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Differences in US-German Time-Allocation: Why Do Americans Work Longer Hours than Germans?

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ABSTRACT

Differences in US-German Time-Allocation: Why Do Americans Work Longer Hours than Germans?

The conventional view is that Americans work longer hours than Germans and other Europeans but when time in household production is included, overall working time is very similar on both sides of the Atlantic. Americans spend more time on market work but German invest more in household production. This paper examines whether these differences in the allocation of time can be explained by differences in the incentive structure, this is by the tax-wedge and differences in the wage differentials, as economic theory suggests. Its analysis of unique time-use data reveals that the differences in time-allocation patterns can indeed be explained by economic variables.

JEL Classification: D12, D13, H31, J22

Keywords: time use, working hours, employment, household production

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I Introduction

Statistics on hours spent in market work suggest that Americans work much longer hours than Germans and Europeans in general. In 1995 the average American employee worked 1952 hours annually compared to just 1561 hours for the German employee (OECD 1998)[1]. This is a reversal of past trends, when the US led the move to shorter working hours. The 40-hour, 5-day working week with paid vacations is an all-American 'invention', which Europe adopted in the 1950s and 1960s. In the early 1970s the average adult German (aged 15 to 64 years) was spending about 13% more hours in employment than the average American, which is the combined effect of higher employment population rates and longer working hours in Germany. By the mid-1990s the working hours of the average adult German had fallen by about 25%, while the working hours of the average adult American were about 20% longer than in 1970. In other words, in 1995 Americans were spending on average 43% more time on market work than Germans.[2] Possible explanations for this difference in hours worked include differences in (1) culture (illustrated by labels like the 'overworked American' and 'leisure park Germany'), (2) income levels (leisure as a superior good), and (3) the division of labor related to the structure of incentives to outsource activities from households.[3]

(1) Culture is probably one of the most fundamental variables influencing the organization of economies in different countries but culture changes only very slowly. If German culture makes Germans to prefer shorter working hours and American culture makes Americans prefer longer hours, it is difficult to explain why the pattern in working time has changed. Furthermore, the surveys of the International Social Science Program (ISSP) show that the desires to participate in market work are very similar

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1 In their overview of time-use research Juster and Stafford (1991) mention that '.. –labor supply hours- turns out to be quite poorly measured in conventional studies, and appears to be much better measured in time diary studies.' (see also below)

2 Calculations are based on OECD Labor Force Statistics and various issues of OECD Employment Outlook.

3 It may also be that collective bargaining favors shorter working hours against the employees' will. This, however, seems not to be the case, since Bell and Freeman (1996) find workers in the US and in Germany equally satisfied with their respective working hours, with the Germans having a slight preference for shorter hours and the Americans for longer hours.

among German and American women. 59% of the German women and 63% of the American women disagreed with the statement ‘A job is just a way of earning money –no more’, which may indicate that the ‘soft’ variables are of similar magnitude in both countries.

(2) Income is another potential explanation for the working time difference. If leisure is a superior good, the country with the higher income would be expected to work shorter hours.[4] However, all the estimates show that the income level of US citizens is above the (West-) German level. The Bureau of Labor Statistics (BLS 1998:10), for example, estimates that West-German per capita income in 1996 was 80% of the US figure.[5] According to the income hypothesis, therefore, the US should work shorter hours than Germany.

(3) The third possible explanation (concerning the division of labor) refers to a broader concept of work, which includes not only hours spent in gainful market employment but also hours spent in household production. 'At the heart of the theory is an assumption that households are producers as well as consumers; they produce commodities by combining inputs of goods and time according to the cost-minimization rules of the traditional theory of the firm' (Becker 1965: 516). In principle, households can choose between gainful employment and the purchase of goods and services in the market on the one hand, and self-provision of these goods and services via household production on the other. The choice of products to be purchased in markets and goods to be provided via household production will be influenced by the relative costs of these two alternatives. In general, market provision will be preferred to household production if the productivity differentials between these two modes of provision are high and/or if the differentials between the individual's own wage and the wage of the professional are high and the wedge is small.

It is well known that the US has a much more dispersed wage distribution than Germany and that non-wage labor costs are largely obligatory and proportional to the wage in Germany, whereas legal non-wage labor costs are lower in the US and effective non-wage labor costs are disproportional to wages. In the US many low-skill jobs provide only the legal minimum level of social security, whereas many skilled jobs offer similar social security as in Germany (Freeman/ Schettkat 1999). In addition, income taxes and sales taxes (valued-added tax in Germany) are higher in Germany, creating a bigger tax-wedge there than in the US. For this reason, it may be more attractive for German households to

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4 Linda Bell and Richard Freeman (1996) explain 'why Americans work harder' (that is, longer hours) on the basis of a tournament model. In the US, wage dispersion within any given group is much wider than in Germany (see Freeman/ Schettkat 2000) and thus the incentive for Americans to work harder in order to 'move ahead in the tournament' is higher. According to this hypothesis, effort pays off more in the US in the long-run.

