Final Report

Project 3/2006:

Disability and Employment in the Australian Labour Market

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Executive Summary

OBJECTIVE

- This research endeavoured to examine two policy questions. The first is whether workers' compensation schemes are currently carrying the full economic burden of work-related conditions. The second is to examine the socio-economic conditions of people with disabilities and the disincentives they face in the Australian labour market.
- An important distinction regarding work-related disabilities is between those disabilities "caused by" work and those which "impact on" work. The disabled population is analysed as a whole, and in closer detail with the examination of some specific sub-groups.

ECONOMIC BURDEN OF WORK RELATED CONDITIONS

- In regard to the first question of whether there is any shifting of costs between the workers' compensation schemes and the social security scheme it was decided that that the current data for this research is inadequate to answer the question in a manner that would be statistically robust and useful from the policy perspective.

PEOPLE WITH DISABILITIES

- In Australia, 17 percent of males and 16 percent of females aged 15 - 64 years report a disability.

- Compared with people without disabilities, people with disabilities are on average:
    - older (on average 7 years)
    - less likely to have a higher education degree
    - more likely to be in receipt of income support
    - more likely to be a member of a family in the lowest 25 percent income group

- Disability within a family is associated with worse labour market outcomes for the other (non-disabled) members of the family.

Labour market characteristics

- There are sizeable differences in the labour force participation rates between people with and without disabilities. People with disabilities are far less likely to be in employment.

- We do not find significant differences in the occupation and industry compositions of disabled and non-disabled employed persons.

Employment difficulties, severity, type and onset of disability

- For both men and women the likelihood of being out of work increases with the severity of the main disability and with the prevalence of multiple disabilities.

- People who become disabled at an early age are more successful in their lifetime labour market experiences than those who become disabled in later stages of their lives.

- Disabilities that make working more difficult reduce the likelihood of labour force participation significantly.

Transitions in and out of employment for people with disabilities

- The likelihood of (i) staying employed or (ii) returning to work after losing a job is higher if a person with a disability is:
    - younger
    - highly educated
    - more experienced in the labour market

- Labour markets are shown to evaluate the human capital investment of persons with a disability in a very similar way to that of their non-disabled counterparts.

- More work experience and higher levels of education are associated with higher labour force participation rates for both people with and without a disability.

- The relationship between labour force participation and the prevalence of disabilities is shown to be highly dynamic. Higher individual labour force participation propensities in the past are strongly associated with higher individual participation propensities in the future in a causal way. A significant portion of the lower participation propensities of people with a disability can be explained by their past labour force outcomes.

- The effect of current and past disabilities on labour force participation is significantly negative. Being disabled for longer *in itself* significantly decreases the probability of participation.

An estimation of the wage gap

- An analysis of hourly wages estimated an approximate wage gap of 7 percent between workers with and without disabilities. Most of this gap cannot be explained by the observed characteristics that drive individual productivity.

PEOPLE WITH WORK RELATED DISABILITIES

- Disabling conditions whether they are caused by work or not are associated with lower labour market engagement, which is manifested through lower full time employment and lower labour force participation.

- Employed people with disabling conditions, independent of the cause of their disability, are more likely to be self-employed and less likely to be in paid employment compared to people without disabling conditions.

- Disabilities that are caused by work are more likely to be physical and more likely to emerge during prime age than disabilities that are not caused by work.

- Individuals with work related disabilities are more likely to be employed in the agriculture sector and less likely to be employed in the trade or finance sectors.

METHODS

- The study uses a combination of descriptive and multivariate regression analysis.

- We estimate various cross sectional regression models to identify the association between disabilities and labour market outcomes. Similar models are used to present the association between socio-economic factors, severity levels and disability types.

- In order to present causal relationships between disability and labour force outcomes we employ static and dynamic panel data techniques.

DATA SOURCES

- The Survey of Disability, Ageing and Carers (SDAC03) is used to analyse:
    - population estimates of people with disabilities
    - people with work related injuries that are not in receipt of workers' compensation

- The Household, Income and Labour Dynamics in Australia (HILDA) survey is used to analyse:
    - return to work outcomes of people with disabilities
    - the causal effect of disability on labour force participation
    - information on severity, type and onset of disability using the questions in the wave 4 disability module

1. Introduction

It is suspected that for a range of reasons that many people with work related disabilities eventually become the recipients of other government income support allowances. It was proposed that this research examine two policy questions. The first is whether workers' compensation schemes are currently carrying the full economic burden of work-related conditions. The second is to examine the economic and social deterrents or incentives to those returning to employment with work-related disability. This research would consider not only those disabilities caused by work but also those which impact on work.

The first question in this project concerns itself primarily with disabilities caused by work. The second question looks more generally at disabilities that impact on the person's capability and willingness to carry out employment-related tasks and concerns itself with participation and retention issues.

In regard to the first question of whether there is any shifting of costs between the workers' compensation schemes and the social security scheme, it was anticipated that one of the possible outcomes would be that there is inadequate data to answer this question. After extensive investigations and consultations the researchers came to the joint conclusion with DEWR that the current data made available for this research is inadequate to answer this first question of cost-shifting in a manner that would be statistically robust and useful from the policy perspective.

As a result this Report examines the second policy question in detail. It contains two main sections. Both sections investigate the labour market conditions of people with disabilities. The main difference between the two sections results from the different scope of the data sets that are used. Section 2 uses a large cross sectional data set that provides a lot of detail but only for the year 2003. Section 3 uses a smaller longitudinal data set that contains a lot of information on changes over time at the individual level. Both sections can be read independently as they contain their own introductory and concluding

sections. The different scopes of the data sets utilised in these two sections, however, makes them complementary.

Put very simply, this report concerns itself with three groups of questions:

What are the labour market characteristics and circumstances of people with disabilities in Australia?

What are the factors that are associated with whether they are employed or not?

What are the factors that are associated with their level of pay?

This Report provides an up to date critical overview of the position of people with disabilities in the Australian labour market. The general structure for both sections runs as follows. First, there is a detailed description of the general individual characteristics of people with disabilities. Second, a detailed description of their characteristics that are pertinent to their labour market position. Third, a multivariate regression section that utilises the potential of each data set in describing the complex interactions that best describe labour market outcomes for people with disabilities. These last sub-sections are especially different between Sections 2 and 3. The multivariate analysis of Section 2 is limited, reflecting the lower potential of cross-sectional data for econometric analysis. By contrast, the multivariate analysis of Section 3 is more extensive and informative, as it allows the study of the dynamics of disabilities in the labour market. Each section contains its own Appendix.

2. Survey of Disability, Ageing and Carers (SDAC03)

2.1 Introduction

This section outlines the socio-economic circumstances of people with disabilities in Australia, primarily using information drawn from the Australian Bureau of Statistics (ABS) 2003 Survey of Disability, Ageing and Carers (SDAC03). We present population weighted information on various topics including the receipt of income support, family formation, and labour market outcomes. We also provide detailed information on the health conditions reported by people with disabilities. We pay particular attention to the sub-group of individuals who suffer health conditions that have been reported to have been *caused* by work.

The main advantage of the ABS SDAC03 data set is that it is representative of the Australian population, it is sufficiently recent and it is large enough to allow for statistical treatment in comparative detail. The Confidentialised Unit Record File (CURF) of the SDAC03 contains detailed information on individuals with specific emphasis on people with disabilities, aged persons, and those who provide care for them. The SDAC03 follows four previous similar surveys that were conducted between 1981 and 1998 and "covers people in both urban and rural areas in all states and territories, except for those living in remote and sparsely settled parts of Australia" (ABS 2003). The sample size is sufficiently large to allow detailed statements as it contains information on 41,386 respondents from 14,019 private dwellings, 303 non-private dwellings and 564 cared accommodation establishments. The quality of the data is excellent.

Between the 23rd of June and the 1st of November 2003, the survey collected information about the long-term health conditions of people with disabilities and their need for and receipt of assistance.[1] In addition to a large number of questions on the type and origin of disability, the SDAC03 data contains a very rich set of questions on demographic, socio-economic and labour market characteristics for all members of the sampled

[1] Similar information was collected for older people who were aged 60 years or older.

household. Additional information is also available on the carers, including the type of assistance provided, the length of care, the availability and use of support and the effect of caring on various aspects of the carers' lives.

A main advantage of the SDAC03 data which makes it highly suitable for the present project is that it explicitly distinguishes between those individuals with health conditions that were *caused by work* and those with health conditions that were *not related to their work.*[2] This is achieved by asking respondents to identify directly the cause of their main disabling condition.

The information derived from the SDAC03 data has been used to answer the following research questions, as presented in Box 2.1 below.

[2] Note that the HILDA survey (which is an alternative source of data) does not include information that identifies the cause of disabilities and long term health conditions.

Box 2.1: Research questions using ABS SDAC03

- *Question 1:* How many adults in Australia report having had a disability. How many are currently in employment? How is their disability related to/influencing their work? How many adults with a disability currently receive income support?
- *Question 2:* How is the labour market position of disabled persons associated with their family status (both in demographic and economic terms)? How is income support distributed and how is it associated with other characteristics when the unit of observation is the family? How is the presence of disability within a family influence the employment status of non-disabled other family members?
- *Question 3:* Of these, what kinds of income support are they receiving, for example; Workers' Compensation, Disability Support, New Start, Parenting Payments or other government allowances (subject to data availability).
- *Question 4:* For those who report a work-related disability but have either never received workers' compensation benefits, or the benefit had ceased:
    a. Reasons stated that benefit was never received (no valid cover, claim disallowed, did not apply for it and reason why did not apply for it etc), or for the benefit ceasing (claim rejected, time for allowances expired etc);
    b. Current sources of income support;
    c. Whether there are multiple sources of income and if so what are the sources;
    d. Disability type, severity, mechanism of injury/disease if known, whether person had any failed attempts to return to work and duration since person last worked;
    e. Circumstances of employment at the time of disability e.g. employee, self employed, contractor, hours worked, employment status etc;
    f. State or Territory where disability occurred; and
    g. Demographic information which may influence the severity or type of injury and theoretical capacity to Return To Work such as age, gender, occupation, level of education etc.

2.2 Selecting the appropriate sample

Individual disability status has been determined by using the "*Whether has a disability"* variable (WTHRDIS). This variable was utilised to construct the sub-samples necessary for Questions 1 to 3. In order to identify the sub-sample for Question 5 we used the *Cause of Main Condition, Where accident happened* and *Main source of cash income* variables.[3]

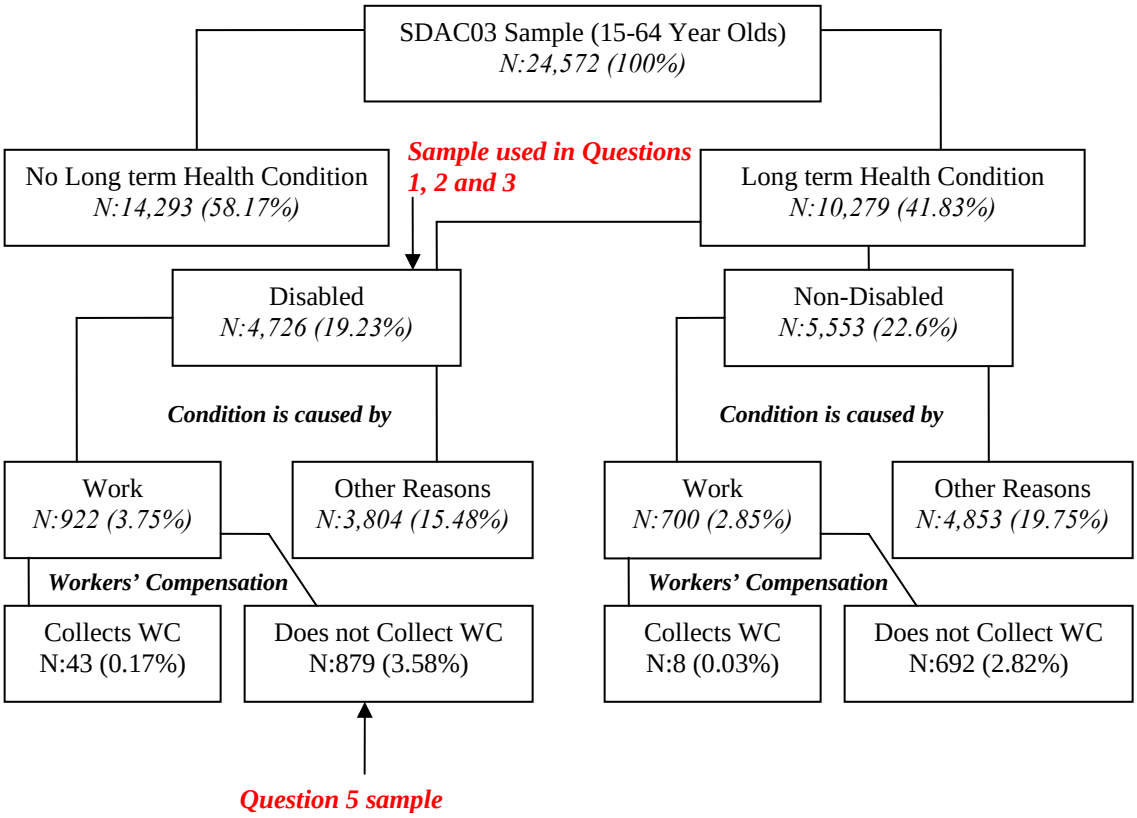
The sub-sample of Question 5, namely "people with a disability that is caused by work and who do not receive workers compensation benefit", is identified as follows: First, persons who state the cause of their condition as "Working conditions or work or overwork" and location of their accident as "Accident happened at work" have been defined in this project as *People with a Disability that was Caused by Work*. From this sub-sample we remove the persons who are in receipt of Workers' Compensation using the "*Main Source of Cash Income*" variable in order to isolate individuals who are not in receipt of Workers' Compensation benefits. Unfortunately, Workers' Compensation is not a stand-alone item in this variable. Persons who are collecting Worker's Compensation as their main source of income, are combined with respondents whose main source of cash income is child support or maintenance.[4] However, only 0.17 percent of the working age sample reported that they belong to this category. Our results are therefore unlikely to be significantly affected by whether persons in this category are included or excluded from the sample. Figure 1 below summarises our sample selection.[5]

For Research Questions 1 to 3, the sample used consists of all working age respondents (15-64 year old men and women). The age restriction is imposed using age categories provided by SDAC03.[6] For Research Question 5, we have selected all working age respondents with a disability who report a health condition that was caused by work, and

[3] SAS names of these variables are CAUSECND, ACCIDHPC and INCMAINC respectively.
[4] More specifically: "Other main source, including workers' compensation or Child support or maintenance" (SDAC03)
[5] The STATA code that is used to create the sample selection rules is included in the Appendix.
[6] In SDAC03 only age intervals 15-19,20-24,…,60-64 can be identified

who are not in receipt of Workers' Compensation. The sub-sample selection and relevant sample sizes are highlighted in Figure 1 below. The sub-samples relevant to Questions 1, 2, 3 and 5 have been marked in the Figure for easy reference.

Figure 2.1: SDAC03 sample (15-64 year olds)



Note: N indicates the number of observations available in the sample. Percentage of total working age sample is in brackets.

2.3 SDAC03: Data analysis of disabilities in general

This section reports the analysis of the ABS SDAC03 data. Our findings are presented taking each of the research questions in Box 2.1 in turn.

All results have been computed using population weights (variable WEIGHTP). The bottom of each table contains a population-augmented total (indicated as Population) as well as the number of observation available from the SDAC03 (indicated as Sample (N)). The measures are calculated for the sample of interest as well as for relevant reference groups.

Question 1.

How many adults in Australia report having had a disability? How many are currently in employment? How is their disability related to/influencing their work?[7] How many adults with a disability currently receive income support?

We start with Table 2.0 which gives an initial look at disability status in the SDAC03 sample. Around 16 to 17 percent of all respondents reported that they have a disability. Men and women are represented approximately equally in the sample (12,113 men and 12,459 women) and the gender breakdown of disability status suggests that disabilities prevail in equal rates among gender as well.

Table 2.0: Disability and gender

	Male	Female
Non-Disabled	83%	84%
Disabled	17%	16%
Population	6,727,916	6,644,241
Sample (N)	12,113	12,459

Table 2.1 below estimates that there are 2,238,258 people between the age of 15 and 64 in Australia who suffer from some form of disability and concentrates on the gender and employment status split amongst them. A higher proportion of males than females with a disability report being employed (53.6 percent males against 42.9 percent females) and a higher proportion of females report being out of the labour force (53.3 percent females against 41.3 percent males). For both genders it is clear that the disability status is negatively associated with being employed (53.6/84.7 = 63.3 for males and 42.9/68.5 =

[7] As explained below, this part of the question will only deal with associations between disability status and work, as the data at hand has not allowed the estimation of direct causal disability effects on work.

62.6 for females). It is noteworthy that the proportion of unemployed increases considerably amongst men with disabilities compared to non-disabled men.

Table 2.1: Labour force participation and disability status

Labour force status (%)	Disability status	
	Disabled	Non-Disabled
	Male	
Employed	53.6	84.7
Unemployed	5.1	4.3
Not in labour force	41.3	11.0
Population	1,143,638	5,584,278
Sample (N)	2,365	9,748
	Female	
Employed	42.9	68.5
Unemployed	3.8	3.8
Not in labour force	53.3	27.8
Population	1,094,620	5,549,621
Sample (N)	2,361	10,098
	All Persons (15-64)	
Employed	48.4	76.6
Unemployed	4.5	4.0
Not in labour force	47.2	19.4
Population	2,238,258	11,133,899
Sample (N)	4,726	19,846

Note: Population represents a population weighted total. Sample (N) represents the number of observations available in SDAC03. The disability status is determined using SDAC03 variable WTHRDIS.

Table 2.2 shows the number of adults with a disability who are currently receiving income support. There is a higher probability of being an income support recipient amongst the disabled population than the not-disabled population. We estimate that 44.6 percent of all disabled males between the ages of 15 and 64 receive income support payments, compared to only 9.8 percent of all not-disabled males. This proportion is a bit higher for females, rising to 50 percent for the disabled and more than doubling for the non-disabled at 22.2 percent.[8]

[8] Income support receipt rates in Table 2.2 are calculated using SDAC03 variables INCRECBC and INCROAA. The categories of all variables are explained in the Appendix.

Table 2.2: Income support receipt and disability status

Income support receipt (%)	Disability status	
	Disabled	Non-Disabled
	Male	
Receive income support payments	44.6	9.8
Do not receive income support payments	55.4	90.2
Population	1,143,638	5,584,278
Sample (N)	2,365	9,748
	Female	
Receive income support payments	50.5	22.2
Do not receive income support payments	49.5	77.8
Population	1,094,620	5,549,621
Sample (N)	2,361	10,098
	All Persons (15-64)	
Receive income support payments	47.5	16.0
Do not receive income support payments	52.5	84.0
Population	2,238,258	11,133,899
Sample (N)	4,726	19,846

Note: Population represents the population weighted total. Sample (N) represents the number of observations available in SDAC03.

Question 2.

How is the labour market position of disabled persons associated with their family status (both in demographic and economic terms)?

Table 2.3 outlines the differences in family composition between disabled and non-disabled persons.

Table 2.3: Family type and disability status

Family type (%)	Disability status		All Persons
	Disabled	Non-Disabled	(15-64)
Couple with children	25.2	41.2	38.5
Couple without children	34.5	26.8	28.1
Lone parent	6.6	6.0	6.1
Single	32.0	25.2	26.4
Other	1.8	0.8	1.0
Population	2,238,258	11,133,899	13,372,157
Sample (N)	4,726	19,846	24,572

Note: Other category contains persons with missing information or people who are not considered as income units by ABS (people who live in cared-accommodation or in non-private dwellings).

The income unit (as defined within the SDAC03 data) is used as the measurement unit of a family in Table 2.3, on the understanding that it also includes single persons. In order to present the economic status of disabled individuals and relate this to their family characteristics and circumstances we constructed income quartiles using equivalised income at family level. Equivalised income is calculated by dividing the *Total weekly cash income* (variable INCWKIUC) of an income unit by the square root of the number of people that belong to that income unit. This measure is assigned to all income unit members, and the resulting equivalised income values are ranked to obtain the income unit quartiles. The advantage of using equivalised income as opposed to observed income is that it is a better reflection of the actual purchasing power and constraints that individuals have to live with. In the present context, if we are interested in how well off individual people are *given their family commitments*, then equivalised income reflects better their true individual income status.[9] Persons who are not living in what would be considered to be a conventional income unit (that is, people who live in cared-accommodation or in non-private dwellings) and individuals with missing income information in the data set are omitted from these calculations by necessity. The contents of Table 2.4 indicate that the family income of disabled persons is overwhelmingly more likely to belong to the lowest quartile of incomes (45.1 percent) than the family income of not-disabled persons (20.9 percent). By contrast, only 14.3 percent of families who have a disabled member belong to highest income quartile.

Table 2.4: Family income by quartile and disability status

Income Quartiles	Disability status	
	Disabled	Non-Disabled
1st Quartile (lowest 25%)	45.1%	20.9%
2nd Quartile (25th – 50th percentiles)	22.2%	25.6%
3rd Quartile (50th – 75th percentiles)	18.4%	26.4%
4th Quartile (highest 25%)	14.3%	27.1%
Population	1,881,723	9,210,303
Sample (N)	3,594	16490

Note: The above statistics are calculated using Equivalised Income Units Income. People with missing observations and people who are not a member of an Income Unit are omitted.

[9] By contrast, if we were interested in the overall purchasing power of a family unit, the total income would have been a better measure, provided that the sampling unit would have been the family.

The income inequalities presented in Table 2.4 are stark. Remember that the bottom (top) *two* quartiles contain all those with the lowest (highest) 50 percent of (equivalised) incomes in Australia. A person with a disability has a 67.3 percent chance of belonging to the bottom half of incomes in Australia compared to a much lower 43.5 percent chance for a person without a disability. By contrast, a person with (without) a disability has a 32.7 (53.5) percent chance of belonging to the top half incomes in Australia. Of course, a lot of the income inequalities are due to the income-generating capabilities of the persons concerned, where capabilities will in turn depend on the persons' labour market status and the degree to which this is influenced by their disability status. The causal links between income, disability status and employment status are looked at in some more detail in the next section. Suffice it to say for now that causal relationships in this context are conceptually and empirically difficult to model and estimate. The principal reason for this is because of the two-way relationships that can be observed in the context of employment status and income generation capabilities. Low income generation capabilities can result in lower labour market participation, as people have less of a financial incentive to work. At the same time, however, a history of low labour market experience (expressed in terms of low labour market participation) can result in lower income generation capabilities. The presence of a disability can influence both income generation capabilities and labour market participation in both directions of their (two-way) relationship.

