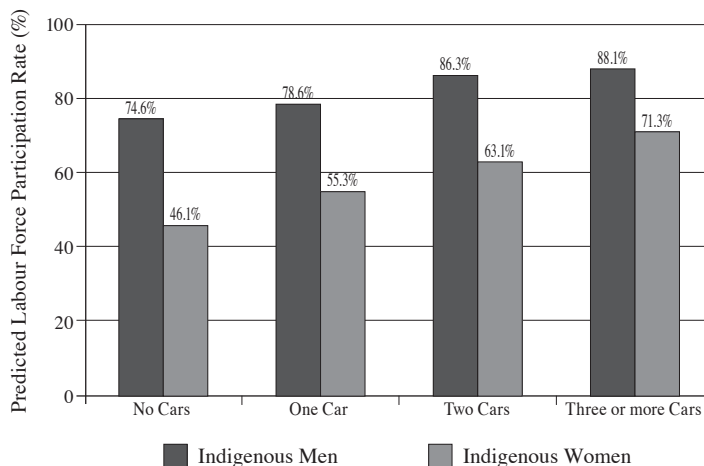
	Full Sample			Remote			Non-Remote		
	Coef.	Std Error	Marginal Effect	Coef.	Std Error	Marginal Effect	Coef.	Std Error	Marginal Effect
Indigenous Men									
<i>Model (i)</i>									
1 car	0.164	(0.083) **	0.040	0.284	(0.123) **	0.064	0.089	(0.119)	
2 cars	0.518	(0.106) ***	0.117	0.475	(0.183) ***	0.094	0.460	(0.141) ***	0.108
3+ cars	0.708	(0.138) ***	0.135	1.165	(0.343) ***	0.152	0.479	(0.172) ***	0.103
Licence	0.410	(0.080) ***	0.110	0.404	(0.129) ***	0.096	0.434	(0.106) ***	0.120
Public transport	-0.192	(0.081) **	-0.047	-0.146	(0.122)		-0.296	(0.115) ***	-0.068
<i>Model (ii)</i>									
Licence & 1 car	0.524	(0.098) ***	0.115	0.677	(0.159) ***	0.133	0.428	(0.133) ***	0.096
Licence & 2 cars	0.940	(0.114) ***	0.185	0.905	(0.219) ***	0.148	0.880	(0.146) ***	0.184
Licence & 3+ cars	1.175	(0.147) ***	0.181	1.421	(0.358) ***	0.162	0.975	(0.177) ***	0.168
Licence & No cars	0.309	(0.137) **	0.067	0.412	(0.193) **	0.081	0.108	(0.203)	
No Licence & 1+ car	0.222	(0.099) **	0.052	0.347	(0.146) **	0.073	0.070	(0.141)	
Public transport	-0.186	(0.081) **	-0.045	-0.146	(0.122)		-0.273	(0.116) **	-0.062
Indigenous Women									
<i>Model (i)</i>									
1 car	0.236	(0.064) ***	0.092	0.036	(0.097)		0.387	(0.089) ***	0.149
2 cars	0.447	(0.082) ***	0.170	0.410	(0.138) ***	0.157	0.549	(0.108) ***	0.206
3+ cars	0.713	(0.112) ***	0.252	0.121	(0.211)		0.965	(0.141) ***	0.320
Licence	0.462	(0.059) ***	0.181	0.520	(0.097) ***	0.203	0.446	(0.077) ***	0.178
Public transport	-0.022	(0.062)		-0.051	(0.089)		-0.046	(0.089)	
<i>Model (ii)</i>									
Licence & 1 car	0.660	(0.071) ***	0.246	0.527	(0.115) ***	0.201	0.787	(0.096) ***	0.288
Licence & 2 cars	0.924	(0.085) ***	0.325	0.977	(0.161) ***	0.333	1.003	(0.109) ***	0.350
Licence & 3+ cars	1.184	(0.118) ***	0.366	0.702	(0.247) ***	0.248	1.378	(0.144) ***	0.403
Licence & No cars	0.322	(0.107) ***	0.122	0.402	(0.164) **	0.152	0.303	(0.148) **	0.114
No licence & 1+ car	0.242	(0.077) ***	0.093	0.063	(0.111)		0.387	(0.111) ***	0.145
Public transport	-0.022	(0.062)		-0.048	(0.089)		-0.053	(0.088)	
Indigenous Men Sample Size:		2,751			948			1,803	
Indigenous Men Mean LFPN:		0.768			0.778			0.763	
Indigenous Women Sample Size:		3,693			1,235			2,458	
Indigenous Women Mean LFPN:		0.553			0.536			0.561	

