Who receives Government Benefits: the Effect of Reading and Writing Assistance on Take-Up of Disability Support Pension

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Abstract

The Disability Support Pension (DSP) is an important income support for individuals with permanent disability in Australia. However, 56.7% of claims for DSP were rejected in 2012-2013, and the largest non-medical reason for rejection was the failure to supply requested information, accounting for 12% of all rejections. In this paper, I examine the impact of receiving reading and writing assistance on the take-up of DSP. I employ age at onset of the disability as an instrumental variable to account for potential selection problem present in receiving the assistance. Using a pooled cross-sectional data (2003, 2009, 2015) from the Australian Bureau of Statistics Survey of Disability, Ageing and Carers, a recursive bivariate probit estimation is carried out to allow for the supposed correlation between the unobserved tendencies and receipt of assistance. Results indicate that reading and writing assistance substantially increases the probability of receiving DSP. The effects are also significant for the sub-samples of individuals with psychological/psychiatric and intellectual/learning disabilities, respectively.

1 Introduction

For any government, equal access and provision of government benefits to the most needed individuals are important policy objectives. At the same time, however, governments need to balance this objective against their budget plan. Thus, governments often times juggle between targeted and universal coverage of benefits. For example, Kottelenberg and Lehrer (2017) find distributional effects of Quebec's universal child care policy on developmental outcomes. A lot of literature on access with regard to health is concerned with expansion of access to health insurance, disability benefits or healthcare services (Moscelli et al., 2018; Weathers and Stegman, 2012). From the perspective of individuals applying for government benefits, however, access depends on stringency of eligibility criteria and complexity of application process. As a result, access to benefits is directly linked to program participation rate or take-up rate.

This paper examines Australia's Disability Support Pension (DSP) and its association with assistance provided. Specifically, I focus on reading and writing assistance (RWassis), which is likely to be directly related to program application process.

Most of the studies on Australian DSP are in relation to labour market conditions or outcomes (Cai and Gregory, 2004; Cai et al., 2007). This paper is more concerned with the probability of DSP take-up and its relationship with personal assistance. According to the government report on DSP, the largest non-medical rejection reason was the failure to supply requested information (12% of all rejections). If a disabled individual has difficulties with paperwork, he/she will be at disadvantage compared to others without such difficulties and more likely to miss out on rightfully entitled benefits. As such, it is reasonable to anticipate that assistance to these individuals will affect their DSP take-up rate. Also, it is likely that certain conditions require more assistance in reading and writing tasks.

In analysing the take-up of DSP, heterogeneity within disabled population is considered as well. The characteristics of those receiving DSP is important because it allows evaluation of whether intended groups of people are receiving the benefits. This will further allow the government to decide on whether to shift target groups for DSP or to provide the benefits to more general population.

One type of heterogeneity within disabled population involves immigrants. Clarke and Isphording (2017) find strong negative effect of language deficiency on health of child migrants to Australia. They use Grossman type production function to explain the mechanisms that link language deficiency to poor health, for e.g., lower access to inputs to health production results in less safe jobs. One plausible explanation for such association is that lower language skills may deter immigrants from accessing benefits that they are entitled to, that consequently negatively affect their health. Yet, Furtado and Theodoropoulos (2016) explore the effect of ethnic network on the take up of Disability Insurance in the US and find that immigrants living among large co-ethnic groups are more likely to take up insurance when their groups have high take-up rates. Part of their estimated network effect reflects differences in satisfying non-disability related requirements, which I take as implying the importance of assistance in application preparing procedures.

Disabled population also vary across different types of impairment and severity of disability. Jones et al. (2018) find long-lasting decline of employment and life satisfaction following disability onset and that while individuals with short-term disability recovers rapidly and completely, they find no evidence of recovery for those with chronic and severe disabilities.

Soldatic et al. (2014) raised concerns about marginalised disability groups, particularly those with intellectual disabilities coupled with language problems and criminal history, that they are at risk of missing out on benefits with the adoption of National Disability Scheme, which began rolling out in July 2016. The main objective of NDIS is to give disabled individuals more choice and control over their lives. It is an insurance package where you buy services according to your life aspiration and the needed fund will be determined by NDIS assessor. But as mentioned by Soldatic et al., the onus of proving eligibility for the program is on the disabled individuals and so, the paper points out that those with complex social exclusion issue will find it more difficult to get the support. The point made about proving eligibility is also relevant to DSP as DSP requires job capacity assessment. In 2012, a new Job Capacity Assessment was introduced whereby potential DSP recipients since 2012 are required to prove that they cannot work more than 15 hours per week. Its been said that this on top of stricter medical assessment has contributed to slower growth of DSP population recently.

In addition, there are other types of government benefits and policies at work that may affect the examination of DSP. For example, Atalay and Barrett (2015) find that gradual increase in eligibility age for Australian Age Pension has resulted in substitution effect of increase in enrolment of DSP by 13 to 23 percentage points which more than offset reduced retirement probability effect that might have saved public expenditure.

The main regressor, the reading/writing assistance, is not exogenous because there may be a confounding variable which affects both the DSP and the assistance. I use the bivariate probit model to solve the endogeneity problem. Shelton Brown et al. (2005) and Belkar et al. (2006) also use the bivariate probit model to account for potential endogeneity in similar contexts. The former uses genetic instrumental variables (IVs) such as family diabetes history for impact of diabetes on employment. The latter models awareness in the taking of cervical cancer screening.

To overcome the difficulty in finding a good instrumental variable, Altonji et al. (2005) develop an estimation method that uses information on selection on observables to estimate the amount of selection on unobservables. I employ their method in performing a sensitivity analysis. Oster (2017) extends their idea into developing a bounding methodology by incorporating R-squared movements. Dahlen (2016) applied this bounding methodology to maternal depression and studied how it affected children's test scores as well as socioemotional outcomes.

There is a growing literature on the effect of information friction on government benefits program participation. Armour (2018) finds that provision of information on personal benefits has substantial positive effect on the US Disability Insurance (DI) application rates for work-limited population. Bhargava and Manoli (2015) claim that informational complexity is associated with low take-up of earned income tax credit (EITC), a cash transfer program. To increase the take-up rate of college financial aid programs, Bettinger et al. (2012) have carried out a randomized field experiment of providing personal assistance in completing aid applications. They saw this as a form of choice architecture, "a different kind of nudge" that will affect the program participation rate.

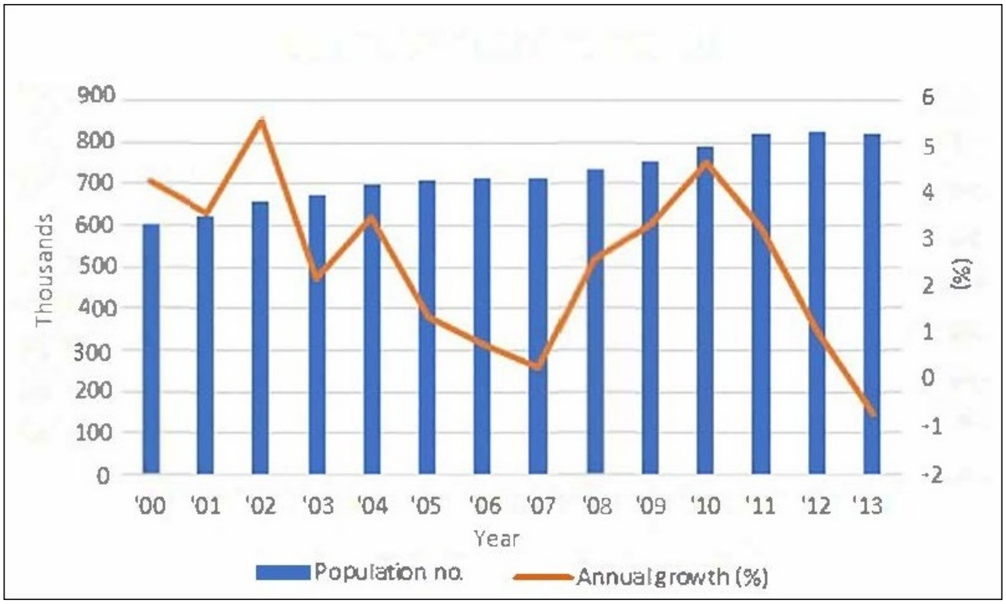
Although reading/writing assistance inevitably involves providing information on benefits if the assistance is given while filling out application forms for corresponding benefits, I do not formally consider information friction in this paper because it is not verifiable whether reading/writing assistance receivers in the sample are also provided with information on government benefits from assistance providers or they already have information and just received assistance in making use of any given information.

2 Disability Support Pension

The Disability Support Pension is the second largest income support for Australians after Australian Age Pension (AAP). Eligibility criteria for DSP is similar to that of AAP. The main difference between the two is that the former is restricted to those with severe disability and the latter is restricted to those above certain age. Consider a cohort of males and females born in the same one-year calendar. Not everyone in the cohort will be eligible for DSP, whereas everyone in the cohort will be eligible for AAP at some point in time. An individual cannot receive both pensions at the same time.

