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Estimating Australian labour supply curves from micro data: is it really meaningful?

A. D. Hall

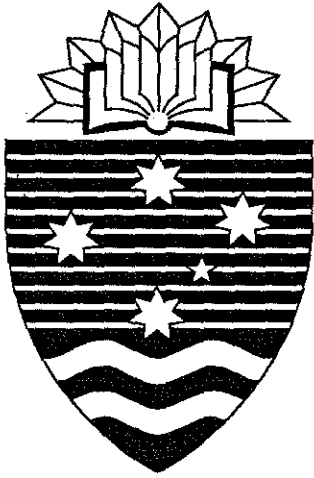
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PAPERS**

**"Estimating Australian Labour Supply Curves
From Micro Data:
Is It Really Meaningful?"**

by

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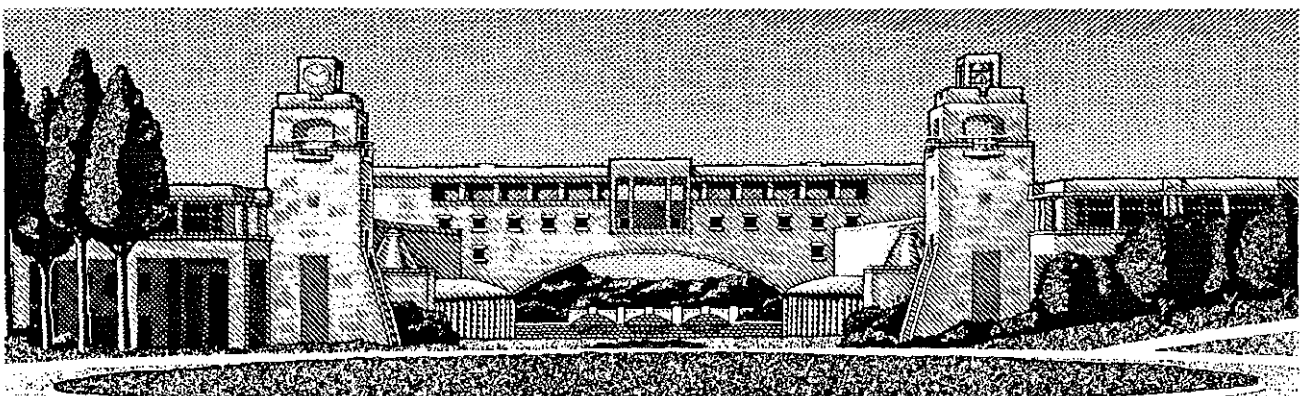
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B O N D U N I V E R S I T Y

Estimating Australian Labour Supply Curves From Micro Data: Is It Really Meaningful?

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Abstract

This paper argues that due to the payment of fringe benefits and the effect of labour legislation entitling workers to non-wage benefits the observed hourly wage is an underestimate of the actual return to labour. Furthermore, as the proportion of total wage comprising fringe benefits increases with hours worked there is a spurious negative relationship between weekly hours and the average hourly wage rate. This is contaminated by the selection bias from individuals optimizing over hours and wage rates. We derive the conditional empirical wage\hours profile while adjusting for the possible endogeneity of hours worked to the wage rate. Our results indicate that the hourly gross wage rate is inversely related to weekly hours worked making the estimation of an upward sloping labour supply curve improbable.

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1. Introduction

The advent of Australian unit record data sets has redirected the focus of micro-econometric studies to the behaviour of the individual. One popular empirical exercise has been the estimation of labour supply functions (see for example Ross (1987), Woodland (1987), Miller & Volker (1987)). While these studies consider different demographic groups and data sources they generally employ the observed hourly gross, or pre-tax, wage as the measure of remuneration to labour. The assumption that the hourly wage rate is independent of the number of hours worked is implicit in such a methodology. However, the available empirical evidence suggests this assumption is inappropriate although the exact nature of the wage\hours relationship remains in dispute (see Moffitt (1984), Lundberg (1985), Biddle & Zarkin (1989) and Vella (1992)). This is an important issue as it has obvious implications for the estimation of labour supply and demand schedules.

