Pricing the Travel Time of Busy Women

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Pricing the Travel Time of Busy Women

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1 Introduction

The changing role of women in recent decades explains much of the growth in hours traveled.

Accurate valuation of the travel time of busy women is required to optimise investment decisions about transport infrastructure.

If policy makers and private sector providers use inaccurate estimates of the shadow price of the travel time of women, they will make incorrect investment decisions and / or will schedule infrastructure investment years too early or too late.

Women are the focus of this paper because in recent decades they accounted for much of the growth in hours travelled, in public transport patronage and vehicle kilometres travelled.

The authors set out the Cavagnoli model, see Cavagnoli (2008) to help transport professionals move away from

- stated preference surveys of the value of time based on tiny sample sizes,

towards

- revealed preferences of hundreds of millions of trips captured by large scale statistical tools, including the emerging time use database for Melbourne of Ironmonger (2006, 2008).

The Cavagnoli model has not yet been tested econometrically, but illustrative numerical examples from overseas studies are promising.

Future work will be reported at ATRF 09 in New Zealand.

This paper is divided in the following sections. Section 2 presents data that show Australians are busy, section 3 discusses travel time trends, section 4 presents travel time outside working hours, section 5 reveals preferences of time use of highly skilled women, section 6 sets out a model of utility maximization for women, section 7 tests our hypotheses against stylized facts and section 8 is the conclusion.

2 Evidence that Australians are busy

In Australia, from 2001-07, evening, public holiday and week-end work increased steadily. In the period 2001 to 2007, 23% of employees worked both on weekdays and week-ends. In Australia 48.8% of male employees work between 41 to 50 hours a week, while 21.1% of female employees work between 41 to 50 hours a week (excluding the self employed) (Vanroy, Oxenbridge, Buschanan, Jakubauscas; 2007).

The majority of highly skilled workers also have demands outside of work, such as childcare (average of about 11 hours a week) and eldercare (average of about 3.5 hours per week). Women spend more time per week caring for children, and women, regardless of their level, have more demands at home (Duxbury and Higgins, 2008).

Highly skilled workers spend an average of 48.4 hours a week in paid employment,5.6 hours per week commuting to and from work, 4.2 hours doing extra work at home in the evening and on weekends, 9.0 hours a week in home chores activities, 5 hours per week in childcare, 1 hour per week in eldercare, and 2 hours per week to career development. These Australians devote an average of 75.7 hours per week to work and family activities; and they enjoy only about 11 hours per week in leisure (Duxbury and Higgins, 2008).

The group of skilled workers that work very long hours receives the highest average weekly earnings. They are at the top-end of the earning distribution; they represent a third of the total full-time working population, and have a high percentage increase in their earnings (ABS, 4120, 2006; Vanroy at al., 2007). However, the majority extend their working hours to perform more work at home. Highly skilled workers spend about 6 hours each week in unpaid overtime, and about 4 hours a week in learning and career development activities.

The Australian data on working hours shows that preferences play a major role in the decision to work overtime. Changed preferences are given as a reason for long working hours (Wooden and Drago, 2007; Tseng and Wooden, 2005; ABS cat. 4102, 2006), and as a consequence of positive economic outlook, the more educated labour force (Bray, Deery, Walsh, and Waring, 2005), greater job opportunities and increased flexibility in working conditions (Burgess, 1998; Campbell, 2002). Moreover, it is important to note that highly skilled workers are more likely to give priority to their work role than to their family role; and that the cohort of 'baby boomers', with dependent care, have higher demands than 'generation Y', the modern highly skilled workers (Duxbury and Higgins, 2008).

Table 1: Employees' working hours preference, 2007

- by status in main job

Working hours preference	Part-time		Full-time		**TOTAL**	
	%	thousand persons	%	thousand persons	**%**	**thousand persons**
Happy with current hours	**74**	2028	**70.6**	3737	**71.8**	5787
Would like to work **fewer** hours	**5.4**	147	**26.5**	1402	**19.3**	1548
Would like to work **more** hours	**20.6**	564	**2.9**	153	**8.9**	717
TOTAL	**100**	2739	**100**	5292	**100**	8061
Population: Employees only	Source: Australia at work W1					

Table 2: Working hours control and preferences by occupation, 2007, per cent

Occupation	Agree: I have control over my work hours	Working hours preference		
		Same	*Fewer*	*More*
Managers	71.7	61.7	35.8	2.4
Professionals	59.1	69.2	24.7	6.0
Technicians & trades workers	56.7	72.5	19.8	7.5
Community & personal service workers	61.3	73.1	9.2	17.7
Clerical & administrative workers	67.6	75.7	17.4	6.8
Sales workers	67.9	69.4	12.7	17.7
Machinery operators & drivers	48.1	68.4	21.2	9.4
Labourers	53.1	72.0	12.3	15.4

N=6,922,017
Population: Employees only
Source: Australia@Work W1

Statistics suggest a high degree of dissatisfaction over hours worked, and a fascinating internal inconsistency in key responses. Part-time workers want to work more hours, while full-time workers want to work fewer hours. 36% of managers want to work fewer hours, while 18% of both clerical and administrative workers, and sales workers, want to work more hours.

Many responses of managers lack internal consistency. 71% of managers claim control over their working hours, so apparently no-one else is preventing the 36% who want to work fewer hours from so doing. Such managers are addicted to work, as they seem unable to withdraw from work.

