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The Labour Supply Curve: A Pluralist Approach to Investigate its Measurements

Donatella Cavagnoli*

Abstract

The neoclassical theory of labour supply cannot unambiguously explain the decision of highly-skilled high-wage male workers to work longer and harder than their counterparts in the 1980s. We investigate the labour supply elasticities of these workers, over time, and across countries, within a ceteris paribus condition. The estimates reveal a shift rather than a movement along the supply curve. We find that ambiguities are due to the absence, in the theory, of a clear distinction between a change in consumption that is partly due to changes in the wage rate and partly due to changes in purchasing power. We apply a new pluralist approach to the standard income-leisure choice framework and provide for a more systematic and consistent method of measuring variations in labour supply, with policy implications.

JEL Codes: J01, D01, H31

Keywords

Compensated wage elasticity; cost price of leisure; income (-consumption) leisure choice framework; reservation wage; uncompensated wage elasticity.

Introduction

The neoclassical theory of labour supply cannot unambiguously explain the reversal in the decline of the average weekly hours of work, that is a phenomenon common in almost all OECD countries (OECD 2004; Virtanen et al. 2010). While the most commonly reported workweek in OECD countries is still 40 hours, the proportion of employees working more than 40 hours has risen; and the proportions of employees favouring a reduction in hours of work has risen, especially in most European Union countries. Some European countries have in fact introduced incentives for firms to reduce working hours. The US, UK, Australia and New Zealand have experienced this reversal since the beginning of the 1980s (OECD 1998, 2004).

In Australia, long hours of work have increased across a range of occupational cohorts of managers, administrators and professionals, and in particular, among

* University of Ballarat, Australia

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highly-skilled high-wage male workers. The majority extend their workday by working from home, in the evening and on weekends. Highly-skilled male workers spend approximately 6 hours each week performing unpaid overtime (Van Vanrooy et al. 2007). On average, they work more than 48 hours a week (ABS, cat. 4102, 2006; Van Vanrooy et al. 2007). Even though their earnings are high, they also express dissatisfaction with their workloads (Van Vanrooy et al., 2007). While they have flexibility in the choice of working hours (Duxbury and Higgins 2008), and a preference for fewer hours (ABS 2006), they do not choose to do so (ABS 2007).

The aim of this article is to help explain this trend from the supply side. To measure the decision of individuals, already working full time, to increase hours of work, it uses the commonly-used measure of uncompensated wage elasticity. It focuses on estimates for highly skilled high-wage male workers in Australia, comparing them, over time, across similar cohorts, and with other countries. The questions asked are the following: across similar groups of workers, does the sign of the uncompensated wage elasticity remain constant over time? What are the implications of a change in sign of this measure?

We propose a pluralist approach to investigating the estimates. We find that the sign of the uncompensated elasticity has changed. We also find that there is no consistency in the methodology for measuring labour supply elasticities. An implication of these findings is that they reflect an increase in the opportunity cost of leisure time relative to the wage rate, and a shift in, rather than a movement along, the supply curve. The consequence is an *unexpected* decrease in both the value of the wage rate, per hour worked, and the value of the reservation wage, which increases *unexpectedly* both hours of work and consumption. If the opportunity cost of leisure time is greater than the *expected*, a consequence is also a decrease in the returns to education and human capital.

This study differs from others in one important way: variations in elasticities are identified as movements away from an expected benchmark condition. We assume that leisure time is superior to work time. Within this condition, the labour supply of highly-skilled high-wage individuals is expected to reveal that the uncompensated wage elasticity is negative. Variations in the sign and magnitude of labour supply elasticities are therefore examined as movements away from this benchmark. The approach proposed in this article represents an innovation, as up to date models of labour supply have been unable to capture the reasons for highly-skilled high-wage individuals to work longer hours.

Because this is a new approach, there is not enough data to 'run' regressions. In order to estimate precisely labour supply elasticities of highly skilled high-wage individuals, an appropriate disaggregation of data is required. For example, only highly skilled and/or professionals, employed full-time and in permanent highly-paid jobs, rather than casuals or contractors or self-employed individuals in any other type of jobs, would 'fit' precisely the definition of 'sellers of labour' in the labour market, and earn 'the wage' as the equilibrium price and quantity of labour hours. Additional disaggregation by industry and regions, for example, as well as age and gender is recommended. The limitations of this article are

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acknowledged in terms of limited empirical evidence but not in terms of the theoretical basis and framework proposed.