The constant hourly wage assumption is particularly untenable in the Australian context due to the use of non-wage labour income. As non-wage labour income comprises a non-trivial proportion of most Australian workers wages it is unrealistic to treat the gross wage as the price of labour. Moreover, it is likely that the proportion of total wages comprising non-pecuniary benefits \4increases \1with the number of hours worked. This is due to legislation entitling full-time workers to specific employer provided benefits and may also result from an effort by employers and employees to avoid income taxation. This generates a negative relationship between the reported gross wage rate and hours worked. Vella (1992) investigates the implications of this relationship, and alternative wage\hours schedules, for estimation of labour supply elasticities. However, more generally, it is informative to examine the empirical relationship between wages and hours for a number of reasons. First, it illustrates the futility of employing the observed hourly wage in labour supply functions. Second, we gain some indication of the premium paid to part-time workers. Finally, it provides some measure of the pecuniary value of the non-pecuniary packages paid to full-time workers.

An additional issue is the endogeneity of the hourly wage rate with respect to weekly hours worked. It is conceivable that those individuals working the longest hours are those who are also the most productive. If part of this productivity is not captured by the included conditioning variables, and this component affects the individual's wage, a spurious relationship between hours and wages may arise. Accordingly, it is important to account for this possibility when estimating the impact of weekly hours on wage rates.

Our primary objective is to illustrate that the estimation of labour supply functions from Australian micro data sets is of relatively limited value given the decreasing hourly wage rate schedule. We estimate the wage\hours schedule for young Australians over the four year period 1985-1988, inclusively, while accounting and testing for the endogeneity of hours worked to the observed offered wage rate. This four year interval encompasses an interesting period as it includes the introduction of the fringe benefit tax (FBT). FBT's were introduced by the Federal Government in 1987 in response to the abuse of fringe benefit payments by employers as a means of tax avoidance. If the payment of fringe benefits affects the gross hourly wage rate it is possible that the introduction of the tax will have some impact on the wage\hours relationship.

The following section presents evidence in support of a wage rate varying with hours worked in the Australian labour market. Section 3 discusses the empirical methodology and Section 4 presents the empirical results. Some concluding comments are presented in section 5.

2. Wages and Hours and the Australian Labour Market

Non-wage pecuniary and non-pecuniary payments are used extensively in the Australian labour market. Due to relatively high marginal tax rates and extensive labour legislation, entitling workers to various forms of fringe benefits and non-wage labor income, non-wage hourly income represents a substantial proportion of total remuneration.¹ Table 1 reports the proportion of total workers receiving selected fringe benefits. It is clear that even those workers engaged in relatively few hours of weekly work receive benefits.² The payment of fringe benefits became so common during the early 1980's that the federal government responded by introducing an employer based fringe benefit tax. However, even in the absence of payment of fringe benefits, as a means of lowering employer and employee tax levels, Table 1 indicates the majority of workers receive substantial non-wage labour income. This is supported by the analysis of Miller & Volker (1987) on non-wage benefit recipients based on the 1985 wave of the Australian Longitudinal Survey (ALS).

The payment of non-wage pecuniary and non-pecuniary income distorts the relationship between the gross hourly wage and the value of labour's hourly marginal product. If labour remuneration is approximately set equal to the value of its marginal product the gross hourly wage rate must be below the hourly marginal product. Moreover, as casual and part-time workers generally do not receive all of the benefits, as suggested by Table 1, it is likely

¹In what follows we refer to non-wage pecuniary income as income from holiday pay, superannuation, sick leave etc. That is, benefits associated with white and blue collar labour. We refer to fringe benefits as benefits associated with managerial employment typically used to avoid taxation.

²We employ data for 1987 in generating this Table as it represents a year from the middle of our sample.

that their wage is set closer to their marginal product. This may produce a casual or part-time premium and induce a negative relationship between the gross wage rate and hours worked over the entire labour market.

