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WHAT'S TO KNOW ABOUT TIME USE?

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ABSTRACT

Stimulated by the availability of large sets of microeconomic data, research on the economics of time use has been a growth industry in the past twenty years. That growth has included studies that have focused on the effect of people's value of time; on the mix of non-market activities that they undertake; on the interactions of spouses' choices of time use; on the valuation of non-market time, and on the timing of non-market and market activities. By laying out these research questions and indicating their importance, this essay provides a framework for a series of meta-analyses.

1. Questions, and Why Now Is a Good Time to Answer Them

Time is increasingly a person's most important resource. Real GDP per capita has tripled in rich countries in the past 60 years. But the number of minutes in a day has not changed, and longevity in these countries has risen by no more than 20 percent. The scarcity of time has increased relative to that of goods. These facts mean that Becker's model of time allocation (Becker, 1965) is increasingly relevant for economic research; and that research should be increasingly useful for policy and, more important, for the average person's understanding of how the world works. The central questions are who does what; how much of it they do; when they do it, and others.

A major issue is how the changing value of people's time affects its allocation and the goods that they buy to consume along with their time. The issue is not the hoary one of the impact of wages and incomes on labor supply to the market. Rather, the questions involve how people choose to allocate their non-market time, and how in the context of a family those choices depend on the opportunity costs of other family members' time.

Labor economists treat the value of people's time as their wage rates (or, if they do not work for pay, as the wage rates of observationally identical people, adjusted for selectivity into market work). This treatment is patently wrong: The opportunity cost of my time at 3AM on Saturday is not the same as when I am engaged in market work at 3PM on Wednesday. How to treat this difficulty is an important issue in decision-making about public investments in highways and other infrastructure, and it is relevant for valuing damages in a variety of legal cases in which the injured party spends time mitigating some harm done to him/her.

As the preceding paragraph suggests, it is not only the amount of time that should be of interest: When an activity occurs also matters. This is partly a macroeconomic question, since the

timing of both market and non-market activities over the business cycle affects our interpretation of the severity of recessions and thus the extent to which policy responses may be desirable. Partly the issue speaks directly to the nature of production, since the productivity of inputs depends on when they are used. To what extent is time at different times substitutable, and to what extent are marginal rates of transformation between different commodities dependent upon the timing of production?

These are all basic economic questions, on which, *mutatis mutandis*, a lot of research has already been conducted. Regrettably, much related research has been by sociologists and has ignored the economic aspects of how people use time. Economists have, however, been getting involved in such research, but many questions remain; and the research that we have produced has not been digested in the sense of comparing results and discerning underlying facts that appear to drive diverse research studies. At a time when the data sets required to answer these questions—surveys that collect diaries of people’s use of time—are increasingly available, there is more reason for economists to work in this area. (The development of the American Time Use Survey, which has provided about 1000 time diaries each month since January 2003, is especially important in this regard.) That in turn enhances the need for studies that digest previous research results.

2. Who Does What, and Why?

In a two-person household the prices of each spouse’s time surely affect their choices between market and non-market activities, a topic that has been studied in numerous papers (beginning perhaps with Ashenfelter and Heckman, 1974). While this line of research has been used to examine how labor supply responds to prices, a broader question is how various components of the non-market time of each spouse respond to their values of time. In the last decade the important literature on bargaining within the household has been expanded beyond the

market-non-market distinction to consider how power affects choices outside the market (Cherchye *et al.*, 2012).

Studying this question is especially important in understanding the nature of marriage: Examining the complementarity of spouses' activities might allow us to infer the extent to which matching in the marriage market arises from the differential productivity of potential spouses in household production as opposed to their potential complementarities in joint consumption. Answers to this question might address the reasons for what appear to be increases in the extent of positive assortative matching in marriage in the U.S. and elsewhere. It is also relevant for the discussion of same-sex marriage in the United States, since some of the arguments against same-sex marriage have rested on notions of inherent gender differences in household productivity that create comparative advantage in production within opposite-sex spouses.

