1947. Letter of 18 June to Newton B. Drury. Included in R.A. Prewitt, *The Economics of Public Recreation: An Economic Study of the Monetary Evaluation of Recreation in the National Parks.* Mimeo. Washington, DC: Land and Recreational Planning Division, National Park Service, 1949.

Bibliography

Dasgupta, P. and Maskin, E. 1986. The existence of equilibrium in discontinuous economic games, II: Applications. *Review of Economic Studies* 53, 27–41.

d'Aspremont, C., Gabszewicz, J.-J. and Thisse, J. 1979. On Hotelling's 'Stability in Competition'. *Econometrica* 47, 1145–50.

hours worked (long-run trends)

Between 1830 and 2000, the average number of hours worked per worker declined, both in the marketplace and at home. Technological progress is the engine of such transformation. Three mechanisms are stressed:

- the rise in real wages and its corresponding wealth effect;
- the enhanced value of time off from work, due to the advent of time-using leisure goods; and
- the reduced need for housework, due to the introduction of time-saving appliances.

These mechanisms are incorporated into a model of household production. The notion of Edgeworth–Pareto complementarity/substitutability is key to the analysis. Numerical examples link theory and data.

Facts

Hours worked dropped precipitously over the course of the 19th and 20th centuries, both in the marketplace and at home. In 1830 the average workweek for an American worker in the marketplace was 70 hours. This had plunged to just 41 hours by 2002. At the same time there was a ninefold gain in real wages. Figure 1 shows the shrinkage of the market workweek and the leap forward in real wages. Likewise, the amount of time spent on housework dropped. A famous study of Middletown, Indiana, documented that in 1924 87 per cent of housewives spent more than four hours per day on housework (see Figure 2). None spent less than one hour. By 1999 only 14 per cent toiled more than four hours per day in the home, while 33 per cent spent less than one hour.

This decline in hours worked, both in the market and at home, was met by a rise in leisure. One implication of the increase in leisure is the uptrend in the share of personal consumption expenditure spent on recreation. This rose from three per cent in 1900 to 8.5 per cent in 2001, as Figure 3 illustrates. Additionally, the amount of time that a person needs to work in order to buy the goods used for leisure has fallen by at least 2.2 per cent a year – real wages grew at an annual rate of 1.65 per cent over the 1901–88 period. This price decline neglects the fact that many new forms of leisure goods have become available over time, or that old forms have improved. As the workweek – or

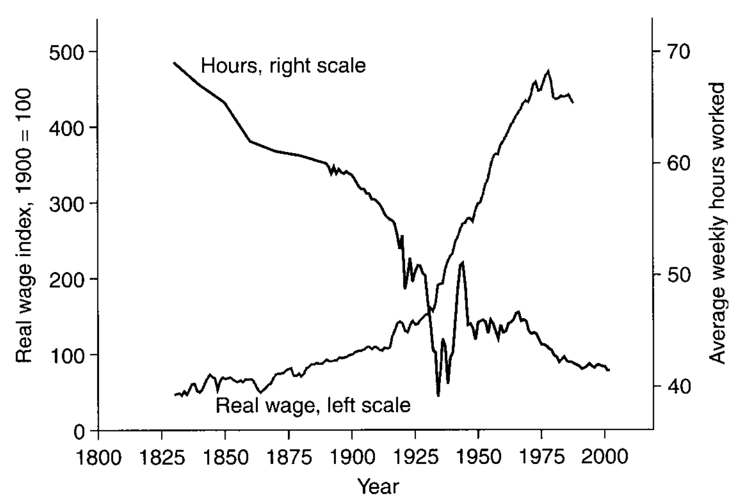

Figure 1 The fall in the US market workweek and the gain in real wages, 1830–2002. *Sources*: Average weekly hours data for 1830–80: Whaples (1990, Table 2.1). 1890–1970: *Historical Statistics of the United States: Colonial Times to 1970* (Series D765 and D803). 1970–2002: *Statistical Abstract of the United States.* Wage data: Williamson (1995, Table A1.1).

