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**Demand in Leisure Markets -  
An Economic Analysis of Time Allocation**

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## Abstract

Leisure industries are big business. U.S. consumer expenditures on leisure are estimated at 740 Billion annually and account for 9.7% of PCE and 6.9% of GDP, quadrupling in size over the last 20 years. Time devoted to leisure activities constitutes some 35% of total waking time - an ample share of daily life. This work studies the micro structure of the demand for leisure. More often than not, a hit book is released, blockbuster movies premier and one's favorite band comes to town. Consumers are then faced with a multifaceted decision: which combination of these new offerings to consume? How much time should be devoted to each? Is the movie or concert worth getting out of the house and spending time commuting? Last and most interesting is where would the time devoted to any of the new offerings come from? These multi million dollar questions were never discussed in the economics literature. This work makes two contributions to time-use and demand analysis. First, it develops a model and estimation strategy for multiple discrete-continuous choices of differentiated leisure activities under a general nonlinear price schedule. The model explicitly allows travel time and costs to be incorporated into consumer decisions. Such a model widens the traditional scope of empirical demand analysis and is easily applicable to fields like production analysis and international trade. Second, model predictions are used to look at demand interdependence in leisure industries. The effects the introduction of bestselling books; hit TV shows and blockbuster movies would have on time allocation across all other leisure activities. Results imply media conglomerates, such as AOL-Time Warner, are subject to competition not only from other firms in specific industries but also from their own offerings across leisure industries when contemporarily introduced. Moreover, the intensity of substitution is found to vary greatly by consumer characteristics. Last, welfare gains associated with participation in 12 separate leisure activities and with total leisure time are recovered together with the effects of increased road congestion on welfare and leisure demand.

**KEYWORDS:** Allocation of time, leisure, spatial competition, consumer heterogeneity, multiple discrete-continuous choice, time budget data.

## Introduction

Recreation and Entertainment industries play an increasingly important role in economic activity. American Time Use data for 2003 indicate an average 35% of waking time (5.5 hours/day) is dedicated to leisure activities. Over the last 40 years, leisure time has increased approx. 20% (Aguilar and Hurst 2006)<sup>1</sup>. Annual consumer expenditure on recreation in the U.S., currently at \$740 billion, has quadrupled over the last 20 years and has grown by a factor of 12.5 since 1965<sup>2</sup>. Expenditure shares on recreation in the U.S. have doubled over the last 20 years and nowadays account for 9.7% of PCE and 6.9% of GDP.

Existing literature had paid much attention to studying demand and competition in individual leisure industries. Examples include publishing (Dertouzos and Trautman 1990), radio broadcasting (Berry and Waldfogel 1999), movies (Einav 2003), performing arts (Baumol and Bowen 1965, Huntington 1993, Leslie 2004), fishing and skiing sites (Phanuef, Kling and Herriges 2000, Morey 1984), newspaper industry (Gentzkow 2004 and Kaiser 2006) and television programming (Goettler and Shachar 2001). However, interactions and dependencies between these industries had never been the subject of economic analysis nor has time allocation been explicitly considered in such previous work. Put simply, no work has ever discussed what happened to book reading when Harry Potter hit the shelves, nor studied the effects it had on the consumption of other leisure activities such as TV viewing or social engagements.

The general problem of time allocation has been discussed extensively in the economics literature (Becker 1965, Owen 1971, Juster and Stafford 1985, Gronau 1997 and Hamermesh 2003). However, existing work had mostly assumed a representative consumer facing linear prices with continuous demand and no corner solutions.

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<sup>1</sup> Leisure is mostly used to refer to non-market activities (e.g. jogging or rest), while recreation is used to refer to market activities (e.g. restaurants or cinema). In this work I use the two interchangeably.

<sup>2</sup> Source: NIPA Tables 1.16, 2.5.4 and 2.5.5, National Bureau of Economic Analysis. All data was converted to 2000 prices.