The empirical evidence in Vella (1992) supports the existence of this negative relationship between gross wage rates and hours worked for young females using data from the 1985 wave of the ALS. Additional support can be found in other Australian labour supply estimates reported in Table 2. These estimates of the labour supply elasticities are low and, in some instances, even negative. To further explore the relationship between hours and wages we combine data from four waves of the ALS for the period 1985-1988. The wage rates are computed by dividing gross weekly earnings by weekly hours worked and are deflated by the consumer price index. The average wage still displays some growth due to the age of the sample. We then treat the data as a single cross section and produce bivariate cross tabulations for hours and wage rates. These are reported in Table 3.

Table 3 reveals some interesting features of the data. First, the empirical distribution of weekly hours work peaks for each gender in the 36-40 hours range. Second, the highest average gross hourly wage is obtained by those working the fewer hours. For both males and females the highest wage is incurred in the 26-35 hours group although there is little difference between this wage and that of the 1-25 hours category for females. Finally, there appears to be a negative relationship between weekly hours worked and the hourly wage rate although the decline for females appears steadier. For males the major fall appears to be at the traditional full-time\part-time division (i.e. less than and greater than 35 hours per week).

Consider the average wage rates for those working 26-35 hours per week. This category could be considered part-time workers and accordingly would be recipients of the part-time premium. Contrast this group with that working the traditional full-time hours (i.e. 36-40 hours per week). The hourly wage decrease is dramatic. For females the wage falls from \$7.99 to \$6.90 while for males it falls from \$9.99 to \$7.63. These represent decreases of 13.6 and 23.6 percent respectively. Also note the hourly wage rates remain well below the part-time level even for those workers engaging in overtime hours.

While this simple relationship does not eliminate the possibility of an upward sloping labour supply curve in gross wages it does make the estimation of such a relationship somewhat unlikely.³ However, other factors may be simultaneously associated with higher wages and lower hours and this spurious correlation may generate this negative relationship. Accordingly, once these factors have been controlled for it is possible an upward sloping

³While we focus on the relationship between the gross hourly wage rate and hours it is apparent that the negative relationship between net, or post-tax, hourly wage rates and hours will be even more dramatic.

supply curve will result. In the following sections we investigate the relationship between hours and gross wage rates after conditioning out the determinants of wages.

3. Estimating a Flexible Relationship Between Hours and Wages

Consider the following the two equation system describing the determinants of hours worked and the observed gross hourly wage rate

$$(1) \quad W_i = \beta'X_i + \delta(H_i) + u_i \quad i = 1,2,\dots,N$$

$$(2) \quad H_i = \alpha'Z_i + v_i \quad i = 1,2,\dots,N$$

where W_i denotes the gross hourly wage rate of individual i ; H_i is the level of weekly hours worked by individual i ; X_i and Z_i are vectors of exogenous variables characterizing the determinants of wages and hours; β and α are vectors of parameters to be estimated; δ is an unknown function; u_i and v_i are zero mean error terms from a bivariate normal distribution with variances σ_u^2 , σ_v^2 and covariance σ_{uv} . The effect of hours on the hourly wage rate is captured by the function δ . Previous efforts to estimate δ have employed polynomial functions in hours (see Moffitt (1984) and Biddle & Zarkin (1989)) and dummy variables (see Vella (1992)). We employ the latter approach as this provides the most flexible parameterization of the wage\hours profile in that, in principle, it allows the relationship to change at every observed hour of work.

A feature of the model is the covariance between the respective error terms capturing the potential endogeneity between wage rates and hours worked. When σ_{uv} is non-zero it is necessary to estimate the hours and wages simultaneously to eliminate the bias in our estimate of the δ function. The covariance also indicates whether the unobserved factors which influence the hours of work also affect the observed hourly wage rate. Thus it is similar to a test of selection bias. However, given the age of individuals comprising the sample it is possible that selection bias is not relevant given that most individuals of this age who have left school are likely to have a strong commitment to market employment. It is useful, however, to test this proposition. Note that it is also possible that there are constraints on the labour supply behaviour of individuals due to the high rates of unemployment. If so, it is possible that selection bias may operate through this mechanism.