Notes: ^(a)The model to estimate the impact of the transport characteristics on labour force participation controls for demographics, education, household characteristics and behavioural traits. The symbol * refers to statistically significant at the 10 per cent level, ** at the 5 per cent level and *** at the 1 per cent level.

The results from the model which directly controls for vehicles, driver's licences and access to public transport indicates that the number of cars owned by the household is positively associated with labour force participation. For example, Indigenous men and women with one car are 4.0 and 9.2 percentage points more likely to participate in the labour force than those without a car. Those with two cars are 11.7 and 17.0 percentage points more likely to participate in the labour market.

As shown in Figure 2, the predicted proportions of Indigenous men participating in the labour market varies by 13.5 percentage points for those with no cars to three or more cars (ranging from 74.6 per cent to 88.1 per cent).⁷ The predicted labour force participation rates vary by 25.2 percentage points for Indigenous women ranging from 46.1 per cent for those without a car to 71.3 per cent for those with three cars.

Figure 2 - Indigenous Australians' Predicted Labour Force Participation Rates By Vehicle Ownership



The impact of vehicle ownership on labour force participation is significantly larger for Indigenous women compared to Indigenous men and is also significantly larger for Indigenous women living in non-remote areas than remote areas, suggesting that car ownership may be of particular importance to female labour force participation decisions. This may be associated with the fact that vehicles may assist women in combining work and with family commitments, such as grocery shopping or taking children to school.

Indigenous men and women with valid driver's licences are also more likely to participate in the labour force. The predicted proportion of Indigenous men with driver's licences participating in the labour market is 76.2 per cent, which is 11.0 percentage points higher than the rate for Indigenous men without a driver's licence, of 65.2 per cent. Indigenous women with a driver's licence have labour force participation rates that are 25.2 percentage points higher than the rates of those without a driver's

⁷ The predicted labour force participation rates are derived from the marginal effects, holding all other variables at their means.

licence (predicted labour force participation rates of 70.7 per cent compared to 45.4 per cent). This finding may be a further indication that access to transport is more pertinent to the labour force participation of Indigenous women than Indigenous men. Whilst there are significant differences in the labour force participation rates of Indigenous Australians with and without driver's licences in remote and non-remote Australia, these differences are relatively small, suggesting that improving Indigenous Australian's ability to hold a driver's licence should have a positive impact on labour force participation in remote and non-remote Australia.

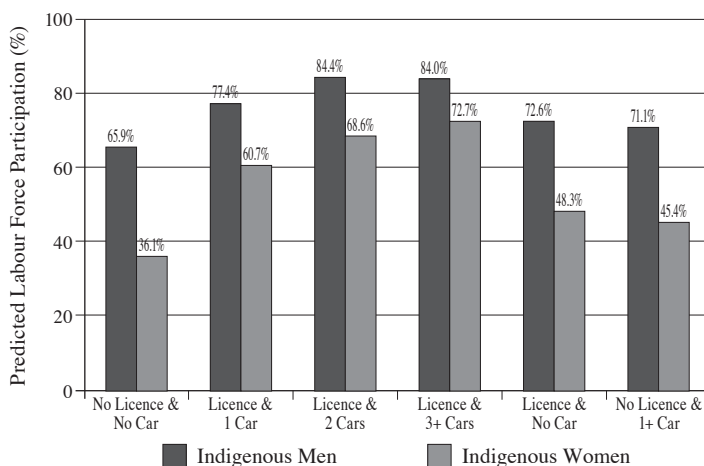
For most of the Indigenous population, there are no significant differences in the labour force participation rates for those who live in areas with public transport and those who do not. The exception to this is Indigenous men living in non-remote communities who are 7.1 percentage points less likely to participate in the labour force if they live in an area with access to public transport than their counterparts without access. The insignificance of the public transport variable for most of the sample could be a result of specification of the public transport variable, as access to public transport does not necessarily equate to public transport use. Indeed, only 35.1 per cent of Indigenous men and 38.8 per cent of Indigenous women who have access to public transport in the sample report that they used public transportation within the past two weeks. When the models were estimated with variables controlling for public transport use in place of public transport access, public transport use was still insignificant. In addition, models were estimated on samples of Indigenous Australians living in high socioeconomic status areas to capture those living in inner cities. The results from these models showed that access to public transport was statistically insignificant. As such the findings suggest that public transport does not have an impact on the labour force participation decisions of Indigenous Australians. This may be a result of public transport not providing adequate links to employment for Indigenous Australians. The significant negative impact of public transport on the labour force participation rates of Indigenous men living in non-remote areas could be due to reverse causation whereby, non-labour force participants live in areas with greater access to public transport. It may also be due to labour force participants being less likely to recognise that public transport is available in their area, reflective of problems in the collection of the information about public transport access in the dataset.

