AUSTRALIAN JOURNAL OF LABOUR ECONOMICS

A JOURNAL OF LABOUR ECONOMICS AND LABOUR RELATIONS

Volume 14 • Number 3 • 2011 • ISSN 1328-1143

the **CENTRE** *for*
LABOUR MARKET RESEARCH

AUSTRALIAN JOURNAL OF LABOUR ECONOMICS

A JOURNAL OF LABOUR ECONOMICS AND LABOUR RELATIONS

ISSN 1328-1143

Official Journal of the Australian Society of Labour Economists

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The Centre for Labour Market Research
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AUSTRALIAN JOURNAL OF LABOUR ECONOMICS
Volume 14 • Number 3 • 2011 • pp 265 - 288

Measuring Work Disincentives: Taxes, Benefits and the Transition into Employment

Alfred Michael Dockery and Rachel Ong, Curtin University
Gavin Wood, RMIT University

Abstract

Disincentives to employment participation arising from the tax-benefit system have been a major concern for welfare reform. Data from the Household, Income and Labour Dynamics in Australia Survey are used to generate and test the robustness of three commonly used disincentive measures for non-working Australians: effective marginal tax rates, replacement rates and participation tax rates. The results of transition models suggest financial disincentives as measured in the current period have a large effect on employment outcomes one year later, and the replacement rate is the preferred measure for modelling disincentives facing the unemployed. While attracting most attention in the welfare-to-work debate, effective marginal tax rates are found to be an inappropriate measure of work disincentives facing the non-employed.

JEL Classification: I380; J640; J220

1. Introduction

The potential disincentive effects of the taxation of earnings and the availability of welfare benefits upon labour supply pose an ongoing dilemma for policy-makers striving to establish a sufficiently progressive tax-benefit regime, both here in Australia and internationally (see, for example, OECD, 1998). In Australia, the McClure Report (Reference Group on Welfare Reform, 2000) cited 'inadequate incentives for some

Address for correspondence: Associate Professor Mike Dockery, School of Economics & Finance, and Director, Centre for Labour Market Research, Curtin University, GPO Box U1987, Perth 6845 Australia. Email: m.dockery@curtin.edu.au
Acknowledgements: The work incentive estimates in this paper are derived from the AHURI-3M tax benefit simulator for the years 2001, 2002 and 2003. The construction and updating of the simulator was funded by grants NRV1 and 30315 awarded by the Australian Housing and Urban Research Institute (AHURI). The authors are indebted to Alice Stoakes from RMIT University, who updated the simulator under AHURI grant 30315, and to Clinton McMurray from Curtin University who assisted with the modelling. This paper uses unit record data from the Household, Income and Labour Dynamics in Australia (HILDA) Survey. The HILDA Project was initiated and is funded by the Australian Government Department of Families, Housing, Community Services and Indigenous Affairs (FaHCSIA) and is managed by the Melbourne Institute of Applied Economic and Social Research (MIAESR). The findings and views reported in this paper, however, are those of the authors and should not be attributed to either FaHCSIA or the MIAESR. Helpful comments and suggestions from an anonymous referee and the editor are gratefully acknowledged. All remaining errors and omissions are the sole responsibility of the authors.

forms of participation and inadequate rewards for some forms of work' as one of four identified shortcomings of Australia's welfare system. A number of changes to the tax and benefits regime have been implemented or foreshadowed following the McClure Report, including a range of 'welfare to work' measures announced in the 2005-06 Commonwealth Budget designed to increase labour force participation.

Two commonly used measures of the disincentives created by the interaction of the welfare and taxation systems are effective marginal tax rates (EMTRs) and replacement rates (RRs). A related measure is the participation tax rate (PTR), sometimes also referred to as the average tax rate. These three measures are used to test whether the labour market behaviour of non-working persons is actually affected by such 'disincentives', and which measure best models those effects, based upon their explanatory power in modelling transitions into employment. While EMTRs have attracted most attention in the welfare-to-work debate, basic labour supply theory suggests EMTRs will have limited relevance to the decisions of non-employed individuals, and RR and PTR will be superior measures. To the best of the authors' knowledge, however, this is yet to be empirically tested in the Australian context and is one important motivation for this paper.

A major challenge in estimating the elasticity of labour supply with respect to work disincentive measures is endogeneity. By design of the income support and tax systems, being unemployed or having low earnings results in individuals receiving more in benefits and paying less in tax than full-time workers with higher incomes – their labour supply decisions effectively 'cause' them to have higher EMTRs, PTRs and RRs. With cross-sectional data it is thus difficult to identify the effect of these measures on labour supply. This paper exploits the longitudinal nature of the Household, Income and Labour Dynamics in Australia (HILDA) Survey for the period 2001-2003 to address some of the endogeneity problems faced in cross-sectional studies by modelling the impact of current work disincentive measures facing non-employed individuals upon their employment outcomes one year later. This overcomes the problem of an individual's current labour supply choice or earnings directly affecting the disincentive measures, but does not eliminate the possibility that unobservables may influence both current disincentive measures and future transitions.

The EMTR measures how much of an incremental increase in an individual's earned income is lost due to higher tax liabilities and the withdrawal of benefits. The RR compares the income of an individual when not in work to their income when in work. The PTR is the same as the EMTR, except that the rate is not calculated with respect to a small increment in private income, but rather the increase in income that occurs as the individual makes a transition into work. Thus an individual facing a high EMTR faces weak financial incentives to increase the number of hours they work, while an individual facing a high RR or PTR sees weak financial incentives to choose work over non-work.

A large number of studies present EMTR and RR estimates for Australia.[1] Few have used the PTR, which is one focus of this study. Our approach also offers some other important innovations over previous Australian studies. The work disincentive estimates are measured on an income unit rather than individual basis. This is

[1] See Beer (1998); Beer (2003); Beer and Harding (1999); Bradbury (1992); Bradbury (1993); Bradbury, Ross and Doyle (1991); Daly (1992); Flatau and Wood (2000); Harding and Polette (1995); Polette (1995); and Whitlock (1994).

important because Australian income support programs and some tax provisions such as the Medicare Levy are administered such that in couple income units, one partner's labour supply decision will impact upon the benefit entitlements of both partners. Measures calculated on an individual basis will then underestimate EMTRs, RRs and PTRs of persons in couple income units. The clawback of rental subsidies for persons living in public housing is also incorporated, as they have a substantial effect on our measures for the small proportion of persons affected.[2]

The results of this modelling exercise are reported in section 4 of the paper. Preceding this, section 2 provides a brief background discussion of the theoretical motivation and modelling issues, followed by section 3's description of data sources, measurement issues and the modelling approach. The implications of the results for policy and for future research are discussed in section 5.

2. Background

Much of the vast international body of empirical research estimating key parameters such as the elasticity of labour supply with respect to wages and work incentive measures, has been motivated by 'welfare to work' policies that are premised on the proposition that existing welfare programs create significant disincentives to employment participation. Extensive reviews of developments in the empirical analyses of labour supply can be found in Blundell and MaCurdy (1999) and Kalb (2003). The theoretical model underlying most micro-economic analyses of labour supply posits that individuals act to maximise their utility (wellbeing), which is an increasing function of the consumption of goods and services (their real disposable income) and hours of leisure. If people are free to choose their hours of work each individual will keep offering additional hours of labour so long as the value they place on net income gained, comprised of their hourly wage less taxes and any withdrawal of benefits, is greater than the value they place on the hour of leisure foregone. Thus people strive for a 'utility maximising' point where the marginal return derived from an additional hour of paid work equates to the value placed on an additional hour of leisure.