Time allocation at the individual level hardly ever exhibits these features. Consumer tastes and preferences play a major role in choosing between activities. Furthermore, on any given day, one rarely engages in all available activities – corner solutions (zero consumption) are therefore the rule, not the exception. While activity choices are discrete (what to do), demand is very much a continuous choice (how much to do). This work is the first to introduce nonlinear pricing schemes into the discrete-continuous framework. Leisure prices, needless to say, are almost never linear (per hour) but rather lump sums (ticket to the movies). Travel time and costs introduce further nonlinearities that play an important role in consumer leisure decisions. Such a demand model, with heterogeneous consumers and multiple discrete-continuous choices *under nonlinear prices* has never been developed or estimated in the literature.

This research therefore makes the following contributions:

- a) Analyze interdependencies between leisure activities with respect to their quality, price and accessibility (e.g. road congestion on the way to the movies).
- b) Develop and estimate a multiple discrete-continuous choice model under a *general price schedule*, structurally allowing for attribute differentiated leisure activities and heterogeneous consumer preferences.

Model estimation results may be used to provide estimates of welfare gains (dollar value) associated with participation in specific leisure activities and of leisure time as a whole. It will also allow us a look at the welfare implications of higher road congestion and its effects on participation in out of home activities such as movies, live shows etc.

The structure of the dissertation is as follows: the first chapter presents a detailed discussion of the objectives and motivation for the research. The second chapter provides an overview of the relevant economics and sociology literature on time allocation and leisure. The model and estimation strategy are discussed in the

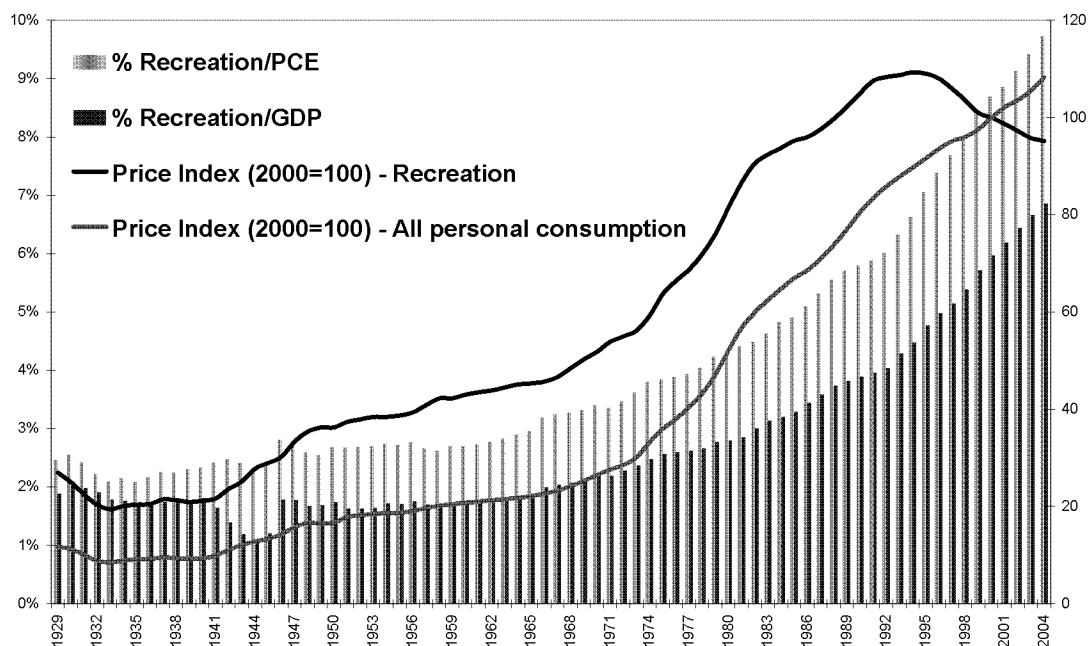
third chapter. Chapter 4 presents the ATUS data set used in the analysis. The discussion concludes in Chapter 5 that presents estimation results, policy and welfare analysis as well as predicted time use in several scenarios.