The results from the model estimated with vehicle ownership interacted with holding a driver's licence are consistent with those from model (i). Hence, Indigenous Australians who hold a valid driver's licence and live in households with cars are more likely to participate in the labour force than those who do not. The largest difference in these labour force participation rates are for those with a licence and three or more cars compared to those without car or licence. As shown in Figure 3, Indigenous Australian men and women with a driver's licence and three or more cars have predicted labour force participation rates that are 18.1 and 36.6 percentage points higher than the rates for their counterparts without a car or licence.

The results suggest that holding a driver's licence but not owning a car is positively associated with labour force participation. Indigenous men and women who hold a driver's licence but do not have a car have labour force participation rates that are 6.7 and 12.2 percentage points higher than the rates of those without a car and licence, respectively (predicted labour force participation rates for males and females of 76.2 and 48.3 per cent for compared to 65.9 and 36.1 per cent, see Figure 3). Living in a

household with at least one vehicle but not having a driver's licence is also positively associated with labour force participation. The predicted labour force participation rates of Indigenous men and women without a driver's licence but who live in households with a car are 71.1 and 45.4 per cent.

Figure 3 - Indigenous Australians' Predicted Labour Force Participation Rates by Vehicle Ownership Interacted with Holding a Driver's Licence



The impact of the variables associated with holding a driver's licence interacted with car ownership is again significantly larger for Indigenous women than Indigenous men. They are also significantly larger for Indigenous women living in non-remote areas than remote areas. This further suggests that transport characteristics are more important to labour force participation for Indigenous women than men, particularly for those in living in non-remote areas. Access to public transport is also generally insignificant, which may be a further indication that it is access to private transportation which affects labour force participation.

The model was also estimated on separate samples of different types of labour force participants. Specifically, the model was used to estimate the probability of being an active job seeker, a job seeker for less than 13 weeks, a job seeker for 13 weeks or more, and being employed relative to not participating in the labour market. These results are presented in Table 3.⁸ As shown in the table, owning a car, holding a driver's licence or both has a very strong positive impact on the probability of being employed relative to not in the labour force for Indigenous Australians. The coefficients for the transport characteristics are relatively larger in the model estimating the probability of being employed compared to the coefficients from the models estimating the labour force participation decisions. This finding could be attributed to reverse causation. However, it may also suggest that holding a driver's licence or having a car improves the likelihood of finding employment for the Indigenous population as well as labour force participation.

⁸ Due to small sample sizes, the models were only estimated on the full sample of Indigenous men and women, not separately for those in remote and non-remote areas.