Table 2.5 reports the labour market status of disabled individuals along with the type of family they live in. The type of family for employed individuals is similar for both disabled and not-disabled persons. However, we observe striking discrepancies in family status when we analyse other groups. For example, when we analyse persons who are not labour force participants, only 19 percent of the group of disabled individuals live with a partner and children compared to 48 percent of the group of non-disabled individuals.

Table 2.5: Family type, disability status and labour force participation

Family type (%)	Disabled			Non-Disabled		
	NILF	Unemployed	Employed	NILF	Unemployed	Employed
Couple with children	19.0	21.3	31.6	47.9	30.5	40.1
Couple without children	37.6	18.3	32.9	23.4	11.3	28.5
Lone parent	8.1	15.1	4.3	12.5	11.4	4.0
Single	32.2	45.3	30.5	15.1	45.5	26.7
Other	3.1	0.0	0.7	1.1	1.3	0.7
Population	1,055,316	100,171	1,082,771	2,155,558	448,130	8,530,211
Sample (N)	2,501	183	2,042	3,899	786	15,161

Note: The above statistics refer to the labour force status of an individual. NILF indicates "Not in the Labour Force".

Table 2.6 links disability status, labour market status and equivalised income level in a three-way tabulation. The columns of Table 2.6 reflect the labour force status of an individual, and the rows report their income quartile. Note that by using equivalised income, we are controlling for family size in an implicit way. The most important differences reported in Table 2.6 are observed in the Not In the Labour Force (NILF) columns.

Table 2.6: Income by quartile, disability status and labour force participation

Income Quartiles	Disabled			Non-Disabled		
	NILF	Unemployed	Employed	NILF	Unemployed	Employed
1st Quartile (lowest 25%)	70.6%	79.5%	17.6%	46.6%	71.3%	11.7%
2nd Quartile (25th – 50th percentiles)	17.5%	14.8%	27.4%	26.8%	16.7%	25.7%
3rd Quartile (50th – 75th percentiles)	8.3%	4.9%	29.3%	15.5%	6.5%	30.2%
4th Quartile (highest 25%)	3.6%	0.9%	25.8%	11.1%	5.5%	32.3%
Population	876,442	86,805	918,476	1,758,669	388,867	7,062,767
Sample (N)	1,684	158	1,752	3,184	684	12,622

Note: Above statistics are calculated using Equivalised Income Units Income. People with missing observations and people who are not a member of an Income Unit are omitted. The labour force status refer to the individual.

About 70 percent of the disabled people who do not participate in the labour force live within a family that belongs to the lowest income quartile. By contrast, only 47 percent of the not-disabled people live within families that belong to the same lowest income

quartile. The considerably smaller differences between the employed disabled and non-disabled could be indicating that (i) once the disabled have secured employment, they are not as badly disadvantaged in financial terms, or (ii) the employed disabled are considerably different than the NILF disabled. The differences between those in employment by disability status appears in the bottom quartile (which is more populated amongst those with disabilities – 17.6 percent against 11.7 percent) and in the top quartile (which is more populated amongst those without disabilities 32.3 percent against 25.8 percent). The two middle quartiles appear to be very similarly populated (with 56.7 percent for those with disabilities and 55.9 percent for those without). Further research is needed on this point as it is not clear to what extent physical disabilities that can be more restrictive for the lower income quartile may also be at play for the top quartile as well. These observed differences across the income distribution may well be related to the type of jobs that people with disabilities are employed in. Given that disabilities will in their most benign form alter human capital in people and in its worst manifestations may even totally destroy human capital, the data may find more people with disabilities amongst those holding low skilled and therefore low paid jobs. Another related possibility is that the hours that a people with disabilities can work may be affected. If a disability limits the amount of work than an individual can do, people with disabilities may supply less hours thus generating lower total employment income. This report suggests that the dynamics of the income position of people with disabilities be studied in more detail.

How is income support associated with other characteristics when the unit of observation is the family?

A very complex relationship between income support, family composition and disability status is presented in Table 2.7. First, take income support recipients with a disability. Those without children constitute the largest majority: couples without children at 32.2 percent and singles at 38.1 percent making a total of 70.3 percent.

Table 2.7: Family type, disability status and income support receipt

Family type (%)	Disabled		Non-Disabled	
	Not Income Support Recipient	Income Support Recipient	Not Income Support Recipient	Income Support Recipient
	(I)	(II)	(III)	(IV)
Couple with children	25.7	17.9	42.7	36.1
Couple without children	31.2	32.2	29.2	17.8
Lone parent	2.7	10.4	3.2	20.7
Single	20.4	38.1	24.1	24.0
Other	20.1	1.4	0.8	1.3
Population	1,175,292	1,062,966	9,354,621	1,779,278
Sample (N)	2,656	2,070	16,560	3,286

Column II of Table 2.7 indicates that those with children make only 28.3 percent of the disabled: 17.9 percent couples and 10.4 percent lone parents. By contrast, amongst the non-disabled income recipients, those without children make only 41.8 percent of the total (almost 30 percentage points less than the 70.3 percent disabled), and those with children make 56.8 percent of the total (almost 30 percentage points more than the 28.3 percent disabled). The clear suggestion from the data is that income support receipt has a stronger association with the presence of children in the family amongst the non-disabled than amongst the disabled. Although this difference was to be expected, in principle, its magnitude is of interest. There is clearly a large number of disabled income recipients that live single lives. There is also a large number of couples without children who include a disabled person in them. The ability of single disabled people to cope and the needs presented to them due to their disability status could be a topic for further research, especially within the context of facilitating their return to the labour market where this may be feasible[10]. The role of formal care could also be a topic for further research. The same problems may apply to couples with no children, with the added dimension of informal care being present. The extent to which the disability of one partner may influence the labour force participation of the non-disabled partner is an important issue which has been highlighted in the international literature and is worth more detailed

[10] Employment difficulties present themselves primarily because single disabled people would require to care for themselves and, as such, they have less time to devote to their employment. An interesting research topic would be the degree to which different types of disabilities would result in different RTW probabilities.

investigation. The dynamics of disability support pension (DSP) and labour market status were investigated by Mavromaras et al. (2006) where it was shown that despite the long-term nature of individual disability status, there is considerable movement over time in the level of income reliance amongst DSP recipients. As that work was done using only the first three waves of HILDA, it would be of considerable policy interest to investigate what further insights could be offered by the additional HILDA waves that have become available.

How does the presence of disability within a family influence the employment status of non-disabled other family members?

In Table 2.8 we compare the labour force status of disabled people along with their non-disabled family members. We used the household and family identification variables (ABSHID and ABSFID) in order to identify and match family members.

Table 2.8: Labour force status and within family disability prevalence

Labour force status (%)	Family with a Disabled Member		Family Without a Disabled Member
	Disabled Person	Non-Disabled Person	
Employed	48.38	73.06	77.17
Unemployed	4.48	4.59	3.94
Not in labour force	47.15	22.35	18.89
Population	2,238,258	1,507,511	9,626,388
Sample (N)	4726	2767	17079

Note: Above statistics are computed at the individual level

The main comparison that can be made in this context is between non-disabled persons within (i) a family *with* a disabled member and (ii) a family *without* a disabled member. The percentages for those in employment are 73.06 and 77.17 respectively. For non-participants (NILF) they are 22.35 and 18.89 respectively.

Question 3.

What kinds of income support are "they" (disabled people) receiving?

Types of income support are determined by aggregating categories presented in SDAC03 variables INCRECBC and INCROAA and are presented in Table 2.9.

Table 2.9: Type of income support received and disability status

Income support payments (%)	Disability status	
	Disabled	Non-Disabled
Age pension	5.7	4.7
Allowances	14.6	29.9
Disability support pension & Disability pension (DVA)	51.1	2.9
Parenting payments	11.7	33.7
Other	17.7	29.4
Population	1,062,966	1,779,278
Sample (N)	2,070	3,286

Note: The above sample consists of persons who are in receipt of Income support. The Allowances category includes New Start Allowance, Sickness Allowance and Youth Allowance. The Other category includes Special Benefit, Mature Age Allowance, Wife Pension, Carer Payment and Widow Allowances.

Table 2.9 confirms the information contained in Table 2.8, where just under 52 percent of all people with disabilities are either unemployed or not in the labour force. In Table 2.9 there are 51.1 percent recipients of disability-related welfare support (DSP and DVA), a figure very close to that revealed in Table 2.8. The 2.9 percent non-disabled people who receive disability-related payments are not easy to explain. This could be a form of mis-reporting in the data. Also note that due to our age restriction (15-64 year olds) the sample that receives Age Pension consists entirely of women who are between 60 and 64 years old.

2.4 SDAC03: Data analysis of disabilities reported to have been caused by work

Question 4.

This question refers to the part of the sample that contains: "*persons who report a work-related disability but have either never received workers' compensation benefits, or the benefit had ceased"***.** The question consists of seven parts which are tackled in the sequence they are asked. The information on relevant reference groups is reported to

enable comparisons. The reference group is chosen to reflect the most pertinent comparator for each case.[11,12]

4(a). Reasons stated that benefit was never received (no valid cover, claim disallowed, did not apply for it and reason why did not apply for it etc), or for the benefit ceasing (claim rejected, time for allowances expired etc)

In SDAC03 we can only identify the occurrence of workers compensation receipt, the reason why an individual is not currently receiving a benefit is not provided. Therefore, we can not answer this research question 4(a).

4(b). Current sources of income support

In Table 2.10 we compare prevalence of income support receipt in our sample of individuals who suffer from health conditions that are caused by work and who are not in receipt of workers' compensation benefits.[13] We see that disabled individuals overwhelmingly rely on income support. A large proportion of individuals in this group (41.5 percent) receive some form of income support compared to the national average (21.25 percent). Another finding is that income support receipt is less common among the sample with non-disabling health conditions compared to the complete working age population.

[11] When disability-specific information (severity, type or onset of disability) is examined, we employ "Disabled persons with conditions that are not caused by work" as the reference group. The reference group for all other tables is "People with non-disabling long term health condition".
[12] This sample is identified using variables WTHRCOND and WTHRDIS.
[13] The numbers of workers' compensation recipients in SDAC03 are too small to warrant detailed statistical analysis.

Table 2.10: Income support receipt

Income support	Condition caused by work, No workers' compensation		All Persons (15-64)
	Disabling	Non-Disabling	
Receive income support payments	380 41.57%	110 15.56%	5,356 21.25%
Do not receive income support payments	499 58.43%	582 84.44%	19,216 78.75%
Population	462,949	379,165	13,372,157
Sample (N)	879	692	24,572

Finally, Table 2.11 presents the type of income support received.

Table 2.11: Type of income support received, for persons receiving income support

Income support payments (%)	Condition caused by work, No workers' compensation		All Persons (15-64)
	Disabling	Non-Disabling	
Age pension	4.69	8.29	4.84
Allowance	13.59	27.65	25.01
Disability support pension & Disability pension (DVA)	55.15	14.91[14]	20.83
Parenting payments	7.25	15.48	25.19
Other	19.40	33.68	24.73
Population	192,490	59,004	2,842,244
Sample (N)	380	110	5,356

Note: Above sample consists of persons who are in receipt of Income support Allowances category include New Start Allowance, Sickness Allowance and Youth Allowance. Other category includes Special Benefit, Mature Age Allowance, Wife Pension, Carer Payment and Widow Allowances.

4 (c). Whether there are multiple sources of income and if so what are the sources

SDAC03 data set reports only the main source of cash income, therefore multiple sources of income cannot be identified. We report the information on main source of cash income in Table 2.12. There are striking differences by disability status. Non-disabling health

[14] Only 8 individuals from this group declare that they receive a disability related payment. Given that this group do not report a disability, we suspect that the high percentage of DSP or DP receipt may be due to the measurement error. Another possibility is that DSP and DP eligibility is defined differently than ABS definition of disability.

conditions are associated with higher income and higher likelihood of wages being the main source of income. The other side of this coin is that lower income support receipt rates are more likely in this group. A possible explanation of this could run as follows: Recall that this group's health conditions were caused by work without, however, resulting in a disability. Therefore we can make a safe assumption that the qualities that made these individuals to be initially employable still persist given that their condition is not disabling them. Hence it is not surprising that a high percentage of individuals in this category are currently working and earning wages (64.9 percent) compared to those with a disabling condition (40.5 percent only). The reason why those with non-disabling conditions are more likely to be wage earners (at 64.9 percent) than the average person in Australia (at 56 percent) is that the rest of the population also includes people who may have never held a job in their lives, whilst those with a non-disabling condition *that was caused by work* have all had (by definition) a job at some point in time in the past.

Table 2.12: Average income and main source of income

Income	Condition caused by work, No workers' compensation		All Persons (15-64)
	Disabling	Non-Disabling	
Average weekly income ($)	446.78	676.38	529.56
Main Source of Cash Income (%)			
Wages	40.5	64.9	56.0
Profit from business	8.3	13.2	7.8
Government payments	38.0	10.8	18.6
Workers' compensation or child support	0.0	0.0	1.3
Other private income	5.6	4.2	3.8
None	7.6	6.9	12.5
Population	462,949	379,165	13,372,157
Sample (N)	879	692	24,572

4 (d).(i) Disability type, severity, mechanism of injury/disease if known

The type of disability is estimated by aggregating information presented in *Disability Type that causes most problems* (MAINIMP) variable.[15]

Table 2.13: Type of disability

Type (%)	Disability caused by work, No workers' compensation	Disability not caused by work
Sensory	11.17	13.16
Physical	77.62	59.51
Other	11.20	27.33
Population	462,949	1,751,039
Sample (N)	879	3,804

Note: Other category includes mental illness, nervous or emotional conditions and 'other limitations and restrictions'

Table 2.13 shows that the prevalence of sensory disabilities is similar in both the disabilities that are caused by work and the disabilities that are not caused by work (with percentages at 11.17 and 13.16 respectively). Work-caused disabilities are more likely to be physical (differences in percentages are 77.6 against 59.5). We observe a large difference in the prevalence of disabilities that belong to category 'Other'. The most likely causal explanation for this observation could be that those with this type of disability (which, it must be noted, includes mental health or psychological problems) may be less likely to be in employment because of their disability. Clearly the present data does not allow the distinction between these two different interpretations of the observed association.

The severity levels in Table 2.14 are created using SDAC03 variable *Disability status* (DISBSTAT)

The severity level of a disability is one of its most important attributes in terms of the well being of the worker and the future prospects of returning to employment. The data contains the following severity categories and their definition/explanation:

[15] The categories of MAINIMP are presented in appendix.

- Severe/profound disability: unable to perform a core activity, or need assistance to perform a core activity at least some of the time.
- Medium/mild disability: do not need assistance, but have difficulty performing a core activity, or use aids or equipment to perform a core activity.
- No restriction: no restriction in core activities.

Table 2.14 shows that about 20 percent of work-caused disabilities are severe/profound, 50 percent are moderate/mild and 30 percent result in no restrictions. The distribution of severity appears to be similar between disabilities caused by work and disabilities not caused by work.

Table 2.14: Severity of disability

Severity (%)	Disability caused by work, No workers' compensation	Disability not caused by work
Profound / Severe	19.49	23.56
Moderate / Mild	50.45	43.49
No restrictions	30.06	32.94
Population	462,949	1,751,039
Sample (N)	879	3,804

The age of onset of disabilities is shown in Table 2.15. This is contained in the "*Age when accident happened/onset of main condition"* (ACCONSEC) variable.

Table 2.15: Onset of disability

Age of onset (%)	Disability caused by work, No workers' compensation	Disability not caused by work
Young age (up to 19 years)	5.42	34.21
Prime age (20-45 years)	67.07	39.78
Older age (46 years and older)	26.53	24.11
Unknown	0.99	1.9
Population	462,949	1,751,039
Sample (N)	879	3,804

A big majority of disabilities presents itself before the age of 46 (about 72.5 percent of work related and 74 percent of not related to work). There is a big difference in the age of onset of disabilities for the youngest group (age up to 19) with 5.42 percent in the

"caused by work" category and 34.21 percent in the "not caused by work" category, presumably due to the lower work exposure of those aged up to 19.[16] The category that is subject to the highest work exposure, the prime working age category, has the highest prevalence of work caused disability. 67 percent of disabilities that are caused by work develop between ages 20 and 45. On the other hand, only 40 percent of the disabilities that are manifested due to non work related conditions are observed in this age of onset category.

4 (d).(ii). Duration since person last worked

One of the major consequences of disabilities is the reduction in labour market activity.

Table 2.16: Duration since last worked

Duration since last worked (%)	Condition caused by work, No workers' compensation		All Persons (15-64)
	Disabling	Non-Disabling	
Not Applicable	66.0	85.3	73.9
Less than 4 weeks	0.5	0.1	0.7
Between 4 and 8 weeks	0.3	0.95	0.8
Between 8 and 13 weeks	1.1	0.6	0.9
Between 13 and 26 weeks	3.3	1.2	1.7
Between 26 and 52 weeks	1.8	1.7	2.3
Between 52 and 104 weeks	3.0	1.6	2.2
104 weeks or more	23.6	8.2	12.4
Never worked (for 2 weeks or more)	0.3	0.4	5.0
Uncertain	0.1	0.0	0.0
Population	462,949	379,165	13,372,157
Sample (N)	879	692	24,572

Note: 'Not Applicable' category consists of persons currently employed or people who do not live in private households

[16] This percentage still appears to be too high for individuals with young age disability onset. Some of this finding can be attributed to the measurement error. It is possible that some respondents with multiple conditions answer the cause of main condition question differently than they answer the onset question. They may, for example, state the age of onset for the condition that they have suffered the longest yet they may not consider that condition as their main condition.

This is measured in two ways. First, for those who consider themselves to be labour market participants, the right measure is the absence from work. For those who consider themselves to have exited the labour market, the right measure is the time that has elapsed since they last worked. This information is reported in Table 2.16 by combining two variables. These are *Duration of unemployment* (LFSUNEMC) that is collected from unemployed persons and *Period since last worked (*LFSDEMPC) that is reported for persons who are out of the labour force. The main difference that arises from Table 2.16 is that disabling conditions are keeping people out of work for much longer than non-disabling ones. A very large percentage of those with disabling conditions (23.6 percent) had been out of work for more than two years when they were interviewed. Perhaps of equal significance is the much lower percentage of those without a disabling condition (8.2 percent) who reported having been out of work for more than two years. These 8.2 percent of individuals (population projected this amounts to just over 31,000 people between the age of 15 and 64) may have less of a health reason for being out of the labour market. Therefore this group may appear to be in need of less help and support to re-join to work force than their disabled counterparts do. However, any policy conclusion regarding this finding should be drawn with caution. It should be noted that the majority of individuals with a non-disabling health condition are people of mature age (57 years old and above). It is very likely that a proportion of this statistic can be attributable to an early retirement effect.

4 (e). Circumstances of employment at time of disability, e.g. employee, self employed, contractor, hours worked, employment status, etc.

There is limited information relating employment status and disability in the SDAC03. Table 2.17 reports current labour force status alongside with current type of disability (caused by work).

Table 2.17: Current labour force status

Labour force status (%)	Condition caused by work, No workers' compensation		All Persons (15-64)
	Disabling	Non-Disabling	
Employed	56.5	85.0	71.9
Unemployed	4.6	2.7	4.1
Not in the labour force	38.9	12.3	24.0
Population	462,949	379,165	13,372,157
Sample (N)	879	692	24,572

The much higher proportion of labour force non-participants is clearly evident (38.9 percent when a disabling condition is present against 12.3 when not). To the degree that this table represents a point in time estimate which reflects an equilibrium position in the labour market, it indicates that disabling conditions caused by work have a very strong negative effect on individual employment chances. The difference between the disabling and non-disabling groups comes up to (85.0 – 56.5 =) 28.5 percentage points.

Table 2.18 contains only one noteworthy result, namely that the presence of disabling conditions are positively associated with a higher proportion of part time employment. The combination of Tables 2.17 and 2.18 implies that disabling conditions are associated with lower labour market engagement which is manifested in lower full time employment, higher part time employment and higher labour force non-participation.

Table 2.18: Current labour market outcomes, for employed persons

Labour market outcomes	Condition caused by work, No workers' compensation		All Persons (15-64)
	Disabling	Non-Disabling	
Full-time employed	70.9%	83.1%	70.0%
Part-time employed	29.1%	16.9%	30.0%
Average weekly hours			
Full-time	45.75	45.40	44.15
Part-time	19.17	20.34	17.83
Population	261,582	322,168	9,612,982
Sample (N)	492	586	17,203

Table 2.19 presents the type of engagement in their current employment of those who report a long term health condition (disabling and non-disabling in the first two columns) and those who report none (in the last column). It distinguishes between being an employee, an employer and an own account worker. Clearly, the engagement, responsibilities and flexibility in these three groups differ substantially. First note the already established difference in participation in the "Not Applicable" row where the non-participation rate of those with disabling conditions is very high. The interesting result in this table is revealed after one discounts for the participation differences. Looking at those who participate in the labour market (the percentages in brackets) we can see that the paid employment rate is somewhat higher for those with non-disabling conditions (82 percent against 79 percent), whilst the own account worker rate is higher for those with a disabling condition (17.5 percent against 13.3 percent). If one were to offer some interpretations, one could argue that the flexibility offered by being an own account worker is welcome for those with disabling conditions, or that the opportunities for paid employment may be lower for those with disabling conditions, so that they are pushed towards being own account workers. The present data does not allow us to distinguish between these alternative interpretations.

