PRELIMINARY—COMMENTS WELCOME

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The Gift of Time

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ABSTRACT

How would people spend time if confronted by permanent declines in market work? We identify preferences off exogenous cuts in legislated standard hours that raised employers' overtime costs in Japan around 1990 and Korea in the early 2000s. Using time-diaries from before and after these shocks, we predict the likelihood that an individual would have been affected by the reform. The direct effect on a newly-constrained worker was a substantial reduction in market time, with the freed-up time reallocated mostly to leisure and personal maintenance, and very slightly to household production. Simulations using GMM estimates of a Stone-Geary utility function defined over time use suggest similar results. The economy-wide drop in market work time was reallocated solely to leisure and personal maintenance. In the absence of changing household technology a permanent time gift leads to no change in time spent in household production by the average individual.

Three-hour shifts or a fifteen-hour week may put off the problem [of little need or desire for market work] for a while. (Keynes, 1930)

I. Introduction

As is quite clear, Keynes' prediction and concern are far from having come to pass. Nonetheless, hours of work did diminish in the U.S. between 1900 and 1940 (Kniesner, 1976) and dropped sharply from 1950 through 1980 in most of Western Europe (Huberman and Minns, 2007). While Keynes' specific prediction was far from the mark, he got the general direction of change correct. Thus asking what people would do with their extra time if they were confronted with a large decline in market hours remains an interesting question.

The difficulty in answering this question is that changes in individuals' time allocations arise from the interaction of changes in the technology of the production of Beckerian commodities with consumers' preferences for those commodities. That makes it impossible to identify how workers will respond to a permanent cut in market work, or to infer the general equilibrium effects of that cut on time allocation in an entire population by looking at historical changes. Over time the technologies do change and can explain some of the changing time allocation (Greenwood *et al*, 2005). Those changes might in turn explain the apparent increase in leisure in the U.S. in the last half century that did not accompany any decline in market work (Aguiar and Hurst, 2007), a change that was mirrored in some European countries (Gimenez-Nadal and Sevilla-Sanz, 2011). But the changing technologies prevent one from inferring preferences for different kinds of non-market activities.

Various authors have considered how time allocation responds to temporary changes in the time available for non-market and market activities. Thus Hamermesh (2002) demonstrated that even an abrupt, fully-anticipated and temporary increase in available time (resulting from a switch off summer time) is non-neutral, with a disproportionate fraction of the increase consumed as additional personal maintenance activities, mostly sleep. Burda and Hamermesh (2010) showed that a temporary, but presumably unexpected decrease in market work (resulting from cyclical changes in employment) is disproportionately taken up by increased household production.

No study has examined how individual workers' time allocations respond to an exogenous permanent decline in market work, nor has any looked at the general equilibrium effects of such a decline on time allocation.[1] None could—there have been very few permanent exogenous shocks to market work; and, in any event, the continuing time-diary information required to analyze the impact of these shocks on the distribution of non-market time has rarely been available. A few countries have indirectly imposed changes in hours of work by introducing legislated changes in laws regulating the standard workweek (e.g., France, see Crépon and Kramarz, 2002) or giving union-management negotiators incentives to alter standard hours (e.g., Germany, see Hunt, 1999); but these changes have been small and have, in any case, not always been permanent.

In an effort to reduce work hours, between 1988 and 1997 Japan shortened the standard work week, resulting in a substantial reduction in market work (Kawaguchi *et al*, 2008). Quinquennial Japanese time-diary data are available from 1976, allowing us to examine the impacts of this shock and to adjust for possible trends in time use that had been occurring. Korea made a similar change in 2004, and the availability of Korean time-diary data from 1999, 2004 and 2009 enables us to examine time allocation before the legislative change was proposed and after its effects had time to be realized.

The exogeneity of the demand shocks allows us to examine changes in time use in relation to the propensity of an individual to have been affected by the policy change. We use time-diary surveys to measure how someone whose market time became constrained reallocated the reduction in paid work, thus measuring the average effect of the legal change on someone who was directly affected. We specify a utility function that allows using the relationships between the propensity to be affected by the law and changes in time allocations to infer the nature of individuals' preferences for different uses of time. Those estimates in turn allow checking whether the reduced-form estimation yields results consistent with the underlying structure.

[1]Goux *et al* (2011) examine the impact of the French change in the standard workweek on the labor supply of spouses of workers who were affected by the legislated change. The focus was only on the spouse's hours of market work. Stancanelli and van Soest (2011) study the impact of the discrete jump in incentives to retire in France after one's 60th birthday on time allocations, an incentive that is permanent and well-known to workers while planning the time paths of their allocations of time.

We then proceed to examine patterns of changes in the allocation of non-market time in the entire population and by gender. These analyses are performed using double-difference estimation, and then triple-difference estimation across days of the week. They allow us to measure the general-equilibrium effect of the legal changes, in particular, whether and to what extent any direct effect was offset by reallocations of others' use of time.

II. The Shocks and the Data

A. Legislated Changes in Work Hours

Statutory working hours in Japan had historically been set at 48 per week and 8 per day. In December 1985 a study group organized by the Ministry of Labor published a report that suggested 45 hours per week and 8 hours per day as new statutory working hours.[2] Following this report the Central Labor Standards Commission, consisting of public, employer and employee representatives, recommended setting standard hours at 46 per week temporarily, followed by 44, and eventually dropping to 40. The Commission also requested a temporary exemption for small- and medium-sized firms. In accordance with its recommendation, the law was revised in 1987 and implemented from April 1, 1988.

This revision in the law immediately set standard hours at 46 per week. An additional revision in December 1990 further reduced standard hours to 44 from April 1, 1991. The Labor Standards Act was further revised in 1993 to implement 40 hours per week beginning in April 1994. In this reduction process, particular exemptions were given to industries with long work hours and smaller establishment sizes. These exemptions ended by March 1997, by which time the standard had become 40 hours per

[2]The Labor Standard Act (LSA) in Japan prohibits employers from employing workers exceeding daily and weekly statutory working hours, currently set at 40 hours per week and 8 hours per day (LSA Section 32). Employers can set hours worked to exceed these legal limits only under an agreement with a workers' group that represents the majority of employees (LSA Section 36). Overtime under this agreement must be compensated by at least a 25-percent wage premium (LSA Section 37).See Sugeno (2002, Chapter 3, Section 5) for an overview of the Japanese legal system on standard hours. Hamaguchi (2004, Chapter 12, Section 2) describes the legal process of reducing the standard hours between 1987 and 1997. Umezaki (2008) also describes the process of the LSA revision based on interviews with two government officials who played central roles in it.

week uniformly across industries and establishment sizes with only a few exception requiring agreement between management and the union representing its workers.[3]

Standard hours in Korea had become 44 per week for all workplaces (Kim and Kim, 2004) by 1991. After the Asian economic crisis in November 1997, reducing statutory weekly working hours from 44 to 40 began to be discussed by the Korean Economic and Social Development Commission. In October 2000 the Commission announced the "Basic Agreement on Work Hour Reduction," which included: 1) A reduction in work hours to 40 hours per week and 2000 hours per year; and 2) Gradual adoption depending on industry and firm size. In July 2002 the five-day workweek was first officially adopted in the banking and finance sector. In August 2003 the law indicating the schedule for adoption of the five-day workweek passed Congress.

The law mandated introducing a five-day workweek on a phased schedule, with workplaces of more than 1000 employees becoming covered in July 2004, phasing into workplaces with between 20 and 49 employees by July 2008 (and with smaller workplaces still not covered today). The government provided some financial incentives for firms that adopted the five-day workweek before it became mandatory on them, and overtime regulations were also altered to encourage adoption. A fair conclusion from all this is that the movement toward reduced workweeks in Korea was becoming partly effective in 2004 and was very widespread, perhaps nearly universal by 2009.

B. Time-Diary Data in Japan and Korea

The Japanese Time Use Survey (JTUS) is conducted by the Bureau of Statistics every five years, with the first survey conducted in 1976. The survey initially targeted the entire population age 15 or older, but the JTUS expanded its coverage to individuals age 10 or older from 1996. Each respondent fills out time diaries for two consecutive days, reporting their activities in ten-minute (1976) or fifteen-minute

[3]Exceptions apply to employees in commerce and service industries in establishments that usually employ fewer than ten workers.

(1986-2006) intervals.[4] The number of pre-coded categories of activity was 17 in 1976, 19 in 1986, and 20 in 1991 and after. The sample is nationally representative with individual survey weights, but it has decreased in scope from about 190,000 persons in 1976 to about 175,000 in 2006. The 1976 surveys were conducted over seven consecutive days in October. The1986 and subsequent surveys were fielded over nine-day periods including two weekends in October.

The Korean Time Use Survey (KTUS) is conducted by the National Statistical Office every five years, with the first survey conducted in 1999. The survey targets the entire population aged 10 or older and has a remarkably high response rate (for time-diary surveys), above 90 percent. Each respondent fills out time diaries for two consecutive days, reporting activities in ten-minute intervals. The number of possible activities was 125 in 1999, 137 in 2004 and 144 in 2009. The sample is nationally representative with individual survey weights, but it decreased from over 40,000 observations in 1999 to barely 20,000 in 2009. The 1999 and 2004 KTUS were conducted over ten consecutive days early in September. The 2009 survey was also fielded over ten-day periods, but, because of concerns about potential seasonality in time use, it was conducted in both March and September.

The JTUS for 1976 and 1986 clearly precede the shock to hours. The 1996 and subsequent surveys are clearly post-shock. The difficulty is with the 1991 survey, which was fielded after the legal changes but before they were fully or widely effective. In most of the discussion we thus treat 1991 as pre-shock, 1996-2006 as post-shock. By chance the timing of the KTUS is almost perfect for the purposes of this study: The first survey precedes any possible effects of the cut in demand for market work, the second occurs as the cut might have begun to have some impact, and the third takes place after the changes had mostly been realized.