To proceed first create the following indicator functions

$$(3) \quad D_{ji} = 1 \text{ if } 1(H_i = j) \text{ for } j = 1,2,\dots,m$$

where m is the number of permissible values for j and reflects various numbers of hours worked by members in the sample. Note that j may represent some interval denoting a range of hours. $1(\cdot)$ is an indicator function denoting the occurrence of event (\cdot) . Now construct a vector D_i by combining the D_{ji} 's. Write the system as

$$(1a) \quad W_i = \beta'X_i + \gamma'D_i + u_i \quad i = 1, 2, \dots, N$$

$$(2) \quad H_i = \alpha'Z_i + v_i \quad i = 1, 2, \dots, N$$

where γ is a $(m-1)$ vector of parameters representing the δ function. Vella (1991) has shown that the least squares estimates of γ are consistent under fairly general conditions providing σ_{uv} is equal to zero and the break points in j are suitably chosen. This first condition may not be satisfied as wages may not be weakly exogenous to hours. We overcome this by conditioning (1a) on the observed values of Z_i and D_i and invoking our joint normality assumption. Rewrite (1a) as

$$(4) \quad E(W_i|Z_i, D_i) = \beta'E(X_i|Z_i, D_i) + \gamma'E(D_i|Z_i, D_i) + \lambda E(v_i|Z_i, D_i) + \eta_i$$

where λ is equal to σ_{uv}/σ_v^2 and η_i is a white noise error term. The expectations operator does not affect the X 's and the expectation of an indicator function given its observed value is itself. All that remains is the conditional expectation of the error term v_i . This is the generalized residual from the reduced form equation (2) and its form depends on the manner in which equation (2) is estimated. As the hours of work variable is censored at zero we estimate equation (2) by tobit. Accordingly, the residuals should take the form corresponding to the tobit model. These are given as

$$(5) \quad \varphi_i = I(H_i > 0)\{H_i - \hat{\alpha}'Z_i\} + [1 - I(H_i > 0)]\{\phi(\hat{\alpha}'Z_i/\hat{\sigma}_v)/\Phi(\hat{\alpha}'Z_i/\hat{\sigma}_v)\}$$

where $I(H_i > 0)$ is an indicator function denoting that individual i reports positive hours; $\hat{\alpha}$ and $\hat{\sigma}_v$ are the tobit maximum likelihood estimates; and ϕ and Φ are the probability density and cumulative distribution functions of the standard normal distribution.

By including these residuals in equation (4) we get consistent estimates of γ by estimating over the sub sample of individuals reporting positive hours. Furthermore, the t -test of λ equal to zero is a test of the weak exogeneity of hours to wages (see Vella (1991)).

4. The Wage/Hours Profile for Young Australians

To estimate the wage\hours profile we employ data from the ALS for 1985-1988.⁴ We only include individuals who have reported that they are not engaged in full-time education. These data represent an excellent focus of study given their detailed information relating to individual behaviour regarding wages and hours. The data also contain sample periods prior to and following the introduction of the fringe benefit taxes. This enables consideration of whether the FBT generated a change in the wage\hours profile. To examine how time effects and gender may influence the wage\hours profile we estimate separate profiles for males and females for each of the individual waves. We also estimate profiles for the entire period for each gender using the pooled cross sections.

It is possible that the unconditional relationship between average hourly wages and weekly hours worked, featured in Table 3, was due to those working the lower average hours being more productive than those working full-time. We examine this possibility in two ways. First we estimate a tobit equation of hours of work to examine whether the characteristics generally associated with higher wages are increasing or decreasing hours worked per week. Second, we employ the procedure outlined in section 3 which estimates the functional relationship between hours and wages while regressing out the other influences on wages.