Table 2.19: Current employment type

Employment type (%)	Condition caused by work, No workers' compensation		All Persons (15-64)
	Disabling	Non-Disabling	
Not applicable	43.50	15.03	28.11
Paid employment	44.45 (79%)	69.27 (82%)	62.42
Employer	1.94 (3.4%)	4.25 (5%)	2.48
Own account worker	9.84 (17.5%)	11.30 (13.3%)	6.67
Contributing family worker	0.26	0.16	0.33
Population	462,949	379,165	13,372,157
Sample (N)	879	692	24,572

Note: 'Not Applicable' category consists of persons who are unemployed or who are not in the labour force. Figures in brackets represent the percentages of individuals who participate in the labour force.

4 (f) and (g). State or Territory where disability occurred, and Demographic information which may influence the severity or type of injury and theoretical capacity to RTW such as age, gender, occupation, level of education, etc.

The SDAC03 does not contain any information on the "State or Territory where the disability occurred". Instead we report state of current residence as a fair approximation, especially regarding the State which is highly likely to be common between residence and the location where disability occurred. We begin answering this question with a list of major socio-demographics in Table 2.20. Beginning with age, there is a clear tendency of non-disabling conditions to be more prevalent amongst the younger, with a gradual shift towards disabling conditions as age advances. There is nothing unexpected here. There is a higher proportion of disabling conditions amongst the non-English speaking background individuals, presumably due to occupational differences. There are no large differences by family type. There are large differences by State and Territory of the proportion of workers with health conditions, but these accord with known demographic differences. There are some differences in the proportion of disabling versus non-disabling conditions by state. For example, the disabling/non-disabling ratio is very close to 1 in New South Wales. It is 0.896 in Victoria, 0.911 in Queensland, 1.51 in South Australia, 1.177 in Western Australia and 1.182 in Tasmania. These differences are large. Given that each state has its own mechanism for determining the degree of severity, then these (self reported) differences may in part reflect state differences in the definition of severity. It could also be that these differences reflect the differences in the riskiness of the occupational structure between states. Without further research which accounts for the composition of industry and jobs in each state, it is difficult to attach a specific interpretation to these observed overall differences. Finally, a reflection of the stratification of work caused disabling conditions is offered when we see how it is distributed by education level. The top education group (that is, University degree holders) are only half as likely to suffer from a disabling condition caused by work (8.94 against 16.60 percent). This is a clear result. For those with education above year 12 there are still differences (46.79 against 53.84) but nowhere near as high as for degree holders.

Table 2.20: Demographic characteristics

	Condition caused by work, No workers' compensation		All Persons (15-64)
	Disabling	Non-Disabling	
Male	68.87	70.98	49.38
Age categories			
Aged 15-24	1.74	4.24	12.30
Aged 25-34	10.87	16.16	16.92
Aged 35-44	21.48	26.71	20.11
Aged 45-54	31.92	29.20	24.81
Aged 55-64	33.99	23.70	25.86
Ethnicity			
Non-English speaking background	18.14	14.35	13.96
Foreign born	28.94	27.03	24.84
Family type			
Couple with children	27.74	32.88	29.89
Couple without children	42.38	37.82	35.27
Lone parent	4.12	2.92	6.24
Single	24.66	25.19	27.39
Other family type	1.10	1.19	1.21
State of residence			
N.S.W	30.42	30.10	30.19
Victoria	22.97	25.64	24.96
Queensland	21.48	23.58	20.75
South Australia	9.72	6.46	8.53
Western Australia	10.98	9.33	10.70
Tasmania	3.37	2.85	2.70
Northern Territory	0.22	0.66	0.53
A.C.T	0.85	1.39	1.64
Region of residence			
Major city	57.12	57.68	64.26
Inner regional	25.88	23.80	22.54
Rural	17.00	18.52	13.20
Education level			
Bachelor degree or higher	8.94	16.60	16.58
Other post-school qualification	41.76	45.31	33.86
Completed high school	5.03	8.53	11.95
Not completed high school	44.27	29.56	37.62
Onset after highest post-school degree	39.76	N/A	11.94
Population	462,949	379,165	13,372,157
Sample (N)	879	692	24,572

Note: 'Onset after highest post-school degree' indicates whether person received his/her highest post secondary degree after the onset of disability. This information is available from SDAC03 variable PSQMCOND and it is defined only for people with a disability that occurred after birth and who completed a post secondary degree.

Finally, those with education less than year 12 are far more likely to find themselves with a disabling work-caused health condition than with a non-disabling one (44.27 against 29.56 percent).

Table 2.21: Current occupation and industry of employed persons

	Condition caused by work, No workers' compensation		All Persons (15-64)
	Disabling	Non-Disabling	
Occupation (%)			
Managers	5.57	10.05	5.88
Professionals	13.15	23.82	23.06
Trade and related workers	9.61	17.01	9.13
Clerical workers	13.27	15.59	22.12
Production and transport workers	8.38	11.57	5.78
Labourers and related workers	6.54	6.93	5.93
Not employed	43.49	15.03	28.11
Industry (%)			
Agriculture	4.30	6.44	2.74
Manufacturing	8.73	11.80	8.10
Construction	8.10	11.72	6.12
Trade	8.05	12.27	13.57
Transport	4.16	5.02	4.37
Finance	4.88	9.27	11.28
Government	3.61	5.16	3.74
Services	13.85	20.41	20.69
Other	0.82	2.90	1.28
Not employed	43.49	15.03	28.11
Population	462,949	379,165	13,372,157
Sample (N)	879	692	24,572

Table 2.21 looks at occupation and industry difference between disabling and non-disabling conditions. Comparison with the final column which contains the total sample (and therefore reflects the national distribution) reveals some interesting empirical patterns. The Table should be read as follows. Nationally, 5.88 percent of those aged between 15 and 64 report that they are managers. Amongst those who report that they have a disabling condition caused by work, 5.57 percent also report to be managers. That is, the presence of managers amongst the people with disabling conditions is similar to the national average. One could then argue that this occupation neither favours nor penalises the employment participation of those with disabling conditions caused at work. Similarly, making the assumption that people do not switch occupations because of a work-caused disabling condition (an assumption that may well be right for some employees/occupations and wrong for others) one could argue that the occurrence of a work-caused disabling condition does not result in the disabled person leaving their occupation (and presumably their workplace too). At the same time, amongst those who

report that they have a non-disabling condition caused by work, 10.05 percent also report to be managers. This is well above the national average of 5.57 percent. A similar interpretation can be given to that offered for disabling conditions. In brief, being a manager is either an occupation that causes more non-disabling conditions and/or favours (or penalises less) the participation of people who have such non-disabling conditions more than other occupations do. Without detailed over time data on both employers and employees, the empirical associations presented here will have to remain without any causal interpretation attached to them.

The interpretation of all occupations follows the same logic, but can lead to different conclusions. Take trade & related workers for example. The percentages are very similar to those for managers, hence the general interpretation would be similar. However, in this case, one could be a bit surprised to see the national average retained for those with disabling conditions.[17] By contrast, the interpretation of the professionals percentages shows that the proportion of those with disabling conditions is well below the national average for all professionals. This could suggest either that the onset of disabling conditions is less prevalent amongst the professionals, or that after the onset of a disabling condition one cannot continue to be a professional, or that people with disabling conditions caused by work are less likely to re-train to become professionals. As already mentioned, without detailed over time data these possibilities cannot be distinguished from one another.

The interpretation of the sectoral prevalence of disabling conditions in Table 2.21 is also of interest. Clearly, agriculture and construction are riskier and/or attract more people with disabilities as their above national average proportions of people with disabling conditions indicate (taking agriculture as an example, note that both disabling at 4.3 percent and non-disabling at 6.44 percent are above the 2.74 percent national proportion in this sector). Trade, finance and services are the opposite. Government and transport appear to be neutral.

[17] A possible explanation of this fact could be that there are more people with disabilities who are self employed and a large proportion of the self employed are trade persons.

The last three tables in this section present the employment status by disability type, severity and time of onset. Table 2.22 shows that the majority of disabling conditions caused by work are of a physical nature (around 78 percent) and that their prevalence is almost evenly split between those employed and those not in the labour force. The majority of disabling conditions not caused by work are also of a physical nature, but their percentage is considerably lower (around 56 percent). They too are split almost evenly between those employed and those not in the labour force.

Table 2.22: Labour force status by disability type

Labour Force Status (%)	Disability caused by work, No workers' compensation		
	Sensory	Physical	Other Type [18]
Employed	80.72	52.32	61.32
Unemployed	6.06	4.24	5.93
Not in labour force	13.22	43.44	32.74
Population	51,718	359,364	51,867
Sample (N)	94	683	102
Percentage in the sample	10.69	77.8	11.6

	Disability not caused by work		
	Sensory	Physical	Other Type
Employed	55.65	46.23	43.22
Unemployed	7.06	3.41	5.46
Not in labour force	37.29	50.37	51.32
Population	230,408	1,042,108	478,523
Sample (N)	420	2145	1239
Percentage in the sample	11.04	56.39	32.57

The severity of disability is shown in Table 2.23 to be negatively associated with being in employment and positively associated with being out of the labour force. This holds for both disabilities caused by work and not caused by work. It should be noted that the proportion of those with profound/severe disabilities who are not in employment is 65.4 percent (disability caused by work) and 75.4 percent (disability not caused by work). Projected into the population these amount to just under 59,000 and just over 311,000

[18] Other type consists of mental and psychological disabilities and impairments that are listed in 'Other limitations and restrictions' category in SDAC03.

persons (by respective cause) who have reported a severe/profound disability and who are not in employment. Finally, we observe that people with work caused disabilities have higher employment rates than those with disabilities that are not caused by work. One possible explanation for this observation may be that the former sample is drawn from those who were employed at some stage in their lives, therefore, this sample may exhibit qualities (work experience, education and other) that make them more likely to be employed than people with disabilities that are not caused by work.

Table 2.23: Labour force status by severity

Labour force status (%)	Disability caused by work, No workers' compensation		
	Severe/Profound	Medium/Mild	No Restriction
Employed	34.63	54.44	74.15
Unemployed	3.75	4.21	5.92
Not in labour force	61.62	41.35	19.94
Population	90,216	233,575	139,158
Sample (N)	169	446	264
	Disability not caused by work		
	Severe/Profound	Medium/Mild	No Restriction
Employed	24.61	43.39	66.71
Unemployed	2.85	3.63	6.68
Not in labour force	72.54	52.99	26.61
Population	412,630	761,556	576,853
Sample (N)	1,226	1,469	1,109

Finally, Table 2.24 reports the association between current labour force status and the age of disability onset. Disabling conditions that presented themselves before the age of 45 are associated with higher employment rates when compared with disabling conditions that appeared at an older age. The relatively poor employment outcomes of people with older age of disability onset could be due to the fact that these individuals have had less time and opportunity to adjust to their disabling conditions. Another interesting observation is that people who are disabled due to their work are more likely to be employed and less likely to be out of the work force compared to disabled people whose detrimental health conditions were due to reasons other than work.

Table 2.24: Labour force status by disability onset

Labour force status (%)	Disability caused by work, No workers' compensation Age of Disability Onset				All Persons (15-64)
	Young	*Prime Age*	*Older Age*	*Unknown**	
Employed	61.73	60.03	46.68	*	71.89
Unemployed	11.62	5.13	1.65	*	4.10
Not in labour force	26.60	34.83	51.65	*	24.01
Population	25,073	310,494	122,809	*	13,372,157
Sample (N)	47	578	244	*	24,572

	Disability Not Caused by Work Age of Disability Onset				All Persons (15-64)
	Young	*Prime Age*	*Older Age*	*Unknown**	
Employed	53.28	50.05	33.73	19.44	71.89
Unemployed	7.44	3.21	2.57	*	4.10
Not in labour force	39.27	46.72	63.69	80.55	24.01
Population	599,094	694,483	422,120	33,342	13,372,157
Sample (N)	1102	1336	817	549	24,572

Note: * indicates less than 25 observations in the sample.

2.5 Multivariate analysis using SDAC03

This section deals with some of the more complex parts that are raised by Question 4.

4 (g). Demographic information which may influence the severity or type of injury and theoretical capacity to RTW such as age, gender, occupation, level of education etc.

The prime objective of this section is to present econometric models which investigate *joint* associations between the severity and type of injury and a number of key social and demographic characteristics. Multivariate regression analysis enables the presentation of *conditional* associations, where the net association between a specific socio-demographic characteristic has been estimated while holding all other characteristics constant and at their mean values. The key benefit from using this method is that correlations between characteristics are controlled for by the estimation method so that where a number of characteristics in the right hand side of an equation have a joint association with the left

hand side variable, the estimation results help apportion different degrees of association to each of the right hand side variables.

The sample used here consists of all individuals with a long term health condition. Ideally, we would have wanted to estimate the relationship between the presence of disabilities caused by work and socio-demographic characteristics, but we encountered estimation problems principally due to the combined effect of a low explanatory power of these variables and a very small sample size.[19] Hence, we carry out our estimations with a more general sample which should provide some insight on the relationship between the prevalence of long term health conditions and the socio-economic factors surrounding them.

The remainder of this sub-section reports and discusses the multivariate regression results. We also include a brief discussion of the estimation methods used for the more technical reader.

2.5.1 Estimating the severity of disability

We model the probability of the prevalence of different severity levels of a health condition using an ordered probit model. Ordered probit estimation is an extension of binary probit estimation, used where the dependent categorical variable has a natural ordering and (unlike the binary case) more than two outcomes. The underlying assumption of this model is that, there is a latent process which relates the severity of the health condition with all right hand side variables, but that this latent process is unobserved. We only observe outcome changes which occur when the unobserved latent process passes thresholds that are defined by different severity levels. Note that the underlying unobserved severity variable is allowed to be continuous in this model, as indeed intuition suggests it should be. Simply put, although we do not observe the actual magnitude of severity we do identify the discrete levels of severity using information

[19] There were convergence problems which for some model specifications prevents us from obtaining numerical results. Where estimates were obtained they were of very low statistical significance and were deemed not trustworthy to report.

provided by our data as this is reported in the survey. The econometric model of severity for an individual who suffers from a health condition can be represented as follows:

$$S_i^* = \beta X_i + \varepsilon_i \qquad (1)$$

where

$S_i = 0$ if $S_i^* < c_0$

$S_i = 1$ if $c_0 \leq S_i^* < c_1$

$S_i = 2$ if $c_1 \leq S_i^* < c_2$

.

.

$S_i = m$ if $c_{m-1} \leq S_i^* < c_m$

In Equation 1, S^* is the unobserved severity, S is an observed discrete severity level (i.e. mild, severe, etc) and c_m are estimates of the unobserved thresholds (usually referred to as cut-off points) that define the observed discrete severity levels. Equation 1 is estimated using the method of maximum likelihood. The ordered probit estimates also estimate the values of the cut-off points that best fit the data. The left hand side (dependent) variable in Equation 1 is defined by the following different severity levels of long term health conditions:

(i) No disability resulting from the health condition at all

(ii) A health condition with a disability that results in no restriction on daily activities

(iii) A health condition with a disability that results in medium/mild restrictions on daily activities

(iv) A health condition with a disability that results in severe restrictions on daily activities.

It is worth recalling at this stage that the estimation sample contains all those who reported to have a long-term health condition (see Figure 1 at the start of this section), some of which health conditions do not result in a disability. Note that whilst this form of estimation is not suitable for making causal statements, there are some relationships that we know are considerably more likely to work one way rather than the other, so to a lesser degree and with less confidence, some causal statements can still be made.

Estimation results from the ordered probit model are reported in Table 2.25. The sign of each coefficient indicates the direction of a relationship, the size of the coefficient the strength of the relationship and the standard error the precision of the estimate itself. Before we examine the details of this estimation, some general remarks are necessary. First, the precision of the estimation is very good. 19 out of 24 variables included are significant at least at the 5 percent level. Given the sample size this is a good result. It is no surprise that the p-value of the joint significance test is extremely small which is good. By contrast, the proportion of the observed variation that is explained by this estimation (that is the proportion of the observed variation in the left hand side (LHS) variable, the disability severity, that is explained by the variation in all right hand side (RHS) variables, the observed characteristics, is very small. What this tells us is that the relationships that we observed are estimated very precisely, but that they do not tell us a lot about the reasons why observed disability severity differences may have arisen, that is, they explain only a small proportion of the LHS variable Given the very strong physiological origins of disability severity differences, this is expected, but still we feel that the overall explanatory power of this estimation is low. Another reason may well be that disability severity is in its essence a continuous variable and that we try to estimate how it works using a very rough approximation (as this is all that our data provides us). This is a reason that may explain the low explanatory power of the estimation to a large extent. The good news in this context is that the estimator itself is pointing in the right direction (in statistical terms it is consistent) and that the distinction between the different levels of severity as they are presented in the data is done with very good accuracy (that is, the cut-off points are estimated precisely). This is indicated by the fact that the moderate and severe cut-off points are estimated with considerable accuracy. The lack of significance of the cutoff point between no disability and a disability without a restriction would accord with our intuitive priors. These arguments would suggest that the overall explanatory power as presented in this estimation should not be considered as a major flaw, rather as an unavoidable statistical feature of an otherwise precisely estimated relationship. We now turn to the interpretation of individual results.

Table 2.25 contains some strong and significant associations between demographic factors and severity levels[20]. There is a clear positive association between age and the prevalence of severity in the effects of disabilities. Note that here severity indicates the degree to which those who have declared to suffer from a long term health condition, also report that this health condition is severe in terms of how much it restricts their lives. A larger proportion of persons with more severe conditions are observed among people who live in cared accommodation (included in the category *other family type*): the causality is clear here, this proportion is higher presumably because people with severely disabling health conditions need to move into cared accommodation. Also it appears that living in partnership (with or without children) may be associated with lower severity of long term health conditions. Considering that age has already been accounted for, this is an interesting result, although the causality is not clear. It could be that being single is detrimental to the prevention of long term health conditions (hence, when we observe the estimated steady state of singles being worse off, we can explain it by looking at the worse lifestyles of singles).

[20] It is worthwhile to recall that the results are conditional on having reported the presence of a health condition.

Table 2.25: Ordered probit estimation of disability severity

Variable	Coefficient	Standard Error
Male	0.024	0.026
Family type (Single is reference category)		
Couple with children	-0.292**	0.035
Couple without children	-0.295**	0.033
Lone parent	-0.118*	0.055
Other family type	0.479**	0.104
Age categories (35-44 is reference category)		
Aged 15-24	-0.170**	0.049
Aged 25-34	-0.154**	0.044
Aged 45-54	0.107**	0.039
Aged 55-64	0.224**	0.042
Ethnicity (Australian-born is reference category)		
Foreign born	0.040**	0.038
State of residence (NSW is reference category)		
Victoria	0.084*	0.037
Queensland	0.140**	0.038
S.A	0.120**	0.042
W.A	0.076	0.041
Tasmania	0.138*	0.056
N.T	-0.097	0.149
A.C.T	-0.086	0.067
Region of residence (Rural is reference category)		
Major city	-0.033	0.040
Inner region	0.035	0.044
Education (No high school is reference category)		
High school	-0.333**	0.044
Other post-school qualification	-0.281**	0.029
Bachelor degree or higher	-0.460**	0.040
Cut off Points		
C1	-0.105	0.060
C2	0.282**	0.060
C3	1.057**	0.061
Joint significance (p-value)	0.0000	
Pseudo R-squared	0.0262	
Sample (N)	10,279	

Note: Sample consists of people with long term health condition. * denotes significance at the 5% level; ** significance at the 1% level. The dependent variable is a categorical variable of severity. Categories are Non-disabling health condition, Disability with no restriction, Disability with medium/mild restrictions and Disability with severe restrictions. The variable is coded in numerical ascending order with the severity of disability. Cut points represent estimated thresholds of the latent severity variable

Alternately, it could also be that those with long term health conditions are less likely to be partnered (hence, when we observe the estimated steady state of singles being worse off, we can explain it by the lower chances of people in bad health to find a partner). Clearly the present data cannot interpret fully this result. When we look at educational attainment, we observe that persons who suffer more severe conditions are more likely to have low levels of education. Another result suggests that detrimental health conditions

of Australian born persons are less severe than those of foreign born individuals. It is not clear if this is the result of non-Australian born persons having arrived in Australia with worse health, or whether this inequality developed during their lives in Australia. Finally, an interesting result is that there appear to be regional differences in the prevalence of severity in long term health conditions. With New South Wales as the benchmark, Queensland, Tasmania and South Australia have a much higher and very precisely estimated prevalence of severely restricting long term health conditions (the coefficients are 0.14, 0.138 and 0.12 respectively). Victoria and Western Australia have a somewhat higher prevalence (the coefficients are 0.084 and 0.076) but they are not as precisely estimated.

2.5.2 Estimating the type of disability

The investigation of the association between socio-demographic characteristics and the type of long-term health conditions is undertaken via the estimation of a multinomial logit model of three outcomes: Sensory, Physical and Other type. Note that here, as in the estimation of severity in the previous section, the dependent variable is categorical (that is, it is not continuous). However, here the dependent variable cannot be given an ordinal interpretation (that is, its discrete values can not be given some order). Hence the estimation method we use is suitable for distinct outcomes that cannot be ordered in any clear way. We can use either a multinomial probit or a multinomial logit. The two models generate almost indistinguishable results when dealing with problems like the one at hand.[21] We have chosen the logit model. We use the SDAC03 variable *Main condition (*MAINCNDC*)* in order to construct the health condition types [22]. Note that this variable refers to the main condition reported. As it is shown in the next section, the HILDA data shows that when people are allowed to report more than one condition they do so. Indeed, it is

[21] When estimating events with very low probability, the two estimations may give slightly different results due to the difference in the tails of the logistic and the normal distributions. This is not an issue here.
[22]The categories of MAINCNDC and the way these are converted into the three reduced categories of Sensory, Physical and Other, are reported in appendix.

sensible to expect that people are often suffering from more than one long term health conditions, especially when they are of an advanced age.[23]

In its simplest form the multinomial logit model can be defined as the estimation of odds ratios of a specific outcome and a base outcome. More precisely, a multinomial logit model estimates how much more or less an outcome may be (when compared with the base outcome) in the presence of a certain characteristic. This model can be represented for an individual *i* who may suffer from a health condition *j* as follows

$$\log(p_{ij} / p_{i1}) = \beta_1 X_i \qquad (2)$$

Where log() is the natural logarithm operator, p_{ij} is the probability of having a health condition of type *j*, X_i contains all observed socio-demographic information for individual *i* and β_1 are the parameters to be estimated.