The time-diary surveys from Japan and Korea allow respondents to list far too many different activities for purposes of analyzing the impacts of the legislated changes. We need to combine the basic activities into tractable aggregates. We take the fourfold breakdown: Market work (M); household

[4]The 1981 survey had a different format from other years. Each respondent directly filled out time spent in each activity in a single day. Perhaps because of this format, the figures for 1981 are not comparable to those from other years, and because of their non-comparability we do not use them.

production (H); tertiary activities (T) and leisure (L), and classify each basic activity in each country into one of these. Market work includes paid employment or self-employment, unpaid employment, job search, commuting and schooling/studying. Household production consists of those activities for which one could find market substitutes (as initially proposed by Reid, 1934). Tertiary activities are those personal maintenance activities, including sleep and eating, that people must typically do at least some of on most days; and leisure activities are those that do not pay, that could not be contracted out and that are not biologically required. For both countries a very few activities were not classifiable, and we prorate the few minutes included in these across the four aggregates in proportion to the time spent in each aggregate.[5] The classifications of the 20 (9) primary sub-aggregates in Japan (Korea) are shown in the Appendix.

III. Inferring the Direct Impact of the Imposed Decrease in Market Work

The cut in the standard workweek in Japan and Korea is an imposed shock, the results of which trace out a locus of equilibria that depend on the preferences of workers. This understanding underlies our treatment in this Section, in which we first measure the direct effect—on an individual who was certain to have been affected by the policy—and then infer the structure of the representative affected individual's preferences for allocating time across the four aggregates to simulate the response to a negative shock to M.

A. Reduced-Form Estimates of the Effect on those Directly Affected

Absent longitudinal time-use data covering the periods before and after the demand-induced declines in M, we generate a pair of cross-sections, with the cells based on the demographic characteristics of the time-diary respondents. We use a matching procedure to link observations across cells in the time-use data before the change (1986 in Japan, 1999 in Korea) to observations after the change (1996 in Japan, 2009 in Korea). In the Japanese data we use the two sexes, individual years of age and the three education categories that are available. We treat the Korean data identically except that

[5]In Korea the number of prorated minutes was 19, 13 and 19 in 1999, 2004 and 2009 respectively. In Japan the total minutes prorated were somewhat greater: 34 in 1976, 34 in 1986, 34 in 1991, 48 in 1996, 53 in 2001 and 50 in 2006.

we use the twelve available education categories. There is a substantial number of empty cells (e.g., in Korea, no young people have zero education); in general, however, the immense size of the underlying samples allows the creation of a larger set of aggregate scores than is usual in studies using this method.

For each country in Year B, before the legislated change we estimate the propensity score for individual i to be affected by the legal change as:

$$\text{Prob}(43 \leq M \leq 48 \mid \text{X}) \text{ for Japan; } \text{Prob}(40 < M \leq 44 \mid \text{X}) \text{ for Korea,}$$

where X is a vector of covariates.[6] These workers are directly affected by the policy in a monotonic way. Workers who worked 40 hours or less before the change are not directly affected. Those workers who worked longer than the old standard hours are affected by the law in a complex way, as the legal change may have increased or decreased their hours, depending on the sizes of the substitution effect on hours per worker and the scale effect due to the increased marginal cost of labor. We derive the average probability that an individual with characteristics X in Year B was constrained, and assign that value to the age-sex-education cell in Year P, post the legal change. The identifying assumption here is that the individual with characteristics X would have been constrained with the same probability in Year P if the law had not changed.

Tables 1J and 1K (a tabular notation we use throughout to denote the results for Japan and Korea) show the averages of the propensity scores across the cells, their standard deviations and a few order statistics. (The statistics differ slightly across the days of the week because of slight differences in the number of available cells on each day.) The main point to note for these statistics is that the average probability that an individual is constrained by the legal change is not large; but the variation in the average propensity across the cells is huge, allowing the possibility of inferring that tightening the hours constraint had substantial effects.

Taking the average propensity scores for each age-sex-education cell, and using the changes in time use in the four categories for each cell, we estimate a reduced form relating the change in time use

[6]For Japan, weekly working hours are reported only in intervals: Up to 14 hours, 15-34, 35-42, 43-48, 49-59, and 60 or longer. Therefore the best propensity would be $\text{Prob}(43 \leq \text{M} \leq 48 \mid \text{X})$.

(post-shock minus pre-shock) to the propensity to be affected. Considerations of the fixed costs of working on a given day suggest that employers have incentives to concentrate their reductions in hours demanded on one or two days rather than across the week.[7] We thus estimate this simple bivariate equation separately for weekdays, Saturdays and Sundays. Simple acquaintance with the labor markets in Japan and Korea lead us to expect that the biggest effects of the legal changes in the propensity to be affected by the legislated change in the standard workweek on changes in time use on Saturdays, with smaller effects on Sundays and still smaller effects on weekdays.

Tables 1J and 1K present the estimates of these reduced forms for the two countries. As expected, the effects are largest, and the regression coefficients most significant, for the estimates for Saturdays. Indeed, in Japan the impact of a higher propensity to be affected by the change in standard weekly hours on ΔM on weekdays is actually positive, although statistically insignificant. Except in that one case, however, in those cells in which the propensity to be affected by the legislated change rose more the decline in M was significantly larger.[8]

In Japan (Korea) a ten-percentage-point increase in the probability of being constrained was accompanied by a 37- (60-) minute decrease in minutes of work on Saturday. In Japan this decrease was accompanied by significant increases in all three other aggregates of time use, with the majority of the change represented by additional leisure and only ten percent accounted for by extra home production. On Sundays the only significant increase (or even change) in Japan in response to the 5-minute decline in market work induced by a ten-percentage-point increase in the probability of being constrained was in L. On weekdays H decreased significantly while L rose. In Korea the significant and large declines in M (16 minutes, 60 minutes and 17 minutes in response to a ten-percentage-point increase in the propensity to be

[7]There is little work directly measuring fixed daily costs of labor, although a number of studies base the empirical work on this concept (e.g., Cogan, 1981; Hamermesh, 1998).

[8]If we look at the extreme centiles of the distributions of the propensity scores, e.g., the 10^{th} and 90^{th}, the results are even stronger. In the former ΔM is close to 0, and there are nearly random changes in the other time-use aggregates. At the 90^{th} percentile ΔM is very large, with its decline being offset entirely by changes in T and L.

affected by the legislated drop in standard hours) were accompanied by significant increases in H throughout the week, and by significant increases in T on weekends.

The crucial inference from the estimates in these tables is that the legislated declines in the standard workweek did lead to cuts in hours of market work that were especially large among workers who would have worked more than 40 hours. The effect on a hypothetically treated worker is estimated to be huge—if a worker were certain to be constrained, essentially all the hours made subject to the overtime penalty would be eliminated. While in both countries the estimates suggest that such a worker used much of the freed-up time to add hours of leisure or personal care, in Korea there is some evidence that the affected workers did reallocate it in part to household production.

B. A Structural Model

The results in the previous sub-section justify using the changes in time use around the time of the legislated cuts to estimate the utility functions describing affected workers' preferences for different uses of time, and to use the estimated preferences to simulate how the gift of time generated by the exogenous decline in market work of a given size might be reallocated across alternative uses. We assume that an agent allocates time according to the following Stone-Geary utility function:

$$\text{Max } \alpha \log(H - \underline{H}) + \beta \log(T - \underline{T}) + \gamma \log(L - \underline{L}) + \delta \log(C - \underline{C}) \qquad (1)$$

where $H + T + L + M \equiv 1440$, total minutes in the day. We use this formulation to allow for the possibility of non-homothetic preferences and thus disproportionate responses to the income effect of the extra non-work time.[9] Consider the case in which M is exogenous and fixed at the legal limit, $\overline{M}$. Consumption C is determined by labor income, which we assume did not decrease in either country due to the policy change.[10] With that assumption and the evidence supporting it, we assume, absent any other

[9]Prowse (2009) estimates a Stone-Geary function over several uses of time with British time-use data.

[10]In Japan real annual earnings grew by 4.1 percent per annum in the quinquennium 1981-86, and by 4.6 percent per annum during the next quinquennium. Quinquennial growth did slow to 1.6 percent per annum between 1991 and 1996, but there is no evidence that earnings dropped in response to the policy change. Presumably the continuing real growth of the Japanese economy was in part consumed in the form of reduced market work, with real earnings still growing, albeit more slowly than might otherwise have occurred. In the quinnenia ending in 1999, 2004 and

information, that the relative demands for H, T and L were unaffected by changes in incomes with which they are combined in household production. Hence we focus on the allocation of time across H, T, and L in response to the policy changes that reduced M.