The inability to account for changes in the sign of these estimates in a consistent and systematic manner, is not at all a trivial matter, as it affects the way incentives (i.e. financial and non-financial) and their consequences are measured. Section 2 of the article reviews the estimates of labour supply elasticities since the 1980s in Australia and internationally; in section 3 we discuss the findings within the neoclassical income-leisure framework and extend the theoretical framework. Section 4 is our conclusion.

Estimates of Labour Supply Elasticities

In this section we investigate the estimates of labour supply elasticities. We review a number of studies done in Australia and internationally. The supply elasticities of highly-skilled high-wage males (singles and/or married, working full time) are the focus of attention. We want to compare estimates, over time, across generations, for the same group of individuals, in order to identify and explain any changes. In particular we want to investigate the sign of the uncompensated wage elasticity, as this elasticity is the measure that captures by how much individuals, already working full time, increase their hours of work, after a change in the wage rate.

The decision to allocate hours to work is measured in terms of both the *compensated* and *uncompensated* wage elasticities of labour supply. The decision to work longer hours is measured in terms of the net income and substitution effect of a change in the wage rate, or the *uncompensated* wage elasticity. The compensated wage elasticity measures the percentage change in a single individual's labour supply resulting from a 1 per cent change in the wage rate. This elasticity is sometimes called the substitution or Hicksian elasticity. This elasticity includes the income effect on hours of work. The uncompensated elasticity measures the percentage change in a single individual's labour supply resulting from a 1 per cent change in the net-of-tax wage rate. This Marshallian elasticity, which is net of the income effect on hours of work, is the focus of this study.

The difference between these two elasticities, which is often overlooked in models of labour supply, is that the Marshallian also reveals the net, income and substitution effects on consumption, whilst holding utility of income constant (i.e. the net compensation from working longer); whereas the Hicksian reveals the gross effect on consumption, whilst holding the price of goods and services constant. Investigating the uncompensated wage elasticity is important as it also reveals whether the price of leisure time changes with respect to its substitutes.

Studies in labour supply reviewed here show a wide range of elasticity estimates. These studies are generally cross-sectional studies. Estimates differ because of a variety of methods applied to the sampling of workers as well as to the choice of the elasticities measured. For example, there are three different methods to estimate labour supply equations and elasticities (Birch 2005; Murray 1997; Buddelmeyer, Creedy and Kalb 2007; Breunig, Cobb-Clark and Gong 2005). First-generation studies are simple, but they suffer from selection bias (Birch 2005). Second-generation studies remedy this by using either a regression

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analysis modified to have an upper and lower limit, known as a Tobit model; or a selection bias correction regression. Complex Probit and Logit methods are used to further the analysis (Birch 2005). Third-generation models, however, are of particular importance as they consider learning experiences, even though preferences are not endogenised. They are known as discrete hours models (Murray 1997; Buddelmeyer, Creedy and Kalb 2007; Breunig, Cobb-Clark and Gong 2005). Discrete hours modelling reflects the labour supply decision where there are contractual barriers to adjusting hours worked, and are consistent with the empirical distribution of hours worked (Van Soest 1995). The elasticities are calculated by comparing labour supply before and after a change in the explanatory variable of interest.

Moreover, estimates differ also in terms of within- and between-periods, short- and long-term elasticities. For example, there are four types of wage elasticities applied to tax and benefits reforms (Blundell and MaCurdy 1999: 1603). They capture unanticipated shifts in the net-of-tax real wages today and in the future. While two are related to a static model of labour supply (i.e. within-period elasticities), the other two relate to lifecycle elasticities. These refer to the inter-temporal elasticity of substitution, which relates to both the Frish specification, measuring responses to evolutionary movements along the lifecycle wage profile, and to the elasticity relating to the full lifecycle specification, which measures responses to parametric shifts in the lifecycle profile itself. They represent average behaviour and they differ substantially. However, they refer to the uncompensated wage elasticity, and hence, importantly they hold utility of income constant.

Studies also report estimates of labour supply elasticity by gender and income, or by gender and skills. Keane and Wolpin (2007, 2010) for example, estimated a dynamic model of female labour supply where marriage, fertility, full and part-time work options, schooling and welfare participation are treated as choices. Cross-wage elasticities for married individuals are estimated by measuring the percentage change in a married individual's labour supply resulting from a 1 per cent change in the wage rate of the spouse. These two studies highlight the importance of the fixed costs of working on hours of work, and elasticities provide the most information at the disaggregated level. Keane and Rogerson (2012), however, argue that even if larger in the aggregate, these elasticities are consistent with small elasticities at a disaggregated level. In our investigation we agree with Keane and Wolpin, even though we focus on estimates for single individuals.