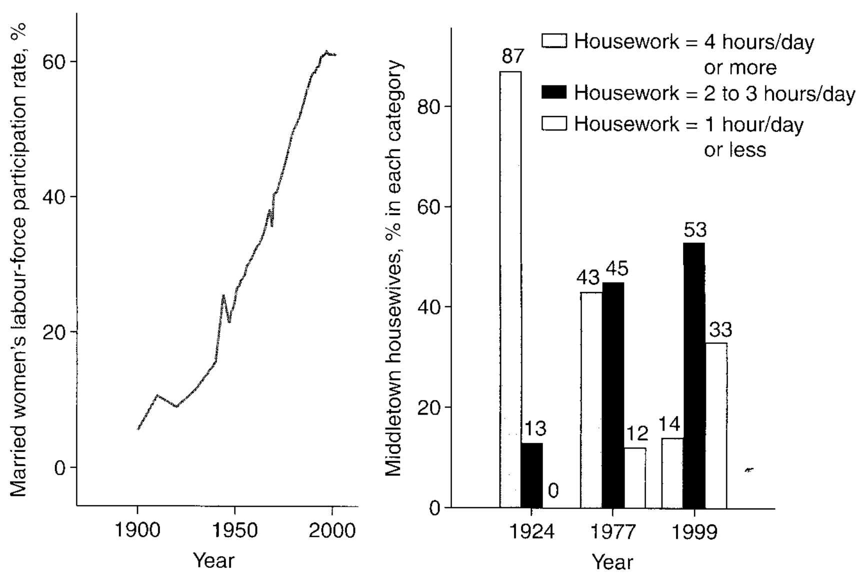

Figure 2 The ascent of US female labour-force participation and the reduction in housework, 20th century. *Sources*: Time spent on housework in Middletown: Caplow, Hicks and Wattenberg (2001, p. 37). Female labour-force participation: *Statistical Abstract of the United States.*

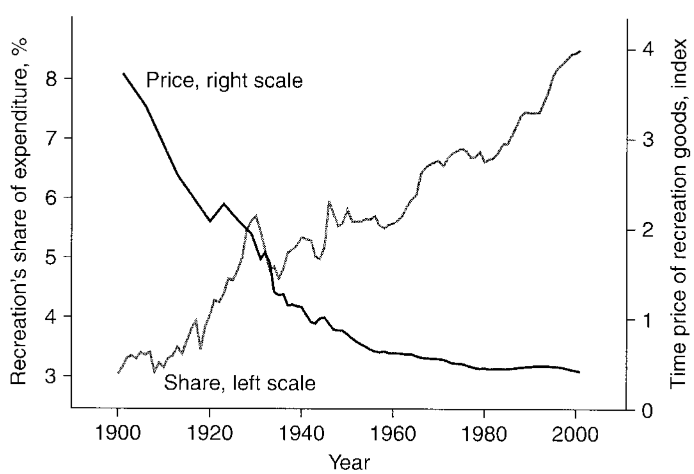

Figure 3 The increase in recreation's share of expenditure and the decline in the time price of leisure in the US, 20th century. *Sources*: Recreation's share of expenditure for the years 1900–29: Lebergott (1996, Table A.1). 1929–2000: *Statistical Abstract of the United States.* Time price of leisure goods: Kopecky (2005).

the time spent on work both in the market and at home – dropped, more and more women entered the marketplace to work. This may seem a little paradoxical. Only four per cent of married women worked in 1890 as compared with 49 per cent in 1980 – again, see Figure 2.

What can explain these facts? The answer is nothing mysterious: technological progress. Three channels of effect are stressed here. First, technological progress increases wages. On the one hand, an increase in real wages should motivate more work effort since the price of consumption goods in terms of forgone leisure has fallen. On the other hand, for a given level of work effort a rise in wages implies that individuals are wealthier. People may desire to use some of this increase in living standards to enjoy more leisure. Second, the value of not working rises with the advent of new leisure goods. Leisure goods by their very nature are *time using*. Think about the impact of the following products: radio, 1919; Monopoly, 1934; television, 1947; videocassette recorder, 1979; Nintendo and

Trivial Pursuit, 1984. Third, other types of new household goods reduce the need for housework. These household goods are *time saving*. Examples are: electric stove, 1900; iron, 1908; frozen food, 1930; clothes dryer, 1937; Tupperware, 1947; dishwasher, 1959; disposable diaper (Pampers), 1961; microwave oven, 1971; food processor, 1975. Some goods can be both time using and time saving, depending on the context: the telephone, 1876; IBM PC, 1984. A model is now developed to analyse the channels through which technological progress can affect hours worked in the market and time spent at home.