This simple framework predicts that higher EMTRs result in a lower incentive to increase the number of hours worked, all other things held constant. In reality, most workers do not have the ability to choose an exact number of hours worked, and instead face more limited options such as choosing between working and not working, or between working part-time and full-time. If the decision is one between working and not working, it is the PTR or RR that determines the individual's choice set, rather than the marginal rate associated with an additional earned dollar. Hence PTRs or RRs would seem a more appropriate measure of the disincentives facing non-working individuals than EMTRs.

The elasticity of labour supply with respect to wages is likely to vary across the distribution of wages earned and hours worked, and to be very different for groups with different non-wage incomes. For example, women and sole parents, who are more likely to be out of the labour force or working part-time, display a stronger elasticity

[2] This is important as Wood, Ong and Dockery (2009) find that relative employment probabilities have declined markedly for those in public housing over the long run. In the case of female public housing tenants, many of whom are sole parents, they estimate that in 2002 the higher RRs of female public renters reduced their employment participation probability by 6 percentage points relative to all working age females. Eight per cent of the sample of non-employed persons used in this paper were public renters.

of hours supplied with respect to wage changes (Cahuc and Zlyberberg, 2004: 40-41). Taxes and benefits determine the net change in income an individual faces given a change in the number of hours worked or in their hourly wage rate. Indeed the empirical literature has relied heavily upon variations created by taxation and benefits regimes and the consequential variations in work incentive measures, to generate estimates of the elasticity of labour supply.

There is a broad consensus in the literature that welfare recipients' blunted work incentives adversely impact labour market outcomes, however, the magnitude of estimated effects fall within a wide range. A common methodology is to estimate a labour supply function using a cross section sample of individuals. The estimated elasticity of labour supply can then be used to infer the impact of different work incentive measures on labour supply under different tax and benefit scenarios. A second approach, requiring panel data, estimates the probability of transitions (such as entering employment, exiting unemployment or moving off benefits) conditional upon the work incentive measures facing the individual, and other factors known to influence labour market outcomes. Particularly convincing evidence of the importance of disincentive effects comes from changes in the unemployment hazard rate in situations in which benefits or unemployment insurance are not open ended. The hazard rate is often observed to increase markedly just prior to the point of benefit exhaustion (see, for example, Card and Levine, 2000).

A limitation of both these approaches is that individuals' expected earnings and their benefit eligibility are typically determined by a similar set of individual characteristics. It is therefore difficult to disentangle the effects of differences in work incentive measures from the effects of differences in individual characteristics. In most cases the rules that determine benefit eligibility are based upon characteristics which are observable to the researcher, however many of the characteristics influencing expected earnings will be unobservable. Methodological difficulties in identifying the impact of policy measures upon labour market outcomes has seen a growing body of contributions based upon natural experiments (sometimes called 'quasi-experiments'). These often rely upon exogenous changes to the tax and benefits system that affect only a subset of the population (see, Rosenzweig and Wolpin, 2000; and Heckman and Smith, 1996, for reviews of research based upon natural experiments).

In line with the overseas literature, Australian empirical studies suggest modest disincentive effects facing welfare beneficiaries although the approaches generally adopted by these studies are not based on natural experiments (see, Kalb, 2003). Duncan and Harris (2001) model the labour supply of sole parents as the outcome of a discrete choice between alternative hours of work. They estimate that a reduction in the withdrawal rate of the sole parent pension from 50 per cent to 40 per cent would motivate a 0.6 per cent increase in the average number of hours worked by sole parents. Kalb (2000) employs a simultaneous discrete choice model to estimate the labour supply of two-adult households. The study estimates small decreases in labour supplied by both married women and men resulting from increases in maximum benefit levels and reductions in taper rates, although women and persons on lower incomes are estimated to be more responsive to these changes.

3. Method

Data and Sample

A sample of working age adults observed to be unemployed or not in the labour force (non-participants) on one or more occasions is drawn from waves 1 to 3 of the HILDA Survey. This covers the period 2001-2003. The HILDA Survey is a nationally representative panel survey of Australian households. As the name implies, the HILDA Survey comprehensively covers the three inter-related areas of income, labour and household dynamics. Among other things, the survey contains a myriad of variables describing labour market histories, housing circumstances and key socio-economic and demographic characteristics.

The selection of the unemployed and non-participants for the sample is geared to an econometric analysis of transitions into work. We include individuals that are observed not working in period t ($2001 \leq t \leq 2003$) and model transitions to employment in t+1 ($2002 \leq t+1 \leq 2004$). Individuals are included in the person-period data set whenever they are observed in non-employment at time t. Thus the data set is 'stacked' in the sense that the same individual may contribute multiple observations and more than one transition.

The sample is restricted to persons aged 25 to 64. Those aged 24 and under are omitted for two reasons.[3] The first is to abstract from movements in and out of education and training that characterise the labour market for young people. Non-participation among many in this cohort is quite different in nature to non-participation among older cohorts and is motivated by different factors. Second, labour market history is known to be a powerful predictor of labour market outcomes and captures important individual effects that would otherwise be unobservable, hence reducing scope for omitted variable bias. In testing various specifications in the models the ratio of time in paid employment to total time since leaving full-time education returned the most robust results. For young people with a very limited history, however, the value of such labour market history variables is questionable.

A sample of 2,900 persons was found to be unemployed (529) or non-participants (2,567) in at least one wave.[4] There were 2,112 persons first observed unemployed or non-participants in wave 1, 469 in wave 2 and 319 in wave 3. Of these, 710 were observed to be out of work in two waves between 2001 and 2003 and 1,071 out of work in all three waves. The work status of the individual was measured with respect to the week in which they were interviewed.

Measurement of Work Incentives

The EMTR, PTR and RR work incentive measures are computed using a tax benefit simulator that includes the full range of government tax and transfer programs (see, appendix I and Wood and Ong, 2008, for details). One innovation over the existing Australian literature is the incorporation of the withdrawal of rent subsidies for public housing tenants. Although only 8.1 per cent of our sample of unemployed and non-

[3] Labour market studies that have either omitted persons aged under 25 or estimated models separately for persons aged under 25 and those aged 25 and over include Breunig and Mercante (2010), Schuetze (2000) and Zavodny (2000).

[4] The sum of unemployed and non-participants exceeds 2,900 as some are observed in both states – there are 196 persons recorded as unemployed in one or more waves, and also recorded as non-participants in another wave.

participants are public housing tenants, work disincentives are particularly acute because rents are 25 per cent of assessable income.[5] More importantly, care is taken to model tax-transfer programs using the income unit as the basis for measurement.[6] Interactions that cause changes in a partner's transfer income are then taken into account. This is potentially important for correct measurement of couples' work incentives. With Newstart Allowance (NSA – the transfer program that unemployed Australians can claim), for example, an individual will lose 70 cents for every dollar increase in his/her partner's income.[7]

The RR measures income when not working as a proportion of income when employed, and is defined as:

$$RR_i = \frac{Y_i^u + G_i^u}{Y_i^e + G_i^e} \tag{1}$$

where Y_i^u is unearned private income net of tax when i is unemployed or a non-participant and G_i^u is income-unit government benefits. Y_i^e and G_i^e are net private disposable income and income-unit government benefits when i is employed. The disposable income measure includes income support payments that are imputed on an income unit basis, but it is the individual's private income (net of tax liabilities), not their partner's, that enters the numerator and denominator of the replacement ratio.[8] The imputed 'in work' earnings cannot be observed, and are predicted from estimated wage equations (see below), as is also the case for PTR.