The interior solutions are:

$$\begin{aligned} H^* &= \frac{\alpha}{\alpha+\beta+\gamma}\left(1440 - \underline{T} - \underline{L} - \underline{H} - \overline{M}\right) + \underline{H} \\ T^* &= \frac{\beta}{\alpha+\beta+\gamma}\left(1440 - \underline{T} - \underline{L} - \underline{H} - \overline{M}\right) + \underline{T} \\ L^* &= \frac{\gamma}{\alpha+\beta+\gamma}\left(1440 - \underline{T} - \underline{L} - \underline{H} - \overline{M}\right) + \underline{L} \end{aligned} \tag{2}$$

The effects of an exogenous unit change in M on H is $\alpha' = \alpha/[\alpha + \beta + \gamma]$, with β' and γ' respectively defined analogously. Since we can observe H*, T* and L*, and we know the change in M, we can recover the subsistence levels, assuming one of the three is identically zero.[11] We assume that $\underline{H} = 0$—nobody must perform household production. Solving and rearranging yields:

$$\begin{pmatrix} \underline{T} \\ \underline{L} \end{pmatrix} = \begin{pmatrix} 1-\beta' & -\beta' \\ -\gamma' & 1-\gamma' \end{pmatrix}^{-1} \begin{pmatrix} T^* - \beta'\left(1440 - \overline{M}\right) \\ L^* - \gamma'(1440 - \overline{M}) \end{pmatrix} \tag{3}$$

Suppose that we estimate the following equations:

$$\begin{aligned} \Delta T_i^* &= \beta' \Delta M_i^* + c_T + u_{Ti} \\ \Delta L_i^* &= \gamma' \Delta M_i^* + c_L + u_{Li} \end{aligned} \tag{4}$$

where c_T and c_L are constants.[12] Then equation (4) allows us to infer the β' and γ' and the subsistence levels. We estimate the model in (4) for the two countries using the cell-based averages of the changes in time use in the four aggregates. Because the change in the constraint bound differently on different days of the week, as the estimates in Tables 1 showed, the parameters are estimated separately for weekdays, Saturdays and Sundays.[13] The first, third and fifth columns in Tables 2J and 2K present the least-squares

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2009 real earnings in Korea grew by 2.5 percent, 4.7 percent and 2.4 percent respectively, suggesting similar conclusions as in Japan.

[11]Unlike in the estimation of Stone-Geary utility functions over goods, where all the parameters are identifiable because of different prices for each good, with the price of unit of time being the individual's wage rate, we must fix one parameter.

[12]The assumption of unchanging preferences implies that the constant terms should be zero.

[13]Implicitly we are assuming that the agent's utility function is separable across the days of the week. Some indirect evidence for other countries (Ichino and Sanz de Galdeano, 2005) suggests that this may be incorrect. Given the

estimates. In addition to the standard errors of the estimates, the implied subsistence levels and their changes are shown, along with bootstrapped confidence intervals around them.

The estimates are fairly satisfactory for Japan.[14] One should note that, although a few of the implied subsistence levels on weekdays and Sundays in Table 2J do not make much sense, the data and estimates for Saturdays for Japan generally imply a gratifyingly constant set of preferences, with the subsistence levels being remarkably unchanged from before the demand shock to afterwards. The least-squares results suggest that it is reasonable to use the Japanese estimates to simulate how people would reallocate their time in response to an exogenous decline in work time.

The results for Korea, shown in Table 2K, are somewhat less satisfying. Although the parameter estimates are statistically significant for both Saturdays and Sundays (remember, the shock to work-hours on Sundays was larger in Korea than in Japan), they imply that the subsistence levels $\underline{T}$ and $\underline{L}$ changed across the years. Since our crucial identifying assumption is that there is an exogenous shock which changes outcomes in the presence of unchanging preferences, the changes in the subsistence levels are disturbing.

Why might the estimates for Korea imply changing subsistence levels? One possibility is that the underlying utility functions for the three types of day are not separable, and that our treatment of them is leading to biased estimates of the sub-utility functions for each type of day. Another possibility arises from the fact that we have treated goods and time as separable, ignoring the underlying household production functions. If changes in the relative prices of goods are differently complementary with H, T and L and thus are not absorbed into the constant terms, estimation limited to time-use data could mistakenly indicate that underlying preferences have changed even when no change has occurred. For example, perhaps the expansion of child-care facilities, a substitute for household production (child care), altered the constant term in the equations describing H and caused the implied exogenous decrease in $\underline{H}$.

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complexities of the estimation presented here, we leave the estimation of an intertemporal aggregator function for future work.

[14]We evaluate the estimates at the sample averages of T^* and L^* ($\overline{T^*}$ and $\overline{L^*}$) in 1996 for Japan and 2009 for Korea. We set $\overline{M}$ at 480 minutes for weekdays and at 0 for Saturdays and Sundays.

Without a complete set of goods prices that we believe are uniquely assignable to the time-use aggregates, we cannot solve this problem.[15]

One may also argue that ΔM_i^* is endogenous, since the actual decline in M may depend, for example, on ΔH. Thus exogenous shifts in fertility might alter time devoted to household production (e.g., fewer children means less time in household education and childcare), leading to a rise in hours of market work. The introduction of such common household technologies as dishwashers and clothes dryers in each of these countries around the times of the shocks to market hours could also have affected market work time. As another example along a different dimension, the expansion of PCs in the household might have led to more leisure-time spent web-surfing, reducing market work time.

To address these concerns, we use the propensity score as an instrumental variable. The propensity score should be significantly and negatively correlated to ΔM_i^*, since the score indicates the propensity with which the average person in the cell has his/her working hours constrained by the new legal limit. The necessary assumption is that the propensity score is uncorrelated with the error term, which will be satisfied because variation in it is identified from the distribution of hours before the policy change. We then use the instrumental variable to estimate the equations jointly by GMM. The GMM estimates are shown in the second, fourth and sixth columns of each table. While a number of the least-squares parameter estimates seemed inconsistent with the underlying theory, this is less so with the GMM estimates. This improvement underscores the importance of accounting for the potential endogeneity between other uses of time and market work.

The purpose of this formal estimation was to obtain estimates of structural parameters to simulate the impacts of an imposed shock to market hours on the distribution of affected workers' time use. The size of the shock is arbitrary; but for convenience we base the simulation results on the average changes in M in the two countries on the particular day. Because we saw that the biggest shocks were on Saturday,

[15]With narrower time-use categories it might be possible to make a link between expenditures on goods and time, as in Gronau and Hamermesh (2006), although even there some of the links are quite arbitrary. With the more highly aggregated time-use categories used here the exercise would be even less credible.

and because the small shocks on weekdays were not closely related to the propensity scores, our simulations concentrate on presenting changes in time allocation on Saturdays.

Table 3 shows the effects of the shocks to M on the other three time-use aggregates on Saturdays. For each of ΔH, ΔT and ΔL we list the change in minutes arising from the change in behavior with the existing utility function, and then that arising from changes in subsistence levels (which seems inconsistent with an unchanging set of preferences). For Japan the estimates do imply the required constant preferences—almost none of the simulated changes arise because underlying subsistence levels change. This is particularly true with the GMM estimates—again showing the need to account for endogeneity. Nearly 2/3 of the decline in M results in an increase in L, with most of the rest of the decline leading to an increase in T. Almost none of the decline in M causes an increase in H. In Korea the results are less encouraging—much of the decline in M is simulated to have occurred through changes in preferences. Nonetheless, the simulations do show that 2/3 of the minutes freed up by the drop in M are used in increased tertiary time, with most of the rest spent as increased leisure.

IV. Effects of the Shocks on Aggregate Market Work Time

In this section and the next we examine how the treatment affected the entire economy. It is quite possible, for example, that those workers not affected by the legal changes increased their work time, or even that non-workers entered the labor force. Even if they did not, it is possible that they altered their behavior, so that in aggregate the increases in non-market time differ from those we have observed among affected workers. Throughout these sections we use all the available time diaries—for Japan from 1976, 1986 and the subsequent quinquennia, and for Korea from 1999, 2004 and 2009. This allows us to account for possible aggregate trends. In much of the work summarized in this section we present the results for all days aggregated, then for weekdays, Saturdays and Sundays separately. The data cover all sample respondents ages 15 and older, and the results use sampling weights that account for population characteristics and variations in sample sizes across days of the week.

Figures 1-3 show minutes of work in the entire week and on the three types of day, for all the sample respondents and separately by gender. The statistics here and in the subsequent figures and tables

reflect the experience of the representative Japanese/Korean in the particular demographic group on the particular day(s) of the week. The left-hand side of the upper panel in Figure 1 supports the notion that there was a one-time decrease in hours of work per worker in Japan after the legal changes governing the standard workweek. In the three quinquennia after the imposed changes the average adult worked 37 minutes less on average than in 1991. The bottom panel shows that in Korea the changes in work-hours from 1999, before the legal changes, through 2004, when they were just becoming effective, to 2009, by which time they had been in effect nearly five years, are on average the same as in Japan—a drop of 37 minutes over the decade.

These declines in market work are not the result of correlations of timing of the legislated changes with declines in labor demand induced by macroeconomic changes. In Japan in 1991 the aggregate unemployment rate was 2.1 percent; in 1996, 2001 and 2006 it was 3.4 percent, 5.0 percent and 4.1 percent respectively. In Korea the aggregate unemployment rate was 6.6 percent in 1999 (immediately after the Asian crisis), 3.7 in 2004 but only 3.6 percent in 2009 (OECD 2010, Table A).

Given that the legislative changes affect the marginal cost of an hour of male labor more than that of female labor, because men worked longer hours per week, we expect larger decreases in market work among men than women. This is true in the aggregate in Korea: Female work time dropped by 29 minutes per day between 1999 and 2009, while male work time decreased by 44 minutes per representative day. The same thing also occurred in Japan: Between 1991 and the average of 1996-2006 daily minutes of work decreased by 43 minutes among men but only 31 minutes among women.

The three sets of graphs in the right-hand panels of Figures 1-3 present the mean minutes of work by type of day in total and separately by gender for each of the years for which we have time diaries. In Japan there was a decrease in work time on weekdays between 1991 and 2006 of 42 minutes per day, of which 22 minutes occurred between 1996 and 2006. But the decline on weekends was much larger, averaging 87 minutes (on a smaller base) on Saturdays (of which 46 minutes happened by 1996), although only 17 minutes on Sundays. The concentration on weekends was even more pronounced in

Korea: Between 1999 and 2009 there was a 16-minute daily decline in minutes of work on weekdays, but a 104-minute decline on Saturdays, and a 62-minute drop on Sundays.