5 The figures used refer to market incomes not including income from self-production, which would have to be included in a more comprehensive income measure (Eisner 1988).

provide certain services[6] themselves ('in-house') rather than to purchase them in the market, whereas it may be better for Americans to purchase services in the market and work longer hours in gainful employment. In other words, more services should be produced in markets in the US, whereas similar services should be provided in household production in Germany.

According to the division of labor hypothesis, both time spent in gainful employment and time spent in household production should be taken into account when evaluating differences in working hours between the US and Germany. This measure provides a very different picture of hours worked in the two economies. Table 1 shows that on average Americans and Germans spend roughly the same hours working, but American spend more time in market work while Germans spend more hours in household production. Americans do not work longer hours than Germans overall, but they allocate a larger share of working time to gainful employment and invest less in self-provision.

6 The choice between market sourcing and self-provision will generally have to be made in relation to services rather than goods, because in the case of goods the productivity differentials between the two modes of provision are usually big (see below).

Table 1: Time-use in the US and in Germany, mean hours per week, 18-64 years[7]

time-use category	US	Germany	US	Germany
	Men		women	
total working time	**53.2**	**53.1**	**52.2**	**53.8**
market work	39.1	35.2	25.4	17.7
household production	14.1	17.9	26.8	36.1
personal time/ leisure	**114.4**	**113.7**	**115.4**	**113.3**
voluntary work	1.0	1.5	.8	.9
total hours per week	**168**	**168**	**168**	**168**

Source: American-German Time-Use Data. For details see data section in Appendix I.

Market work includes: actual time at work (including breaks), commuting time.
Household production includes: child care, housework (cleaning, preparation of meals, household maintenance).
Personal time/ leisure includes: grooming, eating, sleeping, leisure.

Economic theory is undetermined with respect to the effect of wages on labor supply but offers a clear prediction of the effect of productivity differentials, wage differentials and the wedge on the distribution of overall working hours between gainful employment and household production. Building on the seminal work by Gary Becker (1965) and Reuben Gronau (1977), this paper develops a model of household production, investigates the incentive structure in the US and in Germany and analyzes time-use patterns in Germany and the US using unique time-use data.

II A simple model of household production

A household's decision to produce goods and services itself (self-provision) or to purchase those products in markets (market provision) will depend on the relationship between opportunity costs and market costs. The opportunity costs of one hour of self-provision are the foregone earnings, i.e. the gross wage

7 Distribution of employment statuses in Germany in 1991/92 and the US in 1993/94

	total	employed	full-time	part-time	not employed
	Germany				
Men	100.0	81.7	79.0	2.7	18.3
Women	100.0	55.5	36.3	19.5	44.2
	USA				
Men	100.0	84.6	76.4	8.0	15.6
Women	100.0	68.8	54.0	14.8	31.2

minus taxes (including social security contributions).[8] The market-cost equivalent to one hour of self-provision depends on the ratio of productivity in self-provision (A_s) over that in market provision (A_m) times the gross labor costs (gross wages plus social security contributions of employers and taxes like VAT or sales taxes) plus the overheads of the professional organization [$w_m * (1 + t_m + \mu)$].

Opportunity costs for one hour of self-production (h_s):

$$OC = w_s(1 - t_s) \qquad (1.1)$$

Market-cost equivalent of one hour of self-production:[9]

$$MC = \frac{A_s}{A_m} * w_p(1 + t_m + \mu) \qquad (1.2)$$

Where: OC = opportunity costs, w_s = own wage, w_p = wage for a professional, t = tax rate, MC = market costs, A = productivity (A = Q/h; Q = quantity, h = hours), μ = overhead costs, profits, s = subscript for self-provision, m = subscript for market provision, $A_m = f(h_s)$.

Assuming that self-provision and market provision are perfect substitutes[10], the household will spend the maximum possible hours in self-provision until the opportunity costs equal the market-cost equivalent (OC = MC). Since the wedge [$(1-t_s) / (1+t_m+\mu)$] always shifts the odds in favor of self-provision, it needs to be balanced either by a positive difference between the own wage and the wage of the professional provider ($w_s > w_m$) or by higher productivity in professional production than in self-provision ($A_m > A_s$). Productivity differentials between self-provision and professional provision will vary between different products. In some cases $A_s > A_m$ but in many other cases $A_s < A_m$. It is convenient to assume that A_s is constant (i.e. does not change in response to the time spent

8 Social security contributions may actually be seen as an insurance rather than a tax. However, the stronger the redistribution component of social security, the more strongly the contributions resemble a form of taxation. For simplicity's sake, this paper treats social security contributions as a form of taxation.

9 Note that in this expression the market costs are standardized to the equivalent output of one hour in household production. Assuming that households rank activities according to the of productivity in self-provision over that in market provision, A_m may be regarded as a function of time spent in household work [$A_m = f(h_s)$].