Analysis

Setup

Let tastes be represented by

$$U(c) + V(n), \text{ with } U_1, \ V_1 > 0 \text{ and } U_{11}, V_{11} < 0.$$

Here the utility functions U and V are taken to have the standard properties, while c and n represent the consumption of a market good and a non-market good. Now, suppose that the non-market good is produced in line with the constant-returns-to-scale production function

$$n = H(l, d) = dH\left(\frac{l}{d}, 1\right), \text{ with } H_1, \ H_2 > 0 \text{ and } H_{11}, \ H_{22} < 0,$$

where H has standard properties, d represents purchased household inputs, and l is time spent in household production. The idea that non-market goods are produced by inputs of time and goods, just as market ones are, was introduced in classic work on household production theory by Becker (1965) and Reid (1934). Assume for simplicity that there is some indivisibility associated with d. The household must use the quantity $d = \delta$. (This assumption is innocuous. Greenwood, Seshadri and Yorukoglu, 2005, Section 6, and Vandenbroucke, 2005, illustrate how it can easily be relaxed.) This fixed quantity of the household input sells at price q, which is measured in terms of time. Last, an individual has one unit of time that he can divide between working in the market and using at home. The market wage rate is w.

Now, define the function

$$X(l, d) = V\left(dH\left(\frac{l}{d}, 1\right)\right).$$

Household time, l, and purchased household inputs, d, are Edgeworth–Pareto complements in utility when $X_{12} > 0$ and substitutes when $X_{12} < 0$ (cf. Pareto, 1906, eqs. (63) and (64)). When l and d are Edgeworth–Pareto complements in utility, an increase in d raises the marginal utility from l, or X_1, and likewise more l increases the marginal utility from d, or X_2.

The individual's optimization problem is

$$W(w, q) = \max_{l}\{U(w(1 - l) - qw) + X(l, \delta)\}.$$

The upshot of this maximization problem is summarized by the first- and second-order conditions written below.

$$wU_1(w(1 - l) - qw) = X_1(l, \delta) = V_1\left(\delta H\left(\frac{l}{\delta}, 1\right)\right) \times H_1\left(\frac{l}{\delta}, 1\right), \quad (1)$$

and

$$\Sigma \equiv w^2 U_{11} + X_{11} < 0.$$

The left-hand side of (1) represents the marginal cost of an extra unit of time spent at home. An extra unit of time spent at home results in a loss of wages in the amount w. This is worth $wU_1(w(1 - l) - qw)$ in terms of forgone utility. The right-hand side gives the marginal benefit derived from spending an extra unit of time at home, $X_1(l, \delta)$. The solution for l is portrayed in Figure 4.

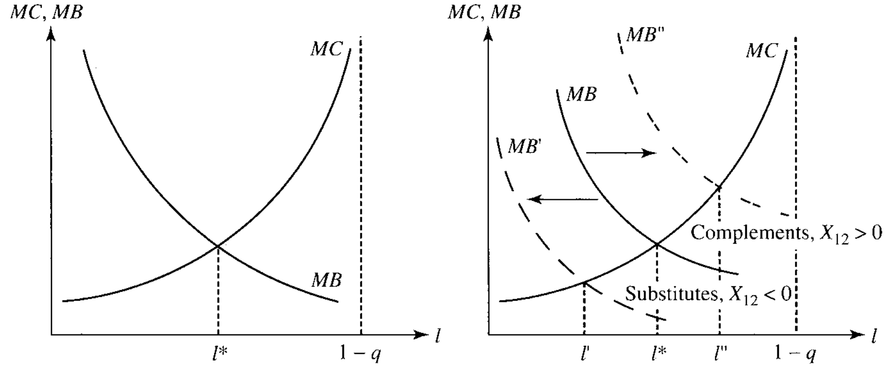

Figure 4 The determination of time spent at home, l

Effect of technological progress in household goods

Now, suppose that there is technological progress in household goods. In particular, let this be manifested by an increase in the amount of home inputs, δ, that can be purchased for q forgone units of time. How will this affect the amount of time spent at home? It is easy to calculate that

$$\frac{dl}{d\delta} = -\frac{X_{12}}{\Sigma} \gtreqless 0 \text{ as } X_{12} \gtreqless 0.$$