EMTRs are most often computed with respect to a one-dollar per week increase in private income (or $52 per annum).[9] Of the three measures they would therefore seem the least applicable to the non-employed, yet continue to attract most attention as a disincentive measure in the welfare-to-work debate. The EMTR is defined here as:

$$E_i = 1 - \frac{\Delta Y_i^d}{\Delta Y_i^p} = 1 - \frac{\Delta Y_i^p + \Delta G_i - \Delta T_i}{\Delta Y_i^p} = \frac{(\Delta T_i - \Delta G_i)}{\Delta Y_i^p} \tag{2}$$

where: E_i = EMTR of person i

ΔY_i^d = change in income unit disposable income of person i

ΔY_i^p = change in gross private income of person i, that is, $52 per year

ΔG_i = change in government benefits payable to person i's income unit[10]

ΔT_i = change in tax liabilities of person i's income unit

[5] For details, see Wood, Ong and Dockery (2009).
[6] An income unit is defined as one or more individual persons whose command over income is assumed to be shared between the persons comprising the unit (ABS, 1997). Income sharing is assumed to take place within married and de facto couples, and between parents and dependent children. A household is a group of people who typically reside and eat together, and therefore contains one or more income units.
[7] This assumes that the partner's income exceeds the threshold at which their own transfer income 'cuts out'.
[8] Partner's private income is therefore not included in the RR measure. Instead, partner's income enters the transition models as a separate independent variable.
[9] Most EMTR studies assume a one-dollar increase in weekly private income (Beer and Harding, 1999; Gallagher and Ryan, 1992; Podger, Raymond and Jackson, 1980; Polette, 1995; Whitlock, 1994).
[10] A partner's actual income is used when the EMTR is computed in contrast to some studies that set the income of a partner equal to zero.

The change in direct tax liabilities, ΔT_i, takes into account the changes in the income unit's personal income tax, Medicare levy, superannuation surcharge and tax offsets.

A closely related measure is the PTR, or average tax rate (see, Adam, Brewer and Shephard, 2006). The PTR formula is the same as equation (2) but the change in income is the wage income individual i earns when making a transition into employment. Hence the PTR aligns more closely than the EMTR with the decision typically facing the non-employed: whether or not to search for and accept employment over non-employment.

Calculation of the RR and PTR at time t requires an estimate of what the non-employed individual would be earning if they were instead employed. To impute this, data from waves 1 to 3 of HILDA are used to estimate wage equations separately for employed males and females with the log of hourly wage in one's main job as the dependent variable. The coefficient estimates are then used to predict the hourly wage rate that an unemployed or non-participant person can expect when working. The predicted hourly wage rates are multiplied by 35 hours per week and 52 weeks in a year to derive a predicted annual wage estimate that each non-worker can expect upon transition into employment. Thus the RR and PTR are derived assuming a transition into full-time employment, and can be assumed exogenous to labour supply choices. The wage equations are estimated using the standard two-stage Heckman procedure to correct for sample selection bias. The inverse Mills' ratio is significant in the case of both the male and female samples. Coefficient estimates are presented in appendix 2.

In 2003, mean-predicted hourly wage rates were $33 for unemployed males and $34 for unemployed females. These were lower than the predicted hourly wage rates for non-participants of $42 for males and $46 for females. There is a reasonable concordance between predicted and actual wages observed for individuals who entered employment.

Table 1 presents the medians and distributions of all three incentives measures computed for our sample of unemployed and non-participants in the first year that they are observed in these categories. The HILDA Survey is completed with respondents between August and December of each calendar year, and labour force status as recorded at this time is used to frame the sample of unemployed and non-worker persons. Detailed annual financial data for the preceding financial year is collected along with weekly financial data at the time of the survey. The estimates reported in table 1 are based on annualised weekly financial information. Reported unearned private income is of particular importance because it is used to impute eligibility and entitlement for payments under income support programs.[11]

[11] Some sources of unearned weekly income and current partner weekly income are not reported and we have in these cases used the previous financial year figures for these items.

Table 1 - Work Incentive Measures by Selected Personal Characteristics, Unemployed and Non-participants[a]

	All	*Couples with Children*	*Couples no Children*	*Sole Parents*	*Singles*	*Public Renters*	*NSA Recipients*
Median measures							
EMTR (%)	0.0	0.0	0.0	0.0	0.0	25.0	0.0
PTR (%)	40.7	35.8	38.9	53.5	44.1	53.1	49.6
RR (%)	21.9	19.0	18.8	51.1	23.6	40.5	35.1
EMTR distribution (% of sample)							
EMTR=0	60.0	55.2	56.1	64.3	71.7	13.4	77.2
0% < EMTR ≤ 20%	7.1	5.1	10.6	6.5	4.5	8.2	3.1
20% < EMTR ≤ 40%	24.5	31.1	24.4	20.6	16.6	71.2	10.0
40% < EMTR ≤ 60%	6.0	7.0	6.8	6.4	2.9	4.9	2.7
60% < EMTR ≤ 80%	1.9	1.4	1.7	2.2	2.8	2.2	5.3
80% < EMTR ≤ 100%	0.5	0.2	0.3	0.0	1.4	0.2	1.5
EMTR>100%	0.0	0.0	0.1	0.0	0.0	0.0	0.3
PTR distribution (% of sample)							
0% < PTR ≤ 20%	2.0	0.7	2.0	1.8	3.8	0.4	0.0
20% < PTR ≤ 40%	46.4	64.1	51.4	12.5	25.8	10.8	3.0
40% < PTR ≤ 60%	46.1	25.9	45.3	64.4	69.2	60.7	80.1
60% < PTR ≤ 80%	5.4	9.1	1.3	21.4	1.2	28.0	16.7
80% < PTR ≤ 100%	0.0	0.1	0.0	0.0	0.0	0.0	0.2
PTR >100%	0.0	0.0	0.0	0.0	0.0	0.0	0.0
RR distribution (% of sample)							
0% < RR ≤ 20%	45.7	52.0	52.3	7.6	40.2	16.7	14.5
20% < RR ≤ 40%	32.0	24.5	35.6	22.5	40.4	32.9	44.9
40% < RR ≤ 60%	16.0	14.9	9.9	42.8	17.7	29.5	29.5
60% < RR ≤ 80%	5.8	7.9	1.9	27.1	1.2	20.4	9.9
80% < RR ≤ 100%	0.3	0.7	0.1	0.0	0.4	0.5	1.2
RR>100%	0.1	0.0	0.2	0.0	0.1	0.0	0.0

Source: Authors' own calculations from confidentialised unit record files of the HILDA Survey waves 1-3.
Notes: a. The estimates are calculated in the first wave that the individual is recorded as unemployed or a non-participant. In most cases (73 per cent) this is wave 1. The sample size is 2,900 and this represents a population equivalent of 3,151,419. There are 251 (265,198) sole parents, 235 (263,998) public renters and 258 (287,591) NSA recipients in the sample (population estimate). HILDA population weights are used.