Even though 62.3% of them say it is easy for them to vary their working hours, 62.1 % of them also say that is difficult to be home when their children get home from school (Duxbury and Higgins, 2008).

They are unable to withdraw from work obligations (addiction). Hours and decisions are affected by the culture of the workplace. Duxbury and Higgins (2008) found that a non supportive manager, for example, leads employees to work hard and have lower levels of perceived flexibility. These employees suffer from work overload; they have more problems balancing work and family and are less satisfied with their jobs.

3 Travel time trends

Travel time estimates for Melbourne show rising hours per week by women travellers. Figure 1. Ironmonger and Norman (2007).

Hours spent by women traveling for consumption purposes, e.g. social interaction, visitation, dining out, entertainment rose by 77 per cent in Melbourne from 1991-2006. Table 3. Ironmonger (2008).

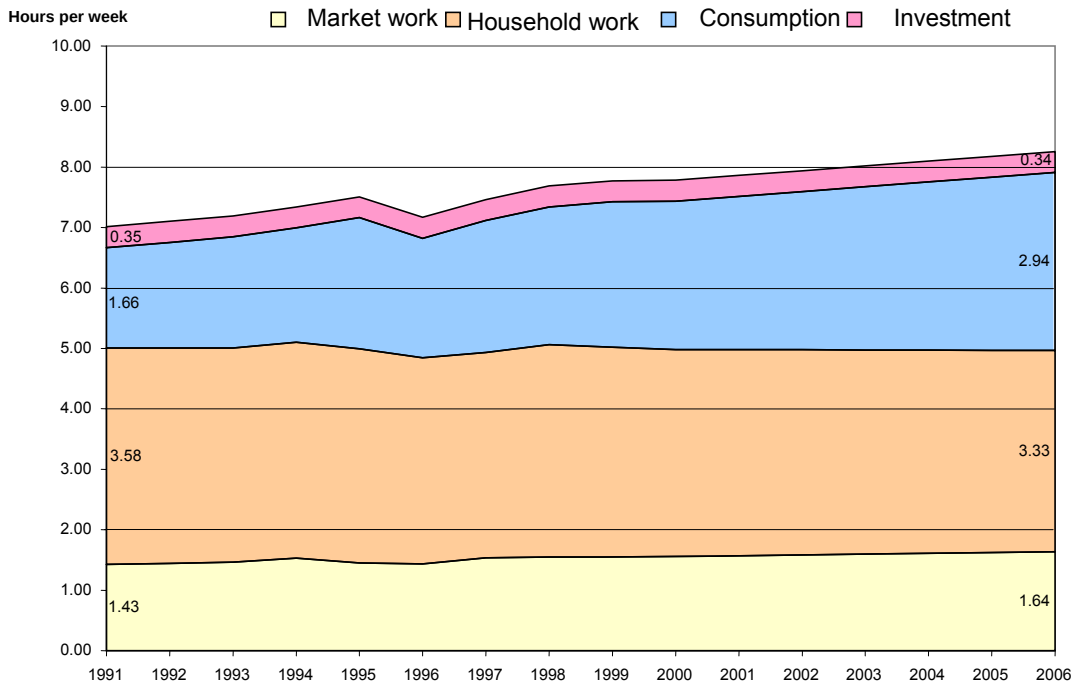


Figure 1: Travel Time – Women, Melbourne 1991-2006 Ironmonger (2008)

Table 3: Growth in hours spent travelling by women in Melbourne 1991-2006

	1991	2006	Percentage change
Hours per week			
Investment	0.35	0.34	**-3%**
Consumption	1.66	2.94	**77%**
Household Work	3.58	3.33	**-7%**
Market Work	1.43	1.64	**15%**
TOTAL	**7.02**	**8.25**	**18%**

Ironmonger (2008)

4. Travel time outside working hours

Generally it is assumed that there is a positive relationship between the wage rate and consumption of social and recreational goods and services, and a negative relationship between the demand for leisure, including travel time, and the wage rate. This assumption implies a negative income effect on the demand for travel time for every increase in the wage rate (Becker and Murphy, 1992; Becker, 1992). However, this is true only if travel time is a normal good.

For every increase in the wage rate, the demand for travel time responds to the price of other substitutable goods; therefore, the higher the wage rate, the greater the price of travel time, so that there is a substitution effect on the amount of time at work. This effect leads to more hours of work until equilibrium in planned consumption is achieved. For high-income earners, if travel time is a normal good, the substitution effect should be lower than the income effect in absolute terms. Therefore, greater income should lead to a greater amount of travel time; especially for highly-skilled workers. However, this is not an outcome revealed by the above statistics.

Essentially, the cause for working longer than necessary has to be found in the psychological motivation so to do. Recent organizational and social studies on behaviour refer to addiction as the cause (Porter, 1996; Robbins & Everitt, 1999; Burke, 2000; Azis and Zickar, 2006; Elster and Skoc, 1999*;* Hamermesh and Slemrod, 2008), and we can distinguish two categories of addicted workers: i) the **workaholics** (Harpaz and Snir, 2001), and ii) the **overworkers** (Peiperl and Jones, 1999).