Current static or dynamic models cannot account for non-price changes. The framework, based on the traditional income(-consumption) leisure choice, assumes that the proportion of the costs of working, relative to the revenues from working, remains constant. The estimates exclude changes in utility (of income) arising from changes in the proportion of these costs. That is, the elasticity of substitution between consumption and leisure, from period to period, is constant (Ashenfelter and Layard 1986: ch.1; Becker and Murphy 1988). Thus we extend the traditional income (-consumption) leisure choice framework, to account for an unrecognised and endogenous change in the proportion of the costs of work-

ing, relative to the wage rate. We investigate changes in the uncompensated wage elasticities, as they measure the difference between the pre- and the post-wage rise position on the budget constraint, and hence, they implicitly measure the effects of these non-price changes on labour supply. They account for changes in the cost price of leisure.

The review of the literature in fact reveals that estimates of labour supply elasticities are conducted in a partial equilibrium framework (Blundell and MaCurdy 1999: 1607). They are measured with supply-side partial equilibrium models. Therefore these models do not include the effects of changes in the firm's demand for labour, for example, or the effects of changes in the demand for goods and services or in the demand for money. Partial equilibrium models assume that estimates are not affected by changes in the tax system, welfare or education policies, for example. Moreover, they cannot account for responses that are expected from different types of individuals. Studies of labour supply provide wage elasticities for various groups, but these are often computed at average values of wages.

In studies of labour supply, there is no consensus on the sign of the uncompensated wage elasticity. For example, in the 1980s, the consensus for highly-skilled high-wage males was for a negative and low elasticity of -0.1. This dominance of the income effect was used to explain the decline in working hours. The low elasticity was taken to mean that highly-skilled high-wage male workers are not very responsive to changes in the wage rate. The most credible estimate for men was based on how taxes affect this elasticity (Hausman 1985; Borjas 2005). Most men worked full-time for the whole week, and so this was a reasonable assumption.

The modern theory of labour supply assumes that wage elasticities are generally larger, or more responsive to price changes within periods, but lower, or less responsive, in the long term. This means that while the substitution effect on hours of work within periods (in the early stage of their working life), is larger than the income effect, on hours of work, the substitution effect is not so in the long term (Becker 1975, 1996). Even when models with endogenous preferences are considered, the long term elasticities are expected to reveal only incremental changes, and hence, that the long term elasticity is low (Becker 1996). Once again, it is assumed that in the long term, utility of income is not affected by a change in the net income and substitution effect.

The range of labour supply elasticities which we can compare is limited. However, signals of a change in the expected estimates can be highlighted to support the argument proposed here. Studies in Australia focus primarily on the uncompensated wage elasticity. Table 1 shows a summary of the estimates found in five Australian studies completed between 1996 and 2005. Of the five, there is only one study (Apps, Killingworth and Rees 1996) which finds negative elasticities for married men. Apps et al. (1996) differentiate between married and non-married men, and find that the uncompensated wage elasticity has a negative sign; the net income and substitution effect on hours of work, relative to the wage rate, is negative. The income effect, therefore, appears to be stronger than the substitution effect, and hours of work are in decline.

Table 1: Summary of uncompensated wage elasticities in Australia 1996–2005

Year	Author(s)	Uncompensated
1996	Apps, Killingworth and Rees	Negative estimates for married men
1996	Apps and Rees	Positive and ranging from 0 to 0.3
2000	Kalb	Positive and ranging from 0 to 0.3
2001	Kidd and Ferko	Positive and ranging from 0 to 0.3
2005	Breuning, Cobb-Clark and Gong	Positive and ranging from 0 to 0.3

The other studies show instead that from 1996 to 2005, the uncompensated wage elasticity is positive (Kalb 2000; Kidd and Ferko 2001; Breuning, Cobb-Clarke and Gong 2005). These studies focus on both married and single men, high- and low-skilled. The estimates reveal that the net income and substitution effect is positive on hours of work. The substitution effect, therefore, appears to be stronger than the income effect, and hours of work are increasing.

Table 2 shows the estimates of uncompensated wage elasticity in more complex (also called third-generation) labour supply models. The following studies distinguish workers by gender, income, skills and family status.