We first estimate the tobit equation of hours of work over the two pooled cross sections for females and males.⁵ While the parameter estimates are not reported the coefficients for both males and females are generally consistent with expectations. In estimating the parameters from the combined data set we do not employ panel data estimation procedures as the increased computational complexity does not provide any benefits in this particular example and the conventional tobit estimates are consistent. An examination of these coefficients does not support the view that more productive individuals are working fewer hours. For example, the higher educated individuals are working longer hours. Also, individuals with health difficulties are working fewer hours. Individuals with higher incidence of previous unemployment also tended to work fewer hours. Overall there are no indications that the individuals working the higher number of hours were less productive. It should be noted however that the tobit estimates also capture the probability of engaging in positive hours of work and it is possible that these results reflect the participation decision. However an examination of simple cross tabulations indicated that the individuals working the greater number of hours have larger endowments of productive characteristics.

⁴A brief description of the data are provided in the data appendix.

⁵We only report the estimates of the δ function in this paper. The full set of tobit and regression results are available from the authors.

With the tobit parameter estimates we generate the generalized residuals. We then regress the gross hourly wage rate against the hours of work dummy variables, the generalized residuals and several variables expected to influence the hourly wage rate. We estimated this regression over the four panels for males and females separately in addition to the pooled regressions for each gender.

Ideally we would have a dummy variable for each hour of work category as this presents the most flexible estimate of the wage\hours profile. However, despite the large number of observations there were several hours cells with small numbers of observations. To overcome small and empty cell sizes we grouped the hours dummies into larger categories. Our choice of hours categories was guided in the following way. For the pooled data sets we experimented with several groupings. However the smallest equal sized windows which provided robust results was four-hourly groups up to 56 hours of work per week and a single group thereafter. An additional approach was the grouping of hours to generate approximately equally populated cells. This generated some large hourly intervals at lower hours of work but individual dummies for the hours in the 35-39 range. Some of the common hourly levels in the full-time range were relatively over populated. There is no obvious way to legitimately reduce the size of these cells. For the individual waves the equal sized windows approach was not employed due to the smaller numbers of observations.

Let us first focus on the pooled results. While we do not report the regression results the implied wage\hours profiles are reported in Table 4. Prior to an examination of these profiles consider the coefficients on the residuals. In none of the four pooled cross section results is there any indication of endogeneity at conventional levels of significance. This perhaps indicates that due to the age of the sample being examined that both genders have a strong commitment to the labour force and there is no systematic sorting across hours groups by unobserved earning capacity. However, the profiles we report are based on equations estimated including the residuals as the estimates remain consistent and we do not exclude other variables on the basis of statistical insignificance.

In generating these profiles we employ only the coefficients of the hours of work dummies. As the hours dummies do not interact with the other conditioning variables the other coefficient and regressor values only affect the intercepts and not the slope of the wage\hours profile. To produce the profiles we incorporate the information in Table 3 and set the lowest hours category equal to \$8.57 for males and \$7.96 for females.⁶ We then adjust the other hours coefficients in order to retain the same absolute differences as is produced by the regression. With these values we set the lowest hourly group equal to 100.00, for **all** groups,

⁶Denote the coefficient for the lowest hour dummy as d_0 and the coefficients for the subsequent hours as d_k . Thus the appropriate formulae for the k 'th hour male entry in Table 4 is given by $(8.57 - d_0 + d_k)/8.57$ and where the appropriate formulae for females replaces 8.57 with 7.96.

and then examine how the wage varies, in percentage terms, as the number of weekly hours increases. It is appropriate to compare rows of the same columns in absolute terms and absolute differences within columns across columns. However comparisons of absolute levels across different hourly groupings are inappropriate.⁷

Consider the profiles based on the four hourly groupings. It is apparent that for both males and females the estimates are contaminated by small cell sizes producing a very erratic relationship. However, it is also apparent that despite the occasional jumps the hourly wage rate is declining as hours of weekly work increase. Now focus on the groupings based on the "equally" populated cells. These results are somewhat more robust and perhaps provide greater insight. The female profile indicates that the highest hourly wage is received by those working the fewest hours. Moreover, with the exception of a minor increase going from the 25-34 to 35 hours and two percent increase going from 41-42 to 43-45 hours the hours wage profile is strictly downward sloping. Furthermore, the 17 percent difference in the wage between those working 1-24 hours and those working 40 hours is substantial. It appears that the estimation of an upward sloping supply curve for females is unlikely.