According to the government report, 62% of DSP 'exits' (individuals who no longer receives DSP but were receiving it a year ago) moved on to AAP as at June 2013. However, if one is eligible for AAP, he or she may be more likely to be eligible for DSP as disability rate increases with age. Furthermore, the underlying purpose for both pensions is to compensate

Figure 1: DSP Population & Annual Growth



Source: Characteristics of Disability Support Pension Recipients June 2013, Department of Social Services, Australian Government

for those who are restricted in working capacity or labour force participation. Although this paper does not look at the dynamics of entry and exit of DSP, DSP recipients exit the program by four main reasons: Age Pension, employment, death and 'other', where 'other' may include improvements in income, assets and health (Cai et al., 2007). Eligibility to DSP depends on severity of disability, job capacity, residency and income and assets tests. The eligible individual must be either completely blind or has impairment assessment score at or above 20 and unable to work more than 15 hours/week for the next 2 years and unable to undertake training activity.

Figure 1 is a graph showing DSP population and the annual growth of the DSP population. The general population has gradually increased but the growth rates saw some big ups and downs, with sharp decline of rate since 2010. And negative growth rate is first observed in 2013, which we may safely contribute to the new Work Capacity Assessment in 2012. Since the adoption of DSP, the number of male recipients were always higher than that of females. Over the last twenty years, however, the proportion of women receiving DSP has increased, reducing the gap between male and female recipients. This is due to several policy changes affecting women. As mentioned, AAP age eligibility criteria has seen gradual increase for females, alternative government benefits intended for women has ceased receiving new entrants and stricter criteria was imposed for Parenting Payment.

3 Data and Empirical Methods

The data is from the Australian Bureau of Statistics Survey of Disability, Ageing and Carers. The survey provides rich data on employment, socio-demographic characteristics and health conditions of the population involving disabled persons, carers and old aged persons. The data also has information about non-disabled persons for use of comparative analyses, but they will be excluded in this study for the purpose of focusing on disabled population.

I have pooled three cross-sections of the Basic Confidentialised Unit Record File (CURF) data for the years 2003, 2009 and 2015, which are from the fifth, sixth and eighth cross-sectional waves of the ABS SDAC survey, respectively. The Basic CURF data includes personal level observations of 41,233, 72,075 and 74,862 for 2003, 2009 and 2015, respectively. The variables created from responses of survey questions are fairly consistent across the three waves, despite some changes and modification of categories and wordings. The pooled sample has 188,160 observations, but the sample is restricted to ages between 16 to 64 and disabled individuals, the total sample is 18,141.

The focus of this paper is on individuals with and without DSP and reading/writing assistance. I have constructed a binary reading/writing assistance variable from responses of two survey questions "[do/does] [you/he/she] receive assistance from any organised services, to help with reading and writing tasks?" and "[do/does] [you/he/she] receive assistance from anyone else, such as a [partner or spouse/parent], family, friends or neighbours to help with reading and writing tasks?" The former question is asking for formal assistance and the latter one for informal assistance, and the responses were combined to form one binary variable.

Receiving reading/writing assistance is potentially endogenous in that individuals who tend to be more motivated and proactive are more likely to seek for any assistance involving paperwork and also procure any available benefits.

The dependent variable, DSP, is a binary variable which is equal to one if an individual is currently receiving DSP and zero otherwise. Unfortunately, my data does not allow identification of whether an individuals has applied for DSP regardless of eventual acceptance to the benefit.

To examine the impact of reading/writing assistance on DSP of more homogeneous group in term of health, and because DSP is only given to individuals with a disability, the sample is restricted to individuals with disability. The sample is further restricted to persons aged 16 to 64 to take into account the age eligibility criteria. In fact, the upper bound of age criteria is Australian Age Pension eligible age, which is 65 for men and 62 to 65 for women depending on birth cohort as the AAP was under progressive reform for women at the collection periods

Table 1: Summary Statistics

	DSP = 0 (n = 13,832)	DSP = 1 (n = 4,309)	RWassis = 0 (n = 16,696)	RWassis = 1 (n = 1,445)
Age	45.8	48.7	47	39.7
Household Size	2.8	2.3	2.6	2.9
Male	0.75	0.25	0.91	0.09
Female	0.78	0.22	0.93	0.07
Married	0.83	0.17	0.94	0.06
Not married	0.71	0.29	0.9	0.10
NSW	0.76	0.24	0.93	0.07
Victoria	0.77	0.23	0.92	0.08
Queensland	0.76	0.24	0.91	0.09
SA	0.75	0.25	0.92	0.08
WA	0.78	0.22	0.92	0.08
Tasmania	0.69	0.31	0.91	0.09
NT	0.81	0.19	0.94	0.06
ACT	0.85	0.15	0.94	0.06
Major Cities	0.78	0.22	0.92	0.08
Non-Major Cities	0.74	0.26	0.92	0.08
Born in Australia	0.76	0.24	0.92	0.08
Immigrants (Eng.)	0.81	0.19	0.94	0.06
Immigrants (Non-Eng.)	0.72	0.28	0.93	0.07
2003	0.79	0.21	0.92	0.08
2009	0.74	0.26	0.93	0.07
2015	0.76	0.24	0.92	0.08
Employment Restrictions	0.64	0.36	0.88	0.12
Permanently Unable to Work	0.33	0.67	0.83	0.17

The sample consists of individuals aged 16 to 64 with disability.

of data used in this paper.

Table 1 presents summary statistics of variables used in this study within the sample, which consists of four groups: whether or not an individual gets DSP and whether or not he/she receives RWassis. On average, individuals receiving DSP is older than those not receiving it. However, individuals receiving RWassis are much younger than those not receiving the assistance. Slightly higher proportion of men are receiving both DSP and RWassis compared to women. Proportion of married individuals receiving DSP is much lower than those who are not married. Also, the DSP participation rate for individuals living in non-major cities are higher than those living in major cities. This may be due to higher opportunity of employment in major cities and therefore, lower need of pension. For the states, the proportion of individuals receiving DSP is the highest in Tasmania and the lowest in ACT (31%

and 15%, respectively). Note that the Northern Territories has low DSP participation rate as well (19%). As to place of birth, individuals born in non-English speaking countries has higher DSP participation rate (28%) than those born in Australia or from English speaking countries. This may indicate language barrier does not prevent receipt of DSP. Moreover, the proportions for reading and writing assistance are not much different across individuals born in Australia, those born in English speaking countries and those born in non-English Speaking countries. This may indicate that language is not a big component in reading and writing assistance.

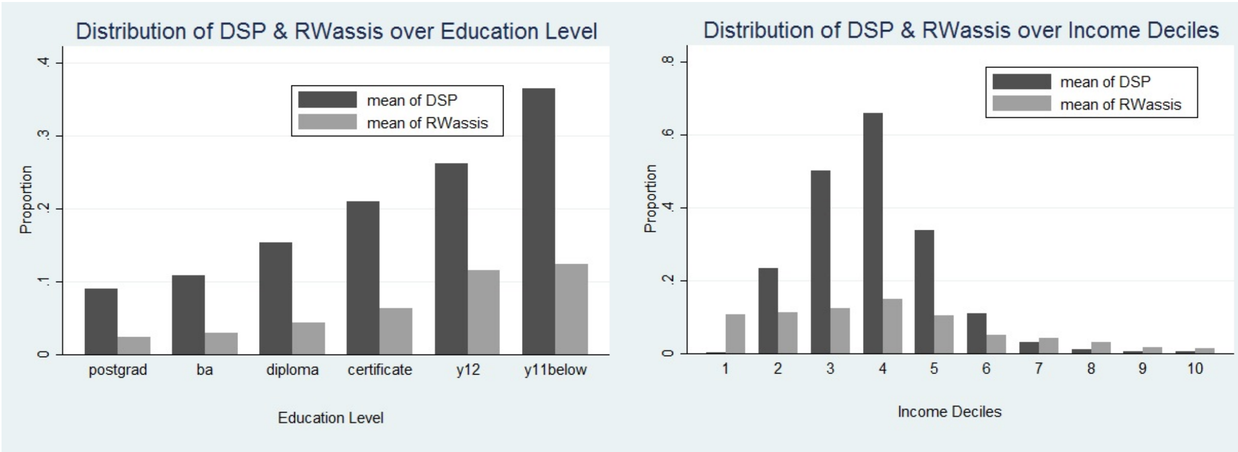
Across the three periods under analysis, the DSP participation rate increased between 2003 and 2009 and then slightly decreased between 2009 and 2015. The last two variables in Table 1, Employment Restrictions and Permanently Unable to Work, are not included in the regressions, but are used to perform subgroup analyses. Many recent papers involving disability focus on populations with work-limiting disabilities and my employment restriction variable corresponds to such individuals. They are experiencing employment restrictions due to disabilities and they include restrictions in type of job, number of hours, in need of equipment, special arrangements or assistance and etc. As is shown in Table 1, 36% of those with some form of employment restrictions are receiving DSP. As expected, substantial proportion of individuals permanently unable to work are receiving DSP, yet 33% of them are not receiving DSP.