If travel time is not perceived to be a normal good, preferences have shifted; and in this paper it is proposed that this is due to addictive behaviour. Addictive behaviour is defined in various ways, but here it is considered as a change in the technology of consumption, given increased education and experience in paid work. The changed technology increases substitution. In a study on overworkers, for example, Peiperl and Jones (2001) emphasise that that people who do choose to work longer, and more than the necessary, display symptoms of addiction; and in a recent longitudinal study of workaholics, addicted workers are found primarily amongst high income earners (Hamermesh and Slemrod, 2008). Pocock (2003) adds to this line of argument by emphasising the sense of guilt that hard working parents feel about their time away from the family, so that they overspend in market goods to compensate for this lack of time for the family.

Further investigation is required about the importance of the psychological motivation to 'strive' in general, and within paid work in particular, as its determinants influence both

- the subjective decision to allocate time; and
- the price of time.

Therefore, substitution is increased by the change in technology (addiction) guilt.

5 Revealed Preferences

The choice to allocate 'extra' hours of leisure to paid work reveal that people over-commit time to paid work. Commitment represents the individual's willingness to exchange time and the ability to control and plan the allocation of time. The commitment to work longer hours is affected by the characteristics of the job, the willingness of others to give up their time in order for the individual to consume more time at work, a high degree of job responsibility, and by the level of satisfaction obtained from work (Cavagnoli, 2008). These factors increase the complexitities of time for current consumption and so its demand, while decreasing the quantity of leisure time available for future consumption.

The decision to work longer hours, therefore, is affected by more than the individual's opportunity cost of time in the market (wage). High income earners prefer paid-work to leisure.

Their preferences reveal complementarities between time in paid work and time in leisure.

If leisure is a normal good, but less time is devoted to it,

- firstly, the 'subjective' price of time (their willingness to exchange time) differs from the real (market) price of time; and
- secondly, the intensity of time in leisure increases.

Both effects increase the consumption of market time-saving goods as well as decreasing the quantity of time to supply to market and non-market work.

If hours in paid work increase above the average of 8 hours a day, given the institutional constraints on time of 24 hours a day, and the natural constraint on the need for up to 8 hours for sleeping, the remaining hours of waking time are subject to an increase in the demands on leisure time. More household tasks need to be done per unit of time, including time for travelling. Increased intensity augments the demand for units of time. The 'subjective' price of time rises well above the price given by the market wage.

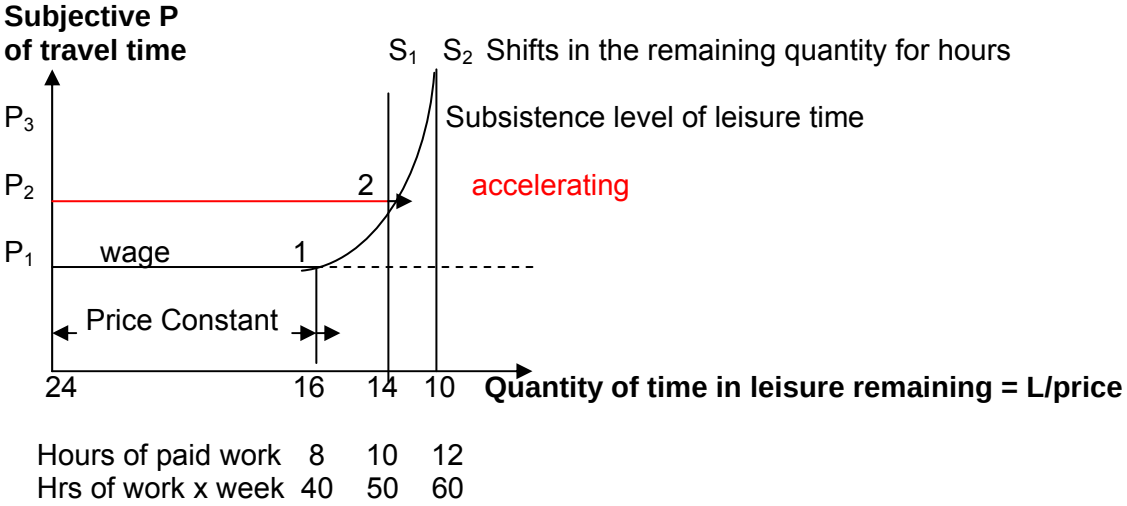


Figure 2: Accelerating intensity of time use

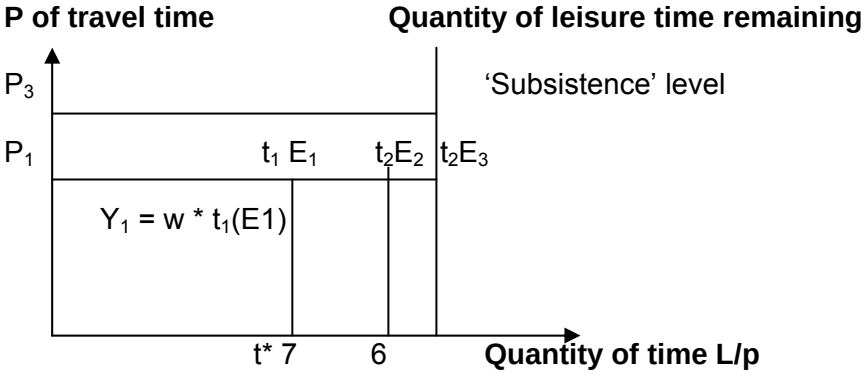
Working women do not decrease time in paid work in order to have more time for traveling. They invest in cars in order to save time for traveling and to avoid congestion. Driving increases the number of stops for every trip. This almost 'complete' switch to driving mode could be argued to be an efficient response to the changes in relative prices of all the other modes (Lancaster, 1966), only if there is a decrease in total time spent traveling, or if total time travelling does not increase. However, this is not the case; travel time increases (Ironmonger, 2006, 2008).