Table2: Summary of uncompensated wage elasticities for men in Australia, 2000–2007

Year	Population group	Range
2000	Men high-income earners	0.03 to 0.09
2005	Highly-skilled married men	0.07 to 0.17
2007	Single and Married men	0.24 to 0.22

Source: Cavagnoli (2008)

The estimated uncompensated wage elasticity has a positive sign. The net income and substitution effect is positive and hours of work are increasing. Between 1996 and 2007, while the magnitude of the uncompensated elasticity remained relatively stable (i.e. low), the direction of change (i.e. the sign) has changed from negative to positive. However, none of the above studies discussed the discrepancy.

We investigate and compare the Australian estimates with the ones presented in international studies (Table 3). As expected, there is a wide range of estimates; but they also highlight, as in the Australian experience, that, over time, there is a change in sign.

Table 3: Labour supply elasticities, some international studies 1990–2008

Year	Author(s)	Country	Uncompensated	LS hours worked
1990	Triest	USA	Between -0.02 and 0.6	Prime-aged married
1999	Aaberge et al.	Italy	0.01 -0.03	In Aggregate Only top 10% richest Households
2005	Kniesner and Ziliak	USA	-0.47	Prime-aged married Head of household
2008	Kumar	USA	0.14	Married and Head of household

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Table 3 shows that until the mid-1990s, the uncompensated wage elasticity is negative; but the sign becomes positive from 1996 onwards. With the exception of two studies, Aaberge et al. (1999), where the estimate is negative for the top 10 per cent richest households (high-income), and Kniesner and Ziliak (2005), where the estimate is negative for the prime age head of the family, the estimates are similar to the ones found in Australia.

A change in the sign of the uncompensated wage elasticity, especially for highly skilled and high-wage workers, is an important signal of market failure. The longer they work the greater the costs of working, relative to the revenues from working. There is an institutional constraint on the average value of the wage, which sets the point after which the revenues from working start to decrease. The constraint is in addition to the well-known budget constraint, and it refers to the ratio of labour endowment to actual labour supply (Ballard et al. 1985: 125), which is used to calculate the average wage rate. This ratio is commonly used in macro-economic modelling of taxation to convert the value of time from work to leisure, as mentioned, for measuring the average wage rate, but also for measuring the compensated and uncompensated wage elasticities. In the goods market, it is used to measure the compensated and uncompensated elasticity of demand for goods and services.

As discussed, models of labour supply adopt the value of the average wage rate that is given, but which is measured using the ratio of labour endowment to actual labour supply. In Australia, this ratio is set to an average working week of 38 hours, for a full-time workers. The 40-hour week was arbitrated in 1947. Since 2009, the average has been 38-hour weeks. Hence, a change in this ratio affects the estimates. However, because labour supply models are partial equilibrium models they cannot capture these effects. A change in this ratio creates a gap between the actual and the estimated elasticity. The next section investigates the estimates within the proposed extended model of the income (or consumption)-leisure choice to include the effects of this change.

Characteristics of the Newly Extended Income-Leisure Approach

This section compares neoclassical estimates of the consumption-leisure choice with the new one proposed here. We extend the current analytical tools of the neoclassical theory of labour supply by assuming that leisure is superior to work.

The theory of consumer choice, for example, tells us that the difference between normal, inferior and superior goods is given by the difference in the rate of consumption relative to an increase in income (Varian 1996). The consumption of normal goods increases with increases in income, and hence, consumption increases at the same rate as income does. However, the consumption of superior goods increases by more than the increase in income. The difference between these categories of goods is given by the difference in purchasing power, or in the difference between the change in consumption and the change in income.

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Within the neoclassical theory of labour supply, the decision to allocate time to work is measured as a response to a *price* (i.e. wage) change (as opposed to a *non-price* change). The decision to work longer hours reflects a movement along the supply curve. The movement is measured in terms of the *income* and *substitution* effects; more precisely, in terms of the *compensated* and *uncompensated* wage elasticities of labour supply. In particular, when focussing on full-time workers, the decision to work longer hours is measured in terms of the *uncompensated* wage elasticity (or the *net*, income and substitution, *effect*).

In this analysis the net effect on hours of work is measured in terms of the difference between the change in consumption and the change in income, after a wage increase. We show the change visually in three steps, within a two period, initially static, partial equilibrium condition, investigating the trade-off between consumption and leisure before and after a wage change, for highly skilled high-income earners. We propose that these workers work longer hours than similar workers in the 1980s because of a decrease in the purchasing power of their earnings from work.