Due to endogeneity, education and income decile variables are also excluded from the regressions. Figure 2 shows two graphs of distribution of DSP and RWassis over education level and income deciles, respectively. Both DSP and RWassis are increasing with lower level of education, which is as expected. Higher level of education is known to be associated with higher income and better health, rendering DSP less neccessary for these groups. As to income deciles, individuals in the fourth decile take up more than 60% of DSP, and individuals in the third and fifth deciles represent the next largest proportion of DSP, respectively. As is expected, DSP and RWassis participation rates are very low for the idividuals in the upper deciles.

Table 2 presents summary statistics across different disability types. Looking at the statistics, two disability types stand out. The average age at onset is less than ten for individuals with intellectual and congenital disabilities, which is quite obvious given the nature of the disability type. Note that the average household size is above three for individuals with intellectual and congenital disabilities, which may indicate that more family members are involved in assisting these individuals.

To account for aforementioned endogeneity, the bivariate probit method is employed to examine the effect of reading/writing assistance on receipt of DSP. Both the endogenous

Figure 2: Distribution of DSP & RWassis over Education Level and Income Deciles



variable and dependent variable are binary variables. The bivariate probit estimation involves two equations where the endogenous independent variable in the final equation is the dependent variable in the first one. Moreover, the IV, the age at onset of disabling condition, is included in the first equation as an independent variable to resolve potential bias issue. To successfully counter potential bias, one needs to find an exogenous variation that is associated with endogenous variable but unrelated to outcome. The age at onset is likely to be negatively related to reading/writing assistance because the later the onset of disability, the more likely that the individual already has reading/writing skills and therefore, less likely to receive corresponding assistance. On the other hand, the onset age is less likely to be related to the receipt of DSP.

The DSP equation is specified as:

$$DSP_i^* = RWassis_i\delta + X_i'\beta + e_i \tag{3.1}$$

where receipt of Disability Support Pension is an indicator variable equal to 1 when the latent variable $DSP_i^* > 0$ and 0 otherwise, x_i is a vector of covariates that include age, age squared, male, marital status, whether born in non-English speaking countries, year of arrival to Australia, state, whether living in major cities, income decile, household size, whether has children aged under 15 and year effect. I have excluded education and income level from the set of covariates due to potential endogeneity problem. These variables are likely to affect DSP through affecting RWassis. The reading/writing assistance equation is specified as:

$$RWassis_i^* = Onset_i\pi + X_i'\beta + u_i \tag{3.2}$$

where reading or writing assistance is also an indicator variable equal to 1 when the latent variable $RWassis_i^* > 0$ and 0 otherwise, $Onset_i$ is an IV, and x_i is a vector of same set of covariates used in DSP equation.

If e and u are correlated due to the endogeneity of reading/writing assistance, the univariate probit will not produce consistent estimates in equation (1). The bivariate probit, on the other hand, will produce consistent estimates by jointly estimating equations (1) and (2) while allowing for correlation between the two error terms.

4 Results

Table 3 shows results from both probit and bivariate probit specifications. The first column is probit without covariates and the second is with covariates. The last two columns show results for the two equations that make up recursive bivariate probit estimation.

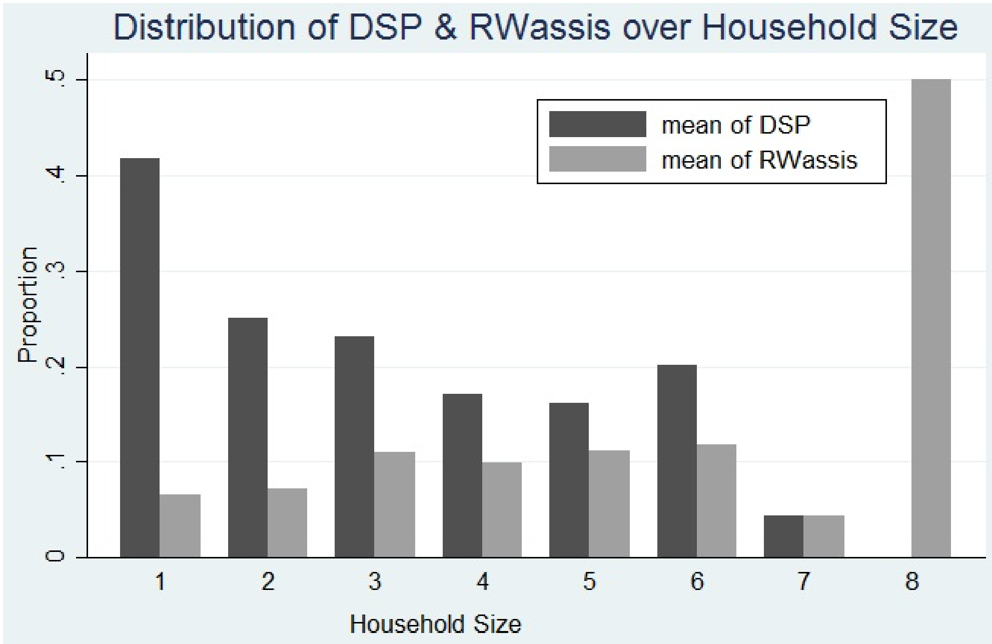
The estimated coefficients on RWassiss are all positive, with the number increasing along the columns. The estimated coefficient for bivariate probit is quite large even when selection has been taken care of in the regression. The estimate of the correlation coefficient, ρ, is significantly different from zero at the 1% level, indicating bivariate probit is preferred to probit as probit estimation will produce bias. The coefficient on age at onset is small and negative but highly significant. As to covariates, there is no significant age effect for RWassis equation, whereas positive age effect is observed in the DSP equation. Males are more likely to get both RWassis and DSP than females. On the other hand, individuals that are married or have children aged under 15 are less likely to get RWassis and DSP than each of their counterparts, respectively. Spousal income might explain particularly strong negative coefficient on married individuals. Household size has positive and statistically significant effect on reading/writing assistance. One probable reason is that individuals with disability may be living in the same household as those providng informal assistance if they are receiving help from their family members. However, the very same variable has negative and statistically significant effect on DSP. Immigrants from non-English speaking countries are more likely than Australian-born individuals to get DSP but more recent immigrants are less likely to get DSP, probably partly due to residence requirement.

Table 4 reports bivariate probit estimation results when the instrument age at onset is used in the analysis as dummy variables. The first two columns show the results of instrument dummy where '1' indicating age at onset being less than or equal to three and '0' indicating age at onset greater than three. The last two columns are for the specification with instrument dummy where '1' indicating age at onset being less than or equal to eighteen. The former specification would show the result for the group of individuals who were either born with a disability or who acquired a disability during an infant stage. The latter specification would show the result for the group of individuals who acquired a disability before completing conventional school education. Both specifications show highly significant and positive effects of reading/writing assistance. So far, the correlation coefficient, ρ, is significantly negative in all bivariate probit specifications with instruments. This indicates that some unobserved factors that increase the probability of receiving reading/writing assistance also decrease the probability of receiving DSP.

Individuals with different types of disability may result in different DSP participation rates. This is more so if we assume work capacity is highly associated with the participation as it is more difficult to work with certain types of disability than others. Table 5 presents probit and bivariate probit estimates for the specification that includes different disability types. Each disability type variable is a dummy variable and the omitted base category is "others." The magnitude of the coefficients on reading/writing assistance is smaller than original specification but bivariate probit estimate is larger than probit one, similar to the original specification. Psychiatric condition and congenital anomalies are the two types that have positive and significant bivariate probit estimates, indicating those with each of these disabilities are more likely than others with "other" conditions to be receiving DSP. Individuals with these two types of disability are also more likely to be receiving reading/writing assistance than individuals with "other" disability. It is worth noting that the coefficient on individuals with intellectual disability in reading/writing equation is largest in magnitude and significant at 1%. The results are consistent with recent government report that Psychological/psyciatric and Intellectual/learning are on the rise since 2001 and that Musculo-skeletal and connective tissue has given out its place as the primary medical condition for DSP receeipients to Psychological/psychiatric in 2011.