The hebdomadal distribution of changes in work time by gender reflects men's greater representation among weekend workers. In Japan, for example, men's (women's) average work time on weekdays declined by 38 (29) minutes between 1991 and the average of 1996-2006. On Saturdays, however, it declined by 86 (52) minutes, while on Sundays it dropped by 22 (11) minutes. The same pattern appears in Korea: The analogous declines (between 1999 and 2009) were 18 (14) minutes on weekdays, 131 (77) minutes on Saturdays, and 74 (49) minutes on Sundays.

The statistics summarized in Figures 1-3 do not, of course, account for demographic changes that occurred over time in the two countries. It is unlikely that our general conclusions would be altered if we took demographics into account, but it is worthwhile adjusting for all the observables that can be viewed as affecting patterns of time use and as probably exogenous to adult time use. In Korea this means adding variables describing: Years of schooling, metropolitan/non-metropolitan location and age. In Japan we add covariates for educational attainment and age.[16]

Tables 4J and 4K describe the results of OLS estimates of regressions describing minutes of market work that pool all the available years of time diaries for each country and that add indicators for each survey year.[17] The upper panel of each table shows the results for the representative day of the week, in total and then separately by gender; the bottom panel lists the estimates for equations fitted separately for weekdays, Saturdays and Sundays. Given our concentration on quinquennial changes, we only list the parameter estimates for the year indicators (along with their standard errors and the R^2 for each equation).

The estimates support the conclusions from the sample means. They suggest: 1) The total effect is around 18 minutes in both Japan and Korea; 2) The effects are much larger among men than among women, a 32-minute decline in working time on the representative day among Korean men, and a 25-

[16]For Japan, Kuroda (2010) implemented essentially the same exercise, but held employment status and the type of employment (full-time or part-time) constant. We do not include these as conditioning variables, since they are affected by the reduction of the standard hours.

[17]There are sufficiently few zeros in the four aggregates that using tobit estimation adds very little to the analysis.

minute decline among Japanese men. There is essentially no decline among Korean women, and only a 10-minute decline among Japanese women; and 3) Adjusting for these few demographic characteristics, even the distributions of the effects of the legislation by day of week and gender seem quite similar in Japan and Korea. In both countries the changes on weekdays are small and perhaps even non-existent. The biggest declines in daily minutes of work are on Saturdays and among men, averaging over 1 hour in Japan, and nearly two hours in Korea. The impacts among women show roughly 40-minute declines on Saturday. The effects on Sundays in Korea are about half of the size of those on Saturdays; and in Japan they are essentially zero among women and less than 15 minutes among men. The results in the previous Section suggested that the aggregate impact of the legislation in both countries was concentrated on that group of workers—men—who were more likely to have been directly affected by the changed hours constraint, and that the effects are observed on those days when the fixed costs of scheduling a day relative to its total productivity may have be highest. Nonetheless, it is also clear that other workers did not increase their market work enough to offset the decline among those affected directly—if they even increased it at all.

While the estimates in Tables 4 account for covariates, they cannot account for any unobservable heterogeneity among the samples' respondents. We can, however, take advantage of the sample design, in which respondents were interviewed on two consecutive days, with some of them being interviewed on Friday and the next Saturday, others on Sunday and the next Monday, to examine the potential role of unobservables. Restricting the samples to those individuals, and using the result that a disproportionate share of the decline in market work appears to have occurred on weekends, we can write market work time as:

$$M_{itd} = \alpha X_{it} + \beta_1 P_{it} + \beta_2 SA_{itd} + \beta_3 P_{it} SA_{itd} + \beta_4 SU_{itd} + \beta_5 P_{it} SU_{itd} + \varepsilon_{itd} , \qquad (5)$$

where i denotes an individual, t denotes a year, and d denotes a day, Friday through Monday; SA is an indicator for Saturday, SU for Sunday, and with separate indicators for Years t=1996, 2001 and 2006 in Japan and t=2004 and 2009 in Korea. If the results above are correct and are not simply produced by unobservable factors, we should observe β_3, $\beta_5<0$—within-person differences between work time on

Friday and Saturday, and Sunday and Monday should be greater after the legislated change. If the results in Tables 4 are correct, that should be especially the case for Friday-Saturday differences, less so for Sunday-Monday differences, with $\beta_3 < \beta_5$.

Table 5 presents estimates of equation (5). We interact indicators for Saturday and Sunday with indicators for all years other than the initial year in each sample. If the legislated change decreased market work mainly on weekends, we would expect the parameter estimates on these interactions to become more negative around the time of the change. This is exactly what we observe. The estimates demonstrate that the implications drawn from Figures 1-3 and Tables 4 do not arise from correlated unobservables. In both countries the same person sharply decreased his/her hours of market work time on Saturdays around and immediately after the changes in hours laws relative to time spent in market work on Fridays. There is no trend in the interactions of Sunday with year, suggesting that there was essentially no change in the difference in time spent in the market by the typical person between Sundays and Mondays. Moreover, all of these changes are larger among men than women.

The descriptive statistics, the parameter estimates describing the entire samples, and the within-person comparisons across weekdays and weekends all show sharp declines in aggregate work time during and immediately after the period when legislative changes raised employers' costs of overtime work. The declines were concentrated disproportionately among men and on weekends, exactly the group with the greatest propensity to have been affected by the treatment of the legal changes. The intriguing result is that the aggregate declines are larger than would be expected from the direct effects and the likely fractions of newly-constrained workers that we estimated in the previous section. They suggest that the policy change caused declines in market work economy-wide.

V. Impacts on the Aggregate Allocation of Non-Market Time

Comparing 1999 and 2009 in Korea, there was an 11 percent decline in the average daily minutes of market work in the entire adult population (both workers and non-workers). Comparing 1991 to 1996-2006 in Japan, the decline was also 11 percent. Adjusting for a number of demographic changes, the aggregate decreases in average daily market work time were about 6 percent in each country. How did

these sudden declines, which we argue are the result of exogenous and permanent changes in labor demand, alter the average person's allocation of time among the other three main categories of time use—home production (H), tertiary activity (T) and leisure (L)? To answer this question we present the same types of calculations here as in Figures 1-3 and Tables 4, showing the amounts of time allocated to these activities before and after the drop in work time.

Figures 4-6 depict the time that the average adult male and female in Japan and in Korea allocated on a representative day of the week to H, T and L. The central conclusion from these summary figures is that there is little evidence that the extra time made available by the permanent negative shock to market work time was taken up in household production. In Japan the increase in H among men that occurred from 1976 to 1991 continued at roughly the same rate, although the decrease in H among women that proceeded during that period did cease. In Korea there was a 4-minute increase in H between 1999 and 2009 among men, but an 18-minute decline among women.

In Korea both men and women allocated the time gift essentially one hundred percent to increases in the time spent in tertiary activities; there was essentially no change in leisure time. In Japan the split was much different, with tertiary activities increasing, but with leisure activities accounting for around half of the time saved in market work Given the differences between the two countries in how basic activities might be classified, one should not make too much of the differential changes in T and L between the two. The most important inference from these summary statistics is that very little of the time gift in either nation was used to substitute household production for market work.

To check whether the changes in the means are caused by changing demographics, Table 6 reports estimates of the same equations for H, T and L that we reported in Tables 4 for M. Taking the aggregate decreases in market work in Japan (Korea) of 18 (18) minutes overall, 25 (32) minutes among men and 10 (-1) minutes among women, this is an accounting exercise that distributes these drops among the other major uses of time after accounting for demographic changes that might have generated them. In Japan nearly 2/3 of the additional time was consumed as leisure, with almost no change in total time

spent in household production. In Korea the drop in market work was allocated more than 100 percent to increases in T: Time spent in both H and L decreased in Korea.

Changes in the Japanese aggregates mask differences by gender. Men increased their time in household production, while women decreased theirs. Nonetheless, the main use of the time gift by both sexes was in additional leisure. In Korea both men and women increased their time in tertiary activities; but among men there was no change in H, while L decreased somewhat; among women the absence of a decline in market activity was accompanied by a large increase in T and shifts away from H and, to a lesser extent, L.

It is worthwhile disaggregating these changes to discover what particular leisure activities (in Japan) and tertiary activities (in Korea) were consumed more intensively after the shock to market work time. In Japan 8 of the roughly 12 minutes of additional daily leisure (and thus nearly half of the time freed up by the legislation) were allocated toward additional television viewing. Of the 44 minute increase in T between 1999 and 2009 in Korea, only 3 minutes were accounted for by increased time spent sleeping or napping; and time spent eating with one's family actually decreased by 2 minutes. Most of the time gift was allocated toward increases in other personal activities that account for only 1/3 of all such time.

One clear result stands out from these two natural experiments: They did not lead to a substitution of household production for market time in the aggregate. Given that, in Korea at least, those directly affected increased the time devoted to household production, this finding suggests that those only indirectly affected offset that reallocation. While the gift of time was consumed in Japan mostly as additional leisure, and in Korea mostly as additional tertiary time, in neither did it generate what might be considered as productive increases in time. By inference, if shocked into working less, in the aggregate participants in a modern economy will use their time gift to enjoy more leisure or recuperate from the stresses of daily activities.

VI. Conclusions and Implications

It is impossible to infer how people would react to freedom from work from historical information on time use: Any long-term change in time-use patterns is determined endogenously through changing incentives produced by changing household technology and changing returns to market work. To circumvent this simultaneity we have relied upon sudden and sharp changes in labor demand generated by discrete and permanent legislated cuts in the standard workweek that gave employers a strong incentive to shorten hours per worker. Using time-diary data for Japan and Korea from before and after the legislation, we first show that time spent in market work by those likely to have been directly affected by the legislation diminished sharply immediately following the legislation's effective date. In Japan those likely to have been affected by the legislation used the extra time to increase leisure activities, while similarly affected Koreans used it to increase both household production and leisure activities. A structural utility model yields parameter estimates that we use in simulations to infer how a shock to market work would be spent. For both countries the results of simulations match those of the non-structural approach, suggesting further that we have identified the behavior of individuals choosing (under a demand constraint) how to allocate their time.