Graph 1 presents the standard neoclassical analytics of the income and substitution effects (following an increase in the wage rate). Second, in graphs 2 and 3, changes in the income and substitution effects are compared in two situations: i) where the income effect is a 'first mover', as in the traditional and modern theory of labour supply; and ii) where the substitution effect is a 'first mover', as in the theory of consumer demand. We want to capture the difference between the change in consumption and the change in income, in the two situations. Third, in graph 4, we adopt the former to consider the final position of individuals, where the proportion of time in leisure and work is fixed at the reservation wage. In graph 5, we allow for the average proportion of time allocated to market and non-market activities to vary, and we investigate its effect on the reservation wage.

Graph 1 is the standard static graphical representation of how individuals respond, in terms of labour supply, to a wage increase. This is the general model taught in standard labour economics textbooks (i.e. Borjas 2005).

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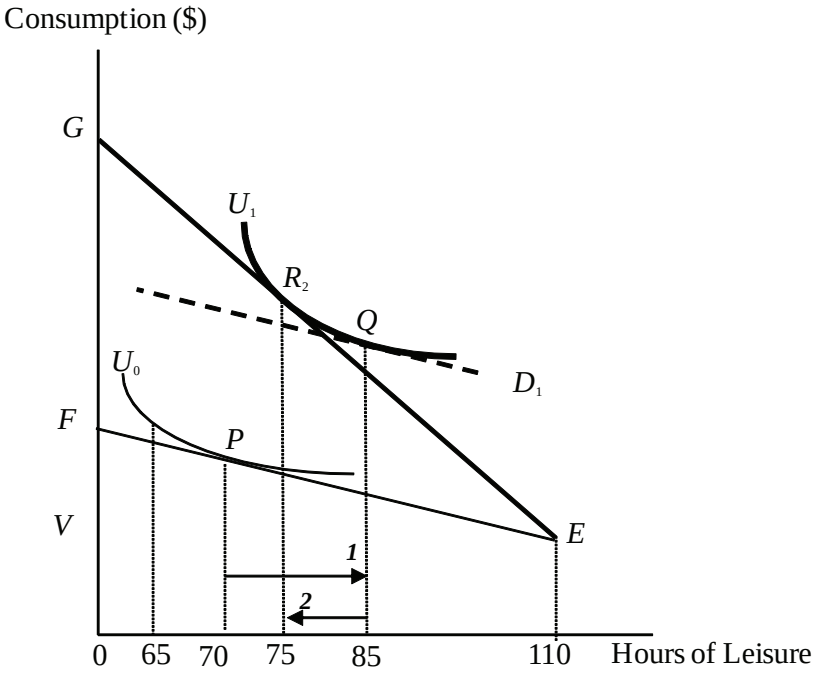
Graph 1: 'Conventional' income effect greater than substitution effect



Graph 1 shows the consumption bundles U_0 and U_1, before and after the increase in the wage rate, respectively. After the increase, the budget line rotates round the endowment point E, from FE to GE. An increase in the wage moves the individual from point P to point R_1, where the consumption of goods and services is greater than at point P. By decomposing the change, an increase in the wage rate generates both an income and a substitution effect.

At a higher wage, it becomes more expensive not to work, and therefore, there is a substitution effect. More time is allocated to paid work. The income effect allows the individuals to have greater purchasing power, and hence, greater, than before, consumption choices. As shown in graph 1, if the income effect is greater than the substitution effect, hours of work decrease when the wage rate rises. Individuals find themselves on a higher, than before, consumption bundle.

As mentioned, the traditional and the modern theories of labour supply however, state that there is an ambiguous relationship between hours of work and the wage rate, and hence, the net effect of a wage increase on hours of work is ambiguous. Whether the substitution effect is greater than the income effect, depends on individuals' preferences.