# 1. Research Objectives and Motivation

The need for leisure and recreation has been around for quite a long time now. Attractions ranged from the gladiator wars at the Coliseum through the Marriage of Figaro in 1786 to Apple's recent iTunes online music service. Wherever there was man, there was leisure. In fact, leisure is quite a big business. Expenditures on recreation in the U.S. amounted to \$740 billion with their share of total Personal Consumption Expenditure (PCE) steadily rising over the period 1929-2004. In 2004, personal expenditures on recreation were 4.3 times higher than those on education and have displayed a real average annual growth rate of 5.2% over the period 1929-2004, far more than other industries (Vogel 2001)<sup>3</sup>.

Figure 1 depicts the expenditure shares and recreation prices in the U.S.:

**Figure 1: Expenditure shares and prices of recreation, U.S. 1929-2004**



During the last 100 years, time spent at market work has continuously decreased with participation rates of individuals aged 65+ falling constantly (Goldin 1998)<sup>4</sup>.

<sup>3</sup> We also note for that period, average annual growth rate of medical care expenditure were 4.5%; of transportation 3.7% and of education 3.4%.

<sup>4</sup> An exception to the above are participation rates of married females starting in the 70's. However, evidence suggests (see Economic Report of the President 2004, Table B-47) such

*Vis-a-vis* these changes, time saving technologies (such as microwaves, washing machines and planes) have made housework and commuting much less time intensive. On the demand side, disposable income and discretionary time available for leisure activities have both increased<sup>5</sup>. On the supply side, technological improvements have increased product diversity and recreation prices followed a negative trend (Owen 1971, George and Waldfogel 2006; see also figures A1, A2, A3 in appendix A6).

Recent studies show leisure time has increased approx. 20% over the last 40 years (Aguilar and Hurst 2006). Data indicates that nowadays Americans, for example, dedicate approx. 5.5 hours a day to leisure activities. Those account for some 35% of average waking time - by all means a considerable share of life.

Broadly defined, time use research is abundant in the economics and sociology literature, both due to its tight relation to labor supply as well as for its intimate connections to society lifestyle and welfare (Kokoski 1987). Unveiling time use's impact on social stratification; traditional gender roles and efficient household/market production had also motivated much interest in time allocation (e.g. Gronau and Hamermesh 2001, 2003; Gershuny 2000). This strand of economic research on time allocation focuses mainly on the determinants of total time devoted to market-work, housework and leisure at the aggregate level.

Nevertheless, individual entertainment industries have received much attention in the economics literature. Dertouzos and Trautman 1990 have studied the effects of media concentration on the newspapers industry. Lately, the competition between on-line and printed newspapers has been examined by Gentzkow 2004 and Kaiser 2006. Competition in the motion pictures industry was examined by Einav 2003, using a model of optimal title release time. The (poor) financial state

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increased work at the market is usually followed by a reduction in house work, leaving leisure time almost constant.

<sup>5</sup> "Consumer Expenditure Survey Anthology, 2003 - Expenditures on Entertainment". The US Bureau of Labor Statistics. See <http://www.bls.gov/cex/csxanthol03.htm>. This means people can dedicate more time to leisure while keeping income constant. It does not, however, mean they choose to do so.

of actors and musicians in the performing arts sector had been analyzed by Baumol and Bowen 1965 by studying the economics of nonprofit organizations. Huntington 1993 and Leslie 2004 have studied the effects price discrimination of Broadway theater tickets has on theatre revenues and consumer welfare. Berry and Waldfogel 1999 examine product diversity and welfare implications of free entry in the radio broadcasting industry. Goettler and Shachar 2001 study competition in the television industry and derive optimal program scheduling for the four national networks. Hausman and Leonard 1997 estimate the value of National Basketball Association superstar players for the broadcasting industry.