Most striking in table 1 is the finding that, with the exception of public housing tenants, median EMTRs are zero; in fact 60 per cent of the sample has a zero EMTR and only 2.4 per cent have EMTRs exceeding 60 per cent, a commonly used benchmark to identify those with blunt work incentives. This limited variability highlights another reason why EMTRs are likely to be a poor instrument for modelling disincentives. It both lacks a rationale from the perspective of economic theory, and if entered into econometric models of transitions into employment (as a measure of work incentives), it will fail to detect potential impacts because most of the unemployed and non-participants will have a zero value. The RR and PTR measures offer a very different picture of work incentives with median values of 22 per cent and 41 per cent, respectively. The RR estimates suggest that around one in five unemployed or

non-participants 'replace' more than 40 per cent of their 'in-full-time work' income. Financial rewards on transition into employment are lower for some income unit types. According to the PTR measure sole parents and singles receive lower financial returns to employment, as do those living in public housing and NSA recipients. Approximately one in four public housing tenants and one in five sole parents have PTRs exceeding 60 per cent compared to one in twenty non-participants in the general population. Similarly, the RR estimates highlight the predicament of sole parents and public housing tenants. The typical income unit in these groups is able to replace between 41 and 51 cents in every dollar of 'in full-time work' income.

Model Specification

Calibrating the numerical value of EMTRs, PTRs and RRs facing working-age Australians represents only part of the story. From a policy perspective, the critical question is whether or not higher rates of such measures really do influence individuals' behaviour and, if so, the extent to which they suppress labour supply. Though we expect EMTRs to be inferior to PTRs and RRs in capturing work incentive effects, all three measures are tested in the transition models so that comparisons can be drawn as to their performance as measures of work incentives in labour supply models. For the sample of non-employed (described above) from waves 1-3 of HILDA, labour force status at time *t*+1 is modelled using data from waves 2-4.

A logistic model that exploits the panel data is estimated with the general form;

$$P\left(Emp_{i(t+1)}\right) = f\left(Work\ Incentives_{it}, X_{it}, Wave_{it}\right) \quad (3)$$

where $P(Emp_{i(t+1)})$ is the probability that individual i transitions into employment in wave *t*+1, Work Incentives$_{it}$ is the EMTR, RR or PTR of individual *i* in period *i*, X_{it} is a vector of *i*'s demographic and human capital variables in *t* and Wave$_{it}$ are dummy variables added as controls for calendar year specific effects. The vector X_{it} includes variables to capture age, marital status, the presence of resident children, labour market history, English language proficiency, health status, level of education, the individual's unearned private income and their partner's disposable income (earned and unearned).

Table 2 presents descriptive statistics on the dependent and explanatory variables at the values they take in the first episode of unemployment or non-participation. Non-participants account for just over 85 per cent of all episodes, and females account for two-thirds of the observations. Most individuals (70 per cent) are first recorded as unemployed or non-participants in wave 1 and many will have begun their spells before the onset of the 2001-02 financial year. The sample is typically middle aged (46 years)[12], and half have no dependent child residing with them. When first recorded as unemployed or non-participant our sample have, on average, spent more than half their working lives in employment despite generally poor levels of schooling; 46 per cent have not completed Year 12 and have no post-school qualifications. Their predicament is strongly correlated with presence of a long-term disability. Unearned incomes of the individuals in the sample are low, but if there is a partner the income unit's financial wellbeing is boosted by a mean disposable partner income of $27,000. There are some distinct differences between the non-participant and unemployed groups. Non-participants are much more likely to be older, female, partnered and disabled.

[12] But note that the sample is restricted to the over 24 year olds as noted above.

Unemployed persons are more likely to be Indigenous and have typically spent more time in paid work since leaving full-time education than the non-participant sample.

Table 2 - Descriptive Statistics by Non-employed State at Initial Observation

Variable	*Non-participant*	*Unemployed*	*All*
Percent non-participant			85.4
Percent unemployed			14.4
Percent initially observed at:			
Wave 1	70.9	60.5	69.4
Wave 2	17.0	25.9	18.3
Wave 3	12.0	13.6	12.3
Socio-demographic characteristics			
Percent female	68.6	42.2	64.8
Mean age of individual (years)	46.8	40.7	45.9
Percent in age band:			
25-34	22.1	31.5	23.5
35-44	21.5	32.2	23.1
45-54	20.6	26.3	21.4
55-64	35.8	9.9	32.0
Family status (percent):			
Single, no kids	17.4	34.0	19.8
Married, no kids	31.9	21.5	30.4
Married with kids	40.4	32.8	39.3
& youngest < 4 yrs	17.4	11.2	16.5
Sole parent	10.3	11.8	10.5
& youngest < 4 yrs	3.0	2.7	3.0
Percent Indigenous	2.4	4.3	2.7
Percent with long-term disability	39.8	28.1	38.1
Human capital characteristics			
Percent of time in paid work since leaving full-time education	61.7	70.5	63.0
Percent where English is 1st language	82.1	82.5	82.1
Percent where English is not 1st language &:			
English good	12.0	12.7	12.1
English poor	5.9	4.8	5.7
Highest education level (per cent):			
University degree	12.7	15.7	13.1
Diploma	8.6	8.8	8.6
Trade	15.1	21.5	16.0
Certificate	2.4	3.9	2.6
Completed Yr 12	13.8	11.1	13.4
No Yr 12 or other qual	47.4	39.1	46.2
Income measures			
Personal unearned private income ($)	6312.3	1165.8	5566.2
Partner's disposable income ($, partnered persons only)	26919.1	25286.7	26734.8
Work disincentive measures			
EMTR (per cent)	12.2	9.6	11.8
PTR (per cent)	41.0	41.1	41.0
RR (per cent)	24.9	24.7	24.9

Source: Authors' own calculations from confidentialised unit record files of the HILDA Survey waves 1-3.

4. Results

The logit models are estimated separately by gender for unemployed persons and non-participants as the importance of factors shaping employment transitions are likely to differ between these groups. The summary statistics reported in table 2 also indicate that there are some distinct socio-demographic and human capital differences between the two groups.[13] The analysis is developed by estimating a random effects logit model; a likelihood ratio test of the null hypothesis that the proportion of the total variance contributed by the panel level variance component ρ equals 0 is conducted (Rabe-Hesketh and Skrondal, 2005). It indicates that the panel level variance component is important for non-participants but unimportant for the unemployed. As a panel estimator is not different from the pooled estimator when ρ equals 0, pooled logit model estimates are reported for the unemployed. Random effects estimates are reported for non-participants.

Table 3 presents the results for persons who were non-participants in waves 1, 2 or 3. After allowing for missing values, there are just over 1,465 males (table 3a) and 3,632 females (table 3b) available for estimation in the pooled sample. Seventeen per cent of the females and 16 per cent of the males were employed at the time of the following survey. Of those who remained non-participants and continue in the panel, seven per cent (three per cent) of the males and eight per cent (four per cent) of females find employment two (three) years after they are first observed as a non-participant. Seventy-seven per cent of males and 73 per cent of females are never observed in employment by the end of the study timeframe (2004).

By and large, the coefficients have the expected signs: non-participants who are older, have young resident children, no post-school qualifications and a long-term disability are less likely to enter employment, regardless of gender. Some of these variables have large effects; those males aged 25-34, for example, have estimated odds of transitioning into employment that are around three times higher than those aged 35-44 in any time period. Married males with children over four years old have a similarly elevated odds ratio compared to single males with no children. Qualifications strongly promote male transitions into employment, and this is particularly evident for university degrees and diplomas, where the estimated odds are around three times those who left school before Year 12. Labour market history is a very important factor for males; each one percentage point increase in the proportion of time spent working since leaving full time education raises the estimated odds by over three per cent. Neither unearned income nor partner income is found to have a significant effect.