Examining the impacts of the legislated changes in the aggregate, the results are somewhat different from among those likely to have been directly affected. In Japan the freed-up hours were used mainly in what we have classified as leisure activities, in Korea mainly in what we have called tertiary activities. In neither country was the cut in market work met by an aggregate increase in household production. This result is striking and was not produced by any unobservable heterogeneity among the people in our samples. It suggests that even those not directly affected by the legal changes benefit by being able to enjoy more leisure.

Assuming that technical change in the intermediate future makes an hour of household production relatively still less productive, as it has over the past century, our results suggest that it is unlikely that people will spend more time in those activities. They suggest instead that at current margins additional

tertiary time and leisure are more enjoyable that additional time in household production, so that those changes in technology would result in expansions along those margins instead.[18]

[18]This observation is not necessarily inconsistent with the hypothesis that international differences in time spent in market work are offset because of differences in service prices by full substitution toward home production (Freeman and Schettkat, 2005).

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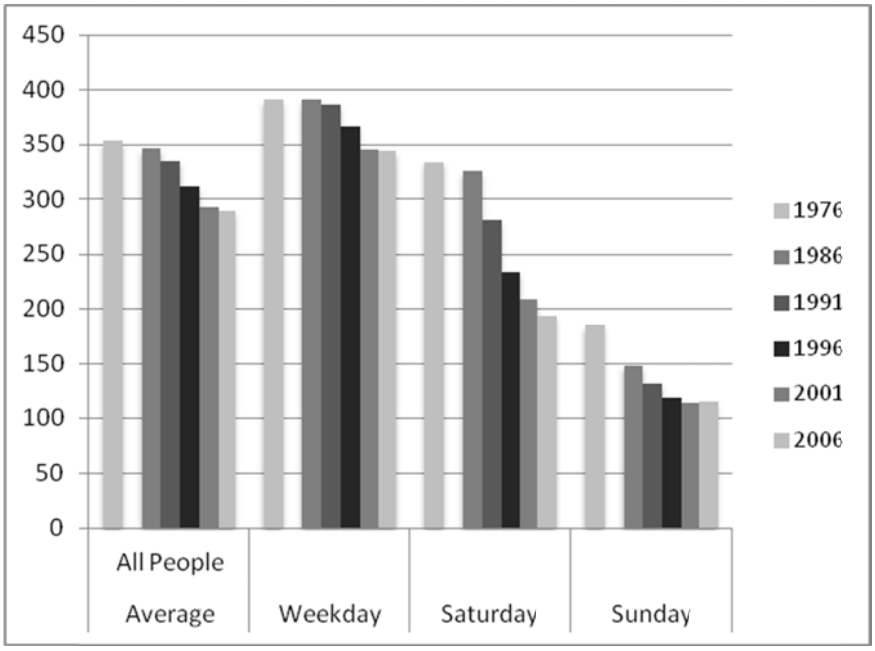

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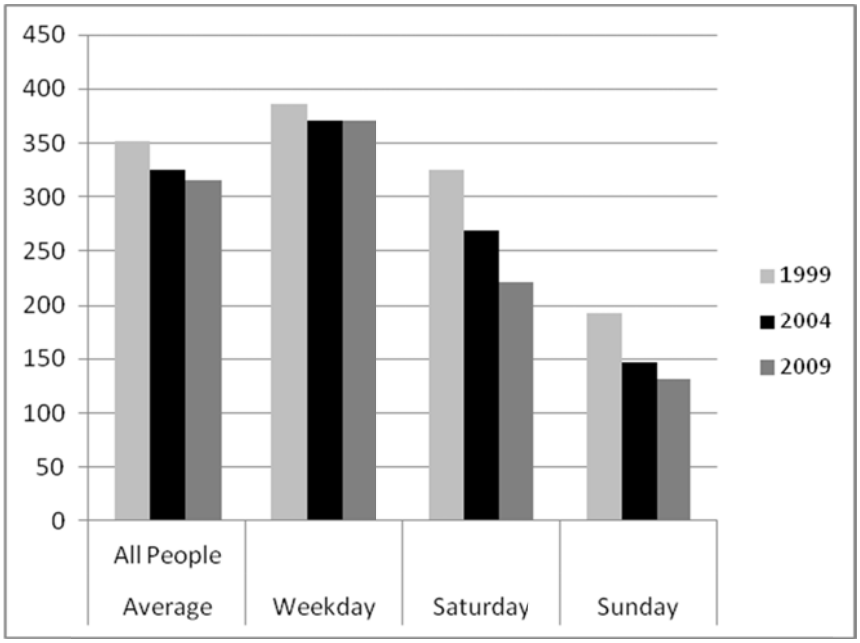
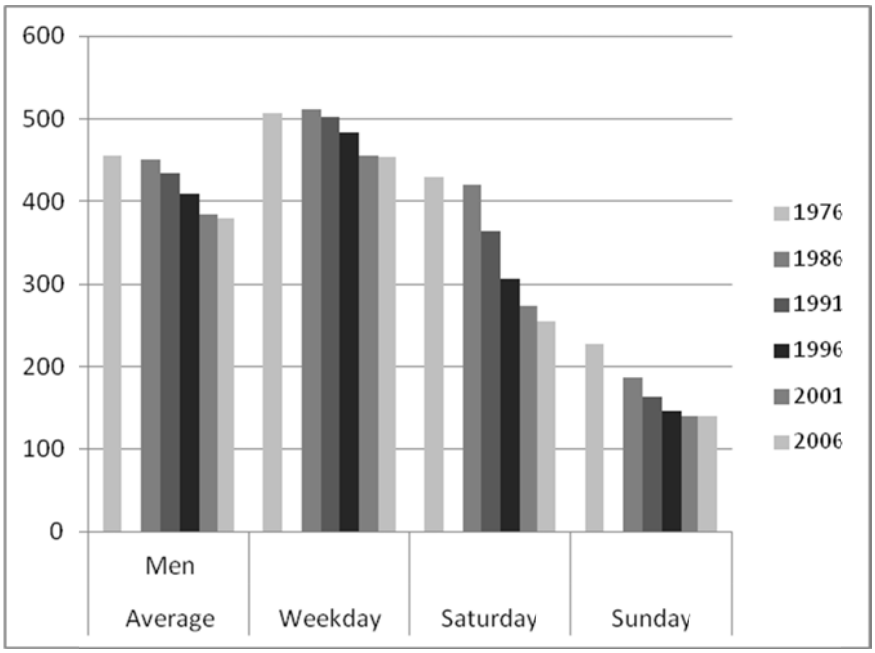


b. Korea

Figure 1. Market Work, Adult Population



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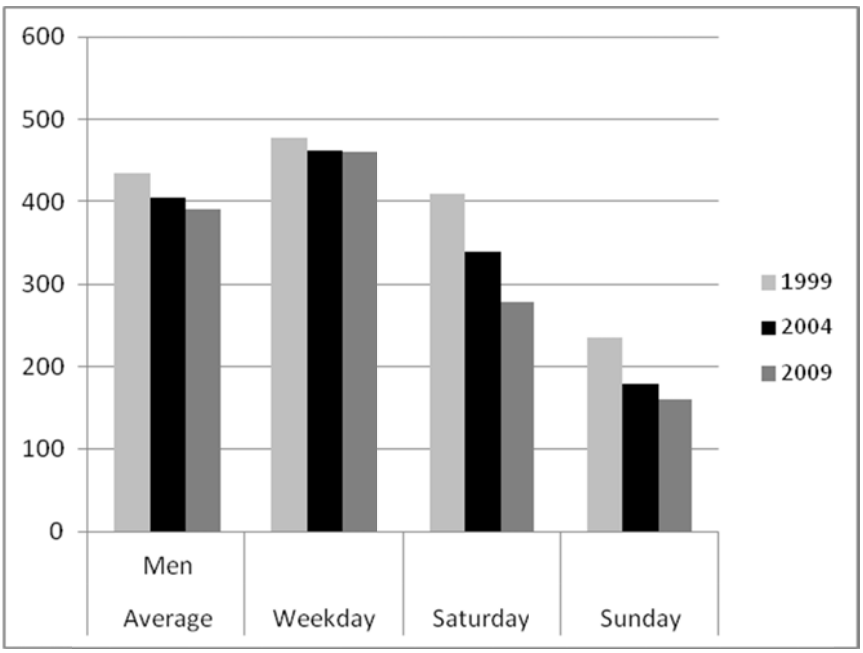
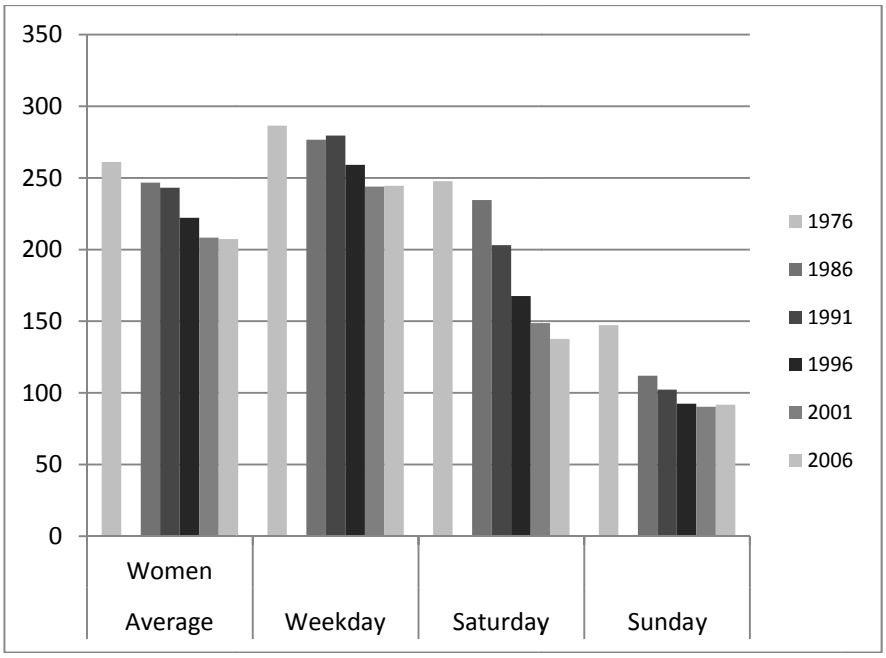