The alternative possible explanation is given by an inefficient private 'over-compensation' (Lancaster, 1966), given by the increased intensity of travel time, which leads to a re-allocation of total time (and total income). The base quantity of recreational time decreases.

If 8 hours of sleep is considered a fixed resource of time, at t* = 16, the cost of traveling increases at an exponential rate when the quantity demanded is above t*. Intensity increases effort time, which in turn increases the quantity of leisure time demanded for traveling.

The cost of traveling equals the generalized costs of the mode (i. e. driving) when the time spent in traveling and the average working hours remain constant; but for every extra time spent traveling, the cost of traveling increases at an exponential rate; thereby, inflating the subjective price of time.

This is important to estimate the ratio of the marginal utility of travel and the total cost.



At P_1t^* = 8 hours of work; 1 hour of travelling; 8 of sleep; E_1

Figure 3: The price of travel time

The greater the hours devoted to paid work, and the more productive individuals are, with education and experience, the greater are the opportunities to produce output and potential output (more time in leisure and more time for travelling). Education and experience, however, also increase the intensity of tasks per unit of time, and hours at work.

The real output of hours remaining in leisure decreases. Each increase in the demand for leisure time (t_1 to t_3) for travel time increases the intensity of travel time (E_1 to E_3). A decreased quantity of leisure time, and an increased intensity of time, lead to a greater substitution between leisure time for traveling time, and to a greater substitution for modes that target many stops in one trip (to save time).

The wage and the 'shadow wage' cannot compensate for the extra hours lost in leisure. The 'subjective' price of consumption of time for traveling is affected by the decreased base of leisure time, as well as by the increased intensity of travel time. Individuals do not decrease paid work time for travelling. There is addiction. They decrease leisure time. The shadow price of time is increased by the amount of over-consumption of time at work and by the intensity of time.

The proposal herein is that the demand for traveling time, for example, is not derived by the options of destinations, but by the characteristics associated with the mode of travelling and the use of modes that maximize the benefits from travelling, per unit of time. 'Time pressure' increases the complexities of time and of tasks. Complexities and lack of leisure time, increase the demands on traveling time. Time pressure and lack of leisure are a characteristic of high income earners.

The data suggests that even though more tasks are accomplished within the same trip and per unit of time; time spent in traveling increases. If the mode of traveling is the car, and if the road chosen leads to many destinations (location of jobs, schools, as well as shops, as well as leisure activities), then the number of tasks achieved, while traveling, satisfy more needs within the same trip. However, the new equilibrium in the use of modes is inefficient, as more time is consumed on the roads, leading to congestion.

6 Utility

According to the theory, the difference between a normal and an inferior good rests in the size and the sign of the income and the substitution effect. A normal good always displays a negative substitution effect and a positive income effect. However, when the income effect is negative and greater than the substitution effect, or when the substitution effect is greater than the income effect, the good in question is inferior.

In the aggregate, the net effect of an increase in the wage is that more market goods and services are bought (Hamermesh and Slemrod, 2008). However, the motivation to consume more might be to decrease the time in travel time. The increased expenditures on fast cars, child-care services, home-time-saving appliances, for example, as well as the increase in the average working week, reveal that people want to 'get rid of' time in non-paid activities for more time in paid work.

If travel time is a normal good, and its demand is downward sloping, the ratio between the change in the demand for travel time with respect to a change in its price, should equal the ratio of the change in demand for travel time with respect to a change in *its* rental price (wage). This ratio should be positive.

However, the above statistics imply a negative ratio between the change in demand for travel time and the change in its price (wage); but also that the marginal utility of consumption (the substitution effect) is greater than the marginal utility of income (income is decreased by the 'subjective' price effect, while substitution is increased by the increased intensity). One of the two prices, the market wage or the subjective price of travel time, differs in the degree of change.

Generally it is accepted that utility is maximized where the marginal utility of travel time gives the additional utility received from consuming an extra hour of travel time, and this 'extra hour' costs 'w' (wage) dollars; therefore, maximization occurs when

- the last dollar spent on travel time activities gives the same utility as
- the last dollar spent on consumption goods so that the marginal utility of travel time is equal to the marginal utility of consumption;

the ratio equals

- the wage rate, or
- the marginal rate of substitution between travel time and consumption.

However, the phenomenon of long hours of work reveals that amongst women high income earners,

- the marginal utility of consumption is greater than
- the marginal utility of travel time.

Individuals do not minimize travel costs. The following model of utility refers to a two-period utility from income from a Beckerian perspective.