Therefore, time spent on household activities will rise or fall depending on whether time and goods are complements or substitutes in household utility. When time and purchased inputs are complements in utility, an extra unit of d raises the worth of staying at home. So, time spent at home should rise. Leisure goods, such as television, fall into this category. Such goods have contributed to the decline in work (either in the marketplace or at home) by both men and women. A detailed account of how this mechanism can contribute to the long-run drop in hours worked is provided by Vandenbroucke (2005). This case is shown in Figure 4 by a rightward shift in the marginal benefit curve from MB to MB'', causing time spent at home to rise from l^* to l''. The opposite is true when d and l are substitutes. This is portrayed in the figure by the leftward movement in the marginal benefit curve from MB to MB'. Time-saving household appliances, such as the microwave oven, are an example of this case. Such products have reduced the need for housework and have contributed to the increase in market work by women. Greenwood, Seshadri and Yorukoglu (2005) show how the increase in female labour-force participation can be explained along these lines. Therefore, technological advance in household products is consistent with the long-run decline in the market workweek (leisure goods) and the rise in female labour-force participation (time-saving appliances and goods).

When are two goods Edgeworth–Pareto complements or substitutes? From (1) the marginal benefit of time spent at home, $X_1(l,\delta)$, is the product of two terms, the marginal utility from non-market goods, $V_1(\delta H(l/\delta, 1))$, and the marginal product of household time, $H_1(l/\delta, 1)$. The marginal utility of housework is decreasing in δ, while the marginal product of household time is increasing in it. Thus, the net effect of an increase in δ will depend upon whether the former falls faster with an increase in δ than the latter rises. Specifically,

$$X_{12} = -V_{11}H_1^2(l/\delta) - V_1H_{11}l/\delta^2 + V_{11}HH_1,$$

so that

$$X_{12} \lesseqgtr 0 \text{ as } \frac{-(l/\delta)H_{11}}{H_1} \lesseqgtr \frac{-nV_{11}}{V_1}\frac{\delta(H - H_1 l/\delta)}{n}.$$

In other words, whether or not $X_{12} \lesseqgtr 0$ depends on whether the elasticity of the marginal product of labour with respect to the time–goods ratio, $-(l/\delta)H_{11}/H_1$, is smaller or larger than the elasticity of marginal utility with respect to the home good, $-nV_{11}/V_1$, weighted by the share of purchased inputs in output, $\delta(H - H_1 l/\delta)/n$. Thus, l and δ are likely to be substitutes in utility when: (*a*) the responsiveness of the marginal product of l/δ is small with respect to a change in δ; (*b*) the marginal utility of home goods declines quickly with more consumption; (*c*) when purchased inputs are important in production.

Example 1 (The impact of leisure goods on hours worked) Let $U(c) = \phi \ln(c)$ and $V(n) = (1-\phi)\ln(n)$. Represent the household technology by the constant-elasticity-of-substitution production function $H(l,\delta) = (\delta^\rho + l^\rho)^{1/\rho}$. The household's budget constraint is $c = w(1 - l - q)$. Given this set-up, the first-order condition (1) can be rewritten as

$$\frac{\phi}{1-\phi} = \frac{1-l-q}{\delta^\rho + l^\rho} l^{\rho-1}. \qquad (2)$$