While the allocation of time to broad categories had been studied extensively and the competition within many specific leisure industries had been given much attention, no work has ever taken an integrated view of leisure demand across industries. The main aim of this work is to explore leisure demand interdependencies - the ways leisure activities compete over consumer time, across different industries.

Take the 2007 Super Bowl for example. Leading film box office revenues have dropped 50-70% on Super Bowl Sunday, resulting in a multi million dollar "cross industry" effect. While it seems obvious that during the Super Bowl broadcast, people devote less time to other activities, a similar argument can be made for the hit books (Harry Potter), high growth of Internet use (blogs and other user content) as well as for ever improved computer games. Where does the time they consume come from? Does total leisure increase? Do other activities suffer? Which ones?

Indeed, Sony's market researchers have taken up the analysis of other studios' Super Bowl fiasco and have come up with a solution. Horror movies (e.g. Sony's "The Messengers") were found to be less vulnerable to the televised major football game event. The characteristics of those who enjoy horror films do not coincide with those who passionately watch the Super Bowl. Taking leisure demand interdependencies into account, Sony successfully premiered "The Messengers" on Super Bowl weekend, grossing 14.5 millions at 1<sup>st</sup> place. The fact industry

players themselves have taken up to investigate demand interdependencies shows that academic novelty and interest aside, these questions are of real value to them as well.

We therefore set our first objective to investigate leisure demand interdependencies. Achieving this would answer questions like how do bestselling books, like the Da Vinci Code or Harry Potter, affect time allocation to other industries (e.g. movies, TV) and activities (e.g. social interactions, active sports). In the age of cross leisure industries conglomerates such as Sony and AOL-Time-Warner, a rigorous analysis of leisure demand interdependencies is of increasing value. Where many leisure services are supplied by the same conglomerate, it is important to learn just how investment in the quality of one would reduce demand for the others.

Empirical work using disaggregated time-use categories is almost nonexistent in the economics literature. Owen 1969, 1971 investigates total demand for leisure. Juster and Stafford 1985 have studied, among other things, the impact of household technology advances on time use. In their 1991 survey, Juster and Stafford also present a contemporary multinational comparison of major time use categories. Kooreman and Kapteyn 1987 have analyzed time allocation among seven groups of household activities. Gronau and Hamermesh 2003 analyze goods-time intensity of various household activities with leisure a monolith time use. These results, however important, do not explicitly account for preference heterogeneity and obvious attribute differentiation of leisure activities, both of which play an important role in time allocation decisions<sup>6</sup>.

One work that does present an analysis which somewhat resembles the one here is that of Holbrook and Lehmann 1981. They study 50 activities by analyzing partial correlations in participation rates among these activities and find positive correlations (interpreted as complementarity) to be the chief relation between them. This research differs from that of Holbrook and Lehman in several key aspects: theirs is a reduced form analysis of correlations with no structural

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<sup>6</sup> Leisure attributes may include degree of physical strain involved (playing football), degree of social interaction required (dinner party), attention and mental strain needed (reading) and so on.

interpretation. Thus, welfare analysis and policy implications cannot be derived. Furthermore, money and time constraints were completely neglected in their analysis, while here they play a major role, as will be explain below. Last, their method does not allow for any quantitative measures of leisure demand interdependencies to be drawn.

Without doubts, the prevailing economic theory of time allocation stems from Becker's seminal 1965 paper introducing home production to the economic thought. It is therefore the intent of this work to develop a unified framework combining product characteristics theory (Lancaster 1966) with household production theory (Becker 1965). The importance of such an analysis stems from the following two observations: First, different leisure activities have different characteristics (e.g. some involve more social interaction then others) and tastes for those characteristics are heterogeneous over the population. Second, time is a scarce resource. Therefore, gains from alternative uses of time, such as market work and household production, affect time allocation to leisure as a whole as well as to specific activities. The demand for movies, for example, is determined both by preferences towards its characteristics as well as by relative gains from alternative time uses, including both other leisure and non-leisure activities.