A variable of particular interest is the household size, which is the number of members in a household, because it is the only variable for which the coefficients with respect to DSP and RWassis have opposite signs. As is shown in the summary statistics table, the mean household size is 2.3 for individuals with DSP and 2.9 for those receiving RWassis. Also, the most common household size for the sample of individuals aged 16 to 64 with disability is two. Figure 3 shows distribution of DSP and RWassis over houehold size. Households with size equal to one has the highest DSP participation, taking up more than 40%. Then, household sizes 2 and 3 represent the next two largest proportions, respectively. The decrease in the participation rate with increase in household sizes may reflect that individuals with disabilities are getting benefits or financial support from other family members. On the other hand, proportions of RWassis increase with household size, although there is little variation between different households. To explore whether household size plays an important role in

Figure 3: Distribution of DSP & RWassis over Household Size



explaining negative correlation of disturbances, I have further restricted the sample according to three main household sizes. Table 6 shows bivariate probit estimates for subgroups of household size equal to one, two and three, respectively, when continuous age at onset variable is used as an instrument. The estimates are positive and highly significant for household sizes one and three. Table 7 also presents bivariate probit estimates for subgroups of different household sizes, but this time a binary age at onset less than or equal to 18 variable, which is the preferred specification, is used as the instrument. Now, the coefficients on RWassis are less than one and insignificant for household sizes of one and two, whereas the coefficient on RWassis is still positive and highly significant for household size of three. One plausible explanation for strong effect for the subgroup of household size three is that there is higher chance of assistance being provided within households when the size is three compared to one or two, which in turn increase the likelihood of receiving DSP once assistance is given. Having assistance provider within household may increase persistence throughout commencement and completion of DSP application and eventual receipt of the benefit.

Table 8 presents bivariate probit estimates for a subgroup of households with one disabled person. The first two columns are the results using continuous age at onset variable as an instrument and the last columns use a binary age at onset variable ('1' if less than or equal to 18) as the instrument. The coefficients on RWassis are both positive and highly significant but correlation coefficients are small and insignificant.

Table 9 presents bivariate probit estimates for sub-samples of individuals with employment restriction and those who are permanently unable to work. The coefficients on RWassis are positive and highly significant for all specifications for the two sub-samples. The coefficient on ρ is negative and highly significant for the sub-sample of employment restriction group when continuous Age at Onset instrument is used. The coefficient on ρ is significantly negative at 10% when binary instrument is used. However, the magnitude of the coefficients on ρ for this group is quite small. For the sub-sample of individuals who are permanently unable to work, the coefficients on ρ are negative and highly significant. Moreover the estimates reflect strong correlation between the disturbances of DSP and RWassis.

Table 10 presents probit and bivariate probit results for the sub-samples of individuals with intellectual/learning and psychological/psychiatric disabilities, respectively. Again, the bivariate probit estimates for RWassis are positive and significant for both types of disability and each are much larger in magnitude than probit estimates, respectively. Also, the coefficients on year 2015 are positive and significant, which is consistent with the government report that the proportions of two types of disabilities among DSP recipients have been rising since 2001. Table 11 also shows bivariate probit results for the sub-samples of two disability types, but the binary variable is used as the instrument in the specifications. The results are similar to the specifications using continuous instrument with only slight decrease in numbers for the estimates on RWassis and ρ.

Table 12 reports average treatment effects across different specifications. The first column is average probability of DSP participation, against which average treatment effects from different specifications can be compared. The second and third columns show probit results without and with covariates, respectively. Note that the difference is not big, indicating that the covariates are not much in action. Remaining columns present results from bivariate probit estimation. Interestingly, the endogeneity corrected specifications produce larger average treatment effect compared to probit estimation. Yet, the numbers decrease again when disability type covariates are added, but still higher than average treatment effects for probit specifications.

Table 13 shows average treatment effects for sub-samples of psychological/psychiatric and intellectual/learning disabilities. Similar to the full sample, average treatment effects increase dramatically between probit and bivariate probit specifications, and then decrease slightly when binary instrument is used. For these sub-samples, other disability type covariates are not used in the specifications.

Table 14 presents average treatment effects for the sub-samples of different types of households. The results indicate that individuals from households with 3 members show strongest average treatment effect as compared to those from households with 1 and 2 members. Further, individuals from households with one disabled member show slightly lower average treatment effects compared to the full sample.

Finally, Table 15 show average treatment effects for sub-samples of individuals with employment restrictions and those who are permanently unable to work. Again, average treatment effects are lower for the specifications using binary instrument. Nonetheless, the average treatment effects are similar across the two sub-samples, ranging from 0.40 to 0.49.

4.1 Sensitivity Analysis

Following sensitivity analysis used by Altonji et al. (2005), the correlation coefficient ρ is varied from -1 to 1 and the bivariate probit model is estimated by constraining ρ to a specified value. The numbers are provided in Table 16. γ is the bivariate probit estimate and $\rho = 0$ corresponds to univariate probit estimation, where the estimated value is the same as the the one from probit estimation performed beforehand. It shows that the correlation between the unobservable determinants of DSP and RWassis would have to be greater than 0.5 to explain the estimated effect under the null of no true RWassis effect. Given that the estimated ρ is negative, it is highly unlikely to get zero RWassis effect.

Altonji et al. (2005) use the condition that the relationship between Catholic High school (CH) and the mean of the distribution of the index of unobservables that determine outcomes is the same as the relationship between Catholic high school and the mean of the observable index, after adjusting for differences in the variance of these distributions. To measure how strong the evidence of their CH effect is, they examine how large the ratio on the left side of the condition would have to be relative to the ratio on the right for the estimated effect to be zero. Oster (2017) extends their idea by formally connecting bias directly to coefficient stability and providing a means for empirical researchers to evaluate the extent of selection on unobservables. I have employed Altonji et al.'s method and used Oster's Stata code *psacalc* to find treatment effect (β) and the relative degree of selection (δ) when δ equals to 1 (equal selection) and β equals to 0 (zero estimated effect), which are presented in Table 17. In my case, the shift in the distribution of the unobservables would have to be 6 times as large as the shift in the observables to explain away the entire RWassis affect, which is highly unlikely.

5 Discussion

The main finding from this study is that reading/writing assistance substantially increases the probability of DSP receipts. The positive effect is stronger when endogeneity has been taken care of. This together with negative sign of correlation of disturbances suggest that unobserved factors that affect reading/writing assistance and DSP work in opposite way.

The analysis also shows that disability type covariates explain much of the effect. Moreover, the choice of instrument makes substantial difference. This study suggests that using a continuous age at onset variable as an instrument may produce overestimation.

The results provide some evidence that facilitating application process increases access to government benefits for individuals more disadvantaged in skills required during the process. Unlike most of the previous literature on disability benefits focusing on older population, my analysis involves disabled individuals as young as 16. This is possible because unlike the US DI, which is partly based on past work history, Australian DSP does not have previous work requirement, although work capacity is factored in during eligibility assessment. Analyzing the assistance effect among younger population is important because individuals tend to stay with DSP once they become eligible for it, and younger population has many more years to receive benefits than older population, resulting in increased cost for the government.

6 Conclusion

In this paper, I find substantial effect of reading/writing assistance on the probability of receiving DSP. The positive effect of the assistance is also observed in various sub-samples.

According to the data used in this paper, most of the assistance are coming from informal source rather than formal (government) one. Given that reading/writing assistance has strong positive impact on receipt of DSP, designing more formal source of assistance may contribute to increased opportunities for those that need disability benefit but were deterred in the application process. Moreover, alleviating pressure on informal assistance is critical as it can improve labour participation and physical and emotional well-being of individuals providing informal assistance. Although, whether providing assistance to selected groups or to everyone with a disability should go through cost-benefit analysis, as administrative cost of selection process may surpass the cost of providing assistance to everyone.

The findings from this study have implications for NDIS, for which reading/writing ability is all the more important especially given that the burden of proving eligibility is higher for potential NDIS recipients. The research questions raised in this paper may be further explored with experimental data, if possible, and with caution, the analytic approach can be applied to other types of benefit programs that require complex application process, whether it be paperwork or online submission.