$u^1(y_1, r_1)$

$r_1 = recreation \quad / travel \quad / sleep$

$y_1 = income$

$s = overtime \quad = 0$

Budget :

$y_1 = (24 - r_1) w_1$

$w_1 = wage \quad = (\$ \ / hour \ )$

$u^2(y_2, r_2, s)$

$s = (24 - r_1)$

$r_2 = leisure \quad _{t_2}$

Budget :

$y_2 = (24 - r_2) w_2$

$w_2 = f(24 - r_1) + (-) A,$

$A = negative \quad (if \ ) addicted$

$s = (24 - r_1)$

$u^1(y_1, r_1) + \delta u^2(y_2, r_2, s)$

$\delta = discount$

$y_1 = (24 - r_1) w_1$

$y_2 = (24 - r_2) w_2$

$s = 24 - r_1$

$w_2 = f(24 - r_1) + A$

$$Discounted \quad U = u^1((24 - r_1)\overline{w}, r_1) + \delta u^2((24 - r_2)[f(24 - r_1) + \overline{A}], r_2, (24 - r_1)$$
$$= \phi[r_1, r_2, \overline{w}, \overline{A}]$$

1^{st} *derivative*

$$\partial U / \partial r_1 = -\overline{w_1}u_1^1 + u_2^1 - \delta u_1^2(24 - r_2)f' - \delta u_3^2 = 0$$

$$\partial U / \partial r_2 = -\delta u_1^2[f + \overline{A}] + \delta u_2^2 = 0$$
$$= \delta u_2^2 - \delta u_1^2 w_2 = 0$$

1^{st} *Condition*

$$u_2^2 / u_1^2 = w_2$$

$$u_2^1 = \delta u_1^2(24 - r_2)f' + \delta u_3^2 + \overline{w_1}u_1^1$$
$$u_2^1 / u_1^1 = [\delta(u_1^2(24 - r_2)f' + u_3^2) / u_1^1] + \overline{w_1}$$

2^{nd} *Condition*

$$u_2^1 / u_1^1 = \overline{w_1} + [\delta(u_1^2(24 - r_2)f') / u_1^1] + u_3^2$$

'A' refers to an autonomous increase in the wage. It represents the change in the subjective price of time given the proclivity to become addicted with the increase in education, experience and time at work. A 'inflates' the price of the real wage. For every increase in the wage, there is an income effect that works in the opposite direction to the standard income effect. It decreases the budget (leisure) constraint. In the second period of utility maximisation, the effect of a change in 'A' on utility is in addition to the income and substitution effect given by the increase in the real wage.

To analyse the effect of the wage and of an autonomous increase in the wage, on the choice to allocate time to paid work or to travel time (leisure), we need an inter-temporal effect on utility. To maximise utility, the first condition reflects that in period 2 the marginal rate of substitution between travel time (recreation) and consumption equals the real wage. The second condition refers to two effects on the process of maximizing utility. In the second period there will be two effects on utility. The first effect is given by the number of hours consumed in paid work (less leisure - intensity increases - increases consumption of market goods and services - substitution effect):

$$u_1^2(24 - r_2)f'$$

The second effect is from addiction (increases intensity – increases subjective price – less leisure time) on utility in the second period:

$$u_3^2 < 0$$

The marginal rate of substitution between consumption and recreation (including travel time) equals the real wage, plus the effect of addiction, plus the effect of the 'discounted' utility on the wage.

Generally, the theory explains that there are 'bad' and 'good' addictions, so that the variable 'A' can take a positive or a negative sign (Becker and Murphy, 1988). Addictive goods however, as defined by the theory, do not include the satisfaction from 'high-intrinsic effort'. This is a 'good' addictive good as it leads to greater earnings (utility increases), but it also leads to a 'negative' outcome on leisure time. There exists an optimal equilibrium quantity of hours consumed in paid work, past which, the 'extra' time consumed in 'high intrinsic effort' affects the willingness to exchange time for money. Leisure time becomes inferior as addiction to work increases the demand for paid work (decreases total utility).

The price elasticity of demand for hours in paid work, as for addicted goods, becomes inelastic, and the income elasticity of demand for time (effort) is negative.

7 Hypothesis versus stylized facts

The motivation to strive requires activities to be categorized according to priorities. While the importance of categorizing activities has been recognized (Mincer, 1962; Ironmonger, 1981), the input of effort (time) has not yet been recognized as an input in itself. Activities need to be categorized by purpose, but also by their degree of complexity (intensity).

> In the possibility that "an individual may be capable of offering more than one kind of labour" a more complicated description of the model is required (Arrow, 1983:161). "If two factors are always used together and always in the same proportion, that are not produced goods but natural resources available in equal quantity, there is a problem with the classification of these two goods, whether they are free goods or scarce" (Arrow: 1983:209).

This thesis clarifies the concept of effort (time) in terms of income, and proposes a distinction between activities that are 'goods', or that produce positive characteristics of time, and activities that are essentially 'bads', such as paid work, which decreases the benefits from effort.

There are activities that have no complexity (sleep), others that have low complexity (routine activities), and high complexity (high cognitive demands jobs). Activities are also free or paid for. Effort time, as an input consumed in these activities, produces different types of characteristics, and so, of learning that affects preferences. The output of time has different characteristics.

The greater the complexity, the greater is the 'high intrinsic effort' produced and the motivation to strive, and the greater the substitution of time for activities that are complex; but the greater the amount of time in complex activities the faster a saturation point is achieved between rewards; after this point, preferences for the use of effort time (and income) change. Behaviour becomes addictive and activities in leisure become inferior 'goods' (as currently revealed by the Australian high income earners).

Effort time as an output affects the individual and the social level of tolerance (preference) both about the quantity of time to be consumed in one type of activity, and about the types of activities that should be prioritized (and are socially accepted). Greater effort time leads to a greater consumption of time, and so to less supply of the resource 'leisure time'. The diminished supply is given by an increased tolerance for satisfying the greater demands placed on time.