The estimated coefficients of Equation 2 are presented in Table 2.26 with Other Type of disability chosen to be the base category. There are very few results that are worth reporting from this estimation. The prevalence of Physical disabilities (as opposed to any other type of disability) is positively and strongly associated with age. There is a very weak positive association between age and Sensory disabilities, but only for those aged 55 plus. In conclusion, the estimation of type of disability using the SDAC data set is not particularly informative.

[23] This implies the presence of a certain level of measurement error in the data, as persons who are severely incapacitated by, say, two conditions, and are only allowed by the data generating process to report only one of the two,. They will overstate the reported one and understate the one that is not reported.

Table 2.26: Multinomial logit estimation of type of health condition

Variable	Type of health condition			
	Sensory		Physical	
	Coefficient	*Standard Error*	*Coefficient*	*Standard Error*
Male	0.962**	0.097	0.463**	0.047
Family type (Single is reference category)				
Couple with children	-0.112	0.128	0.087	0.064
Couple without children	-0.167	0.120	0.036	0.065
Lone parent	-0.359	0.243	-0.076	0.105
Other family type	-0.230	0.381	-0.357	0.218
Age categories (35-44 is reference category)				
Aged 15-24	-0.089	0.191	0.364	0.086
Aged 25-34	-0.160	0.171	0.277**	0.076
Aged 45-54	0.063	0.136	-0.417**	0.071
Aged 55-64	-0.253	0.150	-0.676**	0.079
Ethnicity (Australian-born is reference category)				
Foreign born	-0.079	0.146	0.011**	0.072
State of residence (NSW is reference category)				
Victoria	0.152	0.134	0.076	0.068
Queensland	0.121	0.135	-0.100	0.071
S.A	-0.239	0.166	-0.005	0.078
W.A	-0.287	0.164	-0.067	0.077
Tasmania	-0.273	0.204	-0.129	0.102
N.T	0.251	0.580	0.345	0.287
A.C.T	-0.334	0.262	-0.128	0.120
Region of residence (Rural is reference category)				
Major city	-0.330*	0.137	-0.074	0.074
Inner region	-0.147	0.147	-0.008	0.082
Education (No high school is reference category)				
High school	0.196	0.163	-0.014	0.080
Other post-school qualification	0.243*	0.108	0.034	0.056
Bachelor degree or higher	0.140	0.144	0.084	0.070
Constant term	-2.434**	0.213	-0.460**	0.111
Joint significance (p-value)		0.0000		
Pseudo R-squared		0.0355		
Sample (N)		10,279		

Note: * significant at 5%; ** significant at 1%. The base category is 'other' health condition type. The sample consists of persons with long term health conditions

3. Investigation of disability status and employment using the HILDA survey

3.1 Introduction

Section 2 presented a detailed picture of long term health conditions, disabilities, work and the associated socio-demographics using the SDAC03 survey, a large cross section sample representative of the Australian population in the year 2003. The main advantage of the analysis of the SDAC03 survey was that it allowed the investigation of individual factors in some detail due to the large number of questions asked in the survey and the large sample size. However, the cross sectional nature of the SDAC03 dataset (i.e. just one observation per individual) only allows the study of differences *between* individuals and does not allow the project to track individual changes *over time*. This section looks at the same disability issues from a different angle, by concentrating on over time change. In order to focus on change over time it uses a smaller sample that is also representative of the Australian population, but which traces its subjects over time. We use the first four waves of the Household, Income and Labour Dynamics in Australia (HILDA) survey which were sampled in the years 2001 to 2004. The HILDA survey is a new and modern addition to Australian surveys that is collected on behalf of the Australian Government and is now widely used in Australia for the study of change in a large number of research projects. Apart from providing detailed over time information for Australia, HILDA is also a most useful tool for developing international comparisons on issues of prime policy importance as it has been designed in a similar way to the German Socioeconomic Panel (GSOEP) and the British Household Panel Survey (BHPS). A detailed description of the HILDA survey can be found in Watson et al (2002). HILDA samples some 15,000 individuals in some 7,600 households on an annual basis (between September and March every year). The interviews collect information via a face-to-face interview and a self-completed questionnaire which the interviewees send to the interviewer after the interview has been completed.

One of the most innovative elements of the HILDA survey which is pertinent to this study is that, starting from the second wave, extra modules of data collection are added every year. These are additional questions that are distributed with the annual self-completion questionnaire and which contain questions that focus on a specific subject of interest. The first such module in 2002 focussed on wealth, the second in 2003 on retirement issues and the third in 2004 on disabilities. The objective of these additional modules has been to collect over time information on issues where recording change does not have to be on an annual basis (where change may be slower). They have, therefore, been designed so that they can be repeated in the future in order to generate the necessary panel structure in the data. This project utilises the fourth wave module (2004), which focuses on issues of disabilities with additional information on the relationship between work and disabilities. Although the panel analysis of this information will only become feasible after the second disability module has been collected (the date of which has not yet been decided), some of the information in the disability module can be used in conjunction with the existing more general over time information on individuals in order to study some of the dynamics in the relationship between disabilities and labour market outcomes.

The use of the HILDA survey allows this project to identify and study labour market movements, and identify return to work outcomes and other time-varying information related to people with disabilities. Another advantage stemming from the use of the HILDA survey is that the presence of repeated observations on individuals over time enables us to employ panel data techniques, whereby the possible effects of disability on labour force outcomes can be estimated net of unobserved heterogeneity that is time invariant.

Before we move to the specific questions this section will address, it is useful to explain the way panel techniques can be used to inform our understanding in this context. On the one hand, panel estimation is sometimes presented as a panacea for all empirical problems applied economists face. On the other hand, non-technical readers may be suspicious of the ‘trickery’ that may be contained in what is often stated to be a main

advantage in the use of panel estimation, namely, that it "controls for unobserved heterogeneity". As in most such cases, the truth lies somewhere in the middle. In essence panel data is the closest that we have in economics to the experimental data common in physical, medical and other sciences.[24] Panel estimation methods treat panel data as a natural experiment to understand observed variation in the data.[25] Panel estimation relies on the information of how the behaviour of each individual may change over time as a result of observed changes experienced by the very same individual, and then estimates relationships based on this information for all individuals who experienced a change. Using the relationship between wages and education as an (oversimplified, but clear) example, panel estimation is informed by observing person A increasing their education and then looking at how the wage of that same person A changed before and after their education level changed. Panel estimation then averages all these individual changes in education and income to provide an estimate of how we could expect any given increase in education to increase the wages in the group represented by the data. By contrast, cross section estimation does not observe individual changes. It relies exclusively on the information of how different individuals may be in different positions and have different characteristics at one single point in time. Put simply, when a cross section estimation is talking about the positive "effect" of education on wages, it is estimating the average wage difference between different people with different education levels in the sample. It is *not* estimating the wage increase an individual can expect after an increase in their education. Note that any inherent and unobserved differences in the cross section sample between those who are observed with more education and those who are observed with less education is totally ignored by estimation. In technical words, unobserved individual heterogeneity is not accounted for in cross section estimation. Not all is lost, however, for those who carry out cross section estimations. Controlling for unobserved heterogeneity using panel estimation is useful, but also has limitations: as soon as the panel becomes longer and unobserved heterogeneity starts changing with time, panel estimation runs into

[24] Another method, often disputed amongst economists, is the use of so called Instrumental Variables (IV). Both IV and panel estimation attempt to fill the gap resulting from the lack of true experimental data in economics. Experiments in economics have only been feasible in limited circumstances and data from such a source is not readily available.

[25] The interested but non-technical reader may wish to read the first two chapters of Deaton (1997) which contains one of the best intuitive but highly informative descriptions of comparative uses of data for microeconomic research.

trouble. Furthermore, evidence is emerging in the technical literature that certain problems such as measurement error, sample selection and others are far more complicated in their treatment in the panel context and that getting it wrong has more serious consequences in panel than in cross section estimation. So, there may still be cases where the use of cross section estimation may be the preferred method of estimation. To conclude, the user of applied research should be aware of the following: On the one hand, using panel data avoids the problem of unobserved individual heterogeneity that bedevils cross section analysis. On the other hand, panel analysis is largely based on the information provided by those who change status in one way or other (in technical terms the "switchers") and it is not as informative regarding these characteristics that do not change over time as cross section can be.[26] At the end of the day, which estimation will be appropriate and for which problem is a matter of judgment and both types of estimation have their uses and advantages.

3.2 The research questions

The research questions in this section focus on the disabled population using the specific (work related or otherwise) disability-related information present in the HILDA disability module (type, onset and severity of disability) alongside with the rich socio-demographic information in all waves in HILDA. Emphasis is also given to the way labour market participation changes over time and how these changes may be related to disability characteristics which appear in all HILDA waves.

[26] This example is, of course, an over-simplification of the issue. This is an area of continuous econometric development and increasing complexity. The emergence of high quality panel data is making these developments both more likely to continue and more likely to prove useful at the applied policy level.

The Research brief questions are presented in Box 3.1 below.

Box 3.1: Research questions using HILDA survey

- *Question 5: Characteristics of the people with disabilities who become unemployed? What can be done to help them to stay in, or return to the workforce?*
- *Question 6: Use HILDA waves 1-4 to describe the association between disabilities and labour market and personal characteristics, paying particular attention to the HILDA disability module in wave 4.*
- *Question 7: What disincentives influence people with a disability not to rejoin the workforce? Could this be due to finding work activities too hard to perform?*
- *Question 8: Once people with disabilities start searching for work, what are the obstacles they face? Are these obstacles coming from true productivity losses due to their disability? Or is their employers' perception of them as less productive? Information is also required on the extent to which the stated perception is accurate.*

In essence, these questions belong to the following two wider categories of research issues that have exercised labour and health economists for some time. First comes the general relationship between labour market participation and health. Do health conditions significantly alter labour force participation behaviour once the observed and unobserved factors are accounted for? Second comes the possibility that people with disabilities may be discriminated against in the labour market. We know that people with disabilities earn less than people without disabilities. But, if a wage gap between workers with and workers without disabilities is present, can we attribute this gap to observed characteristics related to one's productivity, or are there any other unobserved and possibly not related to productivity factors at play? These are issues of considerable complexity that this project will try to address.

3.3 The HILDA survey and the sample used in this research

In the first wave of the HILDA survey, 7683 households representing 66 percent of all in-scope households were interviewed, generating a sample of 15,127 persons who were 15 years or older and eligible for interviews, of whom 13,969 were successfully interviewed. Subsequent interviews for later waves were conducted one year apart. The HILDA survey contains detailed information on each individual's labour market activities, socio-economic conditions and health status.

In all four waves, people were asked if they have a long-term health condition by the question "…do you have any long-term health condition, impairment or disability that restricts you in your everyday activities, and has lasted or is likely to last, for 6 months or more?" While this question is being asked, specific examples of long-term conditions are shown on a card, such as, limited use of fingers or arms, or problems with eyesight that could not be corrected with glasses or contact lenses and other.

In consideration of the importance of health and disability related issues waves 3 and 4 asked for further disability related information with an increasing degree of detail. While in the first two waves it is only possible to determine if a person has a disability or not, waves 3 and 4 contain information on the timing of the onset as well as the type of disability. Furthermore, wave 4 includes questions that describe difficulties in daily activities and working life due to the presence of disabling conditions.

This section uses the first four waves of the HILDA survey where the necessary information is asked in all waves. For all comparisons between persons with and persons without disabilities we use information from all four waves. When we utilise information from the special disability module (on type, onset and severity of disability) we restrict the sample to information drawn from wave 4.

3.3.1 Sample characteristics

Table 3.1 presents demographic characteristics of the HILDA sample. The average age of persons with disabilities is higher by about 7 years for both males and females. The country of origin does not seem to make any difference. There are differences in the family type. Couples with dependents and singles without dependents are the family types most likely to include a person with disability. This is a very complex picture that warrants further investigation. Interestingly, home ownership is only a few percentage points lower for those with disabilities. Finally, a strong degree of polarisation can be observed regarding education. People with disabilities are less likely to have higher degrees (about 8 percent for males and 10 percent for females) and less likely to have completed year 12 at school (about 9 percent for males and 12 percent for females). The general picture that arises is that both males and females with disabilities leave school earlier and do not attend university. Instead, people with disabilities appear to be using other non-university post-school qualifications, and this seems to be their main avenue for human capital improvement. It is clear from these education differences that the labour market position of those with disabilities will be strongly influenced by the very different opportunities they are presented with due to their lower education endowment.[27]

[27] Note that the Tables that refer to all waves contain pooled information (that is, all individuals appear in the tables as many times as they have been interviewed). Given the low levels of attrition in the HILDA survey, this is not an issue of statistical concern.

Table 3.1: Demographic characteristics - Disabled vs. Non-Disabled

	Males				Females			
	Disabled		Non-Disabled		Disabled		Non-Disabled	
	Percent (%)	*S.E*	*Percent (%)*	*S.E*	*Percent (%)*	*S.E*	*Percent (%)*	*S.E*
Age (mean)	44.0	0.2	36.8	0.1	43.6	0.2	37.2	0.1
Aged 15-19	5.9	0.3	12.7	0.3	6.8	0.4	11.2	0.2
Aged 20-24	5.2	0.3	10.3	0.2	5.3	0.3	9.5	0.2
Aged 25-34	14.1	0.5	21.8	0.3	14.6	0.5	22.6	0.3
Aged 35-44	22.4	0.6	24.6	0.3	20.1	0.6	26.2	0.3
Aged 45-54	24.2	0.6	19.4	0.3	27.0	0.7	19.0	0.3
Aged 55 plus	28.1	0.7	11.3	0.2	26.2	0.7	11.6	0.2
Ethnicity								
ATSI	2.4	0.2	1.6	0.1	2.9	0.3	2.3	0.1
Australian-born	74.8	0.6	75.7	0.3	75.2	0.7	75.2	0.3
ESB	10.6	0.5	10.3	0.2	9.7	0.4	9.0	0.2
NESB	12.2	0.5	12.4	0.3	12.3	0.5	13.5	0.3
Region of residence								
Major city	54.4	0.7	63.1	0.4	58.3	0.7	62.2	0.4
Inner region	29.1	0.7	23.7	0.3	26.8	0.7	24.4	0.3
Outer region	15.3	0.5	10.7	0.2	13.4	0.5	11.1	0.2
Remote	1.1	0.2	2.1	0.1	1.3	0.2	2.0	0.1
State of residence								
N.S.W	29.4	0.7	29.9	0.4	29.0	0.7	30.4	0.3
Victoria	23.1	0.6	25.4	0.3	25.2	0.7	25.2	0.3
Queensland	20.7	0.6	20.2	0.3	19.8	0.6	20.1	0.3
S.A	11.3	0.5	9.0	0.2	11.5	0.5	8.9	0.2
W.A	9.5	0.4	10.1	0.2	8.4	0.4	10.1	0.2
Tasmania	4.2	0.3	2.6	0.1	3.7	0.3	2.8	0.1
N.T	0.2	0.1	0.7	0.1	0.5	0.1	0.7	0.1
A.C.T	1.5	0.2	2.1	0.1	2.0	0.2	1.9	0.1
Family type								
Couple with dependent/s	37.3	0.7	29.9	0.4	38.4	0.7	29.3	0.3
Couple without dependent/s	33.2	0.7	45.9	0.4	27.7	0.7	44.8	0.4
Single with dependent/s	4.0	0.3	4.0	0.2	11.0	0.5	10.8	0.2
Single without dependent/s	21.4	0.6	15.3	0.3	19.8	0.6	11.9	0.2
Other family type	4.1	0.3	4.9	0.2	3.2	0.3	3.3	0.1
Household size	2.9	0.0	3.2	0.0	2.8	0.0	3.2	0.0
Housing								
Home owner	67.1	0.7	71.0	0.4	65.8	0.7	71.2	0.3
Rent	30.6	0.7	26.7	0.3	31.7	0.7	26.9	0.3
Free board	2.3	0.2	2.3	0.1	2.4	0.2	1.9	0.1
Education level								
Degree or higher	12.4	0.5	21.0	0.3	15.4	0.5	22.5	0.3
Other post-school qualification	38.3	0.7	34.2	0.4	22.1	0.6	21.9	0.3
Completed Year 12	10.9	0.5	15.1	0.3	12.8	0.5	17.4	0.3
Not completed Year 12	38.4	0.7	29.7	0.4	49.8	0.8	38.2	0.4
Sample (N)	4,599		16,667		4,408		18,687	

Note: Pooled information over waves 1 to 4.

The comparison of the employment outcomes in Table 3.2 reveals sizeable differences between people with and without disabilities. More than 85 percent of non-disabled men in our sample are employed compared to only 55.6 percent of disabled men. Disabled persons have also high probability of being out of labour force. The percentages of people who are out of labour force are 38.4 percent for disabled men and 50.5 percent for disabled women.

Table 3.2: Labour market outcomes - Disabled vs. Non-Disabled

	Males				Females			
	Disabled		Non-Disabled		Disabled		Non-Disabled	
	Percent (%)	*S.E*	*Percent (%)*	*S.E*	*Percent (%)*	*S.E*	*Percent (%)*	*S.E*
Employed	55.6	0.7	85.6	0.3	44.9	0.7	69.3	0.3
Unemployed	6.0	0.3	4.8	0.2	4.7	0.3	3.8	0.1
Not in labour force	38.4	0.7	9.6	0.2	50.5	0.8	26.9	0.3
Sample (N)	4,599		16,667		4,408		18,687	

Note: Pooled information over waves 1 to 4.

Table 3.2 shows that the degree to which the labour market is accessed differently by persons with and without disabilities is not associated with gender. Table 3.3 reports the employment related information for those who are employed. There are no significant differences in the weekly hours of work between those with and those without disabilities. The main difference is between males and females. Persons with disabilities report considerably lower weekly wages than people without disabilities, especially so for males. The dispersion of wages is much higher for people with disabilities for both males and females, indicating that earnings inequalities are more pronounced amongst those with disabilities for both genders. There seem to be few differences between the numbers hired in different industries. Construction and Retail appear to hire less males with disabilities, presumably due to their specific needs. By contrast, Government and Defense, Education and Health and Community are the three sectors which appear to hire a larger proportion of persons with disabilities. It should be noted, however, that the sectoral differences are very small and the overall labour market picture is one where once a person with disabilities find themselves in the labour market they are pretty well

Table 3.3: Employment characteristics – Disabled vs. Non-Disabled

	Males				Females			
	Disabled		Non-Disabled		Disabled		Non-Disabled	
	Percent (%)	*S.E*	*Percent (%)*	*S.E*	*Percent (%)*	*S.E*	*Percent (%)*	*S.E*
Hours work (mean)	41.1	0.4	42.8	0.1	30.6	0.4	31.4	0.2
Weekly wage ($) (mean)	839.0	14.1	943.9	7.6	583.0	14.2	603.2	5.0
Full-time employed	81.0	1.0	85.8	0.4	49.5	1.4	52.0	0.5
Part-time employed	19.0	1.0	14.2	0.4	50.5	1.4	48.0	0.5
Industry Classification (ANZSIC)								
Agriculture, forestry and fishing	4.6	0.5	4.0	0.2	1.6	0.3	1.3	0.1
Mining	2.0	0.4	2.4	0.2	0.0	0.0	0.4	0.1
Manufacturing	16.2	0.9	16.5	0.4	5.5	0.6	6.0	0.3
Electricity, gas and water supply	1.7	0.3	1.3	0.1	0.5	0.2	0.2	0.1
Construction	8.3	0.7	9.7	0.3	1.1	0.3	1.5	0.1
Wholesale trade	5.0	0.6	5.2	0.2	3.8	0.5	2.4	0.2
Retail trade	10.2	0.8	12.9	0.4	15.0	1.0	15.6	0.4
Accommodation, restaurants and cafes	4.1	0.5	4.4	0.2	5.2	0.6	6.2	0.3
Transport and storage	5.0	0.6	5.6	0.2	2.3	0.4	2.0	0.2
Communication	3.4	0.5	2.6	0.2	1.4	0.3	1.5	0.1
Finance and insurance	1.8	0.3	3.2	0.2	2.7	0.5	4.4	0.2
Property and business	9.7	0.8	10.5	0.3	9.6	0.8	10.8	0.3
Government and defense	8.5	0.7	5.7	0.2	5.2	0.6	5.1	0.2
Education	6.7	0.6	5.8	0.2	16.5	1.0	14.9	0.4
Health and community	5.7	0.6	3.9	0.2	22.8	1.2	20.8	0.4
Cultural and recreational	3.9	0.5	3.0	0.2	3.4	0.5	2.8	0.2
Personal and other services	3.0	0.4	3.4	0.2	3.5	0.5	4.1	0.2
Occupation Classification (ASCO)								
Managers and administrators	8.3	0.7	10.2	0.3	3.5	0.5	4.3	0.2
Professionals	18.3	1.0	19.5	0.4	26.7	1.2	26.8	0.5
Associate professionals	14.1	0.9	13.9	0.4	11.8	0.9	12.5	0.4
Tradespersons and related workers	16.6	1.0	17.9	0.4	2.1	0.4	2.3	0.2
Advanced clerical and service workers	0.7	0.2	0.7	0.1	6.6	0.7	6.3	0.3
Intermediate clerical, sales and service	9.0	0.7	9.2	0.3	25.0	1.2	26.5	0.5
Intermediate production and transport	13.9	0.9	12.6	0.3	2.6	0.4	1.8	0.1
Elementary clerical, sales and service	7.8	0.7	6.5	0.3	14.4	1.0	13.5	0.4
Labourers and related workers	11.4	0.8	9.5	0.3	7.2	0.7	6.2	0.3
Sample (N)	1,515		9,109		1,279		8,529	

Note: Pooled information over waves 1 to 4.

indistinguishable in the data set from their counterparts without disabilities, with the sole exception of the lower pay of males.

The findings in Tables 3.2 and 3.3 outline an important aspect of the role disabilities play in the labour market. Table 3.2 shows that there are very large differences in labour force participation between those with and those without disabilities. By contrast, after we restrict the sample to people who are in paid employment (Table 3.3) we do not observe many dissimilarities. The implication here is that on the one hand disabilities affect employment status adversely, mainly by limiting access to work and, on the other hand, disabilities have little effect on the type or amount of work that individuals end up doing *once they have entered employment*. It may be tempting at this stage to make causal statement along the lines that disability causes lower participation, but does not have any effect once someone is employed. We should be careful however, because at this stage we are only looking at raw statistics without controlling for any underlying non-random selection effects or other processes which may affect the route into employment and the choice of type of employment and we are also not modelling the dynamic structure of labour market participation.