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Table 2: Descriptive Statistics: Sub-sample Means by Disability Type

Variable	cancer n = 277	endo n = 571	psy n = 2608	intel n = 1284	nerv n = 1746	sense n = 1243	circul n = 885	respir n = 703	musculo n = 6043	congen n = 223	injur n = 1521	other n = 72
Age	51.8	48.5	43.1	29.2	42.1	48.7	53.0	44.9	50.0	31.5	45.4	48.0
Age at Onset	46.0	35.1	29.2	8.9	25.1	28.6	42.3	25.2	36.4	4.9	33.5	35.4
Household Size	2.53	2.69	2.51	3.22	2.86	2.65	2.52	2.66	2.58	3.13	2.71	2.68
DSP	0.300	0.279	0.286	0.298	0.212	0.120	0.292	0.235	0.239	0.359	0.151	0.250
RWassis	0.061	0.069	0.094	0.306	0.097	0.060	0.082	0.044	0.034	0.283	0.052	0.111
Male	0.443	0.466	0.411	0.622	0.397	0.598	0.579	0.451	0.441	0.525	0.624	0.431
Married	0.553	0.513	0.283	0.113	0.431	0.561	0.568	0.393	0.554	0.139	0.484	0.400
NSW	0.220	0.208	0.184	0.215	0.222	0.218	0.237	0.218	0.216	0.158	0.201	0.185
Victoria	0.216	0.204	0.219	0.178	0.195	0.194	0.205	0.210	0.196	0.158	0.185	0.123
Queensland	0.192	0.175	0.188	0.178	0.184	0.179	0.194	0.179	0.173	0.223	0.185	0.262
SA	0.118	0.127	0.139	0.154	0.122	0.127	0.110	0.135	0.136	0.173	0.128	0.138
WA	0.118	0.123	0.114	0.120	0.123	0.129	0.103	0.109	0.118	0.099	0.121	0.108
Tasmania	0.086	0.077	0.087	0.086	0.082	0.077	0.083	0.089	0.086	0.109	0.088	0.031
NT	0.016	0.019	0.023	0.023	0.021	0.033	0.036	0.028	0.023	0.015	0.038	0.062
ACT	0.035	0.066	0.046	0.046	0.051	0.043	0.032	0.033	0.051	0.064	0.055	0.092
Major Cities	0.616	0.607	0.632	0.640	0.643	0.604	0.599	0.604	0.595	0.574	0.588	0.615
Immigrants (Eng.)	0.133	0.089	0.081	0.051	0.107	0.111	0.104	0.078	0.111	0.069	0.105	0.077
Immigrants (Non-Eng.)	0.122	0.146	0.100	0.045	0.085	0.117	0.189	0.094	0.154	0.054	0.132	0.092
Born in Aus.	0.745	0.765	0.820	0.904	0.808	0.772	0.707	0.827	0.735	0.876	0.762	0.831
Arrival P1	0.165	0.177	0.129	0.041	0.128	0.159	0.212	0.132	0.196	0.079	0.148	0.062
Arrival P2	0.035	0.029	0.014	0.012	0.011	0.021	0.032	0.015	0.024	0.015	0.024	0.077
Arrival P3	0.020	0.008	0.014	0.018	0.016	0.015	0.027	0.010	0.018	0.015	0.021	nil
Arrival P4	0.020	0.010	0.013	0.012	0.017	0.014	0.011	0.009	0.012	nil	0.017	0.015
Arrival P5	0.016	0.012	0.011	0.014	0.020	0.019	0.010	0.007	0.015	0.015	0.029	0.015
Child<15	0.176	0.183	0.199	0.114	0.244	0.187	0.150	0.194	0.213	0.124	0.227	0.200
2003	0.253	0.235	0.235	0.339	0.289	0.259	0.318	0.318	0.270	0.262	0.243	0.369
2009	0.404	0.356	0.322	0.291	0.385	0.393	0.356	0.383	0.397	0.351	0.360	0.446
2015	0.349	0.408	0.443	0.370	0.326	0.348	0.326	0.299	0.333	0.386	0.398	0.185

Table 3: Probit and Bivariate Probit Estimates

Endogenous var.	Probit Yes	Probit Yes	BP:DSP No	BP:RWassis No	BP:DSP Yes	BP: RWassis Yes
RWassis	1.05***	1.12***			2.11***	
	(0.04)	(0.04)			(0.10)	
Age		0.06***	0.05***	-0.01**	0.07***	-0.00
		(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Male		0.14***	0.17***	0.14***	0.12***	0.14***
		(0.02)	(0.02)	(0.03)	(0.02)	(0.03)
Married		-0.65***	-0.66***	-0.16***	-0.60***	-0.14***
		(0.03)	(0.03)	(0.04)	(0.03)	(0.03)
Victoria		-0.03	-0.01	0.03	-0.03	0.04
		(0.04)	(0.03)	(0.05)	(0.03)	(0.05)
Queensland		-0.02	-0.00	0.07	-0.03	0.06
		(0.04)	(0.04)	(0.05)	(0.04)	(0.05)
SA		0.08**	0.09**	0.04	0.08**	0.04
		(0.04)	(0.04)	(0.05)	(0.04)	(0.05)
WA		-0.07	-0.06	0.04	-0.07*	0.04
		(0.04)	(0.04)	(0.05)	(0.04)	(0.05)
Tasmania		0.17***	0.17***	0.07	0.16***	0.05
		(0.05)	(0.05)	(0.06)	(0.05)	(0.06)
NT		-0.28***	-0.33***	-0.25**	-0.26***	-0.24**
		(0.08)	(0.08)	(0.11)	(0.08)	(0.11)
ACT		-0.32***	-0.32***	-0.12	-0.29***	-0.08
		(0.06)	(0.06)	(0.08)	(0.06)	(0.08)
Major Cities		-0.09***	-0.10***	-0.05	-0.08***	-0.06*
		(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
Immigrants (Eng.)		-0.04	-0.04	0.01	-0.04	0.02
		(0.05)	(0.05)	(0.07)	(0.05)	(0.07)
Immigrants (Non-Eng.)		0.39***	0.38***	0.09	0.37***	0.10
		(0.05)	(0.05)	(0.07)	(0.05)	(0.06)
Arrival in Aus.		-0.10***	-0.10***	-0.02	-0.10***	-0.02
		(0.02)	(0.02)	(0.03)	(0.02)	(0.02)
Child<15		-0.35***	-0.41***	-0.38***	-0.27***	-0.39***
		(0.04)	(0.04)	(0.05)	(0.04)	(0.05)
Household Size		-0.02	0.01	0.09***	-0.03***	0.09***
		(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
2009		0.08***	0.06**	-0.12***	0.09***	-0.10***
		(0.03)	(0.03)	(0.04)	(0.03)	(0.04)
2015		0.06**	0.06**	0.00	0.06*	0.02
		(0.03)	(0.03)	(0.04)	(0.03)	(0.04)
Age at Onset				-0.01***		-0.01***
				(0.00)		(0.00)
Constant	-0.82***	-2.14***	-1.66***	-0.81***	-2.30***	-0.98***
	(0.01)	(0.14)	(0.13)	(0.16)	(0.14)	(0.16)
ρ				0.51***		-0.55***
				(0.02)		(0.05)
Observations	18,141	16,546	16,356	16,356	16,356	16,356

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1
Age squared variable included in the regressions.

Table 4: Bivariate Probit Estimates: Age at Onset<= 3, <= 18 as IV

	IV: Onset<=3		IV: Onset<=18	
Variables	DSP	RWassis	DSP	RWassis
RWassis	2.13***		1.97***	
	(0.08)		(0.13)	
Age	0.07***	0.01	0.07***	0.01
	(0.01)	(0.01)	(0.01)	(0.01)
Male	0.12***	0.13***	0.12***	0.15***
	(0.02)	(0.03)	(0.02)	(0.03)
Married	-0.59***	-0.13***	-0.61***	-0.15***
	(0.03)	(0.04)	(0.03)	(0.04)
Major Cities	-0.08***	-0.06*	-0.08***	-0.06*
	(0.03)	(0.03)	(0.03)	(0.03)
Immigrants (Eng.)	-0.04	0.01	-0.04	0.01
	(0.05)	(0.07)	(0.05)	(0.07)
Immigrants (Non-Eng.)	0.37***	0.08	0.37***	0.10
	(0.05)	(0.06)	(0.05)	(0.06)
Arrival in Aus.	-0.10***	-0.02	-0.10***	-0.02
	(0.02)	(0.02)	(0.02)	(0.02)
Household Size	-0.03***	0.08***	-0.03***	0.09***
	(0.01)	(0.01)	(0.01)	(0.01)
Onset<=3		0.76***		
		(0.04)		
Onset<=18				0.42***
				(0.03)
Constant	-2.33***	-1.56***	-2.28***	-1.65***
	(0.14)	(0.16)	(0.14)	(0.17)
ρ		-0.57***		-0.47 ***
		(0.05)		(0.07)
Observations	16,356	16,356	16,356	16,356

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Age squared, state, children under 15 and year variables included in the regressions.