The general question is how changes in each spouse's value of time affect their uses of time; and, of course, the answer depends on the particular disaggregation of non-market time that is used in a research study. One can be fairly broad-brush, as Biddle and Hamermesh (1990) were in dividing non-market time into sleep and non-sleep, and as were Stancanelli and Stratton (2014) in examining the price of domestic servants' time along with each spouse's time. One can be somewhat more detailed, as in Kooreman and Kapteyn (1987), choosing multiple uses of home time. The main point is that the literature stemming from those studies has produced numerous estimates of the extent of complementarity/substitutability of spouses' activities. While the particular disaggregations that have been used have differed, it should be possible to meta-analyze this line of research in such a way as to infer the nature of household production/consumption in a family context.

Taxes affect not only the allocation of time between market and non-market activities, but also choices among non-market activities (Gelber and Mitchell, 2012). A few studies have examined this, both within an economy and across economies, and it is an area that is becoming ripe for a synthesis of results. This synthesis would be especially relevant in a discussion of optimal taxation.

Bringing together this literature might seem fairly straightforward, and on a superficial level it is. But thinking a bit more deeply about it requires sorting out several things: 1) How can we distinguish complementarity or substitutability in the production of commodities in the household from complementarity or substitutability in their consumption? The former has to do with skills/abilities, the latter with preferences. We observe only the reduced form that results from these two sets of trade-offs, so that any direct estimates of substitution (e.g., Hamermesh, 2008) necessarily mixes production and consumption in the household. 2) The issue is complicated further by the fact that the timing of activities matters: The same spouses will choose to produce/consume differently depending on when the particular use of time is undertaken.¹ I turn to aspects of this issue in Section 4. 3) The literature values each spouse's time as his/her wage rate. Even ignoring issues of valuing the time of non-participants in the labor market, it is difficult to argue that we always have the opportunity to trade each hour of non-market time for a remunerated hour of market labor. I turn to this issue now.

3. How Do We Value Time?

For someone who works for pay and has the flexibility to increase his/her income by adding hours, it makes sense to value an hour of time at the person's wage rate. Even for such a person, however, that would not be a sensible valuation of an hour of time at an interval not adjacent to

¹For example, even though my wage rate was at least twice my wife's and I am a terrible cook, on weekdays I prepared dinner because my schedule as a professor was more flexible than hers as a partner in a large law firm.

his/her current work time, given the employer's fixed cost of extending hours and the worker's own fixed costs of commuting and switching back to market work from some non-market activity. The difficulty is exacerbated when we are considering the value of time (VOT) in non-market activities; and it is deepened further when we consider people who do not engage in market work.

A simple solution is to value each person's time as his/her wage rate (if working) or as the wage imputed based on his or her characteristics. This is wrong for at least two reasons: 1) Most workers (and others) do not have the option to choose to substitute an hour of market work for an hour of non-market activity; 2) Even if they did, the activity undertaken during the non-market hour might yield more process utility than market work, utility that should enter any calculation of VOT (since activities differ in the amount of happiness they generate—Krueger, 2007).

In one area—the valuation of time spent traveling—a huge literature has arisen. One meta-analysis, Zamparini and Reggiani (2007), examined nearly 100 studies. I take 64 of these and add 32 others, mostly published since that meta-analysis appeared, and infer whether their implications make economic sense. These estimates have been produced using two distinct methods: 1) Examining people's actual choices of methods of transportation that differ in the monetary costs of those choices and in the time that each takes to move between two points. 2) Asking people what choices they would make between different transportation modes/routes under various scenarios of time and money spent on those modes—a so-called contingent valuation.

Table 1 shows the VOT as a percentage of hourly earnings in these studies distinguished by the study area and time period. For evaluating transportation spending, the evidence suggests that this valuation is now perhaps 82 percent in the U.S. Moreover, a regression based on the results of these studies suggests sensible differences and changes in this ratio. The ratio has risen by 0.5 percentage points per annum over the past 50 years, suggesting people's time is becoming more

valuable, as a fraction of what they earn; and it is about 25 percentage points higher in the U.S., where one might believe that people feel more rushed, than in Europe.