Education, experience and social demands affect the length of working hours; fertility rates; congestion time, habits of choice, norms of behaviour. Behaviour is primarily driven by the motivation to strive. The motivation to strive responds to non-pecuniary rewards and to a non-instrumental type of rationality. In this paper 'overtime' is assumed to be a proxy to measure the motivation to strive (effort).

Cavagnoli proposes:

- Time is indivisible with learning between activities (Lancaster, 1966)
  - Discrete versus continuous time modeling

- Learning experiences differ between activities in terms of complexity (Arrow, 1962)

- Effort is measured in terms of time (Cavagnoli, 2008) rather than skills (Becker, 1992)
  - Effort time increases with time (wage) (Becker, 1992) and learning but it increases further in complex activities (intensity)
  - Effort time decrease with time (wage) (Currie and Steedman, 1993) but it decreases further in complex activities (intensity)

- Education (general) leads to an elastic price elasticity of demand for time for complex work = increases substitution

- Effort time in complex activities leads to an inelastic price elasticity of demand for time
  - Income elasticity = -1

- Options in mode of traveling (and of work given the nature of work organized around tasks rather than time)
  - Increase opportunities for substitution
    - Flatter average cost curve
    - Flatter demand for (leisure) time in the long term
      - However, less supply remaining of leisure time

- Behaviour is homogeneous in terms of the motivation to strive (Maslow, 1954; Hirschman, 1984; Bowles and Park, 2005)
  - Behaviour is prone to addiction, to seek complexity. Behaviour is prone to increase the rate of substitution
    - Given opportunities
    - Given general learning and experiences
    - Given habits

- Expenditures reflect the consumption of resources
- Investments are not expenditures, so that sleep time, for example, is not an investment

- Effort, the motivation to strive, does not respond to pecuniary incentives nor does it reflect an instrumental rationality (Sen, 1977; Hirschman, 1984). Its demand is independent of the quantity of market goods and services consumed. Effort is constrained by the amount of time labour is engaged in complex activities. There are only 24 hours a day and effort needs to be renewed in non complex time (sleep).
  - Complementarities between market and non-market time
  - Externalities = overuse of time at work
  - Negative externality on the reserve in leisure time

Methodology

Cross-sectional analysis of working hours – revealed preferences

- two-period static analysis
- High and low income earners

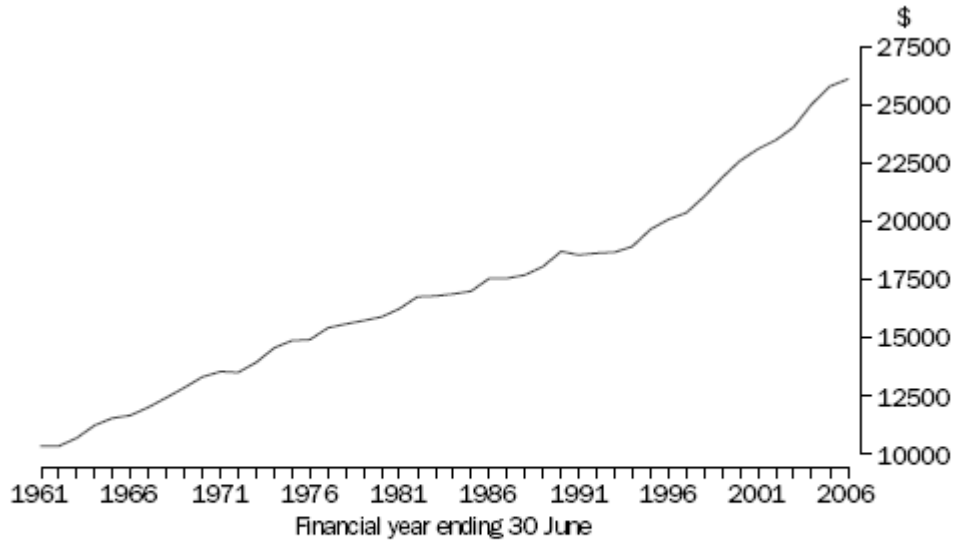
High skilled workers today behave homogeneously and have tolerance for less leisure like the experienced workers 'baby boomers'. Both groups are high income earners. Both groups experience 'time pressure'.

The authors would expect distribution of stated preferences for fast modes of traveling to be skewed for high income earners

- Therefore, revealed preferences segmented by income groups
    - Innovative approach for the estimation of value of time to travel

Discrete-choice modeling

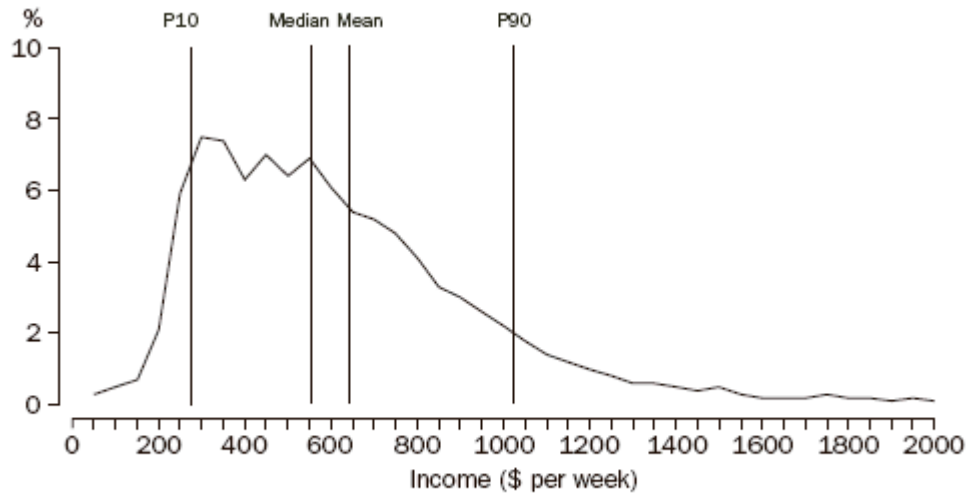
- Parameters: elasticities of demands for consumption of market goods and services



(a) Chain volume measure with the reference year being 2004–05.