A similar result is revealed by the male profiles for this categorization of hours. The male wage peaks in the 35 hours category and then steadily declines as the hours worked increase up to forty hours. There is an eight percent increase in the 40-42 hours grouping, perhaps revealing some overtime effect. However, as with the female results the downward trend is quite dominant and given that the body of observations are in these groups where the wage is decreasing with hours it makes the estimation of an upward sloping supply curve improbable.

Let us now consider the implications of these estimates for the part-time premium and the value of non-wage labour income. First, treat the part-time workers as those comprising the 1-24 hour group and focus on the estimates from the model based on the equally populated cells. If we consider a full-time worker as an individual working between 37 and 40 hours a week the part-time premium ranges, for both males and females, from 13 to 17 percent. This represents a substantial increase over the full-time wage rate. It should be noted however that this represents an under-estimate of the casual premium. An examination of Table 1 reveals that an even at low hours of work many individuals receive a substantial package of non-wage benefits. Moreover, many of these benefits are generally associated with full-time employment. This is partially due to the fact that many part-time workers are permanent workers and receive the entitlement of the full-time workers on some pro-rata

⁷These figures should not be interpreted as evidence of females receiving higher wages than males in particular hours of work categories as the wages are reported to reflect dollar changes within specific gender/hour categorizations. There is an overall gender wage difference of approximately eight percent in favour of males.

basis. These workers do not receive the part-time premium and thus our estimate is contaminated with their presence in the sample and is biased downwards.

Using these estimates now evaluate the non-pecuniary payments to a full-time worker. Consider an employer who wishes to employ labour for 40 hours a week over 48 weeks of the year and consider a pool of potential workers who, at certain wage rates and non-wage labour income level, are indifferent between full-time work or a combination of part-time jobs. Focusing on the female market we see the employer can hire any combination of casual labour at \$7.96 per hour for 40 hours for 48 weeks at a total cost of \$15, 283.20. Alternatively, she could hire a female worker at a full-time rate of \$6.62 for 40 hours a week but pay her for 52 weeks. This generates a total cost of \$13, 769.60. This produces a difference of approximately 11 percent. This suggests that for female workers to be indifferent between full-time work and casual employment the value of non-wage labor income is approximately 11 percent of their gross annual income. This highlights the important role of non-wage income in the Australian labour market. As the part-time premium is almost identical for males a similar result would be found in the male market. Again it should be noted that this estimate is likely to be an under-estimate of the part-time premium given that the permanent part-time workers do not receive the premium.

While there is strong evidence that the observed wage\hours relationship is downward sloping it is useful to at least consider some alternative arguments in support of this schedule. One possible explanation is the division bias argument of Borjas (1980). Briefly stated, Borjas argues that if individuals compute their hourly wage by dividing weekly pay by weekly hours worked they are more likely to err in their estimation of hours. Accordingly, if the total wage is kept constant but individuals either under or over-estimate weekly hours worked, the resulting wage\hours schedule is downward sloping. In this particular context it is possible that this division bias effect explains variation within the full-time groups, as revealed by the downward sloping relationships for the 35 and over categories. This particularly being the case for the male market where there is a peak at 35 hours. However, it seems unlikely to explain the major decreases at the conventional full-time\part-time division.

An alternative explanation is that the data actually identify a demand and not supply curve. Given the high rates of youth unemployment during this period this argument is certainly tenable. However, a more plausible argument may simply be that the results identify the equilibrium relationship and both supply and demand schedules are determined by institutional factors governing non-wage labour income. Irrespective of the relevant market forces it would appear that an upward sloping supply curve is unlikely while a demand curve would only spuriously possess the correct slope.