There are some important differences in the findings by gender. Stage in the life cycle, as represented by age, is not as important among females, and their marital status is only relevant if there are young children present in the household. English as a second language has a consistent negative impact on female employment prospects across alternative specifications, regardless of whether English language skills are good or poor. This may reflect the importance of English language proficiency in female-dominant occupations.

[13] An example of a study that has distinguished between transitions from unemployment and non-participation is Dunsmuir *et al.* (1989).

Turning to the work incentive measures, the estimated effect of higher PTRs and RRs is negative for both women and men, though the estimates are significant only in the case of women.[14] For females, a one percentage point increase in the PTR and RR lowers the estimated odds of entering employment by around two per cent and one per cent respectively. Against expectations, higher EMTRs are estimated to have a small positive effect on the odds of transitioning into employment for both sexes, and this is significant at the five per cent level for females.

Table 3 - Random Effects Logit Model Estimates of the Probability of Entering Employment; Persons Aged 25-64 and not in the Labour Force, HILDA Waves 1-3:

(a) Males

Parameter	*Odds Ratio*		*Z*	*Odds Ratio*		*Z*	*Odds Ratio*		*Z*
Not in labour force in:									
wave1	0.390	**	2.270	0.426	**	-2.220	0.417	**	-2.250
wave2	0.856		0.530	0.871		-0.480	0.890		-0.410
wave3	—			—			—		
Age (yrs):									
25_34	3.200	**	2.160	2.646	**	1.940	2.806	**	2.040
35_44	—			—			—		
45_54	0.163	***	3.700	0.167	***	-3.820	0.158	***	-3.860
55_64	0.036	***	5.300	0.043	***	-5.520	0.039	***	-5.550
Family status:									
Single, no kids	—			—			—		
married, no kids	1.605		1.020	1.567		1.040	1.665		1.150
married with kids	3.750	**	2.440	3.797	**	2.620	4.065	***	2.660
& youngest<4 yrs	0.184	**	2.460	0.232	**	-2.270	0.230	**	-2.260
Sole parent	1.003		0.000	1.047		0.070	1.099		0.130
& youngest<4 yrs	0.903		0.060	0.832		-0.110	0.880		-0.080
Prop. time in work (%)	1.036	***	3.930	1.032	***	3.810	1.032	***	3.750
Indigenous	1.179		0.160	1.146		0.140	1.166		0.160
English is 1st language	—			—			—		
English not 1st language &:									
English good	0.913		0.190	0.880		-0.280	0.849		-0.350
English poor	0.144	*	1.650	0.147	*	-1.700	0.141	*	-1.720
Has long-term disability	0.426	***	2.690	0.465	**	-2.560	0.466	**	-2.520
Highest education level:									
University degree	3.199	**	2.210	2.793	**	2.090	2.773	**	2.060
Diploma	2.974	**	2.010	2.661	**	1.950	2.677	**	1.940
Trade	0.819		0.510	0.800		-0.610	0.809		-0.570
Certificate	0.882		0.090	0.916		-0.070	0.840		-0.140
Completed Yr 12	3.481	**	2.150	3.056	**	2.060	3.364	**	2.210
No Yr 12 or other qual	—			—			—		
Income ($000):									
Personal unearned income	1.000		0.080	1.000		0.010	1.003		0.640
Partner's disposable income	1.000		0.000	0.998		-0.170	0.997		-0.230
Disincentive measure:									
EMTR (%)	1.005		1.180						
Participation tax rate (%)				0.983		-1.420			
Replacement rate (%)							0.989		-1.450

[14] As pointed out by an anonymous referee, it should be noted that because the RR and PTR are constructed using the wage predicted from a separate regression model (or 'generated regressors'), the standard errors for these variables may be underestimated, and hence the statistical significance overstated (see, Pagan, 1984).

Table 3 (continued) - Random Effects Logit Model Estimates of the Probability of Entering Employment; Persons Aged 25-64 and not in the Labour Force, HILDA Waves 1-3:

(a) Males

Parameter	*Odds Ratio*	*Z*	*Odds Ratio*	*Z*	*Odds Ratio*	*Z*
Observations	1465		1465		1465	
Groups	753		753		753	
Wald Chi2(23; 24)	43.47 ***		48.62 ***		47.82 ***	
Log-likelihood	-428.792		-428.917		-428.843	
AIC	907.585		907.833		907.687	
BIC	1039.825		1040.074		1039.927	
$\ln(\sigma_v^2)$ [a]	1.576		1.370		1.412	
σ_v [a]	2.199		1.984		2.026	
Rho (ρ) [a]	0.595		0.545		0.555	
Likelihood ratio test of ρ=0	13.58 ***		11.02 ***		11.98 ***	

(b) Females

Parameter	*Odds Ratio*		*Z*	*Odds Ratio*		*Z*	*Odds Ratio*		*Z*
Not in labour force in:									
wave1	0.560	***	2.720	0.576	***	-2.670	0.576	***	-2.660
wave2	0.818		1.180	0.817		-1.200	0.815		-1.220
wave3	—			—			—		
Age (yrs):									
25_34	1.385		1.480	1.332		1.330	1.427	*	1.640
35_44	—								
45_54	0.437	***	3.060	0.451	***	-3.020	0.411	***	-3.320
55_64	0.115	***	6.380	0.133	***	-6.120	0.111	***	-6.610
Family status:									
Single, no kids	—			—			—		
married, no kids	0.905		0.300	0.889		-0.360	0.915		-0.270
married with kids	1.653		1.470	1.643		1.490	1.704		1.590
& youngest<4 yrs	0.444	***	3.160	0.476	***	-2.970	0.464	***	-3.060
Sole parent	1.160		0.370	1.392		0.830	1.377		0.800
& youngest<4 yrs	0.532		1.310	0.586		-1.130	0.577		-1.160
Prop. time in work (%)	1.025	***	6.690	1.023	***	6.290	1.023	***	6.280
Indigenous	0.456		1.360	0.533		-1.120	0.526		-1.140
English is 1st language	—			—			—		
English not 1st language &:									
English good	0.533	**	2.200	0.534	**	-2.250	0.540	**	-2.200
English poor	0.181	***	2.820	0.190	***	-2.810	0.200	***	-2.710
Has long-term disability	0.534	***	3.130	0.566	***	-2.900	0.562	***	-2.920
Highest education level:									
University degree	4.148	***	5.100	3.831	***	4.990	3.636	***	4.730
Diploma	1.842	**	2.010	1.768	**	1.930	1.747	*	1.880
Trade	1.102		0.330	1.094		0.310	1.102		0.330
Certificate	1.153		0.280	1.147		0.280	1.163		0.300
Yr 12	1.420		1.360	1.411		1.370	1.408		1.360
No Yr 12 or other qual	—			—			—		
Income ($000):									
Personal unearned income	0.984		1.440	0.991		-0.920	0.997		-0.410
Partner's disposable income	1.003		1.170	1.001		0.610	1.002		0.660

Table 3 (b) Females (continued)

Parameter	*Odds Ratio*	*Z*	*Odds Ratio*	*Z*	*Odds Ratio*	*Z*
Disincentive measure:						
EMTR (%)	1.009 **	1.980				
Participation tax rate (%)			0.979 **	-2.500		
Replacement rate (%)					0.990 *	-1.880
Observations	3632		3632		3632	
Groups	1814		1814		1814	
Wald Chi2(23; 24)	118.15 **		124.03 **		123.06 **	
Log-likelihood	-1224.937		-1223.796		-1225.232	
AIC	2499.875		2497.591		2500.463	
BIC	2654.813		2652.53		2655.402	
$\ln(\sigma_v^2)$ [a]	1.369		1.277		1.296	
σ_v [a]	1.983		1.893		1.912	
Rho (ρ) [a]	0.544		0.521		0.526	
Likelihood ratio test of ρ=0	36.82 ***		33.38 ***		34.74 ***	

Source: Authors' own calculations from confidentialised unit record files of the HILDA Survey waves 1-4.
Notes: a. $\ln(\sigma_v^2)$ is the log of variance or the panel-level variance component. σ_v is the standard deviation. Rho (ρ) is the proportion of the total variance contributed by the panel-level variance component, that is, $\rho = \sigma_v^2/(\sigma_v^2+1)$. *** Significant at 1% level; ** Significant at 5% level; * Significant at 10% level.