3.4 Labour market characteristics by type, onset and severity of disability using the disability module in HILDA

In this section, we present the employment characteristics of the sample by breaking it down into disability-related categories. The aim is to capture heterogeneity within the disabled population in terms of *type*, *severity* and *onset* of a long term condition.

3.4.1 Type of disability

The HILDA survey allows the identification of the following long-term conditions:

- Hearing condition (S)
- Speech problems (S)
- Blackouts, fits or loss of consciousness (O)
- Difficulty learning or understanding things (O)

- Limited use of arms or fingers (P)
- Difficulty gripping things (P)
- Limited use of feet or legs (P)
- A nervous or emotional condition which requires treatment (O)
- Any condition that restricts physical activity or physical work (e.g. back problems, migraines) (P)
- Any disfigurement or deformity (O)
- Any mental illness which requires help or supervision (O)
- Shortness of breath or difficulty breathing(O)
- Chronic or recurring pain (P)
- Long term effects as a result of a head injury, stroke or other brain damage (P)
- A long-term condition or ailment which is restrictive even though it is being treated (O)
- Any other long-term condition such as arthritis, asthma, heart disease, Alzheimer's, dementia etc (O)

Note : (S) indicates a Sensory disability , (P) indicates a Physical Disability , (O) indicates all Other Types of disability

We have aggregated the information in order to form four major disability categories: Sensory, Physical, Other (including disabilities that are related to mental health or 'other long term conditions' as specified above) and a category that contains all those who reported more than one category of disability, named Multiple.[28]

Table 3.4 presents labour force outcomes by disability type for males. We observe that the prevalence of multiple health conditions is associated with lower employment rates. More than 58 percent of respondents in this category do not participate in the labour force. Males who only suffer from Sensory disabilities are more successful in gaining/retaining employment compared to the other disability groups: 76.1 percent of males with Sensory disabilities are employed compared to 69.5 percent of males with Physical and 61.1 percent of males with Other disabilities. This finding is in line with both the international and the Australian literature (Hum and Simpson (1989),Wilkins (2004)) that fail to find a significant negative association between Sensory disabilities and labour market outcomes. Table 3.4 suggests that males who report more than one

[28] HILDA includes type of disability as a multiple response question. Hence, creating the *Multiple* category is necessary for identification. It should be noted that multiple conditions can be used as another means for identifying the severity of conditions.

disabilities (the Multiple category) have a much lower probability of being employed: only 37.8 percent of them report to be in paid employment.

Table 3.4: Labour market outcomes by disability type – Males, Wave 4

	Sensory		Physical		Other		Multiple	
	Percent (%)	*S.E*	*Percent (%)*	*S.E*	*Percent (%)*	*S.E*	*Percent (%)*	*S.E*
Employed	76.1	5.9	69.5	3.3	61.1	3.4	37.8	2.8
Unemployed	7.6	3.8	3.6	1.1	6.5	1.8	4.0	1.0
Not in labour force	16.3	5.1	26.9	3.3	32.4	3.3	58.3	2.8
Sample (N)	101		322		302		390	

We observe a similar pattern of participation in the female sample. Females with multiple disabilities have the lowest participation rates and females with sensory disabilities the highest; however, the number of observations in the Sensory disability cell is too low to be reliable. As with males, the presence of multiple disabilities is strongly associated with not being in paid employment: only 34.3 percent of this group are labour market participants (29.9 percent employed and 4.4 percent unemployed).

Table 3.5: Labour market outcomes by disability type – Females, Wave 4

	Sensory		Physical		Other		Multiple	
	Percent (%)	*S.E*	*Percent (%)*	*S.E*	*Percent (%)*	*S.E*	*Percent (%)*	*S.E*
Employed	51.2	7.8	53.4	4.0	56.2	2.9	29.9	2.6
Unemployed	13.0	5.4	3.4	1.0	3.4	0.9	4.4	1.0
Not in labour force	35.8	7.5	43.1	4.1	40.4	2.8	65.6	2.7
Sample (N)	53		285		379		420	

3.4.2 Age at onset of disability

In the 4th wave of the HILDA survey, each question that identifies the type of a long term condition is followed by a supplementary question that asks the year that the condition was first developed. Using this information and the age of the respondent we define the following age of onset categories: Child (0-14 year old), Youth (15-24 year old), Prime Age (25-44 year old) and Mature Age (45-64 year old).

Tables 3.6 and 3.7 combine the age of onset of health conditions with labour market status for males and females respectively. Mature age onset appears to be associated with the worst labour market outcomes. More than half of males and more than 60 percent of females who developed a disability in mature age do not participate in labour force. This finding is consistent with the findings of Wilkins (2004). On average, people who become disabled earlier in life are more successful in the labour market than persons who develop a long term health condition later in life. This finding suggests that individuals adapt to their disabilities better when they are younger and, presumably they have (in relative terms) more stamina and more time to do so. Persons who become disabled at childhood can still develop their human capital around their health limitations and find a job that matches those health limitations.

Table 3.6: Labour market outcomes by age of disability onset – Males, Wave 4

	Child (0-14)		Youth (15-24)		Prime Age (25-44)		Mature Age (45-64)	
	Percent (%)	*S.E*	*Percent (%)*	*S.E*	*Percent (%)*	*S.E*	*Percent (%)*	*S.E*
Employed	67.4	2.2	57.3	2.5	57.0	1.8	43.6	2.3
Unemployed	7.5	1.2	7.2	1.3	3.4	0.6	4.6	1.0
Not in labour force	25.1	2.0	35.6	2.4	39.6	1.7	51.8	2.3
Sample (N)	180		169		346		199	

Table 3.7: Labour market outcomes by age of disability onset – Females, Wave 4

	Child (0-14)		Youth (15-24)		Prime Age (25-44)		Mature Age (45-64)	
	Percent (%)	*S.E*	*Percent (%)*	*S.E*	*Percent (%)*	*S.E*	*Percent (%)*	*S.E*
Employed	50.7	2.2	53.7	2.7	47.6	1.8	35.4	2.3
Unemployed	9.1	1.2	5.1	1.2	2.5	0.6	2.0	0.7
Not in labour force	40.1	2.1	41.2	2.6	49.8	1.8	62.5	2.3
Sample (N)	232		139		337		200	

This is bound to be much harder at older ages, especially so after the age of 45. Note, however, that this does not mean that the onset of a disability during childhood is not associated with relatively poor labour market outcomes. Males who become disabled during their childhood are much less likely to be employed (67.6 percent) than non-

disabled males (85.6 percent, see Table 3.2), there is still a very large difference in participation of almost 20 percent.

3.4.3 Severity of disability

The 4th wave of the HILDA survey includes questions that can be used to construct disability severity levels for individuals. These questions ask about limitations on daily activities such as frequency of need of assistance or the necessity of using aids. This information is combined with the severity of disability definition provided by the ABS in order to construct the following severity levels:

- *Severe/profound:* unable to perform a core activity, or need assistance to perform a core activity at least some of the time.
- *Medium/mild:* do not need assistance, but have difficulty performing a core activity, or use aids or equipment to perform a core activity.
- *No restriction:* no restriction in core activities.

Table 3.8: Labour market outcomes by disability severity – Males, Wave 4

	No Restriction		Medium/ Mild		Severe/ Profound	
	Percent (%)	*S.E*	*Percent (%)*	*S.E*	*Percent (%)*	*S.E*
Employed	56.6	0.8	52.3	3.1	28.1	4.0
Unemployed	6.2	0.4	4.3	1.3	3.1	1.5
Not in labour force	37.2	0.7	43.4	3.1	68.8	4.1
Sample (N)	731		256		128	

Table 3.9: Labour market outcomes by disability severity – Females, Wave 4

	No Restriction		Medium/ Mild		Severe/ Profound	
	Percent (%)	*S.E*	*Percent (%)*	*S.E*	*Percent (%)*	*S.E*
Employed	46.0	0.8	40.7	3.1	28.0	3.3
Unemployed	4.7	0.3	4.9	1.4	3.8	1.4
Not in labour force	49.4	0.8	54.5	3.2	68.3	3.4
Sample (N)	705		246		186	

Tables 3.8 and 3.9 present the associations between labour force outcomes and the reported severity of disabilities. For both males and females, the likelihood of being out of employment is increasing in the severity of the disability. It is only 28 percent of males and females with severe disabilities that are in paid employment. The employment rate of persons with Medium/Mild restrictions are very close to those with No Restrictions for males (52.3 and 56.6 percent respectively), but still well below the paid employment rate of males without any disability. By contrast, there seems to be a difference in the employment rate for females between the category Medium/Mild and No Restrictions (40.7 and 46 percent respectively) and these rates are not as far off the paid employment rates of females without any disabilities. It is not clear why that may be the case. Note that, in general, males are more likely to be in paid employment. However, the gender differences in employment rates appear to be lessened as the severity of disability increases with employment rates being equal for males and females with severe disabilities. This is a result well worth further investigation.

3.4.4 Return to work for people with disabilities

The panel element of the HILDA survey permits the analysis of return-to-work outcomes as there are multiple observations of the same person over the years. We carry out this analysis and distinguish between persons with and without disabilities in order to examine their differences in terms of several socio-demographic characteristics in Table 3.10. Since this Table contains rather complicated information it is worth going over the way it has been constructed. All observations of a person in two consecutive years are treated as an independent pair of observations which we call a Year 1 and Year 2 pair. These Year 1 and Year 2 pairs will be: (2001 and 2002), (2002 and 2003), or (2003 and 2004) pairs. Hence, each survey respondent who has been present in the data for four (three/two/one) consecutive years, will contribute three (two/one/none) pairs of observations for Table 3.10. After all pairs have been defined, we split the sample into those with a disability in Year 1 and those without a disability in Year 1 (the first row in Table 3.10 with two separate columns). Next we split each of the two groups into two further groups those who are in paid employment in Year 1 and those who are not (the second row in Table 3.10 with four separate columns). Finally, we split each of the four

columns into those who are in paid employment and not in paid employment in Year 2 (the third row in Table 3.10 under the heading *Year 2 state* with eight separate columns of information numbered from 1 to 8 and marked either E or NE).

Table 3.10: Percentages of persons aged 15-64 entering or leaving paid employment - Waves 1 to 4, all consecutive years

	With Disabilities in Year 1				Without Disabilities in Year 1			
Year 1 state	Employed in Year 1 (E)		Not-Employed in Year 1 (NE)		Employed in Year 1 (E)		Not-Employed in Year 1 (NE)	
Year 2 state	1. E	2. NE	3. E	4. NE	5. E	6. NE	7. E	8. NE
Employment states	*Stay E*	*Leave E*	*RTW*	*Stay NE*	*Stay E*	*Leave E*	*RTW*	*Stay NE*
Male	57	50	53	44	53	34	44	25
Female	43	50	47	56	47	66	56	75
Age (mean years)	43	44	38	48	39	36	32	39
Australian-born	80	71	78	70	77	78	75	69
Foreign-born ESB (English speaking background)	10	16	8	10	10	7	8	8
Foreign-born NESB (non-English speaking background)	8	11	11	17	11	12	14	19
Major city	59	57	55	57	64	60	66	63
Victoria	26	24	21	21	26	24	24	25
Queensland	19	20	24	21	20	22	21	19
S.A	11	11	9	13	9	10	8	10
W.A	9	12	10	9	10	10	9	10
Tasmania	3	3	4	5	3	3	3	3
N.T	1	0	0	0	1	1	1	0
A.C.T	2	2	2	1	2	2	2	1
Couple with dependent children	37	40	35	40	31	27	24	28
Couple without dependent children	37	29	32	22	45	47	49	46
Single with dependent children	5	7	9	9	5	9	10	14
Home owner	75	67	61	61	75	65	65	67
With education	57	47	40	34	58	43	42	30
Work experience	87	76	70	55	88	76	75	57
Year 1 sample size by Disability status	6,151				23,477			
Year 1 sample size by Employment status	3,153		2,998		17,885		5,592	
Sample (N)	2,719	434	417	2,581	16,762	1,123	1,794	3,798

Note: Not employed sample contains individuals who are either unemployed or not in the labour force. Ideally, one would wish to examine the unemployed and the non-participants separately. Sample sizes were too small for this.

Each column now represents a specific type of transition from Year 1 to Year 2. For example, Column 1 refers to persons *With Disabilities*, who were *Employed in Year 1* and are also *Employed in Year 2*.[29] The row named *Employment* sums up the four main categories of interest:

Stay E:	those who were employed at both interview years.
Leave E:	those who left employment (Employed in Year 1 and not employed in Year 2).
RTW:	those who returned to employment (Not employed in Year 1 and Employed in Year 2).
Stay NE:	those who reported to be not employed at both interview years.

The proportion of males/females amongst persons with disabilities who move in and out of employment (Columns 2 and 3) is very close to 50/50. This is very different for persons without disabilities (Columns 6 and 7) where the proportion of males amongst those who move in and out of employment is 44 and 34 percent respectively. The average age of those who have reported to be not employed in both years is higher for both persons with and without disabilities (48 and 39 years respectively). Return to work appears to be more likely for those of a younger age (38 and 32 years respectively). Australian-born persons with disabilities are more likely to be in stable employment (Column 1 at 80 percent). The proportion of non-Australian born from an English speaking country of origin is high amongst persons with disabilities who leave employment (Column 2 at 16 percent). Also, the proportion of those who are not in employment in both years is proportionately higher for the non-Australian born from a non-English speaking country of origin (Columns 4 and 8 at 17 and 19 percent). A very complex picture arises when we look at how family structures may be associated with

[29] Before we discuss the contents of Table 3.10 we would like to point out that it is based on two simplifying assumptions in order to make its construction and presentation workable. First, it assumes that the disability status does not change between the two years. We know that this is not the case for a small number of people in the sample. Second, we do not consider what happens to employment status between the two sampling points in time. It may well be that someone who appears to be Employed in Year 1 and Employed in Year 2, spent most of the 12 months between the two interviews Not Employed. Although we know that both assumptions will miss out some information, we think the differences revealed in this table are sufficiently strong to not worry about the presence of some small measurement error.

mobility. Disabled persons who belong to couples with children are more mobile (Columns 2 and 3 at 40 and 35 percent) than their counterparts without a disability (Columns 6 and 7 at 27 and 24 percent). The opposite appears in couples without children (29 and 32 percent in Columns 2 and 3 for disabled and 47 and 49 percent in Columns 6 and 7 for non-disabled). Home ownership appears to be evenly spread and not associated to disability status and the short term labour mobility examined in this table. Finally, Columns 4 and 8 suggest that less (more) work experience and education are both positively (negatively) associated with staying not employed (employed). Somewhat counter-intuitively those who move in and out of work, appear to be closer to the average work experience and education levels. Closer examination however, would suggest that this makes sense. Those with the best work experience and education frequent the group of stable employment (Columns 1 and 5) with very similar proportions. Those with the worst work experience and education frequent the group of stable not-employment (Columns 4 and 8) also with very similar proportions. Those who move in and out of employment are in between, some due to chance, some due to lack of work experience, some due to lack of want and some due to combinations of the above. Their proportions (Columns 2, 3, 6 and 7) reflect this.

3.4.5 Employment difficulties faced by disabled people

The fourth wave of the HILDA survey includes a set of questions that aim to identify the type of employment restrictions faced by people with disabilities. These questions have only been answered by people who reported to have a health condition/disability and indicated that their health condition/disability limits the amount and/or type of work that they can do. The answers are present in Table 3.11. Between a third and a quarter of the respondents stated that they are permanently unable to work (Row 1), more so the males than the females. The higher proportion of males may be explained by the different type of work that each gender could have in mind when answering this question, with males more likely to be thinking of a manual job the performance of which could be more adversely influenced by a disabling condition. By far the largest proportion report that their condition restricts the type of job they can do (Row 2). The natural question at this stage is to ask whether another job could be feasible. About a quarter and a fifth of the

respondents report that their disabling condition makes it more difficult to change jobs and/or find a suitable job (Row 4).

Table 3.11: Type of employment difficulties faced by persons with disabilities

	Males		Females	
	Mean	*S.E*	*Mean*	*S.E*
1. Permanently unable to work	32.2	2.3	26.8	2.2
2. Restricts type of job can do	61.8	2.4	59.7	2.3
3. Restricts number of hours can work	39.1	2.4	51.1	2.4
4. Makes it more difficult to change jobs / get better job / find suitable job	25.5	2.1	20.3	1.9
5. Need additional time off work	16.8	1.8	16.6	1.8
6. Need ongoing assistance / supervision at work	5.3	1.1	5.2	1.1
7. Need special equipment / arrangements	7.7	1.4	8.2	1.4
8. Other	8.8	1.4	5.1	0.9
Sample (N)	586		547	

Note: This information is only available in the fourth wave of the HILDA survey. The sample consists of individuals with disabilities who have reported they experience employment difficulties. The SDAC variables that correspond to this information are emprca, emprcb,…,emprcj.

Row 3 reports that 39 percent of males and 51 percent of females think their disabling condition restricts the number of hours they can work. It is not clear why there would be such a marked gender difference here, but the percentage of females is remarkably high and worth further investigation. Finally the last three Rows 6, 7 and 8 show that a small percentage of the HILDA respondents are finding employment difficulties for reasons that could be tackled (e.g. the need for special equipment) but would have cost implications for the employer. The sample sizes are too small in these categories to look into them in more detail, but their presence should be noted.

Having established the main characteristics in the HILDA data, we now turn to multivariate analysis which will enable us to study the joint association between disabilities and surrounding factors and which will also allow a more comprehensive picture of the dynamics of disability and labour market outcomes and circumstances to be investigated.

3.5 Multivariate analysis using HILDA

This section uses multivariate econometric estimations in order to investigate the labour force participation rates as well as the hourly wages of people with disabilities. To do this it first estimates discrete choice models which are designed to measure the association between disability status and the probability of labour market participation. Section 3.4 begins with the estimation of a static model of labour market participation. A static model is one where over time change is not modelled explicitly and which treats all data as a snapshot of reality. The main purpose of the static estimations carried out here is to investigate a number of questions that can best be looked at through the use of the one-off disability module in the HILDA survey, where the information appears only once. The static estimations deal with the relationship between labour market participation and (i) employment difficulties, and (ii) type, severity and onset of disability.

Section 3.4 continues with a set of panel estimations of varying complexity that are designed to take into explicit account the panel nature of the HILDA survey (that is, the repeated observations of individuals over time). The first panel estimation investigates labour market participation and the relationship between disabilities and work experience and education in a simple panel context. The next step in the panel estimations is to introduce a lagged disability variable as well as a lagged participation variable in the right hand side of the participation equation in order to understand the dynamics of the process at hand. There are several econometric ways in which this can be done and we present and compare three types of results: pooled, panel and average partial effects. The participation estimations conclude with a discussion of the effects of (i) current disability status, (ii) past disability status and (iii) past labour market participation status on current labour market participation status. This is the closest that this report gets to investigating directly the return to work issue, given the available data. Finally, Section 3.4 concludes with an estimation of the wage gap between employees with and without a disability and the calculation of an Oaxaca-type wage gap decomposition. The purpose of this last

subsection is to investigate the degree to which pay differentials between those with and those without a disability can be explained by observed human capital differences or not.

3.5.1 Employment difficulties and labour participation outcomes

This section investigates the source of the adverse effects of disability status on labour market participation by looking at the role of employment difficulties reported by individuals with a disability. The data used in this section is drawn from the fourth wave of the HILDA survey where employment difficulties faced by disabled individuals have been reported.[30] As this information appears in the data only once, we can not include repeated observations of an individual and the analysis has to be of a static nature. This implies that we can not control for any unobserved heterogeneity that may be present in the data.

In order to analyse the conditional association of employment difficulties and labour force participation we employ an econometric approach which works on the assumption that behind the observed labour market outcomes (which are essentially discrete in the way they are observed, as a person will either work or not) lies a continuous unobserved labour market participation propensity. The higher this (unobserved and continuous) propensity to participate is, the more likely that the (observed and binary) labour market outcome will be that of participation rather than no participation.[31] The model to estimate can be written as follows:

$$y_i^* = X_i'\beta_1 + \beta_2 D_i + \beta_3 DIF_i + \varepsilon_i \qquad (3)$$

Where we observe $y_i = 1$ if $y^*_i > 0$

and $y_i = 0$ otherwise.

[30] Section 3.3.5 has already described these employment difficulties.

[31] An easy way to understand the theoretical underpinnings of this empirical model is to think of the theoretical model of job search under uncertainty, where individuals decide on their minimum acceptable wage (their reservation wage) and search for a job that offers at least that pay. All magnitudes in that context are continuous variables and it is predictions from this type of model that we test here. The discrete choice/latent variable models we use here are econometric adaptations necessary for estimation.

Where y^* is a latent (unobserved) variable that represents the utility gain (or loss) of individual i due to participating in the labour market, where if the utility derived from participating in the labour market is higher than that derived from not participating in the labour market (i.e. if y^* is positive) the individual will be observed to be a labour market participant, otherwise they will be observed to not be a labour market participant. The size of the difference between the two possible outcomes (to participate or not) cannot be observed, but this is not the issue, as it is the sign of this difference that will determine the labour market participation choice. The data does not observe y^* (the latent variable) it observes the binary variable y_{it} which represents this choice and is used for estimation. To sum up, where the individual participates, $y_i = 1$ (y^* is positive) and where the individual does not participate, $y_i = 0$ (y^* is zero or negative). This empirical specification leads to the conventional definition of a probit model where the dependent variable takes the values of either 1 or 0. Continuing with Equation 3 , X_i are demographic characteristics, D_i is a dummy variable reflecting the disability status and DIF_i is a set of binary variables that identify specific employment difficulties. Marginal effects derived from estimation are reported in Table 3.12. Marginal effects can be interpreted as probabilities. Given that the dependent variable is the probability of labour market participation, a marginal effect of, say 0.081 ((Model I, for the variable Male) has the very simple interpretation that males in this sample are 8.1 percent more likely to be labour market participants than females.