We now focus on the wage\hours profiles based on the individual waves. Tobit equations were estimated for each of the individual waves, by gender, and then we estimate the wage profiles through separate regressions for each wave. As with the pooled regression there was little indication of endogeneity for either gender. Only for the 1985 wave for males and females and the 1986 wave for females was there any sign of endogeneity. The individual wave profiles presented in Table 5 confirm that the pattern revealed in the pooled data is not simply an artifact of pooling. A similar trend appears in each of the waves and the dollar decreases are of the same order of magnitude as those displayed in the pooled data. This is an interesting result as it indicates that the introduction of the FBT's had no impact on the wage\hours profile. This may reflect that the nature of the benefits received by the majority of the sample are not those considered taxable. Alternatively, it is possible that the major cause of the decline in the hourly wage rate is due to benefits attached to full-time employment. Thus, the interpretation of the hourly wage difference is that of a part-time or casual worker premium. It is also possible that due to the youthful nature of the data that the individuals are unlikely to represent the primary recipients of fringe benefits. Accordingly, a similar exercise applied to a higher earning sample may reveal some response to the FBT. Unfortunately no such data is available.

As we do not have detailed data on the fringe benefits being received by the sample it is useful to compare the jumps in the schedule to Table 1. For both genders, and for all four waves and pooled data sets, the major decline in the hourly wage rate occurs at the 36-40 hours category. Table 1 reveals the benefits whose frequency of receipt appear to increase the most at this point are sick leave, superannuation and holiday pay. It would appear that these benefits are responsible for the major decline in the hourly wage rate.

While the most recent labour supply estimates have employed individual record data previous efforts to estimate labour supply estimates from micro data were based on participation rates over specified regional groups (see for example Miller & Volker (1983)). However, participation decisions reflect movements along the extensive margin rather than the intensive margin. Accordingly, there is no way to unambiguously sign the impact of these declining wage schedule on the supply elasticities. For example, consider an market with three individuals where two do not participate, and one works part-time. Furthermore suppose the full-time hourly wage rate is 7.50 and there is a 33% casual premium. In this market the participation rate is 33% and the average wage rate is \$10.00. Now imagine the full-time wage rate increases to 9.00 inducing the individual working part-time to work full-time, one of the non-workers to work part-time, and the other non-worker to remain not working. The average wage rate is now \$10.50 and the participation rate is 66%. This produces an upward sloping supply curve consistent with the observed responses. However, consider an even

more dramatic response to the wage increase. That is, suppose the wage increase induces all three individuals to work full-time. The average wage is \$9.00 and the participation rate is 1. Compared to our starting point this reflects a downward sloping supply curve despite the data being generated by a positive response to wages. It is clear that this problem is at its greatest when the group in question is more likely to participate in part time work.⁸

5. Conclusion

An examination of individual record data on wages and hours worked per week clearly indicates that the hourly wage rate is decreasing in weekly hours worked. This is a product of institutional arrangements in the Australian labour market which compensates part-time and casual workers with a premium. This is compensation for the absence of non-wage and pecuniary and non-pecuniary income received by full-time workers. In this paper we examine the Australian youth labor market over the period 1985-88 to obtain an estimate of the part-time premium. Furthermore, we argue that the payment of such a premium renders the estimation of demand and supply schedules, where the observed hourly wage is used as the price of labour, a relatively meaningless task.

Our empirical results clearly establish this negative relationship between hours worked per week and the observed hourly wage rate. We find that the part-time premium is at least 13 to 17 percent for both females and males. We also find that the introduction of the fringe benefit tax in 1987 appeared to have no significant impact on the wage\hours profile for youth.

⁸Quite often downward sloping supply curves from these studies are interpreted as backward bending labour curves. However, backward bending supply curves reflect movements along the intensive margin and these group participation data only capture the extensive margin. Thus there is no income effect and the bending aspect is simply an artifact of the mismeasurement of wages.