When estimating transitions from unemployment the sample size is considerably smaller. After allowing for missing values, there are 348 males (table 4a) and 307 females (table 4b) available for estimation in the pooled sample. Fifty-two per cent of the males and 45 per cent of the females are employed at the time of the following survey. Of those who remained unemployed and continue in the panel, 19 per cent (seven per cent) of the males and 22 per cent (six per cent) of females find employment two (three) years after their spell of unemployment is first observed. There are 36 per cent of males and 39 per cent of females who remain unemployed at the end of the study timeframe (2004).

Age is strongly influential among unemployed males. The young (25-34 years) are estimated to be around twice as likely to gain employment than the next older age group (35-44 years); on the other hand, males approaching retirement (55-64 years) have estimated odds that are around 11 per cent of the odds for 35-44 year olds. There are then big life cycle differences in the prospects of making a transition into employment, with younger adult males much more able to make such transitions. Of the other variables, labour market history once again stands out as an important influence on unemployed males' prospects in the labour market; each one percentage point increase in the time spent working raises the estimated odds of making a successful transition by about two percentage points. Findings for unemployed females are different in some respects. Possession of university qualifications is very influential for unemployed female labour market prospects, with estimated odds that are more than three times those of unemployed females with no post-school qualifications. Stages in the life cycle other than the pre-retirement years (55-64 years) are not a factor shaping unemployed females' transition into employment.

Turning to the work incentive measures we once again find that the EMTR measure is insignificant, and takes the 'wrong' sign in the unemployed male transition model, confirming that EMTRs are an unsuitable measure of the work incentives relevant to the transition from either non-participation or unemployment into employment. On the other hand, the coefficients on the RR and PTR are negative and statistically significant for both males and females. The Bayesian Information Criterion (BIC) and Akaike Information Criterion (AIC) statistics indicate that among the unemployed the RR is the preferred measure. For males and females, a one percentage point increase in the RR lowers the estimated odds ratio by around two per cent and three per cent respectively.

Table 4 - Pooled Logit Model Estimates of the Probability of Entering Employment; Persons Aged 25-64 and Unemployed, HILDA Waves 1-3

(a) Males

Parameter	*Odds Ratio*	*Z*	*Odds Ratio*	*Z*	*Odds Ratio*	*Z*
Unemployed in:						
wave1	0.879	0.410	0.839	-0.550	0.853	-0.500
wave2	1.194	0.510	1.184	0.480	1.195	0.500
wave3	—		—		—	
Age (yrs):						
25_34	1.936 **	2.030	1.983 **	2.050	2.282 **	2.440
35_44	—					
45_54	0.437 **	2.450	0.400 ***	-2.670	0.351 ***	-2.980
55_64	0.113 ***	4.990	0.105 ***	-5.130	0.078 ***	-5.510
Family status:						
Single, no kids	—		—		—	
Married	1.241	0.590	1.677	1.350	1.930 *	1.660
Sole parent	0.428	1.280	0.562	-0.860	0.663	-0.610
Prop. time in work (%)	1.027 ***	3.890	1.020 ***	2.900	1.019 ***	2.620
Indigenous	0.820	0.330	0.673	-0.640	0.664	-0.660
English not 1st language	0.820	0.510	0.840	-0.450	0.871	-0.360
Has long-term disability	0.638 *	1.680	0.745	-1.080	0.791	-0.850
Highest education level:						
University degree	1.565	1.040	1.404	0.780	1.136	0.290
Diploma	2.272 *	1.660	1.971	1.340	1.715	1.050
Trade	1.606	1.510	1.533	1.350	1.560	1.410
Certificate	0.781	0.390	0.781	-0.380	0.821	-0.300
Completed Yr 12	1.648	1.030	1.600	0.950	1.510	0.820
No Yr 12 or other qual	—		—		—	
Income ($000):						
Personal unearned income	1.038	1.320	1.044	1.550	1.061 *	1.890
Partner's disposable income	1.011	0.800	1.006	0.410	1.004	0.310
Disincentive measure:						
EMTR (%)	1.004	0.540				
Participation tax rate (%)			0.970 ***	-2.990		
Replacement rate (%)					0.976 ***	-3.380
Observations	348		348		348	
Wald Chi2 (19; 20)	84.11 ***		93.12 ***		95.80 ***	
Log-likelihood	-197.496		-192.991		-191.651	
AIC	434.991		425.983		423.303	
BIC	512.035		503.027		500.347	
Likelihood ratio test of ρ=0	0.84		0.30		0.21	

Table 4 (b) Females

Parameter	*Odds Ratio*	*Z*	*Odds Ratio*	*Z*	*Odds Ratio*	*Z*
Unemployed in:						
wave1	0.662	1.220	0.610	-1.430	0.613	-1.410
wave2	0.945	0.170	0.911	-0.280	0.913	-0.270
wave3	—		—		—	
Age (yrs):						
25_34	0.739	0.920	0.746	-0.880	0.878	-0.390
35_44	—		—		—	
45_54	0.769	0.740	0.732	-0.890	0.536 *	-1.690
55_64	0.296	2.080	0.307 **	-2.000	0.180 ***	-2.790
Family status:						
Single, no kids	—		—		—	
Married	0.545	1.510	0.551	-1.440	0.629	-1.080
Sole parent	0.939	0.150	1.196	0.420	1.594	1.030
Prop. time in work (%)	1.024 ***	4.500	1.020 ***	3.690	1.017 ***	3.110
Indigenous	0.358	1.370	0.297 *	-1.640	0.315	-1.560
English not 1st language	0.525 *	1.780	0.545 *	-1.640	0.556	-1.570
Has long-term disability	0.583 *	1.670	0.639	-1.370	0.627	-1.420
Highest education level:						
University degree	3.155 ***	2.820	4.012 ***	3.340	3.319 ***	2.900
Diploma	1.361	0.630	1.432	0.730	1.359	0.620
Trade	1.319	0.670	1.407	0.820	1.439	0.860
Certificate	0.475	1.030	0.413	-1.170	0.382	-1.260
Completed Yr 12	1.067	0.150	1.163	0.340	1.172	0.360
No Yr 12 or other qual	—		—		—	
Income ($000):						
Personal unearned income	1.022	0.810	1.013	0.520	1.024	0.930
Partner's disposable income	1.000	0.010	0.991	-1.140	0.987	-1.490
Disincentive measure:						
EMTR (%)	0.985 *	1.770				
Participation tax rate (%)			0.959 ***	-3.170		
Replacement rate (%)					0.965 ***	-3.620
Observations	307		307		307	
Wald Chi2 (19; 20)	67.18 ***		74.65 ***		78.20 ***	
Log-likelihood	-175.593		-171.858		-170.074	
AIC	391.185		383.716		380.148	
BIC	465.722		458.253		454.685	
Likelihood ratio test of ρ=0	0.03		0.00		0.00	

Source: Authors' own calculations from confidentialised unit record files of the HILDA Survey waves 1-4.
Notes: *** Significant at 1% level; ** Significant at 5% level; * Significant at 10% level.