b. Korea

Figure 2. Market Work, Adult Men



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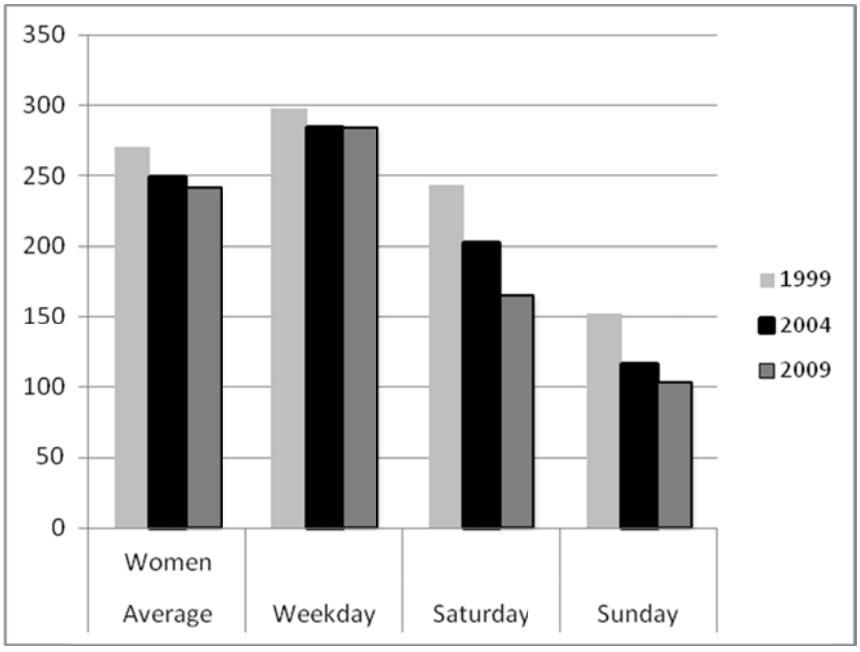
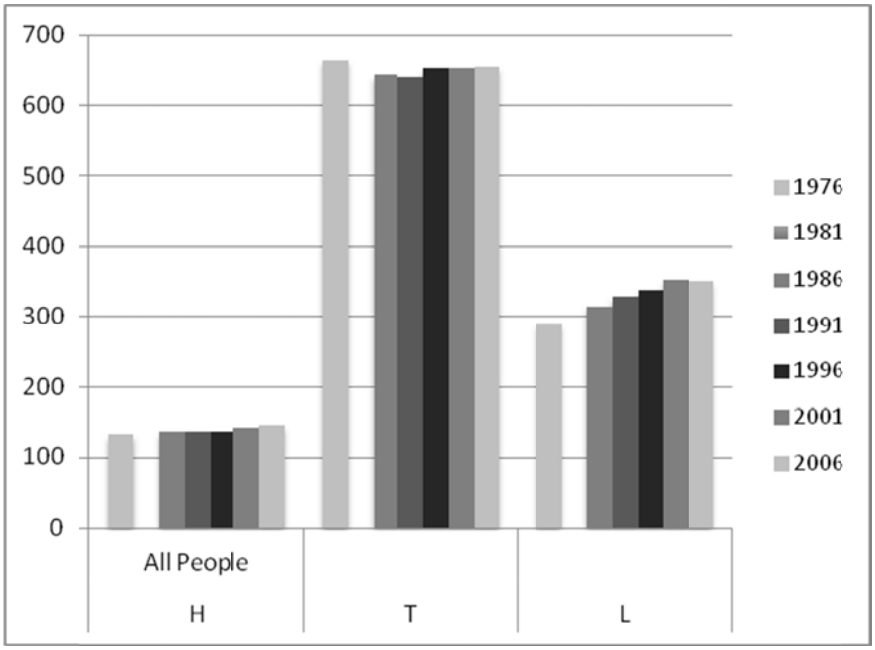


b. Korea

Figure 3. Market Work, Adult Women



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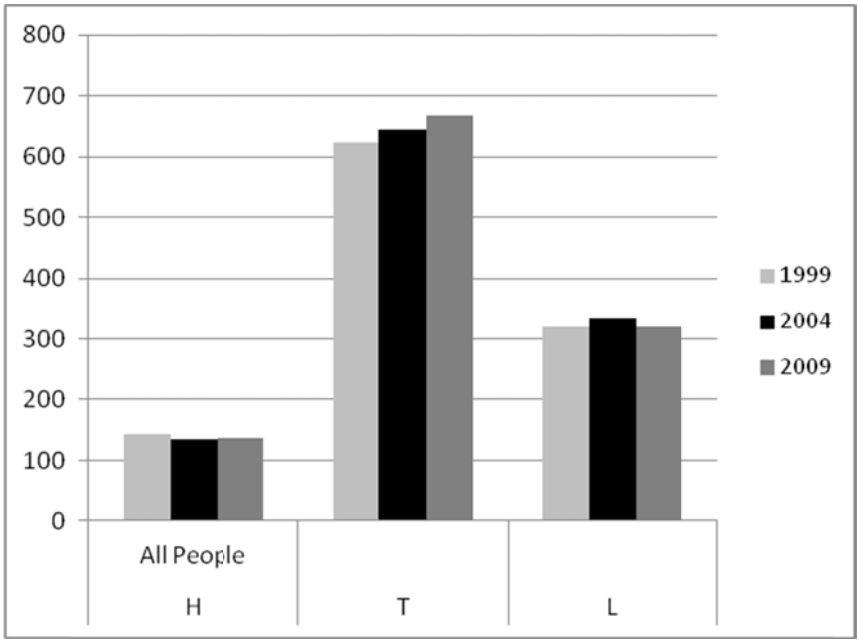
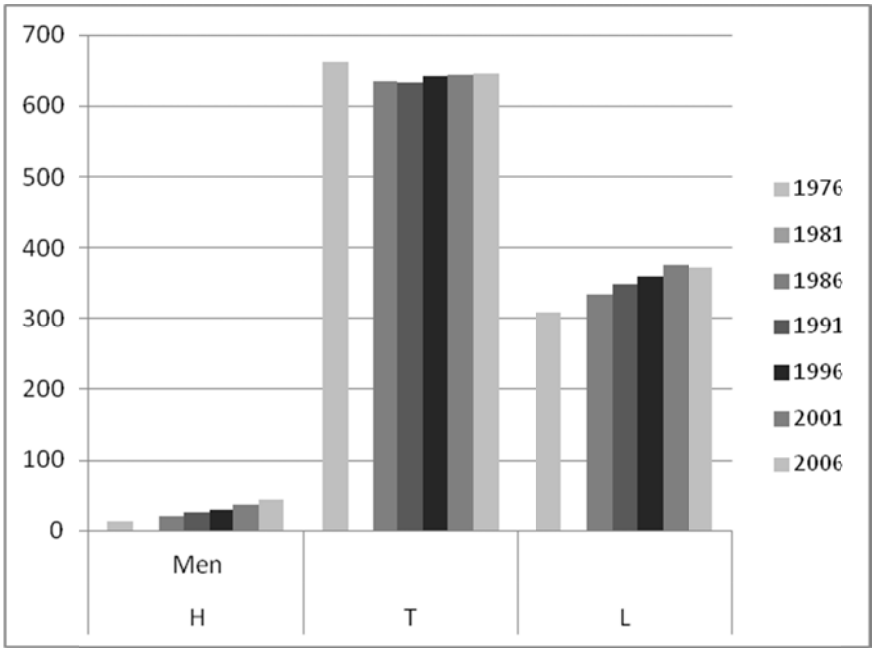