Table 3.12: Marginal effects of employment difficulties on participation - Wave 4

	(I) Marginal Effect	Standard Error	(II) Marginal Effect	Standard Error
Disabled	-0.176**	0.012	0.004	0.016
Male	0.081**	0.008	0.099**	0.009
Age categories (Age 35-44 is reference category)				
Aged 15-19	-0.244**	0.020	-0.259**	0.020
Aged 20-24	0.039*	0.016	0.017	0.017
Aged 25-34	-0.008	0.014	-0.023	0.014
Aged 45-54	-0.027*	0.014	-0.011	0.014
Aged 55 or older	-0.376**	0.020	-0.368**	0.022
Ethnicity (Australian-born reference category)				
ESB	-0.013	0.015	0.002	0.015
NESB	-0.053**	0.014	-0.038**	0.015
Area of residence (Rural and regional reference category)				
Major city	0.003	0.009	0.001	0.009
State of residence (NSW reference category)				
Victoria	-0.009	0.011	-0.009	0.012
Queensland	-0.010	0.012	-0.017	0.013
S.A	-0.054**	0.016	-0.050**	0.017
W.A	-0.008	0.015	-0.007	0.016
Tasmania	-0.052	0.026	-0.039	0.027
N.T	0.074	0.037	0.072	0.038
A.C.T	0.024	0.027	0.028	0.028
Family type (Single without dependent reference category)				
Couple with dependent/s	0.001	0.012	-0.013	0.014
Couple without dependent/s	-0.095**	0.013	-0.119**	0.014
Single with dependent/s	-0.136**	0.021	-0.173**	0.024
Living arrangement				
Home owner	0.034**	0.010	0.027*	0.010
Education				
Bachelor degree and above	0.089**	0.009	0.082**	0.009
Labour market activity				
Work experience	0.465**	0.016	0.431**	0.017
Disability related employment difficulties				
Have an employment difficulty			-0.159**	0.046
Permanently unable to work			-0.688**	0.040
Restricts type of job can do			-0.062	0.035
Restricts number of hours can work			-0.025	0.027
Makes it more difficult to change jobs / get better job / find suitable job			0.038	0.025
Need additional time off work			-0.057	0.039
Need ongoing assistance / supervision at work			0.047	0.047
Need special equipment / arrangements			-0.063	0.055
Other employment difficulties			-0.087	0.061
Pseudo R-square	0.2566		0.3003	
Sample (N)	10,495		10,495	

Note: *, ** denote statistical significance at 5% and 1% levels respectively.

Results from Table 3.12 draw our attention to the complexity of the relationship between disability and labour force participation. Two models have been estimated, one with and another without the variables measuring disability related employment difficulties, in order to allow for comparisons. Model I contains a single disability variable and does not include the employment difficulty variables and estimates that people with disabilities are 17.6 percent less likely to be labour market participants. In Model II we include the employment difficulties variables in the right hand side of Equation 3. The association between the single disability variable drops from 17.6 to 0.4 percent and loses its statistical significance completely. In its place the employment difficulties variables give a more detailed picture. Participation is much less likely for those who consider themselves *Permanently unable to work*. Then the rather vague variable of *Have an employment difficulty* appears to be as strong as the general disability variable was in Model I. The variable which indicates that the disability *Restricts type of job can do*, appears to be the only other one in the list of employment difficulties that is statistically significant (and this one is a borderline case at the10% level of significance only). Interestingly, all other employment difficulty indicators such as restrictions in the hours one can work, their mobility, the need for additional time and other such difficulties, do not appear to have a statistically significant association with labour market participation.

3.5.2 The role of onset, type and severity

The descriptive analysis presented in Section 3.3 shows that there are significant differences in labour market outcomes within the disabled population. We addressed one form of this heterogeneity in the previous section by looking at the role of employment difficulties. This section looks at heterogeneity within disabled people due to type, severity, or age at onset of their disability.

We estimate the joint association of type, severity and onset of disability on labour market participation using a cross-sectional probit model. Again we cannot control for unobserved heterogeneity, due to the fact that severity of disability has only been reported in wave four of HILDA. The probit model we estimate can be written like

Equation (3) by simply replacing variable *DIF* (employment difficulties) with a new set of variables measuring the type, severity and onset of disability.

$$y_i^* = X_i^{'}\beta_1 + \beta_2 D_i + \beta_3 DT_i + \varepsilon_i \qquad (4)$$

Where DT_i represents set of dummy variables for severity levels (severe, medium, and no restriction), age of onset (childhood, youth, prime age and mature age), and type of disability (sensory, physical, other and multiple). The variables y_i*, $y_{i,}$, X_i and D_i are defined in the same way as in the previous section. Marginal effects are reported in Table 3.13.

Findings in Table 3.13 suggest a level of heterogeneity within the group of persons with disabilities. The associations between the timing of disability onset and labour market outcomes resemble those found in Section 3.3. A disabled person is more likely to be a labour market participant if their health condition developed early during their childhood. Regression results suggest that once demographic characteristics (such as age etc.) have been controlled for, persons with prime age disability onset are as likely to be out of the labour force as persons with mature age disability onset. Multiple disabilities are strongly associated with worse labour market outcomes. For example, a disabled individual with multiple disabilities is 16 percent less likely to be a labour market participant compared to a person with a sensory disability only. Severity also plays a crucial role in labour market participation outcomes. A disabled person's likelihood to participate is reduced by 13.3 percent if they have a severe disability rather than a disability without restrictions.

Table 3.13: Labour force participation - Role of type, severity and onset (Wave 4)

	(III)	
	Marginal Effect	Standard Error
Disabled	-0.169**	0.052
Male	0.085**	0.008
Age categories (Age 35-44 is reference category)		
Aged 15-19	-0.264**	0.020
Aged 20-24	0.026	0.016
Aged 25-34	-0.017	0.014
Aged 45-54	-0.016	0.014
Aged 55 or older	-0.361**	0.021
Ethnicity (Australian-born reference category)		
ESB	-0.013	0.015
NESB	-0.053**	0.014
Area of residence (Rural and Regional reference category)		
Major city	0.001	0.009
State of residence (NSW reference category)		
Victoria	-0.011	0.011
Queensland	-0.013	0.012
S.A	-0.059**	0.017
W.A	-0.008	0.015
Tasmania	-0.048	0.026
N.T	0.076	0.037
A.C.T	0.028	0.027
Family type (Single without dependent reference category)		
Couple with dependent/s	-0.003	0.013
Couple without dependent/s	-0.101**	0.013
Single with dependent/s	-0.143**	0.022
Living arrangement		
Home owner	0.029**	0.010
Education		
Bachelor degree and above	0.086**	0.009
Labour market activity		
Work experience	0.456**	0.016
Disability onset (Childhood onset reference category)		
Youth onset	-0087**	0.031
Prime age onset	-0.155**	0.027
Mature age onset	-0.154**	0.032
Disability type (Sensory reference category)		
Physical	-0.001	0.037
Other	-0.058	0.042
Multiple	-0.168**	0.05
Disability severity (Severe reference category)		
Mild	0.092**	0.017
No restriction	0.133**	0.014
Pseudo R-Square	0.275	
Sample (N)	10,495	

Note: *, ** denote statistical significance at 5% and 1% levels respectively. Estimation uses wave 4 of HILDA survey.

The results presented to here indicate that there is considerable heterogeneity in the way persons with disabilities may be influenced by their disability when it comes to their

labour market participation propensity. Although these results are based on an extensive econometric specification, they are open to the criticism that they do not control for any systematic unobserved heterogeneity between those with and those without disabilities. To overcome this criticism, at least in part, we move on to making full use of the longitudinal element of the HILDA survey.

3.5.3 A panel data model of participation

A probit model is used in order to estimate the probability of labour force participation of an individual *i* at time *t.* Having introduced the time element the latent variable model can be written as follows:

$$\begin{aligned} y^{*}_{it} &= X'_{it}\beta_1 + P'_{it}\beta_2 + \beta_3 D_{it} + \beta_4 \left(P_{it} \times D_{it}\right) + \alpha_i + \varepsilon_{it} \\ y_{it} &= 1[y^{*}_{it} > 0] \end{aligned} \qquad (5)$$

As in the previous estimations, a number of explanatory variables X_{it} are used. In this instance we also include a dummy variable D_{it} indicating the disability status, along with variables of observed productivity (education and work experience) denoted by P_{it} . In order to examine the possibility of interactions between disability status and observed productivity, we include a number of interaction variables ($P_{it} \times D_{it}$). In particular we wish to estimate the degree to which higher education and/or work experience may influence the labour market outcomes of individuals with disabilities in a different way than they may do for the average labour market participant.

A time-varying error term ε_{it} is included in the estimation and is conventionally assumed to be distributed following the standard normal with mean equal to zero and a variance equal to one. The longitudinal nature of the HILDA survey enables us to control for individual unobserved heterogeneity by including a random term, α_i . The random term α_i represents time-invariant factors that are specific to the individual but unobserved by the data. The explicit inclusion of individual unobserved characteristics in the econometric specification is useful as it helps approximate and control for a number of

pertinent unobserved factors such as preferences towards work, ability, looks or other individual characteristics that are unknown to the data and the researcher, but that have the ability (if they are not appropriately controlled for by the regression) to bias the estimation results. As mentioned earlier in this section, this is one of the major advantages of using panel analysis.[32]

Table 3.14 reports the estimation results. We present two versions of Equation 3. First we model the propensity of labour market participation without the interaction terms and report the results under the heading Model I. Second, we model the propensity of participation including the interactions between disability status and observed productivity (approximated by education and work experience) and report the results under the heading Model II. We present our findings in the form of marginal effects which have an easy and natural interpretation. For example, the marginal effect of -0.123 in Model I next to the disability status variable has to be interpreted as follows: a person with a disability who has the mean characteristics in all variables that enter the estimation has a lower probability (the minus sign) of 12.3 percent (the marginal effect is -0.123) of being in the labour force than another person without a disability who also has the same mean characteristics in all variables (this is the often referred to as the *ceteris paribus* assumption, which in this instance amounts to the association between disability status and labour force participation estimated for the *average* person).

Model I results suggest that after controlling for observed and unobserved characteristics, being disabled has a strong negative association with participation. Note that, unlike the differences reported in Section 3.3, these differences are present after all demographic characteristics have been controlled for. That is, results say that when one takes two otherwise identical individuals the disabled one has a 12.3 percent lower probability of participating in the labour force than their non-disabled counterpart. Note that this

[32] In the econometric calculations that follow, the effect of these unobserved factors, is removed from the estimation before the parameters of interest (the effect of observed characteristics) are estimated. In order to do that, a probability distribution for α_i is assumed. Following the econometric literature on panel data probit models (see Wooldridge (2002a)), we assume that the effects α_i follow a normal distribution with zero mean and variance σ_α^2.

association between disability status and labour market participation is lower than what was reported in the descriptive tables of Section 3.3. The reason is that there are other differences between the two sub-groups (with and without disability) that account in part for the observed labour market participation difference. For example, the presence of disability is higher as age progresses (see Table 3.1), we see that the age effect is partially responsible for lower participation rates of disabled individuals as they are older on average than their non-disabled counterparts. Compared to the 35-44 age group, the 55+ age group are 55 percent less likely to participate. Other demographic variables have the expected sign and magnitude. For example, being born in Australia is associated with higher participation rates. Men are 7.9 percent more likely to participate than women with comparable characteristics. Living in a major city increases the participation propensity by a small but statistically significant 1 percent compared to living in a rural or inner region. The state of residence does not appear to be significant.

The model estimated in this subsection outlines the importance of education and work experience. Higher educational attainment substantially increases the probability of labour force participation. A bachelor or higher degree increases participation propensity by 6 percent for an average person. Work experience also appears to be important. Compared to an individual without any work experience, an individual who has worked continuously after leaving full time study is 24 percent more likely to be a labour force participant.[33] These estimates are in line with the general predictions of human capital theory where education is treated as an investment. The main question that arises in this context is the degree to which the relationship between labour market participation on the one hand and education and work experience on the other hand may be different between people with and without disabilities.

To address this question we re-estimate the participation model, including the interaction terms between the disability and productivity variables.

[33] Note, however, that the reference category is someone who has not worked at all since they left school, which may be why this marginal effect looks so big.

Table 3.14: Random effects probit model estimates - Waves 1 to 4

	(I)		(II)	
	Marginal Effect	Standard Error	Marginal Effect	Standard Error
Disabled	-0.123**	0.008	-0.184**	0.024
Male	0.079**	0.005	0.079**	0.005
Age Categories (Age 35-44 is reference category)				
Aged 15-19	-0.257**	0.019	-0.259**	0.019
Aged 20-24	-0.016	0.009	-0.016	0.009
Aged 25-34	-0.012*	0.006	-0.012*	0.006
Aged 45-54	-0.034**	0.007	-0.034**	0.007
Aged 55 or older	-0.521**	0.022	-0.524**	0.022
Country of Birth (Australian-born reference category)				
ESB	-0.005	0.008	-0.006	0.008
NESB	-0.081**	0.011	-0.082**	0.011
Area of Residence (Rural and Regional reference category)				
Major city	0.010*	0.004	0.010*	0.004
States (NSW reference category)				
Victoria	0.001	0.005	0.001	0.005
Queensland	0.003	0.006	0.003	0.006
S.A	-0.021*	0.009	-0.021*	0.009
W.A	-0.002	0.007	-0.002	0.007
Tasmania	-0.044*	0.018	-0.044*	0.018
N.T	0.044**	0.005	0.044**	0.005
A.C.T	0.018	0.011	0.018	0.011
Family Type (Single without dependent reference category)				
Couple with dependent/s	0.000	0.005	0.000	0.005
Couple without dependent/s	-0.079**	0.007	-0.080**	0.007
Single with dependent/s	-0.156**	0.017	-0.158**	0.018
Living Arrangement				
Home owner	0.023**	0.005	0.023**	0.005
Education				
Bachelor degree and above	0.060**	0.004	0.059**	0.004
Labour Market Activity				
Work experience	0.248**	0.012	0.242**	0.012
Interactions				
Disabled x Bachelor degree and above			0.017*	0.008
Disabled x Work experience			0.034**	0.013
σ_α^2	1.615**	0.0292	1.613**	0.0292
Log-Likelihood	-15,234.65		-15,228.88	
Sample (N)	44,371		44,371	
Number of individuals	14,472		14,472	

Note: * and ** denote statistical significance at the 5% and 1% levels respectively.

The interaction terms in Model II are both statistically significant and they emphasize the role of education and work experience in disabled individuals' labour market outcomes.[34]

[34]We estimate a similar relationship using interactions of disability related details (onset, severity and type) with education and work experience. The interaction terms were not significant. The results are included in the Appendix, Table A.

Model II suggests that a disabled individual with low education is 18.4 percent less likely to participate in the labour force compared to a non-disabled individual with similar education. Results are encouraging, as they indicate that there is no adverse effect on the way the labour market evaluates the education and the work experience of people with disabilities. On the contrary, estimates suggest that there is a small premium attached to both human capital attributes for persons with disabilities. If the same disabled individual has a bachelor or higher degree the lower participation propensity associated with the presence of disability reduces to (18.4-1.7=) 16.7 percent. The estimate of the 1.7 percent reduction is small but is very precisely estimated (a standard error of 0.008 which gives us a t-ratio of 2.125) The role of work experience is also clear. A continuous work experience after full time study is associated with an additional 3.4 percent increase (with a standard error of 0.013 which gives us a t-ratio of 2.615) in the participation propensity of a disabled person. Note that these interaction terms refer to effects that are only present for disabled persons, that is, they are *over and above* the estimated education and work experience effects for the whole sample. These two estimates suggest that people who encounter a long term health condition have a lower probability of ending up not participating in the labour market if they possess higher education and continuous work experience, the estimate being an increased probability of participation of (1.7 + 3.4 =) 5.1 percent. This result could be the manifestation of the more general and well established influence of human capital investment on labour market attachment: those with higher levels of investment have more to lose from leaving the labour market and will, therefore, need stronger adverse health shocks in order to do so. It could also be that the types of jobs that people with high levels of education do are less likely to be disrupted by the presence of a disability. This would certainly be the case with some jobs that require little physical effort and some disabilities. Finally, it could also be that employers employing employees with higher levels of education may be in general more accommodating towards their employees, and this could include their employees with disabilities.

3.5.4 A dynamic panel model of labour market participation and disability status

The model estimated in the previous sub-sections is now extended to include lagged values of some of the key variables (namely, the dependent variable of labour force participation and the disability status variable) in order to study the dynamic structure of labour market participation for persons with disabilities. Following the same notation we can write the participation decision for an individual *i* at period *t* as follows

$$y^{*}_{it} = \gamma y_{i,t-1} + X'_{it}\beta + \delta_1 D_{it} + \delta_2 D_{i,t-1} + \alpha_i + \varepsilon_{it}$$
$$y_{it} = 1[y^{*}_{it} > 0] \qquad (6)$$

Where y_{it} and y_{it-1} denote the current and lagged labour force participation status respectively, X_{it} is a kx1 vector of individual characteristic and D_{it} and D_{it-1} are the current and lagged disability status. This specification allows the direct effect of past disability status and past labour market status on current labour market status to be estimated. Finally, α_i captures the effect of unobserved heterogeneity. A similar set of explanatory variables is used as in the previous estimations.[35]

The possibility of the presence of state dependence introduces what is called the *initial conditions* problem. State dependence is the term used to describe the case where the past values of a variable of interest influence directly the current values of that same variable. In the present context, we would say that labour market participation shows state dependence if there is evidence that, for example, having been out of work this month decreases the chances of being out of work next month. It must be made clear that this is different from the statement that someone who works in an industry in recession and is out of work this month is less likely to be out of work next month. In this latter example, the cause of being out of work is the specific human capital in an industry in recession that reduces the chances of working next month and *not* the fact of being out of work this month. It is clear how the initial conditions problem relates to this situation and may

[35] In the absence of lagged dependent variable y_{it-1} and conditional on distributional assumption on α_i the likelihood function for the above model can be easily estimated by existing quadrature techniques (Butler & Moffit 1982).

hinder estimation. Simply put, the initial conditions problem amounts to our lack of knowledge on the data generating process which governs the generation of the first observation, y_{i1}. Treating y_{i1} as an exogenous variable is possible, however this would require the assumption that the first labour market choice of each individual observed by the researcher (in this case the labour market status of all HILDA respondents in the year 2001) is in fact the first choice ever made by each individual in the data set. This assumption is manifestly unrealistic and clearly too restrictive for the data source at hand. With the exception of the very young who were entering the labour market at the very start of a survey (2001 for HILDA), it is clear that survey data in general will observe respondents after a considerable amount of employment transitions have already happened. The HILDA survey is no exception to this shortcoming. Some more sophisticated estimation methods have been developed in the literature in order to handle this problem and are presented and are used for estimation below.

We estimate the relationship in Equation (6) by following two approaches: the Woodridge Model and the Pooled Dynamic Model. The former approach, was developed by Wooldridge (2002b), in order to overcome (at least in part) the initial condition problem by adding the first observed participation status as an additional explanatory variable. Equation (6) can be re-written to reflect this modification as follows:

$$y^{*}_{it} = \gamma y_{i,t-1} + X'_{it}\beta + \delta_1 D_{it} + \delta_2 D_{i,t-1} + \delta_3 y_{i1} + \alpha_i + \varepsilon_{it} \qquad (6.1)$$

where y_{i1} is the first participation status that is observed by the researcher. In Wooldridge (2002b) y_{i1} is used as a proxy of unknown initial conditions.[36] Clearly, the degree to which this approach will succeed will depend on the characteristics of the data and the problem at hand, including the relative length of the panel and the process that needs to be described. A short panel which only allows a correction that goes just few periods back, coupled with the attempt to estimate a slow moving process (where the

[36]Technical details of this approach are included in the appendix.

initial conditions lie further back in the past) will not give good results. The opposite combination will work much better.

One caveat of this approach is that the Wooldridge model requires strict exogeneity of all explanatory variables. That is, after controlling for current characteristics, none of the future or past values of the explanatory variables can affect current participation outcomes. We have to assume, for example, that future home ownership is not related to whether a person currently participates in the labour force or not. This would amount to limited future planning on behalf of the economic agents the model describes.[37] In order to relax this assumption, and to test the robustness of our findings, we also investigate the dynamic relationship between disability and labour force participation by using the Pooled Dynamic model. The Pooled Dynamic model allows us to violate the strict exogeneity assumption at the expense of omitting unobserved heterogeneity. The loss in using the pooled dynamic model is that we do not control for the effect of unobserved individual specific heterogeneity. The gain is that the estimates of the Pooled Dynamic model are consistent even if the explanatory variables are not strictly exogenous.[38] The Pooled Dynamic model can be written as follows:

$$y^*_{it} = \gamma y_{i,t-1} + X'_{it}\beta + \delta_1 D_{it} + \delta_2 D_{i,t-1} + \varepsilon_{it} \qquad (6.2)$$

Table 3.15 reports average partial effects (APE) that are obtained from the estimation of (6.1) and (6.2).[39] The APE estimates are readily interpretable as marginal effects of a unit change in the explanatory variables on participation probability.

The results highlight the dynamic nature of labour force participation and its relationship with disability prevalence. Lagged participation estimates are large in size and highly

[37] Like many assumptions that are used in order to make econometric estimation possible and the data at hand useable, this assumption will never be 100% correct. In practice, what matters is the degree to which not fulfilling an assumption may damage the performance of the estimation. To increase our understanding we often employ different estimators which make different assumptions and compare their results.
[38] The term consistent is used here in its statistical meaning. Simply put, this means that for large sample sizes the estimate is pointing towards the true population value. This is a so called large sample property.
[39] The details on how Average Partial Effects are calculated are included in the appendix. The APE measures are directly comparable to the marginal effects of the previous sections.

significant across models. The Wooldridge model suggests that, everything else being equal, an individual who was a labour force participant in the previous period is 25 percent more likely to participate in the labour force in the current period. The pooled estimate of the lagged participation is more than double, at about 56 percent. Both results suggest considerable state dependence of labour market participation. As was noted earlier, this is a result which is over and above all the human capital and labour market characteristics that are accounted for by the estimation.