To illustrate the economic significance of the work incentive estimates, the predicted probability of an individual entering employment is calculated with the RR and PTR set at zero per cent, 25 per cent, 50 per cent, 75 per cent and 100 per cent; and with all other variables set at their mean values (tables 5a and 5b). The means and standard deviations of each disincentive measure are also included to allow an appreciation of the magnitude of such changes in the context of the actual distribution of PTRs and RRs for the sample (EMTRs have not been included given the results above).

From table 5a it can be seen that the predicted probability of entering

employment for the 'average' non-participant with a PTR or RR of zero is more than double that predicted for comparable persons with a PTR or RR of 100 per cent, albeit from a low base-line transition probability. Of these four cases, however, the estimated coefficient on the incentive effects is significant at the five per cent level only in the case of the PTR for female non-participants. Female non-participants with a PTR of zero are predicted to be more than five times as likely to enter employment as those with a PTR of 100 per cent. As shown in table 5b, the magnitude of the effects implied by the work incentive estimates on the unemployed is also very large. Unemployed males facing a zero PTR or RR are predicted to be three to four times as likely to enter employment as those who face a PTR or RR of 100 per cent. The estimated effects are even larger for females.

Table 5 - Predicted Probability[a] of Entering Employment, Conditional Upon Selected Values of the PTR and RR

(a) From Not in the Labour Force

	Males		*Females*	
Reference Rate	*PTRs*	*RRs*	*PTRs*	*RRs*
0%	11.3%	9.7%	17.4%	11.6%
25%	8.5%	8.1%	12.1%	9.6%
50%	6.3%	6.7%	8.1%	7.9%
75%	4.6%	5.5%	5.3%	6.5%
100%	3.3%	4.5%	3.3%	5.3%
mean (PTR/RR)	43.0%	32.0%	41.9%	23.5%
std dev	11.2%	18.5%	10.4%	18.2%

(b) From Unemployment

	Males		*Females*	
Reference Rate	*PTRs*	*RRs*	*PTRs*	*RRs*
0%	70.5%	60.0%	75.6%	61.2%
25%	56.9%	48.8%	56.9%	43.4%
50%	42.2%	37.5%	36.1%	26.9%
75%	28.6%	27.2%	19.1%	14.5%
100%	17.6%	18.6%	8.6%	7.0%
mean (PTR/RR)	44.4%	30.2%	42.9%	27.1%
std dev	13.7%	22.2%	12.8%	21.2%

Source: Authors' own calculations from confidentialised unit record files of the HILDA Survey waves 1-4.
Note: a. The predicted probabilities of entering employment are calculated from the relevant logit models presented in tables 3 and 4; with all other variables evaluated at their means.

The strategy for dealing with endogeneity between the work incentive measures and employment outcomes has been to lag the observation on the incentive measure, on the assumption that a person's employment status in one year's time cannot 'cause' their current EMTR, PTR or RR. However, endogeneity will still affect the disincentive measures if those individuals with a lower likelihood of entering employment also have lower earnings potential, and hence higher measured PTRs and RRs. That is, it may be the pre-existing inferior employability of those with lower earnings potential that impacts upon their transitions, rather than the higher measured disincentives they face. To test this possibility, the transition models were also estimated with the predicted wage included among the explanatory variables. The predicted wage attains significance in around half the models, but largely acts as a proxy for human capital variables already included in the model. Importantly, the inclusion of the predicted wage does not substantially alter the magnitude or significance of the estimates for the disincentive measures in any of the models.[15]

5. Conclusion

Reform of the welfare system has been identified as a policy priority because of concerns that the interaction between the tax and benefit systems creates unemployment traps and limited incentives to increase participation, potentially confining those with low incomes and the unemployed to extended periods of poverty and welfare dependency. Increasing labour force participation more generally has now become a priority as a result of both the current very tight labour market conditions in Australia and concerns about the implications of an aging population for future labour supply.

The analysis of transitions from non-employment to employment has important implications for policy and for methodology in modelling labour supply. In this paper we have presented estimates, in the form of RRs, PTRs and EMTRs, of how Australians' financial circumstances would change as a result of transitioning from non-employment into employment. Sole parents, singles, public housing tenants and NSA recipients are confirmed as groups facing RRs and PTRs above the norm. Whether these measured rates can be considered 'high' depends critically upon the degree to which individuals respond to them by adjusting their labour supply, and this is also critical to the improvement in participation a government can expect from various welfare-to-work measures.

We find that financial disincentives as measured by PTRs do have a significant effect on the likelihood that women who are not in the labour force will enter paid employment. The implied effect is very large relative to the small baseline rate of transition from outside the labour force to paid employment. The estimated elasticity for males who are not in the labour force is of a similar magnitude, though not significant in statistical terms. The impact for women is probably the parameter of greatest policy significance — women have much lower participation rates than men and hence women outside the labour force offer a very large latent labour supply.

For unemployed persons aged 25 to 64, we find very strong evidence of the presence of unemployment traps. These are captured strongly through both the RR and PTR measures, though the BIC and AIC statistics indicate that among the unemployed the RR is the preferred measure. Given that these individuals have, by definition, chosen to actively search for work the problem is not one of disincentives

[15] Estimates are available from the authors on request.

to participation, but rather of a lower likelihood of finding a job given the decision to participate. This would seem to imply that financial disincentives influence their search intensity or their willingness to accept jobs on offer.[16] It should also be noted that these estimates of work disincentives relate only to static effects. Labour market history is known, and confirmed here, to have a very strong association with future labour market outcomes. The effect of high PTRs or RRs will therefore accumulate over time to the extent that they contribute to individuals' accumulated time in unemployment and absence from the labour force. While the EMTR is the most commonly cited measure of the work disincentives created through the tax and benefit system, the results here suggest that it is a very poor measure of the disincentives facing persons out of work. It lacks a justification in economic theory, and since most of those out of work have zero EMTRs it will not detect disincentive effects on their labour supply behaviour even when present. Either RRs or PTRs should be used in preference to EMTRs when measuring and modelling disincentives for this group.

Some caution should be exercised in accepting these results. Courtesy of the longitudinal nature of the HILDA data, the methodology offers opportunities to deal with endogeneity that were not available to cross section studies, but we cannot claim to have eliminated it altogether. Note also that the estimates of the RR and PTR variables are partly driven by the wage equation used for predicting earnings in employment. A contentious element of our approach is the assumption of a full-time wage in calculating the RR and PTR. In Dockery *et al.* (2008) we have predicted the wage using an alternative approach where annual wages from both full-time and part-time workers are estimated to account for the probability of individuals entering either part-time or full-time employment when they secure work. Our modelling results prove to be quite robust to these alternative approaches to generating the predicted wage.