Table 3 - Results from Models to Estimate the Probability a Particular Type of Labour Market Participant: Estimated Impacts for Transport Characteristics^(a)

	Total Unemployed		Unemployed < 13 weeks		Unemployed 13+ weeks		Employed	
	Coef.	Std Error	Coef.	Std Error	Coef.	Std Error	Coef.	Std Error
Indigenous Men								
<i>Model (i)</i>								
1 car	0.042	(0.121)	0.317	(0.170) *	-0.222	(0.138)	0.257	(0.091) ***
2 cars	0.248	(0.164)	0.442	(0.233) *	0.152	(0.184)	0.641	(0.113) ***
3+ cars	0.383	(0.225) *	0.791	(0.292) ***	0.132	(0.266)	0.822	(0.147) ***
Licence	-0.033	(0.118)	0.098	(0.160)	-0.054	(0.136)	0.556	(0.086) ***
Public transport	-0.357	(0.135) ***	-0.459	(0.198) **	-0.317	(0.149) **	-0.184	(0.086) **
<i>Model (ii)</i>								
Licence & 1 car	-0.106	(0.151)	0.378	(0.221) *	-0.291	(0.171) *	0.761	(0.108) ***
Licence & 2 cars	0.190	(0.186)	0.573	(0.279) **	0.055	(0.205)	1.201	(0.123) ***
Licence & 3+ cars	0.428	(0.254) *	0.981	(0.339) ***	0.176	(0.301)	1.430	(0.155) ***
Licence & No cars	-0.058	(0.203)	0.362	(0.286)	-0.194	(0.229)	0.457	(0.148) ***
No Licence & 1+ car	0.037	(0.138)	0.501	(0.197) **	-0.182	(0.157)	0.322	(0.110) ***
Public transport	-0.355	(0.135) ***	-0.472	(0.198) **	-0.301	(0.149) **	-0.177	(0.086) **
Indigenous Women								
<i>Model (i)</i>								
1 car	0.082	(0.095)	0.103	(0.131)	0.061	(0.110)	0.314	(0.070) ***
2 cars	-0.061	(0.136)	-0.026	(0.185)	-0.065	(0.160)	0.578	(0.088) ***
3+ cars	0.286	(0.192)	0.489	(0.241) **	0.086	(0.237)	0.836	(0.118) ***
Licence	0.220	(0.0091) **	0.299	(0.125)	0.137	(0.106)	0.507	(0.064) ***
Public transport	0.105	(0.104)	0.001	(0.141)	0.195	(0.124)	-0.048	(0.065)
<i>Model (ii)</i>								
Licence & 1 car	0.297	(0.108) ***	0.390	(0.145) ***	0.190	(0.126)	0.781	(0.078) ***
Licence & 2 cars	0.186	(0.146)	0.316	(0.190) *	0.056	(0.177)	1.088	(0.091) ***
Licence & 3+ cars	0.497	(0.214) **	0.537	(0.285) *	0.377	(0.252)	1.352	(0.124) ***
Licence & No cars	0.232	(0.156)	0.147	(0.218)	0.223	(0.180)	0.366	(0.117) ***
No licence & 1+ car	0.078	(0.112)	0.028	(0.160)	0.085	(0.129)	0.334	(0.086) ***
Public transport	0.106	(0.104)	-0.004	(0.140)	0.198	(0.124)	-0.048	(0.065)
<i>Indigenous Men Sample Size:</i>								
Indigenous Men Mean(b):	947		754		832		2,443	
Indigenous Women Sample Size:	0.325		0.153		0.232		0.738	
Indigenous Women Mean(b):	1,940		1,763		1,829		3,405	
Indigenous Women Mean(b):	0.148		0.063		0.097		0.515	

Notes: ^(a) The model to estimate the impact of transport characteristics on being a particular type of labour force participant controls for demographics, education, household characteristics and behavioural traits. The symbol * refers to statistically significant at the 10 per cent level, ** at the 5 per cent level and *** at the 1 per cent level. ^(b) The means refer to the proportion of the sample who are that particular type of labour force participant.

Finally, the results from the model estimating the probability of being an active job seeker (i.e. labour force participants looking for employment) reveal that transport characteristics generally have a positive impact on Indigenous Australians' decisions to look for work relative to not being in the labour force. For example, Indigenous men with three or more cars are 13.6 percentage points more likely to be looking for work rather than being a non-labour force participant compared to the population without a car. Indigenous women with a driver's licence are also 4.3 percentage points more likely to be looking for work (relative to those who are not in the labour force) compared to women without a driver's licence. The impact of transport characteristics on the probability of being an active job seeker relative to not working is much more pronounced for Indigenous Australians who have been looking for work for less than 13 weeks. Transport characteristics do not have a large impact on being a job seeker for Indigenous people who have been looking for work for 13 weeks or longer. Whilst this finding may be due to reverse causation where the short-term unemployed are more likely to have access to vehicles and a driver's licence than the long-term unemployed, it does demonstrate the link between transport and successful engagement with the labour market.