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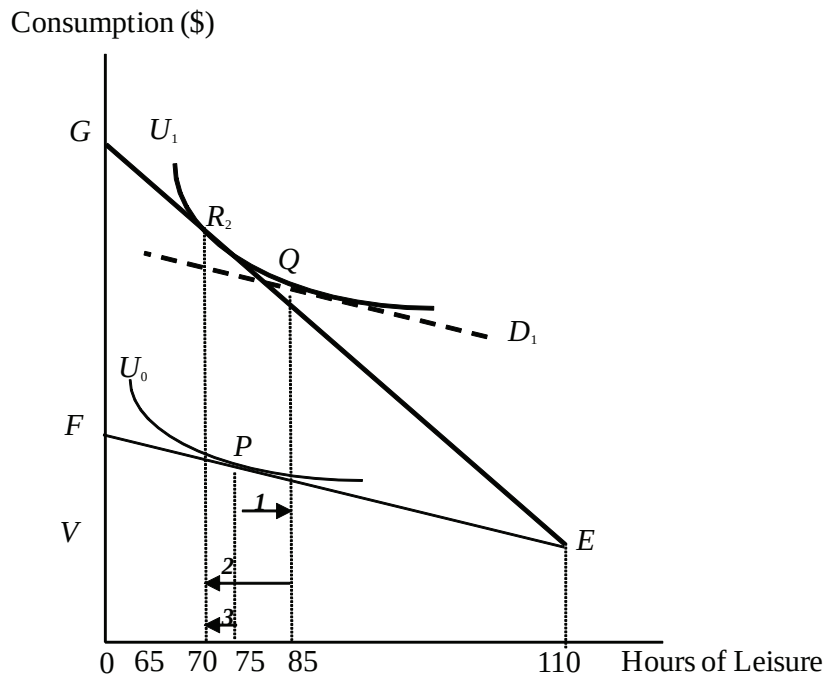
Graph 2: Alternative 1: Income effect as 'first mover'



The difference between the standard and the proposed approaches is explained in the following two scenarios. In the first instance, as given in graph 2, we consider the income effect as a 'first mover', as in the theory of labour supply. Following a change in the wage rate, the income effect takes the individual from point P to point Q; while the substitution effect takes the individual from point Q to point R. The worker has more opportunities to consume on the new budget constraint, which moves from FE to GE. The consumption bundle shifts from U_0 to U_1. What is important to note is the position of Q, on the right of P.

The tangent position of Q is where the MRS between consumption and leisure is equal to the wage rate, and reveals the best possible consumption bundle. Point E is also important. The endowment of labour hours to paid work at E is held constant at 110 hours a week. This is not specified in standard models of labour supply.

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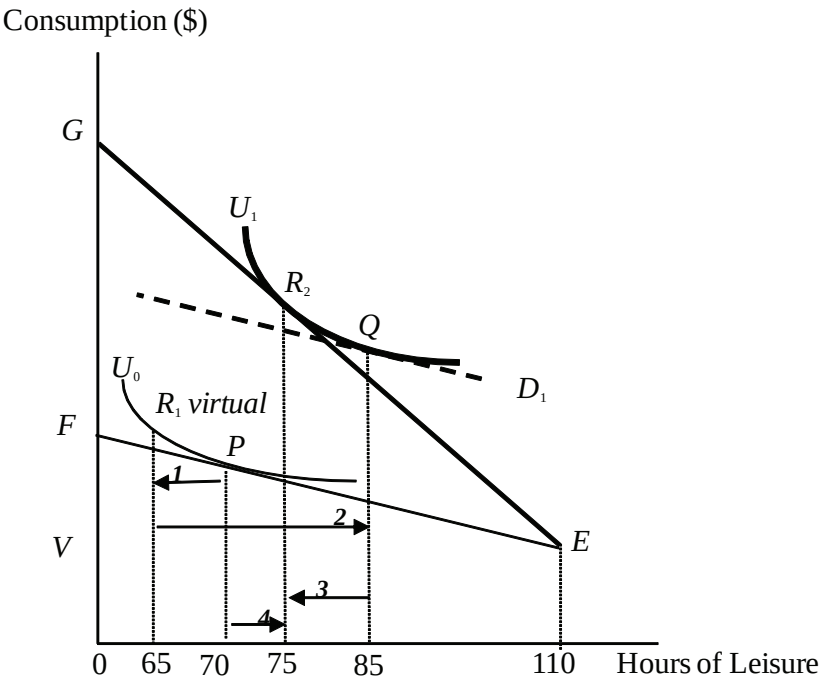
Graph 3: Alternative 2: Substitution effect as 'first mover'



In graph 3, we consider the substitution effect as a 'first' mover, as in the theory of consumer demand. Following a wage increase, the substitution effect takes the individual from point P to a virtual point parallel to R_1 virtual but on U_0. To substitute leisure time for work time individuals buy time-saving goods, such as child-care services, white goods and catering or pre-cooked food, for example. This component of their consumption bundle is consumed in order to work, and more time is therefore allocated to paid work.