Table 5: Probit and Bivariate Probit Estimates: Disability Type

	Probit	BP: DSP	BP: RWassis	BP: DSP	BP: RWassis
		IV: Cont. Onset		IV: Onset<=18	
RWassis	1.04***	1.40***		1.04***	
	(0.04)	(0.20)		(0.26)	
Cancer	0.07	0.07	0.17	0.07	0.12
	(0.10)	(0.10)	(0.14)	(0.10)	(0.14)
Endo.	-0.02	-0.02	0.08	-0.02	0.07
	(0.08)	(0.08)	(0.11)	(0.08)	(0.11)
Psy.	0.16***	0.14**	0.34***	0.16***	0.35***
	(0.06)	(0.06)	(0.08)	(0.06)	(0.08)
Intel.	0.25***	0.13	1.04***	0.25**	1.09***
	(0.07)	(0.09)	(0.08)	(0.11)	(0.08)
Nerv.	-0.03	-0.05	0.29***	-0.03	0.31***
	(0.06)	(0.06)	(0.08)	(0.06)	(0.08)
Sense	-0.65***	-0.63***	-0.04	-0.64***	-0.02
	(0.07)	(0.07)	(0.09)	(0.07)	(0.09)
Circul.	0.02	0.02	0.30***	0.03	0.28***
	(0.07)	(0.07)	(0.09)	(0.07)	(0.09)
Respir.	-0.09	-0.08	-0.26**	-0.09	-0.24**
	(0.07)	(0.07)	(0.11)	(0.07)	(0.11)
Musculo.	-0.13**	-0.12**	-0.24***	-0.13**	-0.23***
	(0.05)	(0.05)	(0.07)	(0.05)	(0.07)
Congen.	0.33***	0.24**	0.83***	0.33***	0.89***
	(0.11)	(0.12)	(0.12)	(0.12)	(0.12)
Injur.	-0.42***	-0.41***	-0.06	-0.41***	-0.06
	(0.06)	(0.06)	(0.09)	(0.06)	(0.09)
Age at Onset			-0.01***		
			(0.00)		
Onset<=18					0.18***
					(0.05)
Constant	-2.36***	-2.35***	-1.81***	-2.34***	-2.12***
	(0.15)	(0.15)	(0.18)	(0.15)	(0.20)
ρ			-0.19*		-0.004
			(0.10)		(0.13)
Observations	16,546	16,356	16,356	16,356	16,356

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1
Other covariates included in the regressions are the same as Table 3.

Table 6: Bivariate Probit Sub-sample Estimates with Onset as IV: Household Size

	hsize=1		hsize=2		hsize=3	
	DSP	Rwassis	DSP	Rwassis	DSP	Rwassis
RWassis	1.77***		0.84**		1.95***	
	(0.42)		(0.42)		(0.25)	
Age	0.04**	0.04	0.05***	0.00	0.07***	0.06***
	(0.02)	(0.02)	(0.01)	(0.01)	(0.02)	(0.02)
Male	0.07	-0.02	0.18***	0.14***	0.13**	0.22***
	(0.05)	(0.07)	(0.04)	(0.05)	(0.06)	(0.07)
Married	-0.29	-0.54	-0.58***	-0.06	-0.52***	-0.19**
	(0.20)	(0.45)	(0.04)	(0.07)	(0.07)	(0.08)
Immigrants (Eng.)	0.01	-0.05	0.04	-0.03	-0.06	0.14
	(0.11)	(0.18)	(0.08)	(0.11)	(0.14)	(0.17)
Immigrants (Non-Eng.)	0.11	0.13	0.36***	0.02	0.51***	0.27*
	(0.11)	(0.17)	(0.08)	(0.11)	(0.12)	(0.16)
Arrival in Aus.	-0.18***	-0.03	-0.12***	0.02	-0.12**	-0.11*
	(0.06)	(0.08)	(0.04)	(0.05)	(0.05)	(0.06)
Cancer	-0.01	0.14	-0.02	0.15	0.02	0.28
	(0.22)	(0.38)	(0.15)	(0.22)	(0.26)	(0.29)
Endo.	-0.17	0.46*	0.11	-0.01	-0.14	0.07
	(0.16)	(0.25)	(0.13)	(0.19)	(0.18)	(0.24)
Psy.	0.09	0.33*	0.23**	0.43***	0.11	0.31*
	(0.12)	(0.20)	(0.10)	(0.13)	(0.14)	(0.17)
Intel.	0.11	0.87***	0.33*	1.17***	0.03	1.15***
	(0.19)	(0.23)	(0.19)	(0.16)	(0.19)	(0.18)
Nerv.	-0.00	0.41*	0.04	0.32**	-0.03	0.34**
	(0.14)	(0.21)	(0.10)	(0.14)	(0.14)	(0.17)
Sense	-0.69***	0.05	-0.72***	-0.03	-0.51***	-0.00
	(0.15)	(0.24)	(0.11)	(0.15)	(0.16)	(0.19)
Circul.	0.09	0.10	0.05	0.37**	-0.10	0.55***
	(0.15)	(0.26)	(0.11)	(0.15)	(0.17)	(0.20)
Respir.	-0.08	-0.53	0.08	-0.00	-0.36*	-0.16
	(0.15)	(0.34)	(0.12)	(0.18)	(0.20)	(0.25)
Musculo.	-0.14	-0.26	-0.09	-0.22*	-0.08	-0.24
	(0.11)	(0.19)	(0.08)	(0.12)	(0.12)	(0.16)
Congen.	-0.08	0.44	0.22	0.94***	0.47**	0.95***
	(0.26)	(0.33)	(0.24)	(0.25)	(0.23)	(0.24)
Injur.	-0.58***	0.10	-0.43***	-0.07	-0.16	-0.06
	(0.14)	(0.22)	(0.11)	(0.15)	(0.15)	(0.19)
Age at Onset		-0.01***		-0.01**		-0.01***
		(0.00)		(0.00)		(0.00)
Child<15			-0.12	-0.30**	-0.39***	-0.31***
			(0.10)	(0.15)	(0.07)	(0.08)
Constant	-1.34***	-1.80***	-2.01***	-1.58***	-2.28***	-2.04***
	(0.43)	(0.57)	(0.29)	(0.33)	(0.32)	(0.37)
ρ		-0.40		0.11		-0.44***
		(0.22)		(0.20)		(0.14)
Observations	3,062	3,062	5,893	5,893	3,025	3,025

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1
Age squared, state, major cities and year variables included in the regressions.

Table 7: Bivariate Probit Sub-sample Estimates with Onset<=18 as IV: Household Size

	hsize=1		hsize=2		hsize=3	
	DSP	Rwassis	DSP	Rwassis	DSP	Rwassis
RWassis	0.65		0.63		1.86***	
	(1.08)		(0.42)		(0.29)	
Age	0.04**	0.04*	0.05***	0.01	0.07***	0.07***
	(0.02)	(0.02)	(0.01)	(0.01)	(0.02)	(0.02)
Male	0.07	0.00	0.18***	0.15***	0.13**	0.22***
	(0.05)	(0.07)	(0.04)	(0.05)	(0.06)	(0.07)
Married	-0.33	-0.52	-0.58***	-0.06	-0.52***	-0.20**
	(0.21)	(0.44)	(0.04)	(0.07)	(0.07)	(0.08)
Immigrants (Eng.)	0.01	-0.07	0.04	-0.02	-0.06	0.14
	(0.11)	(0.18)	(0.08)	(0.11)	(0.14)	(0.17)
Immigrants (Non-Eng.)	0.14	0.13	0.36***	0.02	0.52***	0.28*
	(0.11)	(0.18)	(0.08)	(0.11)	(0.12)	(0.16)
Arrival in Aus.	-0.19***	-0.03	-0.11***	0.02	-0.13**	-0.11*
	(0.06)	(0.08)	(0.04)	(0.04)	(0.05)	(0.06)
Cancer	0.00	0.09	-0.01	0.11	0.02	0.26
	(0.22)	(0.38)	(0.15)	(0.22)	(0.26)	(0.29)
Endo.	-0.11	0.39	0.11	-0.01	-0.14	0.08
	(0.18)	(0.26)	(0.13)	(0.19)	(0.18)	(0.24)
Psy.	0.15	0.37*	0.24**	0.44***	0.11	0.30*
	(0.13)	(0.20)	(0.10)	(0.13)	(0.14)	(0.17)
Intel.	0.36	1.00***	0.39**	1.18***	0.07	1.19***
	(0.25)	(0.22)	(0.19)	(0.16)	(0.20)	(0.18)
Nerv.	0.07	0.45**	0.05	0.32**	-0.02	0.34**
	(0.15)	(0.21)	(0.10)	(0.14)	(0.15)	(0.17)
Sense	-0.69***	0.02	-0.72***	-0.03	-0.51***	0.02
	(0.15)	(0.25)	(0.11)	(0.15)	(0.16)	(0.19)
Circul.	0.10	0.00	0.06	0.36**	-0.09	0.53***
	(0.15)	(0.27)	(0.11)	(0.15)	(0.17)	(0.20)
Respir.	-0.11	-0.51	0.08	0.00	-0.36*	-0.15
	(0.16)	(0.33)	(0.12)	(0.17)	(0.20)	(0.25)
Musculo.	-0.16	-0.26	-0.09	-0.22*	-0.08	-0.24
	(0.11)	(0.20)	(0.08)	(0.12)	(0.12)	(0.16)
Congen.	0.05	0.56	0.27	0.96***	0.50**	1.00***
	(0.29)	(0.34)	(0.24)	(0.24)	(0.24)	(0.24)
Injur.	-0.58***	0.09	-0.43***	-0.07	-0.16	-0.07
	(0.14)	(0.22)	(0.11)	(0.15)	(0.15)	(0.19)
Onset<=18		0.11		0.17**		0.28***
		(0.15)		(0.08)		(0.09)
Child<15			-0.13	-0.30**	-0.40***	-0.30***
			(0.10)	(0.15)	(0.07)	(0.09)
Constant	-1.29***	-2.12***	-1.98***	-1.88***	-2.29***	-2.52***
	(0.45)	(0.59)	(0.29)	(0.35)	(0.32)	(0.39)
ρ		0.18		0.20		-0.39**
		(0.49)		(0.19)		(0.16)
Observations	3,062	3,062	5,893	5,893	3,025	3,025

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Age squared, state, major cities and year variables included in the regressions.