A pertinent observation can be made at this stage about the two models that we have used and how they relate to the issue of state dependence. The Pooled model is by construction not affected by the problem of initial conditions, but it can be subjected to biases due to unobserved heterogeneity. In the present context, this would amount to unobserved characteristics that are more likely to be present by the level of participation. A typical example would be motivation and ability. It can be assumed that, if motivation and ability is unevenly distributed between those in and out of employment, the unevenness will take the form of persons with lower motivation and/or ability in the labour market being less likely to be working. As the data does not observe motivation and ability, the bias from omitting these two variables from the estimation's right hand side would inflate the coefficient of past labour market participation. Hence, if unobserved heterogeneity is an issue the estimate of 0.562 in the Pooled Dynamic model will be an over-estimate of the true relationship. Put simply, the Pooled Dynamic model over-estimates state dependence.

Now turn to the Wooldridge model. This estimation is designed to control for the impact of initial conditions. Take an example of initial conditions. A graduate who enters the labour market at a time when the economy is in severe recession stands worse lifetime income chances than a graduate who enters the labour market during a boom period.[40] The idea behind the design of this estimation is very simple: it uses the oldest information

[40] The reason for this is that, all other things equal (including the unobserved characteristics of the labour market entrant), a thriving economy provides better chances for building human capital than a depressed economy.

there is in the data and assumes it to be a good approximation of the (unobserved) initial conditions. In a long panel, this may be an acceptable approximation.

Table 3.15: Dynamic probit model estimates - Waves 1 to 4

	Pooled Dynamic		Wooldridge		Wooldridge (corrected)	
	Average Partial Effects	S.E	Average Partial Effects	S.E	Average Partial Effects	S.E
Lagged participation	0.562**	0.008	0.253**	0.016	0.243**	0.016
Disabled	-0.090**	0.008	-0.061**	0.009	-0.060**	0.009
Lagged disabled	-0.047**	0.008	-0.036**	0.008	-0.034**	0.008
Male	0.063**	0.005	0.049**	0.006	0.048**	0.006
Age categories (Age 35-44 is reference category)						
Aged 15-19	-0.053**	0.011	-0.009	0.011	-0.065	0.063
Aged 20-24	0.014	0.010	0.009	0.010	-0.031	0.043
Aged 25-34	-0.019*	0.008	-0.015*	0.008	0.005	0.020
Aged 45-54	-0.022**	0.008	-0.016*	0.009	-0.008	0.023
Aged 55 or older	-0.233**	0.013	-0.164**	0.016	-0.054	0.040
Ethnicity (Australian-born reference category)						
ESB	-0.006	0.009	-0.003	0.009	-0.004	0.009
NESB	-0.037**	0.008	-0.026**	0.009	-0.028**	0.009
Area of residence (Rural and Regional reference category)						
Major city	0.000	0.006	0.001	0.006	-0.010	0.015
State of residence (NSW reference category)						
Victoria	0.001	0.007	0.002	0.007	0.003	0.007
Queensland	-0.004	0.007	-0.005	0.008	-0.004	0.008
S.A	-0.024**	0.010	-0.014**	0.010	-0.013	0.010
W.A	-0.008	0.009	-0.008	0.010	-0.005	0.010
Tasmania	-0.024	0.016	-0.019	0.017	-0.016	0.017
N.T	0.037	0.027	0.024	0.026	0.021	0.027
A.C.T	0.011	0.018	0.007	0.019	0.009	0.018
Family type (Single without dependent reference category)						
Couple with dependent/s	-0.005	0.008	-0.003	0.008	0.015	0.018
Couple without dependent/s	-0.052**	0.008	-0.034**	0.008	-0.095**	0.022
Single with dependent/s	-0.062**	0.013	-0.035**	0.013	-0.097**	0.036
Living arrangement						
Home owner	0.021**	0.006	0.014**	0.006	0.029**	0.014
Education						
Bachelor degree and above	0.054**	0.006	0.040**	0.006	0.084**	0.023
Labour market activity						
Work experience	0.204**	0.010	0.300**	0.011	0.208**	0.031
Initial participation	N/A		0.183**	0.015	0.184**	0.015
σ_α^2	N/A		0.567**	0.028	0.577**	0.026
Log-Likelihood	8,277.87		7,720.71		7,661.43	
Sample (N)	28,517		28,517		28,517	
Number of individuals	11,156		11,156		11,156	

Note: * and ** denote statistical significance at the 5% and 1% levels respectively. The models are identified for individuals that are interviewed in at least two consecutive waves.

In a short panel (like the one used here which contains only four waves of HILDA) this may be questioned. If the Wooldridge estimator is not doing a good job (that is, if it is not controlling for the initial conditions satisfactorily) then the influence of past participation on current participation will be under-estimated (that is the true value of the effect of past on present values will be higher). Put simply the Wooldridge model under-estimates state dependence.[41] In view of the possible mistakes that the two different estimation methodologies may make, we compare the two estimates. The Pooled is 0.562 and, if wrong, it will be lower. The Wooldridge is 0.253 and, if wrong, it will be higher. Clearly, combining these two results generates a much more precise estimate as it indicates that the estimated state dependence lies between 0.25 and 0.56.[42] Clearly, this result indicates that either the initial conditions assumption or the unobserved heterogeneity assumption (or both) are violated to a degree. Whether the true estimate lies closer to 0.25 or closer to 0.56 will depend on which of the two assumptions is violated most in the data at hand and the labour market process estimated. Having established some feasible estimates of state dependence, we now turn to the main focus of this section, the relationship between disability status and labour market participation.

The estimation of dynamic models re-emphasises the inverse relationship between disability status and labour market participation that was described in Section 3.3 and estimated in the static models in Section 3.4.3. Now, using panel estimation we can talk about detecting a direction of causality, and start talking about the adverse *effect* of disability on labour market participation. Note, however, that the negative estimate of the effect of disability is much lower in the dynamic models (9 percent and 6 percent for the Pooled and the Wooldridge models respectively) than the association estimated in the static models (12 percent, see Model I in Table 3.14). The difference between the findings of the dynamic and static models is worth emphasizing. The dynamic models suggest that a significant portion of low participation rates of disabled individuals may be

[41] We also estimated dynamic models using the approach suggested by Heckman (1981). This approach requires a participation equation for wave one to be estimated jointly with the main dynamic equation. The results were not significantly different from the Wooldridge model results.

[42] In essence looking at the two models together has converted the two independent two-sided significance tests into a single confidence interval between 0.253 and 0.562. This is not a formal statistical proof, but, given the good statistical attributes of both estimation methods used, it is a very good indication as to the values that we can expect state dependence to take.

explained by their past labour force outcomes. That is, one of the reasons why people with disabilities may perform worse in the labour force may not be entirely due to their current limitations (attributable to their current disability status). Instead, it could be that their lower participation rates are also the product of their past labour market failures. One possibility is that these past failures can naturally be due to past disabilities (more on the effect of past disability below). Another possibility is that people who currently suffer from disabilities, also lack persistently in certain characteristics that are valued by the labour market and that their lower participation propensity may be due (at least in part) to these persistent characteristics. In this last case the effect would be over and above the negative effect of disabilities themselves. The estimates of lagged participation indicate that the incidence of past non-participation directly lowers the probability of current participation.

The inclusion of the lagged disability variable has been made in order to investigate the dynamic effect of disability status on labour force participation. We see that in both models past disability is shown to lower the probability of current labour force participation. The Wooldridge estimates imply that the participation propensity of a person reporting current disabilities is reduced by further 3.4 to 3.6 percent if they also reported a disability in the previous interview. The Pooled Model estimate of lagged disability effect is -4.7 percent.

Throughout the Section 3.4, we emphasised the role of education and work experience in lowering the adverse effect of disability on labour force participation. The results from the dynamic models confirm these findings (the estimated increases in the likelihood of participation with respect to education and work experience measures are approximately 6 and 24 percent respectively). These results imply that education may be an effective way for overcoming the labour market disadvantages that are generated by disabilities. They also suggest that work experience is crucial in reducing any disability-generated participation penalty. This result could imply that people with disabilities can be well served by being helped to not get out of the labour force when their long term health condition arises, as their exit from employment will reduce their future work experience

and will also allow the effect of lagged participation to kick in. Taken together the education and work experience variables are shown to have a considerable effect on labour force participation. Other control variables such as age, country of birth, and state of residence exhibit marginal effects that are similar in magnitude and significance in the Pooled and the Wooldridge models. This means that our findings are not an artifact of restrictive statistical assumptions but they are very robust across different model specifications and estimation methodologies.

3.5.5 Estimating the wage gap between persons with and without disabilities

An earnings decomposition model

The objective of this section is to investigate the differences in hourly pay between persons with and without a disability. The underlying assumption is that, other things being equal, disability status should not make any difference regarding the pay of labour market participants. This is a normative statement and whether it holds is a testable empirical hypothesis. To test it, we would need to see if there are any wage differences between persons with and without disabilities *after we have controlled for their overall human capital (productivity) differences*.[43] If we find that there are, we will have to consider the possible origins of these differences and their policy implications.

A conventional human capital model of wage determination is presented in Equation 1. It uses a Beckerian earnings function as its starting point (Becker 1971). Wages are taken in their logs, ln(W), in order to reflect their diminishing marginal utility, X contains all variables that may be associated with wages, β is a vector of coefficients to be estimated and ε is the conventional random error term. Put simply, W and X is our data and β will be estimated in order to give us our best guess of the relationship between W on the one hand and all X variables jointly on the other hand.

[43] It should be noted that there is also a normative element in this method as well. By assuming that controlling for the existing human capital differences is an adequate control for unacceptable wage differentials, one makes the assumption that the opportunities for the acquisition of human capital is equal for people with and without disabilities. This is an assumption that may be challenged. There is no clear-cut line at which one can stop arguing that the very process that generates outcomes that may be considered discriminatory may be in itself discriminatory. Given that there is little empirical research on these issues in Australia to guide this report we assume a simple case and point towards the need for further developments in the future.

$$\ln(W_s) = X_s^{'}\beta_s + e \qquad (6)$$

The subscript *s* denotes the disability status and takes the values *d* for persons with a disability and *nd* for persons without a disability and *p* when the full sample containing both persons with and without a disability is estimated. A conventional and simple method for estimating the presence or not of a disabled/non-disabled wage differential would be to estimate Equation 6 for the full sample and include a disability status indicator variable, that is, a variable that takes the value 1 for persons with and 0 for persons without a disability. This would be a very crude test because it would make the assumption that all other *X* variables have the same associations the wage variable *W*, for both persons with and without a disability, an assumption that can be unduly restrictive and not supported by the data[44]. The natural extension of the analysis of wage differentials would be to allow all variables to be different between persons with and without disabilities. There is a long literature as to how this can be done and how estimation results can be used to understand wage differentials. The origin of this research stems from the gender pay equality literature which first appeared in the United States in the 1970s in response to the need for evidence in litigation (see the pioneering works of Oaxaca 1973 and Blinder 1973). The main outcome in that literature was the development of new decomposition methods which split the observed wage differential between two groups of interest:

(i) the part that is due to observed human capital and other differences and

(ii) the part that cannot be explained by any of the observed differences.

Many different interpretations have been provided in the literature for the resulting decomposition parts. The essential characteristic is that this decomposition method splits the wage differential in the part that the model explains and the part that the model does not explain. The explained part appears under several names, including human capital, observed, productivity, endowment, non-discriminatory. The unexplained part also appears under several names, including discrimination, market, unobserved. The name

[44] It is advisable that preliminary estimations are carried out in such cases to test this assumption. Pooled estimations indicated that this assumption cannot be sustained in the present context.

often relates to the context of the research. This research uses the terms explained and unexplained in order to allow the readers to attach what they consider to be the appropriate interpretation. Despite the fact that decomposition methods have undergone considerable development in terms of sophistication and generality, there are still several unresolved issues, including the interpretation given to the unexplained part of a wage differential, the importance of controlling for unobserved heterogeneity using panel data and the degree to which sample selection may influence results and their interpretation.[45]

The econometric results from wage decompositions and their interpretation depend on the assumption of what the wage would have been if there were no unexplained differences. Take two groups, one with higher average pay then the other. Use males (higher pay) and females (lower pay) for exposition purposes. Earlier studies used the Oaxaca-Blinder decomposition technique, which makes the restricting assumption that, in the absence of unobserved human capital differences (assumed to be the result of gender discrimination in the early studies), one of the two extreme alternatives would ensue: either (i) males would receive a pay cut, all the way down to the level of female pay, or (ii) females would receive a pay rise, all the way up to the level of male pay. These two cases could be thought of as the boundaries of how existing wages would be re-shuffled in the economy in the absence of discrimination. While the Oaxaca-Blinder discrimination estimates generated by (i) and (ii) are different, due to the non-linearities involved in their estimation, it was shown later in the literature that they do not form the boundaries of all possible discrimination estimates (Neumark 1988, Oaxaca & Ransom 1988 and 1994). This finding reduced the intuitive appeal and potential usefulness of the Oaxaca-Blinder model considerably and gave rise to the development of weighted decompositions.

This research uses the Oaxaca & Ransom (1988) and (1994) pooled model decomposition technique which is based on estimating Equation 1 for three different samples: people with disabilities, people without disabilities and the complete pooled sample. The pooled

[45] Although investigating these issues in depth may lie beyond the scope of this research, it is noted that there is considerable scope for advanced econometric research in this area for the Australian economy in two main ways. First, the HILDA survey contains information that can be unique in the international research scene and second, the policy issues that could be informed by this research have not been fully explored in the Australian literature.

model has been developed as a consequence of appreciating how useful but how limiting at the same time the empirical Oaxaca/Blinder (1973) decomposition models were. Continuing with our example of male-female wage gaps, note the role played by the pooled estimation in this context. Pooling males and females together and estimating their earnings as if gender did not exist, provides estimates of the actual remunerative value attached by the (assumed non-discriminatory) market to observed characteristics. Crucially, using the pooled model assumes a non-discriminatory wage structure, which on average coincides with the actual wage structure and a non-discriminatory labour market, which pays the same *total* wages as the actual market. There is an important advantage of the pooled model in that one does not have to assume that, in the absence of discrimination, total wages paid in the market would have to be other than the currently paid total wages. After all it is only sensible to expect that reducing discrimination would not influence total demand for labour in the economy in any wider way.

Coming back to the wage differences between persons with and without a disability, three estimations of Equation 1 are carried out. After the three estimations have been carried out (with disability, without disability and pooled) the resulting estimates are combined to generate the following decomposition of the wage gap $WG = \ln W_{nd} - \ln W_d$:

$$WG = \overline{X}'_{nd}(\beta_{nd} - \beta_p) + \overline{X}'_d(\beta_p - \beta_d) + (\overline{X}_{nd} - \overline{X}_d)'\beta_p \qquad (7)$$

Terms 1 and 2 of the right hand side of Equation 7 represent the unexplained part of the wage gap and term 3 represents the explained part. In the presence of a wage gap of about 7 percent in the raw data, a large explained part of the 7 percent wage gap would imply that labour market participants with disabilities have observed characteristics that according to the market are of lower quality. Note that this difference (Term 3 in Equation 7) depends on the difference in the observed characteristics $(X_{nd} - X_n)$. By contrast, a large unexplained part of the 7 percent wage gap would imply that the characteristics of both persons with and without disabilities are similar, but that these characteristics are remunerated by the market differently. Note that this difference would imply that the term $(X_{nd} - X_n)$ would be close to zero and that Terms 1 and 2 make most

of the wage gap. Note that the size of Terms 1 and 2 depends on differences in the estimated coefficients $(\beta_{nd} - \beta_p)$ and $(\beta_p - \beta_d)$. Having set up the econometric model for the estimation of the wage differentials between persons with and without a disability we now turn to the presentation and discussion of the results.

The detailed results from the estimation of Equation 2 three times (with disabilities, without disabilities and pooled) can be found in the Appendix. The objective having been to control for as much of the observed variation in wages, an extensive model was estimated. Results appeal to intuition and, as expected, the earnings of people without a disability can be explained in a more precise way by the estimations. In the remainder of the section we present the decomposition of the earnings difference between the two groups of persons with and without disabilities. The raw gap is 7 percent.

Table 3.15: Oaxaca Ransom Wage Gap Estimates

Total Gap	Explained Gap	Unexplained Gap
$WG = \ln W_{nd} - \ln W_d$	$(\overline{X}_{nd} - \overline{X}_d)' \beta_p$	$\overline{X}'_{nd}(\beta_{nd} - \beta_p) + \overline{X}'_d(\beta_p - \beta_d)$
0.0700	0.0068	0.0632
	9.7%	90.3%

The decomposition of this gap reveals that the observed characteristics explain only 9.7 percent of this gap, leaving 90.3 percent unexplained. Given that the regressions that were used to generate these decompositions contain most conventionally used human capital variables, other explanations have to be sought. The estimation results clearly suggest that the 7 percent lower average wage of those with disabilities is not due to the variables that were controlled for by the regression. These include age, gender, work experience, education, rural residence, state or territory, marital status and children, a time trend, as well as industry sector. There are two explanations that can be offered here. First, it is possible that there is an unobserved systematic difference between the productivity of persons with and without disability which the data simply does not capture. It is often argued in labour economics that such unobserved heterogeneity can

result in pay differences which is observed in the raw data (in our case the wage gap) but cannot be explained by the estimation. Such differences in the present context could be due to functional and other difficulties that are not recorded in the data but are clearly seen in the workplace and result in lower pay. The problem of controlling for unobserved heterogeneity has not been resolved satisfactorily as yet in the decompositions literature. Second, it is possible that persons with disabilities may be discriminated against in the labour market and are paid below what an equally well qualified person without a disability would have been paid for the same job. There is a large literature on pay discrimination in the labour market, the presentation of which is beyond the scope of this research. The dynamics of disability status and the resulting pay are an area of active research by the authors of this report. The main conclusion from this section is that there are suggestions that notwithstanding the heavy selection into employment that takes place between persons with and without disabilities (note that the participation rate for those with disability is about 62 percent and that for those without is about 75 percent) a very large proportion of the observed wage gap between employed persons with and without disabilities is not due to differences in their conventional human capital characteristics. Employed persons with disabilities appear to be paid less than their non-disabled counterparts by about 7 percentage points without us been able to trace the origin of this difference in the data. It is clear that further research is needed in this direction.

4. Conclusion

This project examined the socio-economic characteristics and labour market conditions of people with disabilities in Australia in the early 2000s. Two major sources of information were used for the analysis, the ABS Survey of Disability, Ageing and Carers (SDAC03) and the Household, Income and Labour Dynamics in Australia (HILDA) survey. The larger sized SDAC03 data set allowed detailed cross-section analysis, whilst the smaller sized HILDA data set allowed the examination of changes over time. The study utilised a combination of descriptive and multivariate regression analyses estimating a number of cross-sectional and panel models to fit the potential of each of the data sets used.

The analyses concentrated on the associations between individual and labour market characteristics with the presence and type of disability. People with disabilities have been found to have lower levels of labour market participation, and also earn less. Their human capital is less developed and what they possess is less appreciated by the labour market. The main problem that people with disabilities face in the labour market is overcoming the obstacles of participation.

Participation: There are sizeable differences in the labour force participation rates between people with and without disabilities. People with disabilities are far less likely to be in employment. More work experience and higher education is associated with higher labour force participation rates for both people with and without a disability.

Wages: An analysis of hourly wages estimated an approximate wage gap of 7 percent between workers with and without disabilities. Most of this gap cannot be explained by the observed characteristics that drive individual productivity.

State dependence: The relationship between labour force participation and the prevalence of disabilities is shown to be highly dynamic. Higher individual labour force participation propensities in the past are strongly associated with higher individual participation propensities in the future. A significant portion of the lower participation propensities of people with a disability can be explained by their past labour force outcomes. The effect of current and past disabilities on labour force participation is significantly negative. Being disabled for longer *in itself* significantly decreases the probability of participation.

A large number of more detailed and specific results have arisen from the analyses. These include the following. People who become disabled at an early age are more successful in their lifetime labour market experiences than people who become disabled at later stages in their lives. For both men and women likelihood of being out of work is increasing in severity and in the prevalence of multiple disabilities. Employed people with disabling conditions are more likely to be self-employed and less likely to be in paid employment compared to people without disabling conditions.

5. References

Arulampalam, W. (1999) "A Note on Estimated Coefficients in Random Effects Probit Models", *Oxford Bulletin of Economics and Statistics*, 61: 597-602.

Blinder, A. (1973) "Wage discrimination: Reduced form and structural estimates", *Journal of Human Resources,* 8: 436-455.

Becker, G. (1971) *The Economics of Discrimination*, Revised Edition Chicago: University of Chicago Press.

Butler, J. and Moffitt, R. (1982) "A Computationally Efficient Quadrature Procedure for the One Factor Multinomial Probit Model", *Econometrica*, 50: 761-764.

Deaton, A. (1997) *The Analysis of Household Surveys: A Microeconomic Approach to Development Policy*, Johns Hopkins University Press: Baltimore, Maryland.

Guilkey, D. and Murphy, J. (1993) "Estimation and testing in the random effects probit model", *Journal of Econometrics*, 59(3): 301-317.

Heckman, J. (1979) "Sample Selection Bias as a Specification Error", *Econometrica*, 47: 153-61.

Heckman, J. (1981) "The Incidental Parameters Problem and the Problem of Initial Conditions in Estimating a Discrete Time-Discrete Data Stochastic Process" in Manski, C. and McFadden, D. (eds.), *Structural Analysis of Discreet Data with Econometric Applications*, London: MIT Press.

Hum, D. and Simpson, W. (1996) "Canadians with disabilities and the labour market", *Canadian Public Policy*, 22: 285–99.

Mavromaras, K., Lee, W. and Black, D. (2006) "An Examination of Welfare Transitions Using the First Three Waves of the HILDA Survey", Melbourne Institute Report prepared for Australian Government Department of Employment and Workplace Relations under the Social Policy Research Services Agreement.

Neumark, D. (1988) "Employers' discriminatory behavior and the estimation of wage discrimination", *Journal of Human Resources,* 23: 279-295.

Oaxaca, R. (1973) "Male-female wage differentials in urban labor markets", *International Economic Review,* 9: 693-709.