4. Summary and Policy Discussion

Indigenous Australians face high levels of transport disadvantage in terms of vehicle ownership, holding a valid driver's licence and access to public transport. The population also has considerably lower labour force participation rates than non-Indigenous Australians. To date, little is known on how transportation characteristics such as vehicle ownership, holding valid driver's licence and access to public transport impact on Indigenous Australians' labour force participation. The purpose of this paper was to examine this issue. The paper has found that when controlling for various other factors known to influence labour force participation such as education and health, Indigenous Australians' labour force participation rates are positively associated with the number of cars in their household. They are also positively associated with holding a valid driver's licence. The models which accounted for vehicle ownership combined with holding a driver's licence suggest that it is the combination of having a valid driver's licence and access to a car which has the most pronounced impact on Indigenous Australians' labour force participation decisions. However, Indigenous Australians who hold a driver's licence but do not have a car as well as those who do not have a licence but live in households with a car were also found to have higher labour force participation rates than those without a car or licence. The paper also found that the impact of transport on labour force participation was much larger for Indigenous women than Indigenous men as well as for Indigenous women living in non-remote areas than those in remote areas. Transportation characteristics have a positive impact on not only on labour force participation but also employment. They generally had a positive impact on the probability of being an active job seeker relative to not in the labour force, particularly for Indigenous Australians who have been looking for work for shorter periods of time. Finally it appears that access to public transport does not impact on the labour force participation rates of Indigenous Australians.

The findings of this paper can be used to assist policymakers and researchers in improving the labour market outcomes of Indigenous Australians. It clear from the

paper that there is a strong positive association between vehicle ownership and holding a driver's licence with labour force participation rates. Cars and driver's licences also have a positive impact on Indigenous Australians being employed, compared to not being in the labour force as well as being an active job seeker opposed to not working. Therefore, policies aimed at reducing the transport disadvantage faced by Indigenous Australians should have a positive impact on their labour force participation, which is paramount to the 'Closing the Gap' targets. Such policies may be more beneficial to Indigenous women given that their labour force participation is more closely linked to private transportation characteristics than Indigenous men. They may also be more beneficial for Indigenous women living in non-remote areas compared to remote areas as their labour force participation is also more sensitive to transport characteristics.

The results from this paper have shown that Indigenous Australians with a driver's licence are more likely to participate in the labour force. Even Indigenous Australians who do not own a vehicle but who hold a driver's licence were found to have higher rates of labour force participation. As such, policy aimed at directly improving Indigenous Australians' access to obtaining driver's licences should have a positive impact on their labour market outcomes. Removing the barriers Indigenous Australians face to get a driver's licence, such as the fear of the police responsible for licencing, financial constraints, documentation issues and supervised driving requirements could have a positive impact on their labour force participation (AONSW, 2013). There are currently a number of programs to support Indigenous Australians in obtaining licences such as ones relating to proof of identity requirements, changes in the supervised driving requirements and driving education programs (see Department of Transport, 2012; and Health Info Net, 2015). However, many of these programs are state or even region specific. There may be merit in expanding such programs to a national scale, so that all Indigenous Australians benefit from such policies.

In addition, Indigenous Australians are much more likely to have their driver's licences revoked due to fine default and more likely to be imprisoned for driving offenses (AONSW, 2013; and Skinner and Rumble, 2012). As a means of improving the proportion of Indigenous Australians with driver's licences, it may be beneficial for policymakers to consider alternative punishment methods for not paying fines. For example, Dockery and Hampton (2015) support a system of provisional 'locked' licences for employment purposes so that driving offences do not negatively impact on employment.⁹ It may also be beneficial for government and law enforcers to review cases for Indigenous Australians who have lost their licences for 'life' to see if there is scope for allow such persons to reapply for driver's licences, particularly if their potential employment requires a driver's licence.