Source: 2005–06 Australian System of National Accounts (ABS cat. no. 5204.0); *Australian Historical Population Statistics, 2006* (ABS cat. no. 3105.0.65.001); *Australian Demographic Statistics, September 2006* (ABS cat. no. 3101.0).

Figure 4: In recent years' real consumption per capita in Australia has over-shot its long term trend.



Note: Persons with an income between $25 and $2,025 are shown in $50 ranges on the graph

Source: ABS catalogue 6523.0 Household Income and Income Distribution, Australia, 2005-06

Figure 5: Distribution of Equivalised Disposable household Income, 2005-06.

Costs

The quantity of time at work is a function of the wage (and reservation price).

The quantity of time for leisure is a function of a change in the quantity of total time. It is different between 1991 and 1997 and 2007. It differs between educated high income earners and low income earners.

Consumption costs

The cost is a function of 'A'

A = is the product of increased intensity and increased consumption of time

$A = D_{effort}$

Effort (as addictive behaviour) is a constant.
$E = c - \beta (A - E)$

A/E x dE/dA = elasticity of intensity of Time

The relationship between stops per trip and time consumed traveling should show an increasing trend in the distribution. Therefore, β can be an estimate.

The cost of traveling should be proportional to the increase in time, but increasing with intensity.

Notes

$E = f(w)$
Effort time increases with the wage (Becker, 1992)

Effort time decreases with the wage (Currie and Steedman, 1992)
$E = f(w)^{-1}$

Therefore, effort time $E = f(w)$ when t_1 (average working time 8 per day)
8 hours average = effort intensity of time at t_1 (non-complex work)

$E = f(w)^{-1}$ at t_1
when intensity increases (complex work = increases speed of tasks = increased output per unit of time)

At t_2 E demands more time to work (increase the subjective price of time – increase substitution) but decreases time in leisure (decreases budget income)

8 Conclusion

Innovative micro-economic theory and the emerging statistical database of time use in Melbourne both suggest busy women value each hour highly.

The consumption technology of time changes with education, experience and intensity of tasks. The marginal utility of consumption of time is greater than the marginal utility of income, which in turn is greater than the wage rate.

The greater the income and the time at work, the more are the opportunities to substitute leisure time with market-time-saving goods. Further substitution decreases the total time available for leisure, down to a subsistence level when physical, mental and family health suffers, and the productivity of the time-pressured worker falls.

This paper concludes that the price of travel time of busy women in Melbourne far exceeds their wage rates.

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References

Ajzen, I., (1985), 'From Intentions to Actions: A Theory of Planned Behaviour', in J. Kuhl & J. Beckmann (eds.), Action-Control: From cognition to behaviour, Heidelberg: Springer

Arrow K. J. (1962), 'The Economic Implications of Learning by Doing', *Review of Economic Studies*, 29: 405-19.

Barneveld, van K., Nassif, R. (2003), 'Motivations for the introduction of Australian Workplace Agreements', *Labour and Industry*, Dec. vol. 14, i2 p.21(17).

Becker, G. S. (1992), 'Habits, Addiction and Traditions', *Kyklos,* vol. 45(3), p. 327-346

Becker, G. S. and Murphy K. M. (1988), 'A Theory of Rational Addiction', *Journal of Political Economy*, vol. 96, pp. 675-700

Becker, G. S. and Murphy K. M. (1992), 'The Division of Labor, Coordination costs, and Knowledge', *The Quarterly Journal of Economics*, Vol. 107, n. 4, November, pp. 1137-1160

Benavides, F. G., Benach, J., Muntaner, C., 'Psychological risk factors at the workplace: Is there enough evidence to establish reference values? Job control and its effect on public health', *Journal of Epidemiology & Community Health*, April 2002, Vol 56, n. 4, p. 244(2)

Bowles S. and Park Y. (2005), 'Emulation, Inequality, and Work Hours: Was Thorsten Veblen Right?', *The Economic Journal,* Vol.115 Issue 507

Bray, M., Deery, S., Walsh, J., and Waring, P., (2005), *Industrial Relations: a Contemporary Approach*, 3rd ed., McGraw-Hill.

Campbell, I. (2002), 'Extended working hours in Australia', *Labour and Industry* 13(1), August, pp. 91-110

Cavagnoli (2008) 'Commitment, Functional Flexibility, and Addiction' *Journal of Industrial Relations*, Vol. 50, No. 2, 339-348 (2008).