Table 1. Estimates of the Value of Time as Fraction of Average Hourly Earnings (Median, Mean, 95-Percent Confidence Interval, Number of Studies)*

All Studies	0.48	U.S. Studies	0.64
	0.65		0.74
	[0.56, 0.74]		[0.54, 0.95]
	96		28
Recent Studies	0.62	Recent U.S. Studies	0.82
(Published 2004-)	0.74	(Published 2004-)	0.85
	[0.58, 0.90]		[0.55, 1.15]
	28		11

There are many activities besides commuting time for which we would like to know how consumers value an hour spent. Child care is one, as are household chores more generally. In all cases, including commuting time, one seeks to go beyond the wage rate of the individual involved to infer how to discount (or raise it) to measure the extent to which the disutility from the activity is less than (or exceeds) that of market work. Regrettably essentially no research has been conducted in any other area, even though the issue is central if one wants to expand beyond treating GDP as the value of market production and add the value of non-market production (see Abraham and Mackie, 2005). No meta-analysis is possible yet, but the availability of better data should enhance the value of undertaking studies that can eventually feed into useful meta-analyses.

4. When Do We Do Things?

The timing of economic activities is the most important understudied aspect of research on time. Every production or consumption function implicitly contains time subscripts on its arguments: We choose when to produce or consume, and those choices yield different output or utility even given the same objective physical inputs. This consideration yields a variety of interesting questions on which some research has been conducted but never synthesized.

Perhaps the most important question here is the kinds of activities that people undertake when they become unemployed or work fewer hours (or at the macroeconomic level, how non-market time is allocated when aggregate unemployment increases). When they spend fewer hours working for pay, do people simply substitute household production for goods that would otherwise have been produced in the market, or do they instead increase their personal and/or leisure time? If the former, then one might be less disturbed by an increase in aggregate unemployment, since what is being produced really has not changed (although changing the locus of production—non-market as opposed to market—may alter utility). This issue has been addressed in the context of reductions in weekly work hours induced by changes in overtime laws (Lee *et al.*, 2012) and in the context of aggregate fluctuations (Burda and Hamermesh, 2010, Aguiar *et al.*, 2013).

The timing of activities is an economic outcome, determined by technology, preferences and to some extent also by prices. What is that extent? How do temporal variations in the price of labor change when stores are open or factories are producing (e.g., Cardoso *et al.*, 2012)? How does each spouse's value of time affect which spouse is caring for children at which time of the week, or how a spouse varies child-care time between weekdays and weekends (e.g., Ichino and Sanz de Galdeano, 2005)?

Going still further, the entire nature of production depends upon interactions among people and firms with desires to engage in production and consumption activities at different times, motivated either by profit or utility maximization. Yet the nature of production and consumption makes it crucial to coordinate with others in the economy and with agents in other economies on the timing of these activities, increasingly so as improved transportation and communications reduce costs. How does this coordination work? How do institutions affect the nature of coordination (e.g., Jacobsen and Kooreman, 2005; Hamermesh *et al.*, 2008)? How does the

presence or absence of peers alter these maximizing choices (e.g., Jenkins and Osberg, 2005)? Comparing the results of the burgeoning research in this area should yield some useful inferences on the nature of economic coordination.

5. Summing Up

I have outlined a number of areas in the empirical analysis of the economics of time use where enough research has been conducted to allow the meta-analysis of results. These meta-analyses regrettably cannot merely involve the tabulation of estimates of the single parameter that have been generated using different data sets for different countries at different times. Synthesizing the results produced on any of the questions raised here requires thinking about what each particular study is trying to get at. The task is not easy, but the questions are sufficiently important that making the effort to meta-analyze the research results could be very worthwhile.

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