The findings of this paper also indicate that Indigenous Australians who live in a household with more vehicles are more likely to participate in the labour force. This is even for the population who do not have a driver's licence. Given that Indigenous Australians have poorer access to vehicles than the rest of the Australian population, policies aimed at improving vehicle ownership among the Indigenous population could have a positive impact on their labour force participation rates. It may be of merit for the

⁹ It should also be noted that given the negative impact of jail on labour force participation, alternate punishments which avoid sending Indigenous Australians to jail for driving offences should positively impact on their labour force participation.

government to subsidise the cost of purchasing a vehicle and running a vehicle (such as vehicle registration fees) for the Indigenous population. There may also be merit in programs to train Indigenous Australians in car mechanics to improve the longevity of vehicles. Whilst the programs would be expensive to implement, increasing labour force participation for Indigenous Australians is beneficial to the Government budget (Gray *et al.*, 2014). The benefits of improved labour force participation may outweigh the costs of such programs.

The results in the paper show that it is a combination of having a driver's licence and owning a vehicle which has the largest impact on labour force participation. Policy aimed at improving Indigenous Australians' access to driver's licences and vehicle ownership need to take this into consideration. The current licencing requirements in Australia stipulate that an individual must complete a certain amount of driving time with a suitable instructor. As such, all individuals need access to a car to obtain a licence. Given that Indigenous Australians are less likely to own a car than other Australian population sub-groups, especially in remote areas, there may be some scope for the government to provide cars in Indigenous communities specifically for driving instruction.

Access to public transport did not have major impact on Indigenous Australian's labour force participation rates (and when it did, it had a negative impact on labour force participation). This result may suggest that public transport does not provide Indigenous Australians with enough mobility to travel to their places of employment. It may also be reflective of other factors, as access to public transport is not parallel to private transport use. Further research is required to examine the relationship (if any) between public transport and the labour market outcomes of Indigenous Australians.

On a final note whilst this paper has established a clear association between vehicle ownership and holding a driver's licence and the labour force participation rates of Indigenous Australians, this study is not without its limitations. This largely stems from the fact that it is based on cross-sectional data. The study has been unable to correct to the issue of reverse causation between access to transport and labour force participation decisions. It cannot be ruled out that the relationship between vehicle ownership and having drivers licence, and labour force participation is a result of participating the labour market providing Indigenous Australians with the means to obtain a licence or vehicle. Much more research is needed on the impact of transport characteristics on the labour supply of Indigenous Australians. The NATSISS is limited in the sense that it cannot provide a more detailed analysis how access to transport impacts labour market participation in certain regions which may be of further merit. For example, the NATSISS by remoteness only defines remote and non-remote areas but does not further define regional areas. It would also be of value to be able to compare how transportation characteristics impact on other minority groups and the Australian population as a whole. It would be of value for more data sets, such as the Australian Census to include variables relating to driver's licences. In addition, there is a real need for detailed panel data on Indigenous Australians to test for reverse causation and endogeneity issues when examining their labour market outcomes. This would be of particular value for policymakers and researchers to gain a more detailed understanding of the factors driving the labour force participation rates of Indigenous Australians.