Observe that a change in wages, w, does not affect hours worked in the market, $1-l$. The length of the workweek in the 1890s was about 42 per cent above that of the 1990s. In 1995 the typical worker spent about one-third of his available time working in the market. So, set $1 - l_{1995} = 1/3$ and $1 - l_{1895} = 1.42 \times 1/3$. Let $\delta_{1895} = 0.1$. The share of leisure goods in expenditures, s, is given by $s = q/(1-l)$. Costa (1997) reports that this share was two per cent in the 1890s and six per cent in the 1990s. Thus, the time-price q is given by $q_t = (1 - l_t)s_t$, for $t = 1895$ and 1995. Finally, pick $\rho = -0.6$, which implies an elasticity of substitution between leisure time and leisure goods of 0.63. Proceed now in two steps. First, use (2) to back out the value of ϕ that is consistent with $l = l_{1895}$, $q = q_{1895}$, and $\delta = \delta_{1895}$. This results in $\phi = 0.19$. Second, use this equation to find the value of δ_{1995} that is in agreement with $l = l_{1995}$, $q = q_{1995}$, and $\phi = 0.19$. This leads to $\delta_{1995} = 0.69$. Voilà, an example has now been constructed where the change in market hours matches exactly the corresponding figure in the US data. Additionally, the share of expenditure spent on leisure is in line with the data. In physical units, households in 1995 had 6.90 times more leisure goods than did households in 1895. This number depends upon the elasticity of substitution between leisure time and leisure goods. The higher the degree of complementarity (or the smaller is ρ), the less is the required increase in δ.

Remark An example can be constructed in very similar fashion to show that labour-saving household inputs (or the case of Edgeworth–Pareto substitutes) can account for the rise in female labour-force participation. The interested reader is referred to Greenwood and Seshadri (2005, Example 5, p. 1256).

Effect of an increase in wages
How will rising wages impact hours worked? It's easy to calculate that

$$\frac{dl}{dw} = \frac{U_1 + w(1-l-q)U_{11}}{\Sigma} \gtrless 0 \text{ as } U_1 \lessgtr -w(1-l-q)U_{11}.$$

On the one hand, a boost in wages increases the opportunity cost of staying at home. This should reduce the time spent at home, l, and is represented by the substitution effect term, $U_1/\Sigma < 0$. On the other hand, higher wages make the individual wealthier. The individual should use some of this extra wealth to increase his time spent at home. This income effect is shown by the term, $w(1-l-q)U_{11}/\Sigma > 0$. Thus, time spent at home can rise or fall with wages depending on whether the income effect dominates the substitution effect. In general, then, anything can happen, as the following two specialized cases for U make clear.

1. Let $U(c) = ln\,(c)$, the macroeconomist's favourite utility function. Here, $U_1 = 1/c$ and $w(1-l-q)U_{11} = -1/c$. Therefore, the substitution and income effects from a change in wages exactly cancel each other out. Long-run changes in wages have no impact on hours worked in the market, $1-l$.
2. Suppose $U(c) = ln\,(c - \mathfrak{c})$, where $\mathfrak{c} > 0$ is some subsistence level of consumption. Now, $U_1 = 1/(c - \mathfrak{c})$ and $w(1-l-q)U_{11} = -c/(c-\mathfrak{c})^2$. Therefore, $dl/dw = -\mathfrak{c}/[(c-\mathfrak{c})^2\Sigma] > 0$. Consequently, rising wages lead to a fall in market hours, $1-l$. The intuition is simple. At low levels of wages an individual must work hard to meet his subsistence level of consumption, $\mathfrak{c}$. Achieving the subsistence level of consumption becomes easier as wages rise and this allows the individual to ease up on his work effort. Thus, this form for the utility function is in accord with a long-run decline in hours worked. Additionally, it is consistent with the observation reported in Vandenbroucke (2005) that unskilled workers laboured longer hours in 1900 than did skilled ones, while today they work about the same.

Can an increase in wages explain the decline in the workweek? The answer is 'yes', as the following example makes clear.