The analysis presented is based on data from the years 2001 to 2004. There were relatively few reforms to the tax and benefits system over this time and the most important of the current welfare-to-work reforms were implemented in July of 2006, including significant changes relating to the Disability Support Pension and Parenting Payments. Ongoing development of the tax-benefit simulator to incorporate policy changes will provide a ready basis for measuring the impact of these policy initiatives upon alternative measures of financial disincentives, and for predicting the likely labour supply responses. Updating of the tax and benefit parameters for Waves 4 and 5 of HILDA undertaken subsequent to this analysis may also permit a more sophisticated modelling approach to identifying labour supply responses, including the potential for natural experiments created by the July 2006 policy changes. And while this paper has focussed on persons who are not working, an intended extension of the analysis is to look at how financial disincentives affect the hours of labour supplied by those in work, particularly those in part-time work.

[16] Further investigation revealed some evidence of a relationship between the RR facing unemployed individuals and their reservation wage (see, Dockery, Ong and Wood, 2008).

Appendix I

Tax-benefit Models, 2001-2003

Table A1 - Parameters in the 2001-02, 2002-03 and 2003-04 Tax-benefit Models

Tax	*Benefit*
Personal income tax	**Means-tested pensions**
Tax-free threshold $6,000	Age Pension
	Disability Support Pension
Medicare levy	DVA Service Pension
Beyond the upper income limit, the levy is calculated at 1.5% of taxable income. Family concessions apply	Wife Pension
	Carer Payment
	Parenting Payment Single
Non-refundable tax offsets	**Means-tested allowances**
Dependent spouse tax offset	Newstart Allowance
Senior Australians tax offset	Youth Allowance
Pensioner tax offset	Mature Age Allowance
Beneficiary tax offset	Sickness Allowance
Low income tax offset	Parenting Payment Partnered
Superannuation pension or annuity tax offset	Special Benefit
	Widow Allowance
	Partner Allowance
Refundable tax offsets	Carer Allowance
Franking tax offset	Austudy
Superannuation surcharge	**Non-means-tested pensions or allowances**
Employer superannuation contribution rate based on 2002-03 average rate by industry	DVA War Widow's Pension
	DVA Disability Pension
	Family payments
	Family Tax Benefit Part A
	Family Tax Benefit Part B
	Supplementary payments
	Pharmaceutical Allowance
	Large Family Supplement
	DVA War Widow's Income Support Supplement
	Housing assistance
	CRA
	Public housing subsidy

Appendix II

Table A2 - Wage Regression Results (Heckman Two Stage Model Estimates, HILDA waves 1-3 pooled)

	Males				*Females*			
Explanatory Variable	*Coef.*		*Std. Err.*	*t*	*Coef.*		*Std. Err.*	*t*
Wave of observation:								
Wave 1								
Wave 2	0.028	**	0.012	2.331	0.035	***	0.011	3.056
Wave 3	0.077	***	0.012	6.259	0.073	***	0.012	6.314
Whether father employed while aged 14	0.026		0.017	1.546	0.034	**	0.016	2.089
Country of birth:								
Australia								
Main English-speaking countries	0.014		0.016	0.890	0.015		0.016	0.937
Other	-0.038	*	0.021	-1.771	-0.017		0.020	-0.828
Age	0.036	***	0.004	8.707	0.034	***	0.004	9.032
Age squared	0.000	***	0.000	-4.275	0.000	***	0.000	-7.963
Marital status:								
Married/partnered								
Never married	-0.049	***	0.016	-3.049	-0.029	*	0.015	-1.873
Separated, divorced or widowed	-0.002		0.022	-0.094	0.008		0.016	0.502
Highest qualification:								
Year 12 or below								
Non-defined certificates	-0.091		0.112	-0.806	0.001		0.068	0.012
Certificate level 1 or 2	-0.094	**	0.045	-2.078	-0.084	**	0.040	-2.097
Certificate level 3 or 4	0.035	***	0.013	2.765	0.003		0.015	0.189
Diploma	0.177	***	0.020	8.895	0.119	***	0.017	7.105
Bachelor degree	0.298	***	0.020	14.805	0.297	***	0.015	19.187
Graduate degree	0.293	***	0.029	10.223	0.390	***	0.022	17.466
Postgraduate degree	0.366	***	0.032	11.418	0.409	***	0.030	13.427
Labour market history since left full-time education:								
% of time in paid work	0.000		0.001	-0.108	0.003	***	0.001	4.627
% of time unemployed	-0.002	**	0.001	-2.201	-0.003	***	0.001	-4.447
English 1st language								
English not 1st language &:								
Speaks English poorly	-0.131	**	0.058	-2.248	-0.334	***	0.063	-5.331
Speaks English well	0.058	***	0.023	2.543	0.071	***	0.022	3.287
Location:								
Sydney								
Rest of New South Wales	-0.129	***	0.020	-6.335	-0.153	***	0.018	-8.433
Melbourne	-0.031	*	0.017	-1.896	-0.091	***	0.016	-5.763
Rest of Victoria	-0.211	***	0.025	-8.285	-0.176	***	0.022	-8.099
Brisbane	-0.125	***	0.020	-6.225	-0.140	***	0.019	-7.327
Rest of Queensland	-0.153	***	0.022	-6.894	-0.198	***	0.019	-10.283
Adelaide	-0.149	***	0.024	-6.324	-0.149	***	0.022	-6.649
Rest of South Australia	-0.250	***	0.040	-6.266	-0.245	***	0.032	-7.620
Perth	-0.085	***	0.022	-3.877	-0.131	***	0.022	-6.071
Rest of Western Australia	-0.108	***	0.032	-3.331	-0.198	***	0.035	-5.725
Tasmania	-0.197	***	0.036	-5.544	-0.173	***	0.030	-5.778
Northern Territory	-0.133	**	0.059	-2.268	-0.062		0.055	-1.125
Australian Capital Territory	0.076	**	0.036	2.125	0.000		0.034	-0.011

Appendix II (continued)

Table A2 - Wage Regression Results (Heckman Two Stage Model Estimates, HILDA waves 1-3 pooled)

	Males			*Females*		
Explanatory Variable	*Coef.*	*Std. Err.*	*t*	*Coef.*	*Std. Err.*	*t*
Number of dependent children:						
Aged 0-2 years	0.014	0.014	1.008	-0.009	0.033	-0.259
Aged 3-4 years	0.012	0.017	0.719	0.017	0.022	0.783
Aged 5-9 years	0.006	0.011	0.537	-0.012	0.011	-1.057
Aged 10-12 years	-0.019	0.013	-1.502	-0.015	0.012	-1.237
Aged 13-14 years	-0.029 *	0.017	-1.677	0.000	0.016	0.003
Has disability	0.011	0.029	0.375	-0.068 ***	0.021	-3.264
Housing tenure:						
Outright owner	0.030	0.019	1.543	0.015	0.015	1.023
Owner purchaser	-0.070 ***	0.019	-3.758	-0.063 ***	0.017	-3.697
Private renter	-0.098 **	0.040	-2.430	-0.110 ***	0.040	-2.774
Public renter	-0.188 ***	0.025	-7.414	-0.147 ***	0.025	-5.786
Rent free	-0.195 ***	0.067	-2.917	0.136 **	0.061	2.231
Inverse Mills ratio	2.094 ***	0.125	16.781	1.843 ***	0.113	16.375
Constant						
Sample	10461			9543		
F (43)	71.623 ***			51.172 ***		
Adjusted R^2	0.225			0.184		

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