Oaxaca, R. and Ransom, M. (1988) “Searching for the Effect of Unionism on the Wages of Union and Non-union Workers”, *Journal of Labor Research,* 9: 139-148.

Oaxaca, R. and Ransom, M. (1994) “On discrimination and the decomposition of wage differentials”, *Journal of Econometrics,* 61: 5-21.

Watson, N. and Wooden, M. (2002) *“The Household, Income and Labour Dynamics in Australia (HILDA) Survey: Wave 1 Survey Methodology”,* HILDA Project Technical Paper Series No 1/02, Melbourne Institute of Applied Economics and Social Research, University of Melbourne.

Wilkins, R. (2004) “The effects of Disability and Labour Force Status in Australia”, *The Australian Economic Review*, 37(4): 359–82.

Wooldridge, J. (2002a) *Econometric Analysis of Cross Section and Panel Data*, MIT Press: Cambridge, MA.

Wooldridge, J. (2002b) “Simple Solutions to the Initial Conditions Problem in Dynamic, Nonlinear Panel Data Models with Unobserved Heterogeneity”, *Journal of Applied Econometrics,* 20: 39-54.

6. Appendix A2

Categories of Variable INCRECBC:

1 Australian Age Pension
2 Newstart Allowance, Sickness Allowance or Youth Allowance
3 Mature Age Allowance, Wife Pension, Carer Payment, Widow Allowance (Widow B Pension), (Centrelink) or Partner Allowance
4 Service Pension (DVA)
5 Disability Support Pension (Centrelink)
6 Special Benefit or don't know
7 None of these

Categories of Variable INCROAA:

1 War Widow's Pension (DVA)
2 Disability Pension (DVA)
3 Carer Allowance (Child Disability Allowance) (Centrelink)
4 Overseas pension or benefits
5 Parenting Payment
6 Other pension, benefit or allowance
7 None of these
8 Don't know

Categories of MAINIMP - Main Impairment (Disability):

01 Loss of sight (S)
02 Loss of hearing (S)
03 Speech difficulties (S)
04 Breathing difficulties (P)
05 Chronic or recurring pain or discomfort (P)
06 Blackouts, fits or loss of consciousness (P)
07 Slow at learning or understanding (O)
08 Incomplete use of arms or fingers (P)
09 Difficulty gripping or holding things (P)
10 Incomplete use of feet or legs (P)
11 Nervous or emotional condition (O)
12 Restriction in physical activities or work (P)
13 Disfigurement or deformity (P)
14 Mental illness (O)
15 Other limitations and restrictions (O)

S : Sensory Disability, P : Physical Disability , O : Other Disability

Categories of MAINCNDC - Main Condition:

0100 Certain infectious and parasitic diseases (O)
0204 Breast cancer (O)
0205 Prostate cancer (O)
0299 Other neoplasms (tumours/cancers) (O)
0300 Diseases of the blood and blood forming organs and certain disorders involving the immune system (O)
0401 Disorders of the thyroid gland (O)
0402 Diabetes(O)
0404 High cholesterol(O)
0499 Other endocrine/nutritional and metabolic disorders(O)
0500 Mental and behavioural disorders n.f.d. (O)
0511 Dementia(O)
0512 Schizophrenia(O)
0513 Depression/mood affective disorders (excluding postnatal depression) (O)
0521 Phobic and anxiety disorders(O)
0522 Nervous tension/stress(O)
0530 Intellectual and developmental disorders n.e.c. (O)
0531 Mental retardation/intellectual disability(O)
0532 Autism and related disorders (including Rett's syndrome and Asperger's syndrome) (O)
0595 Attention deficit disorder/hyperactivity(O)
0596 Speech impediment(S)
0599 Other mental and behavioural disorders(O)
0604 Parkinson's disease(O)
0605 Alzheimer's disease(O)
0607 Multiple sclerosis(O)
0608 Epilepsy(O)
0609 Migraine(O)
0611 Cerebral palsy(O)
0612 Paralysis(O)
0613 Chronic/postviral fatigue syndrome(O)
0699 Other diseases of the nervous system(O)
0703 Retinal disorders/defects(O)
0704 Glaucoma(O)
0707 Sight loss(O)
0799 Other diseases of the eye and adnexa (S)
0802 Diseases of the middle ear and mastoid (S)
0803 Diseases of the inner ear (except noise induced deafness) (S)
0804 Tinnitus (O)
0810 Deafness/hearing loss (S)
0811 Deafness/hearing loss—noise induced (S)
0812 Deafness/hearing loss—congenital (S)
0899 Other diseases of the ear and mastoid process (S)
0910 Heart disease (O)

0913 Angina (O)
0914 Myocardial infarction (heart attack) (O)
0919 Other heart diseases (O)
0922 Hypertension (high blood pressure) (O)
0923 Stroke (O)
0929 Other diseases of the circulatory system (O)
1002 Bronchitis/bronchiolitis (O)
1003 Respiratory allergies (excluding allergic asthma) (O)
1004 Emphysema(O)
1005 Asthma(O)
1099 Other diseases of the respiratory system(O)
1101 Stomach/duodenal ulcer(O)
1102 Abdominal hernia (except congenital) (O)
1103 Enteritis and colitis (O)
1104 Other diseases of the intestine (O)
1199 Diseases of the digestive system (O)
1202 Skin allergies (Dermatitis and Eczema) (O)
1299 Other diseases of the skin and subcutaneous tissue (O)
1301 Arthritis and related disorders (O)
1303 Back problems (dorsopathies) (P)
1304 Repetitive strain injury/occupational overuse syndrome (O)
1306 Other soft tissue/muscle disorders (including Rheumatism) (O)
1307 Osteoporosis (O)
1399 Other diseases of the musculoskeletal system and connective tissue (O)
1401 Kidney and urinary system (bladder) disorders (except incontinence) (O)
1405 Menopause disorders (O)
1499 Other diseases of the genitourinary system (O)
1500 Certain conditions originating in the perinatal period (O)
1600 Congenital malformations, deformations and chromosomal abnormalities (O)
1701 Breathing difficulties/shortness of breath (P)
1704 Pain n.f.d. (O)
1705 Unspecified speech difficulties (P)
1799 Other symptoms/signs and abnormal clinical and laboratory findings n.e.c. (O)
1801 Head injury/acquired brain damage (P)
1802 Arm/hand/shoulder damage from injury/accident (P)
1804 Leg/knee/foot/hip damage from injury/accident (P)
1808 Complications/consequences of surgery and medical care n.e.c.(O)
1899 Other injury/poisoning and certain other consequences of external causes (O)
1904 Restriction in physical activity or physical work (P)
1907 Other 2003 codes which have no ICD–10 equivalent (O)

S : Sensory Disability, P : Physical Disability , O : Other Disability

STATA Code that Generates the Sample Selection Rules

The following code was used for the generation of the sample derived from the ABS SDAC data set.

```
******************POPULATION DESCRIBED******************;

gen sample_1=1*(wthrdis==1)+2*(wthrcond==1 &
wthrdis==2)+3*(wthrcond==2);

label var sample_1 "General Breakdown";
label define sample_1 1"Disabled" 2"Nondisab Condition" 3"No
Health Condition";
label values sample_1 sample_1;

tab sample_1;

gen sample_2=1*((causecnd==4 | accidhpc==2) &
wthrdis==1)+2*((causecnd~=4 & accidhpc~=2) & wthrdis==1)
+3*((causecnd==4 | accidhpc==2) &
wthrdis==2)+4*((causecnd~=4 & accidhpc~=2) & wthrcond==1 &
wthrdis==2)+5*(wthrcond==2);

label var sample_2 "Breakdown by Cause";

label define sample_2 1"Disability caused by work"
2"Disabilty caused by other" 3"Ndis Cond caused by work"
4"Ndis Cond caused by other" 5"No Health Condition";
label values sample_2 sample_2;
tab sample_2;

gen
sample_3=1*(sample_2==1&incmainc==7)+2*(sample_2==1&incmainc
~=7)+3*(sample_2==3 & incmainc==7)+4*(sample_2==3 &
incmainc~=7);
replace sample_3=5 if sample_3==0;

label var sample_3 "Breakdown by WC Collection";

label define sample_3 1"Dis. Wrk Rel-WC" 2"Dis. Wrk Rel-No
WC" 3"NDis Cond Wrk Rel-WC" 4"NDis Cond Wrk Rel-NoWC"
5"Other";
label values sample_3 sample_3;
```

tab sample_3;

7. Appendix A3

Table A3.1: Labour force participation - Role of type, severity, onset and interactions (Wave 4)

	(IV)	
	Marginal Effect	Standard Error
Disabled	-0.178**	0.054
Male	0.085**	0.009
Age categories (Age 35-44 is reference category)		
Aged 15-19	-0.262**	0.020
Aged 20-24	0.026	0.016
Aged 25-34	-0.017	0.014
Aged 45-54	-0.016	0.014
Aged 55 or older	-0.363**	0.021
Ethnicity (Australian-born reference category)		
ESB	-0.014	0.015
NESB	-0.053**	0.014
Area of residence (Rural and Regional reference category)		
Major city	0.001	0.009
State of residence (NSW reference category)		
Victoria	-0.012	0.011
Queensland	-0.013	0.012
S.A	-0.059**	0.017
W.A	-0.009	0.015
Tasmania	-0.051*	0.027
N.T	0.076	0.037
A.C.T	0.028	0.027
Family type (Single without dependent reference category)		
Couple with dependent/s	-0.003	0.013
Couple without dependent/s	-0.102**	0.013
Single with dependent/s	-0.145**	0.022
Living arrangement		
Home owner	0.029**	0.010
Education		
Bachelor degree and above	0.086**	0.010
Labour market activity		
Work experience	0.444**	0.018
Disability onset (Childhood onset reference category)		
Youth onset	0.015	0.054
Prime age onset	-0.203**	0.083
Mature age onset	-0.139	0.105

Table A3.1 (continued):

	Marginal Effect	Standard Error
Disability type (Sensory reference category)		
Physical	-0.015	0.081
Other	-0.003	0.074
Multiple	-0.216*	0.103
Disability severity (Severe reference category)		
Mild	0.069	0.050
No restriction	0.093	0.040
Youth onset interacted with		
Bachelor degree and above	-0.144	0.103
Work experience	-0.114	0.078
Prime age onset interacted with		
Bachelor degree and above	-0.041	0.066
Work experience	0.048	0.075
Mature age onset interacted with		
Bachelor degree and above	-0.057	0.078
Work experience	-0.011	0.950
Physical disability interacted with		
Bachelor degree and above	0.109	0.095
Work experience	0.001	0.089
Other disability interacted with		
Bachelor degree and above	0.094	0.044
Work experience	-0.817	0.083
Multiple disabilities interacted with		
Bachelor degree and above	0.082	60.044
Work experience	0.040	0.804
Medium/Mild restriction interacted with		
Bachelor degree and above	-0.055	0.084
Work experience	0.056	0.091
No restriction interacted with		
Bachelor degree and above	-0.109	0.084
Work experience	0.106	0.738
Pseudo R-Square	0.277	
Sample (N)	10,495	

Note: *, ** denote statistical significance at 5% and 1% levels respectively. Estimation uses wave 4 of the HILDA survey.

Table A3.2: Log hourly wage estimations

	Non-Disabled		Disabled		Pooled sample	
	Coefficient	*S.E*	*Coefficient*	*S.E*	*Coefficient*	*S.E*
Male	0.0683**	0.0135	0.0097	0.0372	0.0591**	0.0130
Age categories (Age 35-44 reference category)						
Aged 15-19	-0.0054**	0.0003	-0.0062**	0.0009	-0.0054**	0.0002
Aged 20-24	-0.0018**	0.0002	-0.0010	0.0006	-0.0017**	0.0002
Aged 25-34	-0.0006**	0.0001	-0.0006	0.0004	-0.0006**	0.0001
Aged 45-54	-0.0002	0.0002	0.0000	0.0004	-0.0002	0.0001
Aged 55 or older	-0.0006*	0.0003	-0.0004	0.0006	-0.0006*	0.0003
Labour market activity						
Work experience	-0.2173	0.1544	-0.4397	0.4529	-0.2581	0.1509
Work experience-squared	0.3141**	0.1113	0.4907	0.3189	0.3471**	0.1082
Education						
Bachelor degree or higher	0.0024**	0.0002	0.0025**	0.0006	0.0024**	0.0002
Area of residence (Remote reference category)						
Major city	0.0010**	0.0001	0.0015	0.0018	0.0012**	0.0004
State of residence (NSW reference category)						
Victoria	-0.0009**	0.0002	-0.0005	0.0004	-0.0009**	0.0001
Queensland	-0.0005**	0.0001	-0.0005	0.0005	-0.0005**	0.0001
S.A	-0.0012**	0.0002	-0.0010	0.0006	-0.0012**	0.0002
W.A	-0.0006**	0.0002	0.0000	0.0005	-0.0005**	0.0002
Tasmania	-0.0003	0.0003	0.0005	0.0008	-0.0002	0.0003
N.T	0.0014**	0.0005	0.0014	0.0010	0.0015**	0.0005
A.C.T	-0.0008	0.0005	0.0014**	0.0005	-0.0005	0.0004
Family type (Single without dependent reference category)						
Couple with dependent/s	0.0004**	0.0002	0.0005	0.0004	0.0004**	0.0001
Couple without dependent/s	0.0005**	0.0002	0.0012**	0.0004	0.0007**	0.0001
Single with dependent/s	0.0000	0.0003	0.0007	0.0007	0.0001**	0.0002
Time factors (Wave 1 reference category)						
Wave 2	-0.1187**	0.0118	-0.1465**	0.0371	-0.1214**	0.0111
Wave 3	-0.0200	0.0106	-0.0964**	0.0310	-0.0337**	0.0100
Wave 4	-0.0037	0.0112	-0.0150	0.0304	-0.0056	0.0104
Industry classification (Agriculture, forestry and fishing reference category)						
Mining	0.0065**	0.0006	0.0074**	0.0016	0.0066**	0.0006
Manufacturing	0.0034**	0.0004	0.0041**	0.0012	0.0035**	0.0004
Electricity, gas and water supply	0.0049**	0.0006	0.0056**	0.0013	0.0051**	0.0006
Construction	0.0038**	0.0004	0.0033*	0.0013	0.0037**	0.0004
Wholesale trade	0.0026**	0.0005	0.0027*	0.0013	0.0027**	0.0004
Retail trade	0.0018**	0.0004	0.0017	0.0013	0.0018**	0.0004
Accommodation, cafes and restaurants	0.0019**	0.0005	0.0006	0.0014	0.0017**	0.0005
Transport and storage	0.0034**	0.0005	0.0022	0.0014	0.0033**	0.0005
Communication	0.0044**	0.0005	0.0054**	0.0013	0.0046**	0.0005
Finance and insurance	0.0050**	0.0005	0.0045**	0.0013	0.0049**	0.0005
Property and business services	0.0032**	0.0004	0.0023	0.0013	0.0030**	0.0004
Government administration and defence	0.0041**	0.0004	0.0038**	0.0012	0.0040**	0.0004
Education	0.0026**	0.0004	0.0021	0.0013	0.0025**	0.0004
Health and community services	0.0029**	0.0004	0.0012	0.0013	0.0027**	0.0004
Cultural and recreational services	0.0016**	0.0006	0.0026	0.0014	0.0017**	0.0005
Personal and other services	0.0018**	0.0005	0.0015	0.0014	0.0018**	0.0005

Table A3.2 (continued):

	Non-Disabled		Disabled		Pooled sample	
	Coefficient	*S.E*	*Coefficient*	*S.E*	*Coefficient*	*S.E*
Occupation classification (Managers and administrators reference category)						
Professionals	0.0065	0.0006	0.0074	0.0016	0.0066**	0.0006
Associate professionals	0.0034**	0.0004	0.0041	0.0012	0.0035**	0.0004
Tradespersons and related workers	0.0049**	0.0006	0.0056**	0.0013	0.0051**	0.0006
Advanced clerical and service workers	0.0038**	0.0004	0.0033**	0.0013	0.0037**	0.0004
Intermediate clerical, sales and service workers	0.0026**	0.0005	0.0027**	0.0013	0.0027**	0.0004
Intermediate production and transport workers	0.0018**	0.0004	0.0017**	0.0013	0.0018**	0.0004
Elementary clerical, sales and service workers	0.0019**	0.0005	0.0006**	0.0014	0.0017**	0.0005
Labourers and related workers	0.0034**	0.0005	0.0022**	0.0014	0.0033**	0.0005
Type of employment (Full-time employed reference category)						
Part-time employed	-0.0134	0.0157	-0.0147	0.0427	-0.0168	0.0150
R-squared	0.1709		0.1661		0.1673	
Sample (N)	24831		3898		28729	

Note: *, ** denote statistical significance at 5% and 1% levels respectively. The results are obtained by pooling the four waves of HILDA.

Table A3.3: Summary statistics of the variables used in the HILDA estimations

Variable	Mean	Standard Deviation
Lag participation	0.772	0.420
Disabled	0.770	0.421
Lag disabled	0.210	0.407
Male	0.200	0.400
Age categories (Age 35-44 reference category)	0.475	0.499
Aged 15-19	0.063	0.243
Aged 20-24	0.085	0.278
Aged 25-34	0.205	0.404
Aged 45-54	0.222	0.416
Aged 55 or older	0.163	0.369
Ethnicity (Australian-born reference category)		
ESB	0.099	0.299
NESB	0.126	0.331
Area of residence (Rural and regional reference category)		
Major city	0.621	0.485
State of residence (NSW reference category)		
Victoria	0.251	0.433
Queensland	0.202	0.402
S.A	0.096	0.294
W.A	0.099	0.299
Tasmania	0.030	0.170
N.T	0.007	0.083
A.C.T	0.020	0.139
Family Type (Single without dependent reference category)		
Couple with dependent/s	0.322	0.467
Couple without dependent/s	0.414	0.493
Single with dependent/s	0.070	0.255
Living arrangement	0.029	0.168
Home owner	0.714	0.452
Education		
Bachelor degree and above	0.217	0.412
Labour market activity		
Work experience	0.789	0.259
Initial participation	0.769	0.422
Sample (N)	28517	

Note: Above statistics are obtained from a pooled sample of HILDA waves 1 to 4.

A3.1.1 Dealing with the dynamic panel estimation problems

We start with Equation 6 from the main text:

$$y^{*}_{it} = \gamma y_{i,t-1} + X'_{it}\beta + \delta_1 D_{it} + \delta_2 D_{i,t-1} + \alpha_i + \varepsilon_{it} \qquad \text{(A6)}$$

This Appendix describes the econometric methods used to deal with the initial conditions problem. The approach that is suggested by Wooldridge (2002b) can be described as follows: the likelihood function is explicitly conditioned on all past realisations of the dependent variable, including the initial observation y_{i1}. Letting $y_1=[y_{11}\ y_{21}\ \ldots\ y_{N1}]$ the conditional likelihood function can be written as

$$f(y_1, y_2, ..., y_T \mid y_0, x, \alpha; \beta) = \prod_{t=1}^{T} f(y_t \mid y_{t-1}, y_0, x, \alpha; \beta) \qquad \text{(A6.1)}$$

Since the fixed terms α_i are unobserved they will have to be integrated out by calculating the following

$$f(y_1, y_2, ..., y_T \mid y_0, x, \alpha; \beta) = \int_{-\infty}^{\infty} f(y_t \mid y_{t-1}, y_0, x, \alpha; \beta) f(\alpha \mid y_0, x, ; \beta) d\alpha \qquad \text{(A6.2)}$$

In order to carry out this integration a specific form of the conditional distribution $f(\alpha \mid y_0, x, ; \beta)$ has to be assumed. Wooldridge (2002b) proposed the use a linear function of initial conditions[46] This assumption can be written out as

$$\alpha_i = \alpha_1 y_{i0} + v_i \qquad \text{(A6.3)}$$

The main advantage of this approach is that the researcher can be agnostic as to the true distribution of y_{i1} and, more importantly, estimation can be carried out using standard

[46] Time averages of all time variant explanatory variables can be added to (A6.3). We omit this possibility in order to be consistent with our static model set up of the Section 3.4.3.

econometric packages including STATA or LIMDEP (Wooldridge 2002). However the consistency of the estimates relies heavily on the strict exogeneity assumption. This amounts to the assumption that the current labour force participation (which is conditional on lagged participation status, y_{it-1}, and unobserved individual effects) should not be related with any of the (past or future) future values of the remaining regressors. Whether this assumption of strict exogeneity can be sustained or not is a purely empirical matter, which can be tested by adding lags (or leads) of potentially endogenous variables (such as disability status) in the right hand side of the equation. If the estimates of these added variables prove to be statistically significant, then the estimates of this method cannot be relied on. Another disadvantage of this method of estimation is that serial correlation cannot be introduced in the equation.[47]

Finally, pooled dynamic probit estimates are produced. Guilkey and Murphy (1993) presented simulation evidence showing that pooled probit estimation performs reasonably well when the error structure is mis-specified. Given how little we often know about the error structure underlying the data we estimate, this can be a very useful property. Unlike the estimates derived from the random effect models mentioned earlier, estimates with robust standard errors derived using the pooled dynamic probit estimation method perform reasonably well even when there is arbitrary serial correlation which is ignored (see Wooldridge 2002b). Furthermore, the pooled dynamic probit estimator does not require the strict exogeneity assumption. The pooled dynamic probit results are used as a robustness check for the rest of the panel estimates in order to evaluate the possible effect of ignoring individual heterogeneity.[48]

A3.1.2 Pooled versus panel results and average partial effects

The estimated coefficients of pooled and panel models are not directly comparable due to difference in scaling in the estimation (see Aralampulam (1999) for a detail discussion) In order to compare the results, panel estimates should be re-scaled by a factor of

[47] A detailed discussion of the Wooldridge approach can be found in Honore (2003).
[48] Recently, Green (2004) showed that if unobserved heterogeneity is correlated with the exogenous variables, it is more appropriate to estimate a pooled model than a random effects model which ignores this correlation.

$\sqrt{(1-\sigma_u^2)}$. Additionally since coefficient estimates of the probit models are not interpretable aside of their sign and significance, the Average Partial Effects (APE) (Wooldridge (2005)) are reported. APE of the variables of interest evaluated at the individual level and averaged across the sample.