Example 2 (The impact of rising wages on hours worked) Let $U(c) = ln\,(c - \mathfrak{c})$ and $V(n) = \alpha n$. Represent the household technology by $H(l, d) = l$. Equation (1) appears as

$$1 - l = \frac{1}{\alpha} + \frac{\mathfrak{c}}{w}, \qquad (3)$$

which gives a very simple solution for hours worked, $1-l$. Let the time period for this example be 1830 to 1990. The real wage rate in 1990 (actually in 1988) was 9.15 times the wage rate of 1830 (Williamson, 1995). So, set $w_{1830} = 1$ and $w_{1990} = 9.15$. Following the discussion in Example 1, fix hours worked in 1830 and 1990, or $1 - l_{1830}$ and $1 - l_{1990}$, using the equations $1 - l_{1830} = 1.65 \times 1/3$ and $1 - l_{1990} = 1/3$. Employing these restrictions in conjunction with (3) leads to a system of two equations in the two unknown parameters α and $\mathfrak{c}$. Specifically, one obtains

$$1 - l_{1830} = \frac{1}{\alpha} + \frac{\mathfrak{c}}{w_{1830}},$$

and

$$1 - l_{1990} = \frac{1}{\alpha} + \frac{\mathfrak{c}}{w_{1990}}.$$

Solving yields $\alpha = 3.26$ and $\mathfrak{c} = 0.24$. The subsistence level of consumption, $\mathfrak{c}$, amounts to 44 per cent of consumption in 1830, and eight per cent in 1990.

The 20th century saw the advent of labour income taxation. So perhaps the previous example should have focused on the rise of after-tax wages. This is easy to amend.

Example 3 (The effect of higher labour income taxation on hours worked) Take the setup from Example 3 with one modification, to wit the introduction of labour income taxation. In particular, suppose that wages are taxed at rate τ. A fraction θ of the revenue the government receives is rebated back to the worker via lump-sum transfer payments, t. The rest goes into worthless government spending on goods and services, g – or equivalently one could assume that it enters into the consumer's utility function in a separable manner. Hence, the worker's budget constraint reads $c = (1-\tau)w(1-l) + t$, while the government's appears as $g + t = \tau w(1-l)$. The first-order condition for this setting is

$$\frac{(1-\tau)w}{c - \mathfrak{c}} = \alpha.$$

Combining the worker's and government's budget constraints yields $c = [1 - \tau(1-\theta)]w(1-l)$. Using this fact in the above first-order condition results in

$$1 - l = \frac{1-\tau}{\alpha[1-\tau(1-\theta)]} + \frac{\mathfrak{c}}{w[1-\tau(1-\theta)]}. \qquad (4)$$

Observe that when $\mathfrak{c} = 0$ and $\theta = 0$ (no rebate) an increase in the tax rate will have no impact on hours worked, because the substitution and income effects exactly cancel each other out. When $\mathfrak{c} = 0$ and $\theta = 1$ (full rebate) higher taxes will dissuade hours worked since only the substitution effect is operational. Alternatively, if $\mathfrak{c} > 0$ and $\theta = 0$ (no rebate), then it transpires that a rise in taxes will cause hours worked to move up. Here the negative income effect from the increase in government spending, which will result in more hours being worked, outweighs the substitution effect. Therefore, in general the effect of labour income taxation on hours worked is ambiguous. The result will depend on how the government uses the revenue it raises, and the functional forms and parameter values used for tastes and technology.

Take labour income taxes to be zero in 1830. Assume a rate of 30 per cent in 1990, in line with numbers reported by Mulligan (2002). Fix $\theta = 0.33$, its value for 1990 as measured by the National Income Product Accounts. By following the procedure in Example 3, it can be deduced that the observed fall in hours worked is occurs when $\alpha = 2.86$ and $\iota = 0.20$. Furthermore, it can be inferred that the rise in wages accounts for 93 per cent of the fall, while the increase in taxes explains the remaining seven per cent. (For those interested, the decomposition is done as follows: Represent the right-hand side of (4) by $L(w,\tau)$. Then,

$$(1 - l') - (1 - l) = [L(w', \tau') - L(w, \tau') + L(w', \tau) - L(w, \tau)]/2 + [L(w', \tau') - L(w', \tau) + L(w, \tau') - L(w, \tau)]/2.$$

The first term in brackets is a measure of the change in hours worked, $(1 - l') - (1 - l)$, due to the shift in wages from w to w', while the second term gives the change due to a movement in taxes from τ to τ'.)