Table 8: Bivariate Probit Estimates for Households with one disabled person

	IV: Continuous Onset IV		IV: Onset<=18	
Variables	DSP	Rwassis	DSP	Rwassis
RWassis	1.28***		0.89***	
	(0.29)		(0.33)	
Age	0.06***	0.01	0.06***	0.02
	(0.01)	(0.01)	(0.01)	(0.01)
Male	0.19***	0.14***	0.20***	0.15***
	(0.03)	(0.04)	(0.03)	(0.04)
Married	-0.68***	-0.07	-0.69***	-0.08
	(0.04)	(0.05)	(0.04)	(0.05)
Immigrants (Non-Eng.)	0.33***	0.13	0.33***	0.12
	(0.06)	(0.09)	(0.06)	(0.09)
Child<15	-0.28***	-0.35***	-0.30***	-0.34***
	(0.05)	(0.07)	(0.06)	(0.07)
Household Size	-0.04**	0.08***	-0.03*	0.08***
	(0.02)	(0.02)	(0.02)	(0.02)
Cancer	0.11	0.15	0.11	0.11
	(0.12)	(0.19)	(0.12)	(0.19)
Endo.	-0.09	0.14	-0.08	0.12
	(0.10)	(0.14)	(0.10)	(0.14)
Psy.	0.13*	0.43***	0.16**	0.45***
	(0.07)	(0.10)	(0.07)	(0.10)
Intel.	0.19	1.20***	0.32**	1.25***
	(0.13)	(0.11)	(0.14)	(0.11)
Nerv.	-0.00	0.31***	0.02	0.32***
	(0.08)	(0.11)	(0.08)	(0.11)
Sense	-0.64***	-0.04	-0.64***	-0.03
	(0.09)	(0.12)	(0.09)	(0.12)
Circul.	0.04	0.25**	0.05	0.22*
	(0.09)	(0.12)	(0.09)	(0.12)
Respir.	-0.11	-0.19	-0.11	-0.16
	(0.10)	(0.15)	(0.10)	(0.15)
Musculo.	-0.11*	-0.26***	-0.12*	-0.25**
	(0.06)	(0.10)	(0.06)	(0.10)
Congen.	0.08	0.77***	0.16	0.83***
	(0.15)	(0.16)	(0.15)	(0.16)
Injur.	-0.49***	-0.09	-0.49***	-0.09
	(0.08)	(0.12)	(0.08)	(0.12)
Age at Onset		-0.01***		
		(0.00)		
Onset<=18				0.12*
				(0.06)
Constant	-2.08***	-1.80***	-2.06***	-2.02***
	(0.21)	(0.25)	(0.21)	(0.27)
ρ		-0.11		0.09
		(0.14)		(0.16)
Observations	10,084	10,084	10,084	10,084

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Age squared, state, major cities, immigrants (Eng.), arrival in Australia and year variables included in the regressions.

Table 9: Bivariate Probit: Employment Restriction & Permanently Unable to Work

	Rest. (Onset)		Rest. (Onset<=18)		Permanent (Onset)		Permanent (Onset<=18)	
Variables	DSP	RWassis	DSP	RWassis	DSP	RWassis	DSP	RWassis
RWassis	1.50***		1.26***		1.70***		1.68***	
	(0.17)		(0.23)		(0.08)		(0.10)	
Age	0.06***	0.01	0.06***	0.02*	0.09***	-0.00	0.10***	0.01
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Male	0.16***	0.10***	0.17***	0.11***	0.26***	0.07	0.27***	0.08
	(0.03)	(0.03)	(0.03)	(0.03)	(0.04)	(0.05)	(0.05)	(0.05)
Married	-0.57***	0.02	-0.58***	0.01	-0.47***	0.18***	-0.47***	0.18***
	(0.03)	(0.04)	(0.03)	(0.04)	(0.05)	(0.06)	(0.05)	(0.06)
Immigrants	0.31***	0.05	0.31***	0.05	0.22***	-0.13	0.22***	-0.13
(Non-Eng.)	(0.06)	(0.07)	(0.06)	(0.07)	(0.08)	(0.10)	(0.08)	(0.10)
Child<15	-0.28***	-0.33***	-0.29***	-0.33***	-0.15**	-0.22**	-0.16**	-0.21**
	(0.04)	(0.05)	(0.05)	(0.06)	(0.07)	(0.09)	(0.07)	(0.09)
Household Size	-0.04***	0.07***	-0.04***	0.07***	-0.09***	0.06***	-0.09***	0.06***
	(0.01)	(0.02)	(0.01)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
Cancer	-0.17	0.09	-0.17	0.03	-0.25*	0.12	-0.25*	0.05
	(0.11)	(0.15)	(0.11)	(0.15)	(0.14)	(0.19)	(0.14)	(0.19)
Endo.	-0.03	0.13	-0.03	0.13	-0.00	0.18	0.00	0.21
	(0.09)	(0.12)	(0.09)	(0.12)	(0.13)	(0.16)	(0.13)	(0.16)
Psy.	-0.03	0.29***	-0.02	0.30***	-0.26***	0.28**	-0.26***	0.28**
	(0.06)	(0.09)	(0.07)	(0.09)	(0.09)	(0.11)	(0.09)	(0.12)
Intel.	-0.05	1.05***	0.04	1.09***	-0.58***	0.86***	-0.57***	0.88***
	(0.10)	(0.09)	(0.12)	(0.09)	(0.13)	(0.14)	(0.13)	(0.14)
Nerv.	-0.09	0.41***	-0.07	0.43***	-0.36***	0.51***	-0.35***	0.54***
	(0.07)	(0.09)	(0.07)	(0.09)	(0.11)	(0.12)	(0.11)	(0.12)
Sense	-0.43***	0.27***	-0.42***	0.29***	-0.28*	0.67***	-0.27*	0.68***
	(0.08)	(0.10)	(0.08)	(0.10)	(0.14)	(0.16)	(0.15)	(0.16)
Circul.	-0.04	0.30***	-0.03	0.27***	-0.12	0.31**	-0.12	0.29**
	(0.08)	(0.10)	(0.08)	(0.10)	(0.11)	(0.13)	(0.11)	(0.13)
Respir.	-0.08	-0.29**	-0.09	-0.28**	0.01	-0.15	0.01	-0.16
	(0.09)	(0.13)	(0.09)	(0.13)	(0.13)	(0.16)	(0.13)	(0.16)
Musculo.	-0.23***	-0.29***	-0.24***	-0.29***	-0.04	-0.25**	-0.04	-0.24**
	(0.06)	(0.08)	(0.06)	(0.08)	(0.09)	(0.11)	(0.09)	(0.11)
Congen.	0.25*	0.95***	0.34**	1.01***	-0.03	1.01***	-0.00	1.04***
	(0.14)	(0.13)	(0.15)	(0.13)	(0.27)	(0.21)	(0.28)	(0.21)
Injur.	-0.46***	0.00	-0.47***	0.00	-0.45***	0.13	-0.45***	0.14
	(0.07)	(0.10)	(0.07)	(0.10)	(0.11)	(0.13)	(0.11)	(0.13)
Age at Onset		-0.01***				-0.01***		
		(0.00)				(0.00)		
Onset<=18				0.24***				0.34***
				(0.05)				(0.05)
Constant	-1.82***	-1.40***	-1.81***	-1.80***	-1.58***	-0.60*	-1.59***	-1.15***
	(0.17)	(0.21)	(0.18)	(0.23)	(0.32)	(0.35)	(0.32)	(0.35)
ρ		-0.39***		-0.25*		-0.88***		-0.87***
		(0.10)		(0.13)		(0.07)		(0.08)
Observations	11,064	11,064	11,064	11,064	4,374	4,374	4,374	4,374

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Age squared, state, major cities, immigrants (Eng.), arrival in Australia and year variables included in the regressions.