b. Korea

Figure 4. Distribution of Non-Market Time, Adult Population



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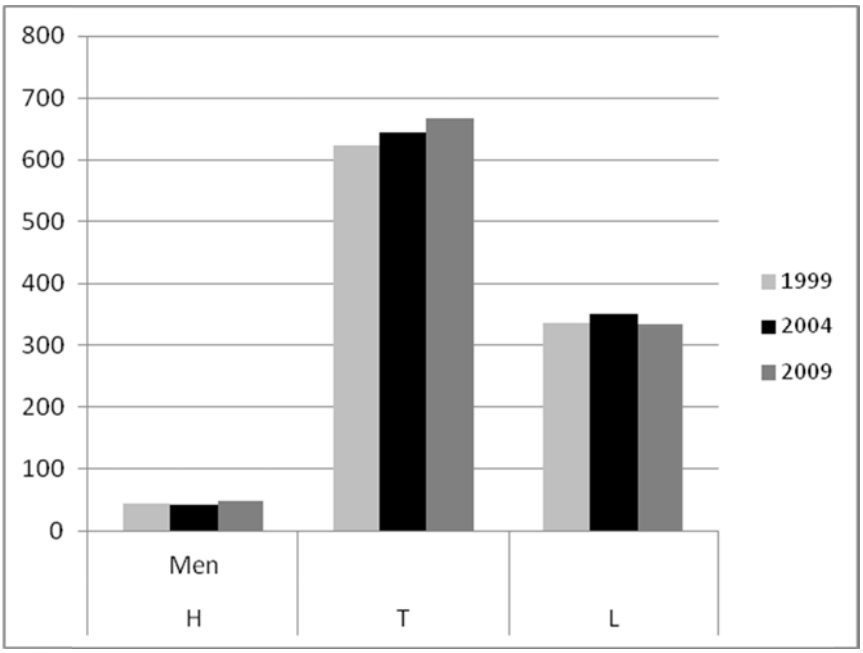
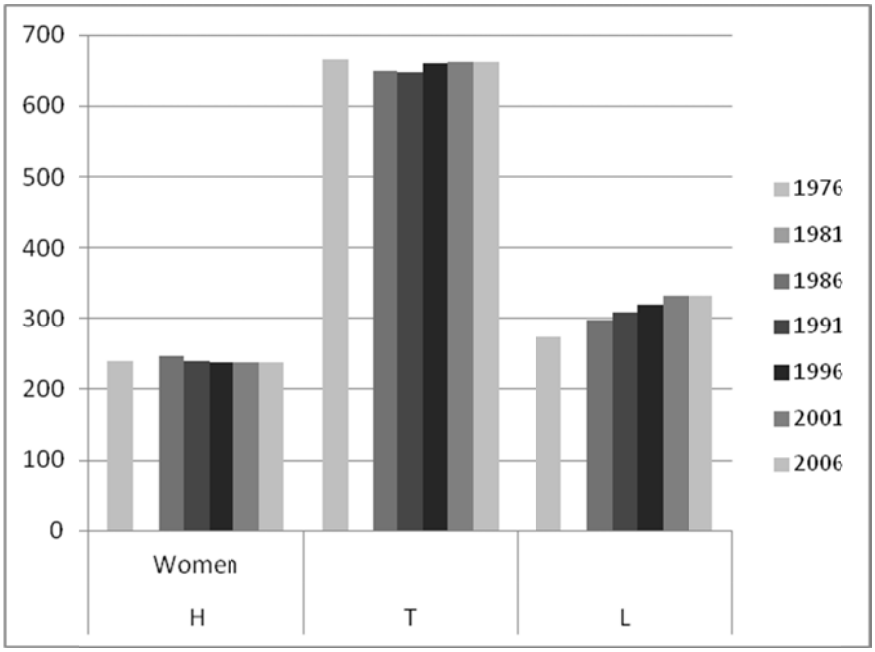


b. Korea

Figure 5.Distribution of Non-Market Time, Adult Men



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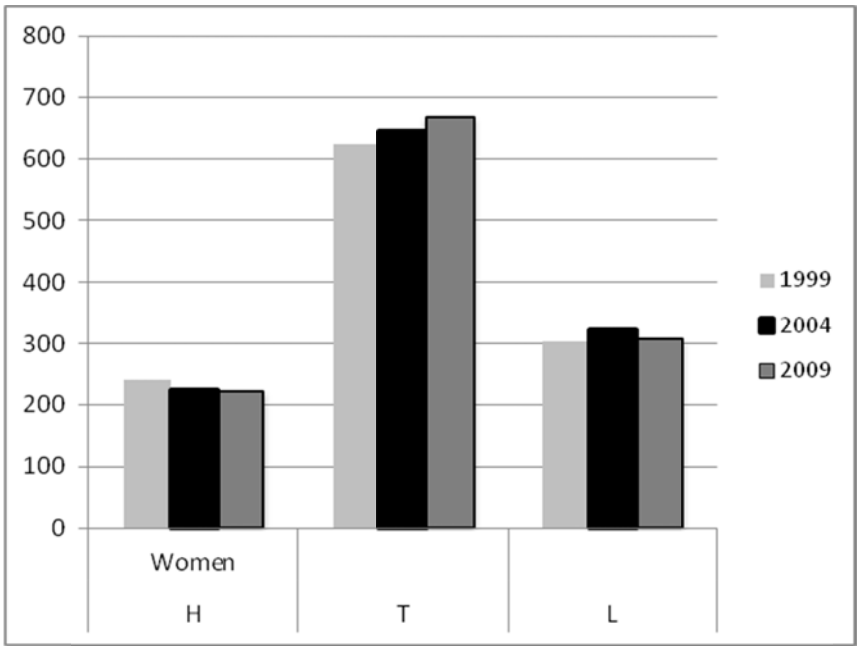

b. Korea

Figure 6. Distribution of Non-Market Time, Adult Women

Table 1J. Reduced-form Estimates of Changes in Time Use on the Treatment Propensity Score, Japan*

	Weekdays		**Saturdays**		**Sundays**	
	(N=447)	R^2	**(N=481)**	R^2	**(N=484)**	R^2
ΔM	0.30	0.006	-3.66	0.334	-0.47	0.021
	(0.19)		(0.23)		(0.15)	
ΔH	-0.51	0.022	0.35	0.011	-0.22	0.004
	(0.15)		(0.15)		(0.16)	
ΔT	-0.14	0.004	0.83	0.088	0.20	0.006
	(0.11)		(0.12)		(0.16)	
ΔL	0.35	0.009	2.49	0.280	0.49	0.018
	(0.17)		(0.18)		(0.16)	
Mean propensity	0.11		0.11		0.11	
SD propensity	(0.09)		(0.09)		(0.09)	
[10^{th}, 90^{th}]	[0.004, 0.24]		[0.003, 0.24]		[0.003, 0.24]	

Table 1K. Reduced-form Estimates of Changes in Time Use on the Treatment Propensity Score, Korea*

	Weekdays		**Saturdays**		**Sundays**	
	(N=994)	R^2	**(N=783)**	R^2	**(N=757)**	R^2
ΔM	-1.58	0.014	-5.95	0.135	-1.71	0.013
	(0.43)		(0.54)		(0.54)	
ΔH	1.56	0.041	2.59	0.084	1.62	0.042
	(0.24)		(0.31)		(0.28)	
ΔT	0.06	<0.001	0.94	0.017	0.69	0.007
	(0.17)		(0.26)		(0.30)	
ΔL	-0.05	<0.001	2.41	0.033	-0.60	0.002
	(0.33)		(0.47)		(0.48)	
Mean propensity	0.06		0.07		0.07	
SD propensity	(0.08)		(0.09)		(0.09)	
[10^{th}, 90^{th}]	[0.002, 0.17]		[0.003, 0.18]		[0.003, 0.20]	

*Estimated by weighted least squares, with weights equal to the average population sizes of the cells across the two years.

Table 2J. Structural Estimates of Equation (4), Japan*

	Weekdays		Saturday		Sunday	
	OLS	GMM	OLS	GMM	OLS	GMM
α'	0.382	1.683	0.194	0.095	0.287	-0.462
	(0.034)	(0.869)	(0.023)	(0.042)	(0.041)	(0.365)
β'	0.122	0.477	0.216	0.226	0.178	0.427
	(0.026)	(0.376)	(0.018)	(0.029)	(0.031)	(0.242)
γ'	0.497	-1.16	0.591	0.679	0.535	1.035
	(0.035)	(1.059)	(0.020)	(0.038)	(0.040)	(0.316)
$\overline{H^*}$	132		148		154	
	(0.800)		(0.722)		(0.742)	
$\overline{T^*}$	641		662		701	
	(0.827)		(0.649)		(0.734)	
$\overline{L^*}$	301		396		466	
	(0.998)		(1.118)		(1.122)	
$\underline{T}$	656	603	324	310	-421	844
	[369, 1727]	[567, 636]	[225, 409]	[53, 426]	[-1814, 101]	[757, 1340]
$\underline{L}$	3232	278	-382	-427	-2428	930
	[1838, 8549]	[232, 322]	[-599, -165]	[-1152, -88]	[-5973, -1250]	[757, 1340]
ΔSubsistence level T	2	2	13	8	9	6
	[1, 3]	[0, 3]	[10, 15]	[-2, 13]	[7, 11]	[3, 8]
ΔSubsistence level L	10	5	38	21	18	12
	[8, 12]	[3, 7]	[33, 43]	[-1, 33]	[15, 23]	[6, 15]

*Standard errors in parentheses. Bootstrapped 90-percent confidence intervals in brackets, based on 500 resamplings.

Table 2K. Structural Estimates of Equation (4), Korea*

	Weekdays		Saturday		Sunday	
	OLS	GMM	OLS	GMM	OLS	GMM
α'	0.306	0.993	0.259	0.436	0.145	0.946
	(0.015)	(0.220)	(0.017)	(0.049)	(0.019)	(0.328)
β'	0.126	0.039	0.122	0.158	0.222	0.405
	(0.012)	(0.103)	(0.015)	(0.047)	(0.019)	(0.166)
γ'	0.567	-0.032	0.619	0.406	0.633	-0.351
	(0.016)	(0.200)	(0.019)	(0.060)	(0.023)	(0.396)
$\overline{H^*}$	130		151		152	
	(1.362)		(2.261)		(2.211)	
$\overline{T^*}$	652		694		725	
	(0.853)		(1.669)		(1.642)	
$\overline{L^*}$	287		374		432	
	(1.610)		(2.830)		(2.812)	
$\underline{T}$	57	123	-128	-65	-711	-89
	[35, 65]	[98, 147]	[-285, -121]	[-154, 50]	[-864, -456]	[-310, 97]
$\underline{L}$	323	658	-727	140	-1738	934
	[263, 337]	[614, 695]	[-1053, -578]	[-54, 334]	[-2215, -1158]	[604. 1152]
ΔSubsistence level T	45	38	70	70	47	51
	[43, 48]	[35, 41]	[67, 75]	[67, 74]	[40, 54]	[47, 56]
ΔSubsistence level L	11	-23	17	14	-35	-15
	[7, 20]	[-27, -17]	[5, 31]	[6, 22]	[-54, -18]	[-22, -9]

*Standard errors in parentheses. Bootstrapped 90-percent confidence intervals in brackets, based on 500 resamplings.