Appendix

Table A1 - Description of Variables Used in the Analysis

<i>Variable</i>	<i>Description</i>	<i>Mean</i>	<i>Std. Dev.</i>
Dependent variables:			
LFPN	Equal to 1 for labour force participant, and 0 for non-labour force participant	0.644	0.479
Employed	Equal to 1 for employed and 0 for non-labour force participant	0.608	0.488
Unemployed	Equal to 1 for unemployed and 0 for non-labour force participant	0.206	0.405
Unemployed < 13 weeks	Equal to 1 for unemployed for less than 13 weeks and 0 for non-labour force participant	0.090	0.286
Unemployed 13+ weeks	Equal to 1 for unemployed for 13 or more weeks and 0 for non-labour force participant	0.139	0.346
Independent variables:			
<i>Transport:</i>			
1 car	1 car owned by household members	0.387	0.487
2 cars	2 cars owned by household members	0.108	0.311
3+ cars	3 or more cars owned by household members	0.108	0.311
No car	Omitted category: No cars owned by household members	0.247	0.431
Licence	Possesses a current driver's licence	0.643	0.479
No licence	Omitted category: does not possess a current driver's licence	0.357	0.479
Public transport	Public transport available in local area	0.662	0.473
No public transport	Omitted category: Public transport is not available in local area	0.338	0.473
Licence & 1 car	1 car owned by household members and possesses a current driver's licence	0.268	0.443
Licence & 2 cars	2 cars owned by household members and possesses a current driver's licence	0.222	0.416
Licence & 3+ cars	3 or more cars owned by household members and possesses a current driver's licence	0.095	0.293
Licence & No cars	Possesses a current driver's licence but has no cars owned by household members	0.057	0.231
No licence & 1+ car	Has at least 1 car but does not possess a current driver's licence	0.168	0.374
No licence & No car	Omitted Category: No cars owned by household members and does not possess a current driver's licence	0.190	0.392
<i>Demographics:</i>			
Remote	Lives in remote/very remote areas based on ASGC remote area classification	0.339	0.473
Non remote	Omitted category: lives in non-remote areas based on ASGC remote area classification	0.661	0.473
Age	Age	37.071	12.550
No English	Main language spoken at home is not English	0.150	0.357
English	Omitted category: main language spoken at home is English	0.850	0.357
Married	Married or de facto relationship	0.509	0.500
Not married	Omitted category: not married or de facto relationship	0.491	0.500
<i>Education:</i>			
Degree	Highest educational attainment is a tertiary qualification	0.289	0.454
High school	Highest educational attainment is the completion of year 10, 11 or 12	0.456	0.498
Unqualified	Omitted category: highest educational attainment is less than year 10	0.254	0.435
<i>Households:</i>			
3+ adult household	Three or more household members aged over 15 years	0.360	0.480
2 adult household	Omitted category: two or less members of the household aged over 15 years	0.640	0.480

Table A1 - Description of Variables Used in the Analysis (continued)

<i>Variable</i>	<i>Description</i>	<i>Mean</i>	<i>Std. Dev.</i>
1 child	One child aged under 15 years in the household	0.191	0.393
2 children	Two children aged under 15 years in the household	0.180	0.384
3+ children	Three children or more under aged under 15 years in the household	0.206	0.405
No children	Omitted category: no children aged under 15 years in the household	0.422	0.494
Non-Indigenous household	Some members of the household are non-Indigenous	0.359	0.480
Indigenous household	Omitted category: All members of the household are Indigenous	0.641	0.480
<i>Behaviour:</i>			
Homelands	Recognises an area as homelands/traditional country	0.262	0.440
No homelands	Omitted category: does not recognise an area as homelands/traditional country	0.738	0.440
Cultural group	Identifies with a clan, tribal or language group	0.664	0.472
No cultural group	Omitted category: does not identify with a clan, tribal or language group	0.336	0.472
Removed	Forced removal from family by the government	0.093	0.291
Not removed	Omitted category: not forcibly removed from family by the government	0.907	0.291
Excellent health	Self-assessed health rated as excellent or very good	0.411	0.492
Good health	Self-assessed health rated as good	0.349	0.477
Fair health	Self-assessed health rated as fair	0.163	0.369
Poor health	Omitted category: self-assessed health rated as poor	0.077	0.266
High Psychological Distress	Is in a high or very high level of psychological distress measured by their score on the Kessler Psychological Distress Scale (K5) (see ABS, 2009 for more information)	0.333	0.471
Low Psychological Distress	Omitted category: not in a high or very high level of psychological distress	0.667	0.471
Smoker	Current smoker	0.526	0.499
Non-smoker	Omitted category: not a current smoker	0.474	0.499
Daily drinker	Drinks alcohol every day	0.064	0.245
Drinker	Drinks alcohol, but not every day	0.696	0.460
Non-drinker	Omitted category: does not drink alcohol	0.241	0.427
Illicit drug use	Has taken an illicit drug in the past 12 months	0.218	0.413
Non-illicit drug use	Omitted category: has not taken an illicit drug in the past 12 months	0.782	0.413
Arrested	Has been arrested in the last 5 years	0.164	0.370
Not arrested	Has not been arrested in the last 5 years	0.836	0.370
Jailed	Has been incarcerated	0.105	0.307
Not jailed	Has never been incarcerated	0.895	0.307

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