All of the above examples are intended solely as illustrations of some secular forces that potentially influence hours worked. A quantitative assessment of the impact that taxes have on hours worked will depend upon the particulars of the model used. A serious study is conducted in Prescott (2004).

The real world seems to have experienced two conflicting trends: a decline in market work and a rise in female-labour participation. A more general model could be consistent with both of these facts. To see this, imagine a framework with two types of labour, male and female. There is a division of labour in the home. Men work primarily in the market. Females do housework and, time permitting, market work. Households purchase both time-saving and time-using household inputs. Female labour-force participation would rise as labour-saving goods economize on the amount of housework that has to be done. Simultaneously, the market workweek would decline, due either to the introduction of leisure goods or to an income effect associated with a rise in wages. The value of leisure would rise for both men and women. Interestingly, Aguiar and Hurst (2006) document a dramatic increase in leisure for both men and women over the period 1965–2003. They construct various measures of leisure. They all showed a gain over the period under study. The narrowest definition rose by 6.4 hours a week for men and 3.8 hours for women, after adjustment for demographic changes in the population. This measure included time spent on activities such as entertainment, recreation, and relaxing. The authors' preferred measure increased by 7.9 hours a week for men and 6.0 hours for women. This broader definition also included activities such as eating, sleeping, personal care, and childcare. Another manifestation of the rise in the value of leisure is the increase in the fraction of life spent retired. Kopecky (2005) relays that a 20-year-old man in 1850 could expect to spend about six per cent of his life retired, while one in 1990 should enjoy about 30 per cent of his life in retirement. She shows how the trend towards enjoying more retirement can be analysed in much the same way as the decline in the workweek.

JEREMY GREENWOOD AND GUILLAUME VANDENBROUCKE

See also **household production and public goods; labour supply; leisure; technical change; time use.**

Bibliography

Aguiar, M. and Hurst, E. 2006. Measuring trends in leisure: the allocation of time over five decades. Working Paper No. 06-2, Federal Reserve Bank of Boston.

Becker, G. 1965. A theory of the allocation of time. *Economic Journal* 75, 493–17.

Caplow, T., Hicks, L. and Wattenberg, B. 2001. *The First Measured Century: An Illustrated Guide to Trends in America, 1900–2000*. Washington, DC: AEI Press.

Costa, D. 1997. Less of a luxury: the rise of recreation since 1888. Working Paper No. 6054. Cambridge, MA: NBER.

Greenwood, J., Seshadri, A. and Yorukoglu, M. 2005. Engines of liberation. *Review of Economic Studies* 72, 109–33.

Greenwood, J. and Seshadri, A. 2005. Technological progress and economic transformation. In *Handbook of Economic Growth*, vol. 1B, ed. P. Aghion and S. Durlauf. Amsterdam: North-Holland.

Kopecky, K. 2005. The trend in retirement. Economie d'avant garde Research Report No. 12, Department of Economics, University of Rochester.

Lebergott, S. 1996. *Consumer Expenditures: New Measures and Old Motives*. Princeton, NJ: Princeton University Press.

Mulligan, C. 2002. A century of labor–leisure distortions. Working Paper No. 8774. Cambridge, MA: NBER.

Pareto, V. 1906. *Manual of Political Economy*. New York: Augustus M. Kelly. 1971.

Prescott, E. 2004. Why do Americans work so much more than Europeans? *Federal Reserve Bank of Minneapolis Quarterly Review* 28, 2–13.

Reid, M. 1934. *Economics of Household Production*. New York: John Wiley.

US Bureau of the Census. 1975. *Historical Statistics of the United States: Colonial Times to 1970*. Washington, DC: US Department of Commerce.

US Bureau of the Census. 2003. *Statistical Abstract of the United States*, Mini Historical Statistics (suppl.). Washington, DC: US Department of Commerce.

Vandenbroucke, G. 2005. A model of the trends in hours. Economie d'avant garde Research Report No. 11, Department of Economics, University of Rochester.

Whaples, R. 1990. The shortening of the American work week: an economic and historical analysis of its context, causes, and consequences. Ph.D. dissertation, University of Pennsylvania.