Table 3. Decomposition of the Change in Market Work on Saturdays (minutes and percentage distributions)

	Japan		Korea	
	OLS	GMM	OLS	GMM
Observed ΔM (minutes)	*87*	*87*	*104*	*104*
ΔH via α' (H1)	17	8	27	45
ΔH via change in subsistence level (H2)	-10	-3	-23	-37
ΔT via β' (T1)	19	20	13	16
ΔT via change in subsistence level (T2)	2	1	59	57
ΔL via γ' (L1)	51	59	64	42
ΔL via change in subsistence level (L2)	8	1	-37	-20
H1+H2	7	6	4	9
Fraction of total ΔM	0.08	0.06	0.04	0.08
T1+T2	21	21	72	73
Fraction of total ΔM	0.24	0.24	0.69	0.70
L1+L2	59	60	28	22
Fraction of total ΔM	0.68	0.69	0.26	0.21

Table 4J. Changes in Minutes of Market Work Since 1976, Japan, 1986-2006*

	All Days			Weekdays			Saturdays			Sundays		
Year:	All	Men	Women	All	Men	Women	All	Men	Women	All	Men	Women
1986	1.05	0.11	2.19	7.06	6.85	8.10	4.32	3.22	3.48	-29.47	-34.46	-24.96
	(2.06)	(2.55)	(2.38)	(1.76)	(1.89)	(2.60)	(2.72)	(2.95)	(3.63)	(3.99)	(4.76)	(4.08)
1991	-2.72	-10.11	5.54	11.62	6.30	18.76	-32.83	-45.01	-22.14	-42.58	-54.19	-31.51
	(2.09)	(2.61)	(2.38)	(1.71)	(1.84)	(2.60)	(2.78)	(3.08)	(3.63)	(3.92)	(4.65)	(4.02)
1996	-17.11	-27.21	-5.58	1.27	-4.36	9.77	-71.1	-95.06	-49.54	-52.07	-68.15	-36.64
	(2.19)	(2.79)	(2.46)	(1.84)	(2.04)	(2.77)	(2.77)	(3.12)	(3.62)	(3.87)	(4.58)	(3.97)
2001	-27.26	-43.33	-9.37	-9.86	-22.20	5.85	-87.82	-118.74	-59.46	-51.54	-69.9	-33.73
	(2.19)	(2.83)	(2.51)	(1.89)	(2.20)	(2.83)	(2.80)	(3.22)	(3.68)	(3.90)	(4.69)	(4.05)
2006	-18.83	-35.74	0.78	2.34	-9.82	19.36	-92.46	-125.95	-61.72	-46.65	-66.6	-27.19
	(2.36)	(3.06)	(2.64)	(2.03)	(2.43)	(2.96)	(2.96)	(3.46)	(3.77)	(3.98)	(4.76)	(4.19)
R^2	0.219	0.168	0.148	0.322	0.298	0.204	0.143	0.105	0.087	0.049	0.022	0.037
N =	2449297	1152241	1297056	1047384	492348	555036	700020	329164	370856	701877	330723	371154

*Each regression also includes indicators for educational attainment and a quadratic in age. The specifications for all adults also include an indicator for female.

Table 4K. Changes in Minutes of Market Work Since 1999, Korea, 2004 and 2009*

	All Days			Weekdays			Saturdays			Sundays		
Year	All	Men	Women	All	Men	Women	All	Men	Women	All	Men	Women
2004	-15.68	-24.30	-5.11	-4.00	-10.69	5.00	-42.78	-59.17	-25.34	-37.25	-47.79	-26.13
	(1.81)	(2.63)	(2.40)	(2.20)	(3.08)	(3.00)	(3.66)	(5.50)	(4.73)	(3.43)	(5.47)	(4.16)
2009	-17.98	-32.10	1.07	2.37	-7.50	18.18	-78.76	-109.88	-44.48	-46.44	-61.40	-29.69
	(2.10)	(3.04)	(2.83)	(2.53)	(3.51)	(3.53)	(4.25)	(6.42)	(5.44)	(3.89)	(6.10)	(4.80)
R^2	0.166	0.103	0.144	0.231	0.168	0.192	0.145	0.103	0.106	0.063	0.045	0.057
N =	172,264	80401	91863	103952	48427	55525	34464	16132	18332	33848	15842	18006

*Each regression also includes years of schooling, a quadratic in age, and an indicator of metropolitan location. The specifications for all adults also include an indicator for female.

Table 5. Fixed-Effect Estimates of Trends in Weekday-Weekend Differences in Minutes of Market Work, Japan, 1976-2006, Korea, 1999-2009*

a. Japan

Interaction with:	**Saturday**	**Sunday**	**Saturday**	**Sunday**	**Saturday**	**Sunday**
Year:	**All**		**Male**		**Female**	
1986	-15.39	-39.05	-22.07	-44.14	-6.7	-30.34
	(2.40)	(3.48)	(3.90)	(5.46)	(2.81)	(4.15)
1991	-54.77	-45.17	-68.72	-58.02	-41.51	-32.79
	(2.55)	(3.57)	(4.20)	(5.63)	(2.95)	(4.16)
1996	-67.93	-35.61	-92.72	-50.3	-45.74	-21.73
	(2.74)	(3.63)	(4.52)	(5.74)	(3.15)	(4.26)
2001	-70.46	-33.98	-96.87	-51.11	-46.00	-18.18
	(3.18)	(4.02)	(5.20)	(6.49)	(3.64)	(4.55)
2006	-90.56	-28.45	-120.09	-48.60	-63.56	-11.32
	(3.45)	(4.24)	(5.60)	(6.77)	(4.02)	(4.67)
R^2 (within)	0.295		0.392		0.207	
N =	620821		292027		328794	

b. Korea

Interaction with	**Saturday**	**Sunday**	**Saturday**	**Sunday**	**Saturday**	**Sunday**
Year:	**All**		**Male**		**Female**	
2004	-31.54	-25.76	-40.70	-40.19	-22.73	-12.95
	(4.14)	(6.17)	(6.59)	(9.70)	(5.03)	(7.38)
2009	-83.49	-34.36	-115.36	-53.01	-52.65	-15.34
	(5.58)	(7.06)	(9.00)	(10.87)	(6.43)	(8.57)
R^2 (within)	0.292		0.368		0.22	
N =	69454		32238		37216	

Table 6J. Changes in Minutes of H, T and L Since 1976, Japan, 1986-2006*

	All Adults			Men			Women		
Year	H	T	L	H	T	L	H	T	L
1986	2.48	-23.36	19.83	5.31	-18.31	21.65	-0.92	-19.88	18.61
	(0.84)	(0.79)	(1.44)	(0.37)	(1.48)	(2.00)	(1.55)	(0.93)	(1.40)
1991	0.69	-27.86	29.89	9.76	-19.85	32.58	-9.48	-23.79	27.73
	(0.86)	(0.81)	(1.46)	(0.41)	(1.48)	(2.02)	(1.54)	(0.95)	(1.42)
1996	-0.51	-19.00	36.62	12.19	-9.98	39.83	-14.68	-13.67	33.94
	(0.88)	(0.84)	(1.54)	(0.42)	(1.51)	(2.15)	(1.59)	(0.97)	(1.50)
2001	2.15	-21.71	46.82	18.99	-14.02	51.63	-16.62	-16.61	42.6
	(0.93)	(0.87)	(1.55)	(0.48)	(1.55)	(2.17)	(1.66)	(1.04)	(1.52)
2006	4.30	-24.91	39.44	24.30	-15.75	41.34	-18.11	-20.44	37.78
	(1.01)	(0.93)	(1.64)	(0.60)	(1.62)	(2.32)	(1.78)	(1.12)	(1.64)
R^2	0.351	0.131	0.089	0.023	0.127	0.076	0.15	0.134	0.09

*Sample sizes are the same as in Table 1J. The regressions include the same controls

Table 6K. Changes in Minutes of H, T and L Since 1999, Korea, 2004 and 2009

	All Adults			Men			Women		
	H	T	L	H	T	L	H	T	L
Year 2004	-13.27	20.96	8.11	-4.18	21.45	7.11	-24.09	20.92	8.43
	(0.93)	(0.76)	(1.38)	(0.71)	(1.12)	(2.17)	(1.61)	(1.03)	(1.70)
Year 2009	-12.29	43.88	-13.49	1.38	43.78	-12.98	-30	44.38	-15.33
	(1.08)	(0.88)	(1.58)	(0.87)	(1.25)	(2.44)	(1.90)	(1.22)	(2.00)
R^2	0.34	0.065	0.083	0.014	0.06	0.076	0.156	0.074	0.087

*Samples sizes are the same as in Table 1K. The regressions include the same controls as in that table.

APPENDIX. Classification of Sub-aggregates into M, H, T and L

	Japan*	Korea**
Market Work M	Work	Working and Work-Related Activities
	Schoolwork	Educational Activities
	Commuting to/from school or work	Non-school Educational Activities
	Studying and Researching	
Household Production H	Housework	Household Services
	Child Care	Caring for Household Members
	Child care	
	Shopping	
Tertiary Activities T	Sleep	Personal Care (includes Sleep)
	Personal Care	
	Meals	
	Medical Examination or Treatment	
Leisure L	TV, Radio, Reading	Volunteer Activities
	Rest and Relaxation	Socializing and Leisure
	Hobbies and Amusements	
	Sports	
	Volunteer and Social Activities	
	Social Life	
Prorated	Travel Other than Commuting	Other Activities
	Caring and Nursing	
	Other Activities	
	*Schoolwork was first included in 1996, Caring and Nursing from 1991. Non-commuting travel is prorated across H, L and medical treatment. The rest is prorated across all aggregates.	**Travel for each activity is added to the appropriate aggregate.