The income effect shifts the virtual demand for goods and services from the old budget FE, to the new budget GE. Utility U_0 shifts to U_1. Holding utility of income constant at Q, always to the right of P, the budget rotates to the next indifference curve, and earnings change by more (or grow faster) than the change in consumption. Q is always to the right of P. Only then, the tangent position is optimal, where the MRS between consumption and leisure is equal to the wage rate. Hence, there is a movement along the supply curve.

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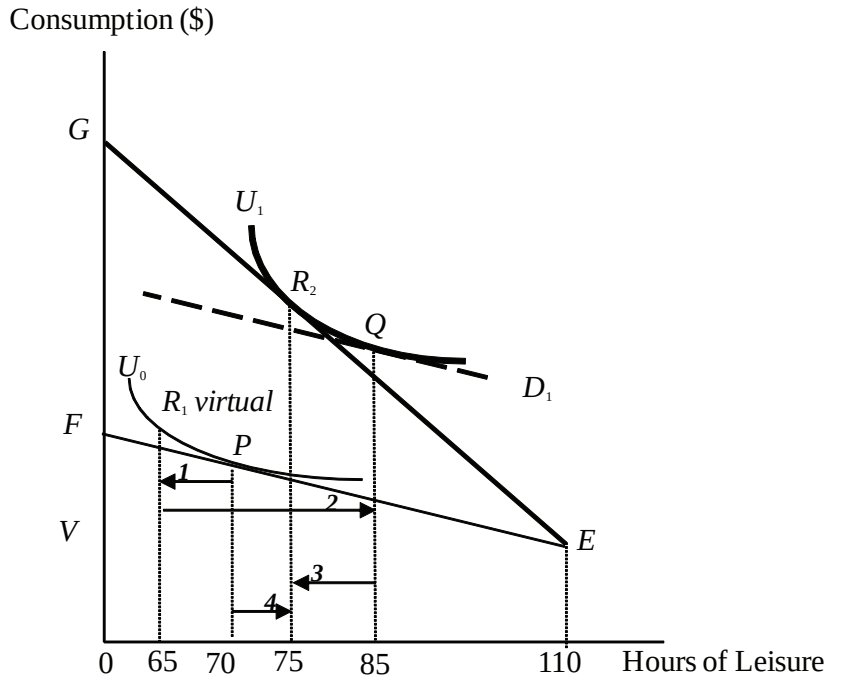
Graph 4: Proposed net income and substitution effect



As before, while the worker has more opportunities to consume, at point R_2, on the new budget constraint GE, the consumption bundle shifts from U_0 to U_1, and while his/her new consumption position is at R_2, his/her new income position is at Q. The position of E remains constant at 110 hours a week. Graph 4 shows the net income and substitution effect, holding E constant at the ratio of labour endowment to actual labour supply.

The change from P to R_1 'virtual' on U_0 is counterbalanced by the change from Q to R_2 on U_1. The net effect is the distance between P and R_2 on U_1. The approach differs from the standard approach as it distinguishes the 'net overall effect' of a wage change, on hours of work, between a change in consumption that arises from the substitution effect (P to R_1 virtual, on U_0) ('sub effect' in the graph above), and consumption that arises from increased purchasing power (from Q to R_2 on U_1) ('sub effect after income effect' in graph above).

The change in consumption has two components. This distinction differs from the one expressed in the Slutzky equation. There is an extra effect on consumption that arises from consuming goods and services to work, but which does not arise from the income effect, and it is endogenous. The extra consumption reveals a greater than expected effect on hours of work, as there is an asymmetry between the expected and the actual costs of working.

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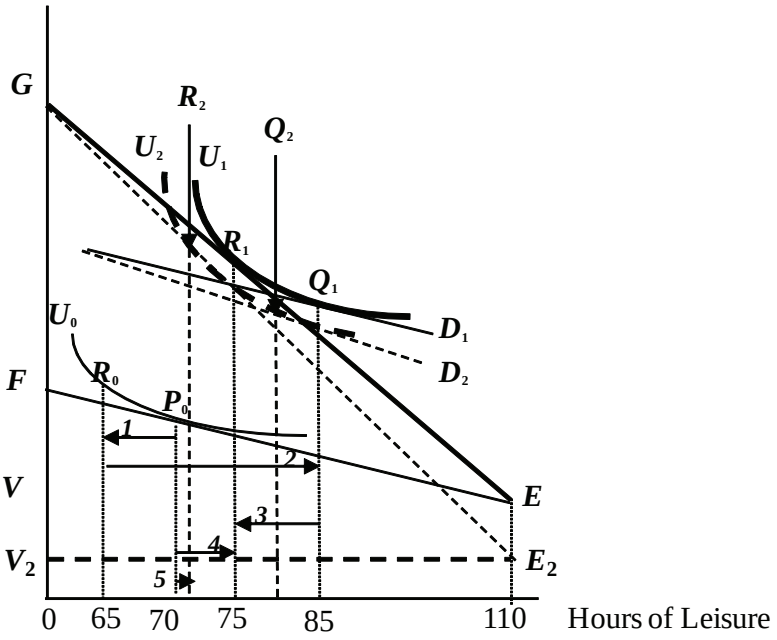
Graph 5: Proposed net effect, final position after the unexpected change in E