The demand for leisure activities at the individual level exhibits features seldom found in standard demand models (e.g. discrete choice à-la Logit or continuous demand systems as the LES and AIDS<sup>7</sup>). In our case, consumers choose both the optimal mix of activities they engage in (multiple discrete choice of activities) as well as the total amount of time (continuous choice) dedicated to each one. These "multiple discrete-continuous" choices are made subject to both total time and total income constraints. Second, the per hour pecuniary price for most activities is mostly zero (e.g. TV, reading), while activity specific setup costs are common (e.g. theatre admission fees, cost of a newspaper). Nonlinearities in price due to setup costs are therefore the rule rather than the exception in individual time allocation decisions.

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<sup>7</sup> The Linear Expenditure System and Almost Ideal Demand System.

In addition, travel time and travel related expenditures associated with activities out of one's home should also be incorporated into the constraints. When deciding whether to "catch a movie", one considers the time it would take to get to the theater as well as the out of pocket expenses involved. For example, a ticket to the subway costs 1-3\$ (16%-50% of the film admission fees) and travel time may well be 15 to 45 minutes including walking to and from the station (4.5%-13.5% of daily average leisure time). The same goes for a night out in a pub or a restaurant etc. Travel costs introduce further nonlinearities into both time and money constraints but are too important to be ignored.

Although multiple discrete-continuous choice models have appeared in the literature (see Hendel 1999; Dubé 1999; Kim, Allenby and Rossi 2002 and Chan 2005) none of them is easily extendable to accommodate a nonlinear price regime. This is due to the fact they use Kuhn-Tucker F.O.C to derive optimal choices, which are not sufficient conditions under nonlinear prices.

We therefore set out a second objective to develop a multiple discrete-continuous choice model of time allocation that could accommodate a generalized nonlinear price structure. The model should explicitly account for activity attributes and consumer heterogeneous preferences (Lancaster 1966) while allowing for time and expenditures devoted to non-leisure activities to be combined by a household production function yielding a flow of non-leisure commodities (Becker 1965).

It is noteworthy that given the unique price structure and the discrete-continuous nature of leisure demand, with its inherent consumer preferences heterogeneity, the questions of cross industry demand dependencies cannot be properly addressed in a simplified model. These ingredients are essential if we wish to allow rich substitution patterns among activities that depend both on activity and consumer characteristics while retaining the price structure faced by consumers (esp. traveling costs).

The model developed here is applicable not only to time use research, but rather may serve in a variety of settings. The most immediate example is empirical

demand analysis where consumers choose more than one product of the same type (e.g. soft drinks, ready to eat cereals etc.) and may purchase multiple units of each product, subject to price nonlinearities (e.g. coupons, quantity discounts etc.). Such nonlinearities arise when one may buy a six-pack of coke cans at a lower price per unit than she could buy one can or when coupons offer the usual two for the price of one or three for the price two and so on. Production analysis in a multi-factor environment with fixed costs is another example. The model developed here may be put to use in estimating production functions in cases where production factors profiles exhibit a discrete-continuous nature (i.e. one may substitute out certain factors by purchasing more of others) and fixed costs are present. International trade at the country level is also subject to setup costs of establishing relations and trade agreements. Given which, a country decides just how much and with whom to trade out of a wide range of products it manufactures locally. Helpman, Melitz and Rubinstein 2007 develop a model of international trade similar to the one described above. The estimation strategy developed here is much more general than the one presented by Helpman, Melitz and Rubinstein 2007. As such, the model developed here is by no means tailor made to fit one problem. Rather, it is easily applicable to many applied research topics.

The time budget survey data used in the analysis are both rich and unique. American Time Use Survey 2003 micro-data files provide duration information on all activities engaged in by a representative sample of the population. Supplementary data include detailed individual socio-demographic information, income and wages and household composition. Prices of leisure activities and traveling costs were collected from various sources.

The following chapter provides a detailed review of time use research in both economics and sociology literature.