Williamson, J. 1995. The evolution of global labor markets since 1830: background evidence and hypotheses. *Explorations in Economic History* 32, 141–96.

household portfolios

Household portfolios comprise the array of assets – financial (such as liquid accounts, stocks, bonds, and shares in mutual funds) and real (such as primary residence, investment real estate, and private businesses) – as well as liabilities held by a household, such as mortgages and consumer debt. This article focuses on three areas of active research – stockholding, housing, and credit cards – with respective household participation rates for the United States of the order of 50 per cent, two-thirds, and two- thirds. European participation rates vary. Stockholding participation approaches 60 per cent in Sweden and 40 per cent in the UK, but it is less than 20 per cent in France, Germany, and Italy. Homeownership rates are closer to that of the United States, but in some countries, such as Germany, the majority does not own a home. The features of credit cards vary across European countries. In some countries, households have only debit cards linked to accounts with overdraft facilities.

The study of household portfolios, or 'household finance', is a partner to corporate finance and asset pricing, and it bridges economics and finance by extending analyses of saving to incorporate portfolio choice. It has grown considerably since the early 1990s, along with the complexity of household portfolios, in the face of 'supply side' developments encouraging risky asset holding. Privatization of public utilities in Europe was often accompanied by broad campaigns to educate households on the nature and benefits of stockholding. The demographic transition encouraged introduction of tax-deferred retirement accounts, promoted through educational campaigns, first in the United States and subsequently in Europe. The internet facilitated provision of information, opening of accounts, and trading internationally.

The development of household-level databases has in turn facilitated empirical research by allowing study of overall portfolios and their links to demographics and attitudes. Modern computational methods have enhanced understanding of behaviour towards non-diversifiable, background risk regarding income or health expenditures. Observed portfolio behaviour often differs from predictions of standard models, creating puzzles variously attributed to inadequate models or 'investment mistakes'.

Stockholding

Understanding household stockholding is important, as it embodies key aspects of behaviour towards risk. In most countries, the majority of households holds no stocks, even indirectly through mutual funds, retirement, or managed accounts (Guiso, Haliassos and Jappelli, 2001; 2003). Exceptions were Sweden and the United States in 2001 (57 per cent and 52 per cent, respectively), but the United States fell back to 48 per cent in 2004. Non-participation despite an expected return premium ('equity premium') is inconsistent with standard expected utility maximization and constitutes the 'stockholding puzzle' (Mankiw and Zeldes, 1991; Haliassos and Bertaut, 1995). For a non-stockholder, stocks dominate bonds in expected return and do not contribute to consumption risk as they have zero covariance with consumption.

Various explanations have been proposed for limited participation in stock markets, given its widespread nature. Restrictions preventing borrowing at the riskless rate and short sales of stock yield zero stockholding, but only for poor households with no assets (Haliassos and Michaelides, 2003). Positive correlation between labour income risk and stock returns, coupled with short sales constraints, could justify zero stockholding among households intending to short stocks to hedge income risk, but is exhibited in practice by households likely to hold stocks – for example, the more educated and entrepreneurs.

The most widely accepted cause of limited participation is fixed entry or participation costs, actual or perceived, that discourage small potential investors. Costs can be wide-ranging, from brokerage costs to costs of one's time devoted to monitoring the stock market. In their presence, factors contributing to higher costs or lower desired stockholding, such as risk aversion or low resources, become relevant for non-participation. An interest-rate wedge between borrowing and saving rates coupled with an empirically based assumption that borrowing rates are roughly equal to the expected return on equity also generates limited stock demand. Although Davis, Kubler and Willen (2006) offered this as an alternative to fixed costs for explaining non-participation, it could usefully serve also as a complement. Empirical estimates by Paiella (2001) and Vissing Jorgensen (2002), and numerically computed costs in Haliassos and Michaelides (2003) imply that relatively small fixed costs could justify observed patterns of non-participation.

The empirical participation literature provides various findings consistent with the presence of fixed costs (see contributions in Guiso, Haliassos and Jappelli, 2001; Rosen and Wu, 2004). More educated, financially alert,