The asymmetry is given by a change in the expected average proportion of time allocated to market and non-market activities. Graph 5 shows how an unexpected change in the ratio of labour endowment to actual labour supply (at E), which affects utility.

An unexpected change in the ratio of labour endowment to actual labour supply shifts the budget GE to a parallel but lower than expected (dotted budget line) budget; and a consequent lower tangent point, on a lower demand for goods and services (dotted line). As consumption is held fixed at point G, the budget and the demand curve rotate. The final position of R is on a steeper than expected budget constraint and steeper than expected, demand curve of goods and services. By comparing the net effect before and after the change in the average proportion of time allocated to market and non-market activities, it can be seen that the *net overall effect* is much smaller than the *net overall effect* in the previous instance, and hence, smaller than the effect as per expected in models of labour supply.

A steeper than expected budget constraint and demand for goods and services means that these workers are able to afford fewer than expected and available, options, and their demand for goods and services is, lower than expected. These workers find themselves on an inferior 'not optimal' position, compared to the theoretical expectations for highly-skilled high-wage workers, and compared to their previous generation.

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Conclusion

The neoclassical theory of labour supply cannot unambiguously explain the trend of long hours of work in the last three decades, in particular for highly skilled, high-wage workers. The phenomenon is a reversal of a long term trend in the opposite direction. In this article we proposed a new pluralist approach to measuring labour supply elasticities. We investigated the labour supply elasticities of full time, high-wage highly-skilled male workers (single) in Australia and internationally, over time. We focussed on the uncompensated wage elasticity and we found ambiguities in its measurements. These are due to the fact that models of labour supply are partial equilibrium models, but also to the fact that the value of the wage, used to calculate the elasticity, is not adjusted to include a change in the cost-price of leisure time.

Within the condition that leisure time is superior to work time, a difference was found between actual and expected responsiveness. The elasticity changed in sign. The estimates reveal a shift in, rather than a movement along, the supply curve. We employed the consumption-income leisure choice model, in a two period framework, to show that there is an unrecognised 'extra' substitution effect on hours of work because the cost price of leisure time has increased relative to the expected cost and relative to the wage rate. The change and the ambiguities in measuring the average value of the wage rate, affect the sign of the uncompensated wage elasticity.

Acknowledging that the average value of the wage rate is affected by a change in the average proportion of time allocated to market and non-market activities draws on a measure used in macro-economic models of taxation. This enables a distinction between two types of substitution effect: i) that between leisure time and work time, following a change in the wage rate (as inputs to produce utility), and ii) the substitution between consumption and leisure. The change in consumption, following an increase in the wage rate, includes three components: consumption of goods and services in order to work, consumption of goods and services in order to do extra hours of work, and consumption from increased purchasing power. Changes in these components affect the average proportions of costs relative to earnings and non-labour income.

Labour supply theory identifies changes in consumption due to changes in the wage rate and those due to changes in purchasing power. Contrary to the neoclassical theory of labour supply, the estimates reveal that leisure time is not superior to work time. However, the consequences of this change have not yet been recognised in models of labour supply. Studies investigating a change in the average proportion of time allocated to market and non-market activities (i.e. the ratio of labour endowment to actual labour supply) are limited. To estimate precisely labour supply elasticities of highly skilled high-wage individuals, the value of the wage rate needs to be adjusted to include a change in the cost-price of leisure time. An appropriate disaggregation of data is also required, based, for example on types of job, industry, region, age and gender.

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About the Author

» **Donatella Cavagnoli** is an Adjunct Research Fellow at the University of Ballarat. She holds a PhD in Labour Economics (2009). Her research interests are in labour economics, innovation and transport economics. As a researcher, she has published papers primarily in labour economics. She can be contacted at d.cavagnoli@gmail.com.

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