Table 1: Percentage of Workers Receiving Selected Employment Benefits in Main Job By Hours of Work in 1987

Benefit	Hours of Work					
	<20	20-29	30-34	35-39	40	41+
No Benefits	44	23	9	3	4	4
Goods & Services	13	15	14	13	15	18
Superannuation	20	27	44	50	40	49
Annual Leave	41	62	86	94	93	90
Long-Service Leave	36	51	74	81	72	71

Source: Employment Benefits 1987, Australia: Australian Bureau of Statistics Catalogue No. 6334.0

Table 2: Australian Micro Data Studies of Labor Supply

Study	Demographic Group & Measure of Supply	Data Source	Supply Response
Ross (1987)	Married Women Hours	1980 Survey of Sydney Women	1.30 (a)
Miller & Volker (1983)	Married Women Participation	1976 Australian Census (LGA's)	1.82 (b) 0.93 (c)
Miller & Volker (1987)	Youth Hours	1985 Wave of ALS	negative (d)
Woodland (1986) (e)	Older Workers Participation	1981 Survey of Older Workers	positive (f)

Notes: a) denotes estimated supply elasticity of hours to wage rate.
 b) denotes participation rate elasticity to wage rate from instrumental variable estimation.
 c) denotes participation rate elasticity to wage rate from OLS.
 d) denotes that wage coefficient in hours of work equation is negative.
 e) denotes wage variable computed from extraneous data source.
 f) denotes that participation responses to wages were generally positive.

Table 3: Average Hourly Wage By Hours Worked

Weekly Hours Worked	Females			Males		
	Observations	Average Hours	Wage	Observations	Average Hours	Wage
0	1330			613		
>0	3370	35.91	7.14	4543	40.87	7.74
1-25	437	15.75	7.96	105	15.74	8.57
26-35	421	32.95	7.99	270	33.76	9.99
36-40	2162	38.80	6.90	2925	38.82	7.63
41-45	213	43.63	6.81	509	43.81	7.68
>45	137	51.79	6.33	734	53.18	7.24

Table 4: Wage/Hours Profiles for Pooled Sample

Hours Worked	Females	Males	Hours Worked	Females	Males
1-4	100.0	100.0	1-24	100.0	100.0
5-8	106.7	54.7	25-34	96.8	98.4
9-12	94.8	60.5	35	96.9	115.6
13-16	104.6	80.7	36	96.6	97.4
17-20	93.3	74.6	37	91.3	95.7
21-24	94.3	103.8	38	87.3	86.8
25-28	95.6	66.0	39-40	83.2	83.2
29-32	95.6	83.0	41-42	79.8	91.1
33-36	95.4	87.0	43-45	81.2	82.0
37-40	84.3	65.7	46-50	77.1	80.5
41-44	77.4	67.2	>50	66.0	72.6
45-48	81.9	60.2			
49-52	72.9	60.5			
53-56	80.8	56.8			
>56	56.5	52.4			

Table 5: Wage/Hours Profiles for Separate Panels

Hours	1985		1986		1987		1988	
	Females	Male	Females	Males	Females	Males	Females	Males
1-24	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.00
25-34	103.7	113.5	95.9	105.1	99.4	75.9	88.8	100.4
35	101.6	140.9	93.3	111.6	98.1	96.4	91.7	119.0
36	102.5	122.1	90.3	97.8	94.9	80.7	96.2	93.5
37	94.5	121.3	86.6	92.5	93.3	76.3	94.5	99.2
38	92.1	111.7	79.8	85.0	89.3	67.9	87.2	89.9
39-40	88.0	108.2	76.4	82.3	82.0	64.4	84.7	86.1
41-42	86.1	109.1	66.8	87.6	77.6	78.4	86.4	94.8
43-45	87.3	104.6	75.6	80.3	82.9	63.0	79.2	84.6
46-50	68.7	110.2	73.9	79.6	75.7	61.0	81.5	79.5
>50	67.5	108.9	73.2	73.0	55.2	51.7	66.1	74.5

Data Appendix

The data employed in this study is a panel extracted from the four waves of the ALS. Data was extracted for each individual, not in full-time education, for the following variables; seven age categories; eight education categories; six country of birth categories; three residential categories; duration of Australian residence; whether an apprentice; whether undertaking part-time study; experience in the work place; whether had any health problems restricting the type or amount of work; whether long term unemployed; restricted English language skills; six categories relating to parents education; marital status; number of dependent children; whether partner unemployed; eight categories of partner's educational status; partner's pay; and all other income.

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