Table 10: Sub-sample Estimates: Psychological/Psychiatric and Intellectual/Learning

	Psychological/Psychiatric				Intellectual/Learning			
	Probit	Probit	BP: DSP	BP: RWassis	Probit	Probit	BP: DSP	BP: RWassis
RWassis	0.85***	0.71***	1.99***		0.96***	0.75***	1.64***	
	(0.09)	(0.09)	(0.15)		(0.08)	(0.09)	(0.20)	
Age		0.11***	0.09***	0.04*		0.19***	0.15***	0.04*
		(0.02)	(0.02)	(0.02)		(0.02)	(0.03)	(0.02)
		(0.00)	(0.00)	(0.00)		(0.00)	(0.00)	(0.00)
Male		0.23***	0.15**	0.18**		-0.19*	-0.16*	-0.01
		(0.06)	(0.06)	(0.07)		(0.10)	(0.09)	(0.09)
Married		-0.55***	-0.50***	0.04		-0.87***	-0.71***	-0.08
		(0.08)	(0.08)	(0.09)		(0.18)	(0.18)	(0.16)
Victoria		-0.00	-0.02	0.21*		-0.00	0.00	-0.05
		(0.09)	(0.09)	(0.12)		(0.15)	(0.14)	(0.14)
Queensland		-0.12	-0.13	0.21*		-0.00	-0.08	0.23
		(0.10)	(0.10)	(0.12)		(0.15)	(0.15)	(0.14)
SA		-0.01	-0.05	0.31**		0.04	-0.05	0.24
		(0.10)	(0.10)	(0.13)		(0.15)	(0.14)	(0.15)
WA		-0.24**	-0.24**	0.25*		-0.19	-0.21	0.04
		(0.12)	(0.11)	(0.14)		(0.17)	(0.16)	(0.15)
Tasmania		-0.20	-0.20	0.21		0.31	0.32*	-0.22
		(0.13)	(0.13)	(0.16)		(0.20)	(0.19)	(0.19)
NT		-0.37*	-0.31	-0.12		-0.39	-0.31	-0.40
		(0.21)	(0.19)	(0.29)		(0.31)	(0.31)	(0.29)
ACT		-0.10	-0.13	0.18		-0.13	-0.13	0.07
		(0.15)	(0.15)	(0.19)		(0.25)	(0.22)	(0.21)
Immigrants		0.32**	0.24	0.26*		0.23	0.20	0.07
(Non-Eng.)		(0.15)	(0.15)	(0.15)		(0.34)	(0.33)	(0.30)
Child<15		-0.44***	-0.34***	-0.26**		-1.22***	-0.86***	-0.46***
		(0.10)	(0.09)	(0.11)		(0.19)	(0.22)	(0.17)
HH Size		-0.05	-0.06**	0.09***		0.02	-0.01	0.07**
		(0.03)	(0.03)	(0.04)		(0.04)	(0.04)	(0.04)
2009		0.23***	0.29***	-0.32***		0.18	0.16	0.02
		(0.09)	(0.09)	(0.10)		(0.13)	(0.12)	(0.12)
2015		0.19**	0.24***	-0.22**		0.23*	0.25**	-0.18*
		(0.08)	(0.08)	(0.09)		(0.12)	(0.11)	(0.11)
Age at Onset				-0.01***				-0.03***
				(0.00)				(0.01)
Constant	-0.66***	-2.78***	-2.55***	-2.03***	-0.87***	-3.72***	-3.42***	-0.53
	(0.03)	(0.36)	(0.36)	(0.42)	(0.05)	(0.48)	(0.49)	(0.44)
ρ				-0.74***				-0.63***
				(0.09)				(0.15)
Observations	2,608	2,085	2,054	2,054	1,284	994	971	971

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Age squared, major cities, immigrants (Eng.) and arrival in Australia variables included in the regressions.

Table 11: Psychological/Psychiatric and Intellectual/Learning with Onset<=18 IV

	Psychological/Psychiatric		Intellectual/Learning	
	BP: DSP	BP: RWassis	BP: DSP	BP: RWassis
RWassis	1.92***		1.56***	
	(0.20)		(0.38)	
Age	0.09***	0.05***	0.16***	0.06***
	(0.02)	(0.02)	(0.04)	(0.02)
Male	0.16***	0.19***	-0.16*	0.00
	(0.06)	(0.07)	(0.10)	(0.09)
Married	-0.50***	0.04	-0.73***	-0.13
	(0.08)	(0.09)	(0.20)	(0.16)
Victoria	-0.02	0.20*	0.00	-0.06
	(0.09)	(0.12)	(0.14)	(0.14)
Queensland	-0.13	0.20	-0.08	0.20
	(0.10)	(0.12)	(0.15)	(0.15)
SAe	-0.05	0.30**	-0.04	0.20
	(0.10)	(0.13)	(0.15)	(0.15)
WA	-0.25**	0.22	-0.21	0.03
	(0.11)	(0.14)	(0.16)	(0.16)
Tasmania	-0.19	0.22	0.32*	-0.21
	(0.13)	(0.16)	(0.19)	(0.19)
NT	-0.31	-0.17	-0.35	-0.44
	(0.19)	(0.29)	(0.33)	(0.29)
ACT	-0.12	0.17	-0.14	0.03
	(0.15)	(0.20)	(0.22)	(0.21)
Immigrants (Non-Eng.)	0.25*	0.26*	0.21	0.00
	(0.15)	(0.15)	(0.33)	(0.30)
Child<15	-0.35***	-0.25**	-0.91***	-0.50***
	(0.09)	(0.11)	(0.28)	(0.17)
Household Size	-0.06**	0.09**	-0.01	0.08**
	(0.03)	(0.04)	(0.04)	(0.04)
2009	0.29***	-0.31***	0.16	0.03
	(0.09)	(0.10)	(0.13)	(0.11)
2015	0.24***	-0.22**	0.25**	-0.17
	(0.08)	(0.10)	(0.11)	(0.11)
Onset<=18		0.33***		0.75***
		(0.09)		(0.16)
Constant	-2.57***	-2.67***	-3.48***	-1.74***
	(0.36)	(0.45)	(0.56)	(0.46)
ρ		-0.70***		-0.56
		(0.11)		(0.29)
Observations	2,054	2,054	971	971

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1
Age squared, major cities, immigrants (Eng.) and arrival in Australia variables included in the regressions.

Table 12: Average Treatment Effect

	Average Prob.	Probit	Probit	BP	BP	BP	BP	BP	BP
$Pr(DSP = 1)$	0.238	0.386	0.375	0.655	0.459	0.659	0.625	0.525	0.339
Covariates		No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Disability Type		No	No	No	Yes	No	No	Yes	Yes
Instrument				Onset (cont.)	Onset (cont.)	Onset <=3	Onset <=18	Onset <=3	Onset <=18
n	18,141	18,141	16,546	16,356	16,356	16,356	16,356	16,356	16,356

Table 13: Average Treatment Effect: Sub-samples of Disability Types

	Psychological/Psychiatric				Intellectual/Learning			
	Probit	Probit	Biprobit	Biprobit	Probit	Probit	Biprobit	Biprobit
$Pr(DSP = 1)$	0.322	0.245	0.603	0.590	0.344	0.228	0.506	0.480
Covariates	No	Yes	Yes	Yes	No	Yes	Yes	Yes
Instrument			Onset (cont.)	Onset<=18			Onset (cont.)	Onset<=18
n	2,608	2,085	2,054	2,054	1,284	994	971	971

Table 14: Average Treatment Effect: Sub-samples of Heterogeneous Households

	Size = 1	Size = 2	Size = 3	Size = 1	Size = 2	Size = 3	HH w/ 1 disabled person	
	BP	BP	BP	BP	BP	BP	BP	BP
Pr(DSP=1)	0.533	0.283	0.620	0.237	0.209	0.595	0.414	0.284
Covariates	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Disability Type	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Instrument	Onset (cont.)	Onset (cont.)	Onset (cont.)	Onset <=18	Onset <=18	Onset <=18	Onset (cont.)	Onset <=18
n	3,062	5,893	3,025	3,062	5,893	3,025	10,084	10,084

Table 15: Average Treatment Effect: Sub-samples of Individuals with Employment Restrictions

	Employment Restrictions		Permanently Unable to Work	
	BP	BP	BP	BP
Pr(DSP=1)	0.492	0.424	0.400	0.397
Covariates	Yes	Yes	Yes	Yes
Disability Type	Yes	Yes	Yes	Yes
Instrument	Onset (cont.)	Onset <=18	Onset (cont.)	Onset <=18
n	11,064	11,064	4,374	4,374

Table 16: Sensitivity Analysis: Estimates of RWassis Effects across Alternate Correlation of Disturbances

ρ	-1.0	-0.8	-0.6	-0.4	-0.2	0	0.2	0.4	0.6	0.8	1.0
γ	nd	2.51	2.19	1.86	1.50	1.12	0.72	0.30	-0.14	-0.61	nd

*nd: not defined

Table 17: Sensitivity Analysis: Treatment Effect and Relative Degree of Selection

β	δ	$Rmax$
0.51	1	1
0	5.73	1