Claessens, B. J. C., Van Eerde, W., Rutte, C. G., Roe, R. A. (2004), 'Planning Behaviour and Perceived Control of Time at Work', *Journal of Organizational Behaviour*, vol. 25, pp. 937-950

Currie, M. and Steedman, I., (1993), 'Taking Effort Seriously', *Metroeconomica*, vol 44:2, pp. 134-145

D'Souza, R. M., Strazdins, L., Lim, L. L.-Y., Broom, D. H., Rodgers, B. (2003), 'Work and health in contemporary society: demands, control, and insecurity', *Journal of Epidemiology & Community Health*, November, Vol. 57, n. 11, p. 849(6)

Duxbury L and Higgins C. (2008) Work-Life Balance in Australia in the New Millennium: Rhetoric versus Reality, paper presented to Forum of Beaton Consulting, Melbourne 8 April 2008

Fetter, J. and Mitchell, R., (2004), 'The Legal Complexity as the acceleration of the speed of learning of Workplace Regulation and Its Impact upon Deregulated workplace in Australian Workplaces', *Australian Journal of Labour Law*, November, vol. 17

Gurney, Ross M. 1980. "Does unemployment affect the self-esteem of school leavers?*. Australian Journal of Psychology,* 32, pp. 175-82.

Hamermesh S. D. and Slemrod B. J. (2008), The Economics of Workaholism: We should not have worked on this paper, *The B.E. Journal of Economic Analysis*, 8, iss. 1, art. 3. The Berkley Electronic Press.

Hartley J. (1980), The impact of unemployment upon the self-esteem of managers. *Journal of Occupational Psychology,* 53, 147-55.

Heller, F., Pusic, E., Strauss, G., Wilpert, B. (2000), *Organizational Participation: Myth and Reality*, Oxford University Press.

Heiler, K. (1998). What Has Happened to Standard Hours of Work in Australia? Or Do We Need to Bring Back the Bundy Clock?. in B. Cass and R. Couch ed., *Divided Work, Divided Society: Employment Unemployment and the Distribution of Income in 1990s Australia.* pp. 75-99, Research Institute fro Humanities and Social Sciences, University of Sydney.

Hirschman, O. A. (1984), 'Against Parsimony: Three Easy Ways of Complicating Some Categories of Economic Discourse', *AER*, May, *Papers and Proceedings* vol. 74 (2), Pp. 89-96.

Ironmonger, D. S. (2006), 'A System of Time Accounts for Melbourne' a report commissioned by the Department of Infrastructure, Victoria, Australia.

Ironmonger, D. S. (2008), 'A System of Time Accounts for Melbourne' a report commissioned by the Department of Infrastructure, Victoria, Australia – *Second Edition June 2008.*

Ironmonger, D. S. and Norman P. M. (2007), 'Travel Behaviour of Women, Men and Children: What Changes and What Stays the Same? IATUR 29th Annual Conference 17-19 October 2007 Washington DC USA

Kuper, H., Singh-Manoux, A., Siegrist, J., Marmot, M. (2002), 'When reciprocity fails: effort-reward imbalance in relation to coronary heart disease and health functioning within the Whitehall II study', *Occupational and Environmental Medicine*, November, vol. 59, n. 11, p. 777(8)

Lancaster K. (1966), 'A New Approach to Consumer Theory', in M. Ricketts ed., *Neoclassical Microeconomics vol. I*, (1988), Adershot, Hant, England: E. Elgar.

Lansbury, D R. and Davis, M. E. (1992), 'Employee participation: Some Australian cases', *International Labour Review*, 131, 2

Le Fevre M., Matheny J., and Kolt S. J. (2003), "Eustress, distress, and interpretation in occupational stress", *Journal of Managerial Psychology*, Vol. 18 No. 7, pp. 726-744, Emerald Group Publishing Limited

Jacobs, J.A., and Gerson, K. (2001), Overworked Individuals or Overworked Families? Explaining Trends in Work, Travel time and Family Time, *Work and Occupations*, 28, February, p. 40-60

Macdonald, D., Campbell, I. and Burgess, J., (2001), 'Ten years of enterprise bargaining in Australia', *Labour and Industry* 12(1), August, pp. 1-26

Maslow A. H., (1954), 'Motivation and Personality', Harper, New York

Peiperl, M. Jones, B. (2001), Workaholics and Overworkers: Productivity or Pathology? *Group & Organization Management*, 26, n. 3, September, p. 369-393

Petzall, S., Abbott K., and Timo N., (2003), 'Australian Industrial Relations in an Asian Context', second edition, Emerald, Vic.: Eruditions Pub.

Pocock, P. (2003), *The Work/Life Collision: What Work is Doing to Australians and What to do About it,* The Federation Press, Leichardt (Sydney).

Pocock, P. (2005), *The Impact of Workplace Relations Amendment (Work Choices) Bill 2005 on Australian Working Families,* Paper prepared for Industrial Relations Victoria, November http://www.business.vic.gov.au/BUSVIC.621477948/STANDARD//PC_61103.html

Scabracq, M. J., Winnbst, M. A. J., and Cooper, L. C. (2003), *The Handbook of Work & Health Psychology*, 2nd ed., John Wiley and Sons, Ltd. USA

Sen, A. K. (1977), 'Rational fools: A Critique of the Behavioural Foundations of Economic Theory', *Philosophy and Public Affairs*, vol. 6: 317-344.

Vanroy et al (2007), Australia@Work, The Benchmark Report, University of Sydney

Vickery, G., Wurzburg, G. (1996), 'Organisation for Economic Cooperation and Development', *The OECD Observer*, Paris (Oct/Nov), Iss. 202, pp17-21

Wickens, C. D., and Hollands, J. G. (2000), *Engineering Psychology and Human Performance*, 3rd ed., Prentice Hall, New Jersey

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