10 Pollak/ Wachter (1975) emphasize that time spent in work activities may provide utility directly and these may differ in market work and in household production. This analysis is limited to household activities for which a close market substitute exists (household production in a narrow sense), where the joint production problem is similar to that in market work.

in household production) but that A_m differs in various activities. Then if households rank individual products according to the difference between market-cost equivalents and opportunity costs so that products with the highest difference are produced first, those with the second highest difference next etc., the ratio A_s/A_m will be a decreasing function with respect to hours spent in self-provision (h_s).[11]

The household production function which is the integral over the market-cost equivalent curve (MC, equation 1.2, the equivalent market price for the products that can be produced in one hour of household production) will then be an upward sloping function with diminishing marginal returns to self-provision. Assuming that own wages and the wages for market provision are independent of hours worked and that taxes, social security contributions, overheads and profits are constant, the household production function (HPF) will be:

$$HPF = \int \frac{A_s}{A_m} * w_p(1+t_m+\mu) * dh_s = a + A_s * \ln A_m w_p (1+t_m+\mu) \qquad | A_m \geq 1 \qquad (1.3)$$

where a = 0 (the household production function will start at the origin), A_m= f(hs).

The household production function will have a steep slope for the first few hours spent in household production, when productivity in market provision is low, and will flatten out as hours in household production rise and productivity in market provision increases.[12] Self-provision is extended to the point where the opportunity costs are higher than the market-price equivalent and the household will prefer gainful employment and market provision to further household production from this point on. Incorporating the term $w_p(1+t_m+\mu)$ into the opportunity cost function makes the dependence of the household's time allocation on the wage differences and the tax-wedge more visible in the inter-country comparison. A bigger wedge and/or a lower wage difference between the own the professional wage will flatten the wage-wedge curve and will lead to a higher share of time spend in household production (see Figure 1). The household will be indifferent between self-provision and market provision if the opportunity costs of self-provision over market provision are equal to one:

$$\frac{OC}{MC} = \frac{w_s}{w_p} * \frac{(1-t_s)}{(1+t_m+\mu)} * \frac{A_m}{A_s} = 1 \qquad (1.4)$$

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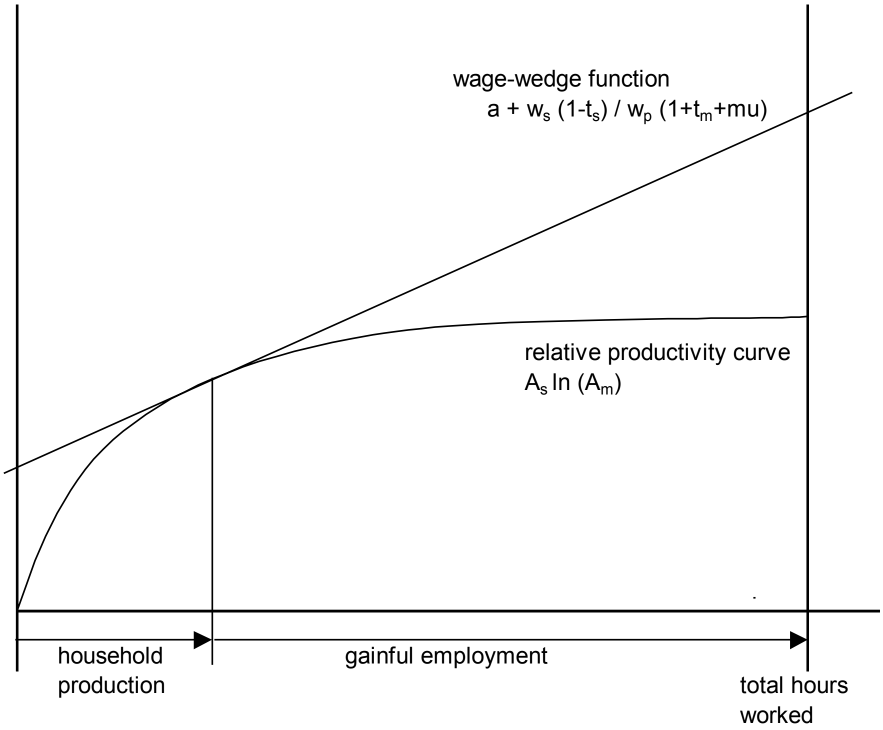
11 This presentation is related to the "stage-model" of household vs. market production developed by Luis Locay (1990), who argues that increases in the productivity of market production explain the historical shift of production from households to markets.

12 One may argue that the professional is always more productive than the self-provider, but indivisibility may either lead to overly high costs of market provision (low productivity; for example, hiring someone just to clear the breakfast table).

In equilibrium, therefore, opportunity costs (OC) equal market costs (MC) and the wage-wedge curve is a tangent to the production function which slope is the ratio (A_s / A_m).

$$\frac{w_s}{w_p} * \frac{(1-t_s)}{(1+t_m+\mu)} = \frac{A_s}{A_m} \quad (1.5)$$

Figure 1: Household production versus market provision



As long as self-provision and market provision are regarded as perfect substitutes, the overall income function will first consist of the household production function (HPF) and then of the market income or opportunity cost function (MC). The division of time between self-provision and market work will not depend on income preferences if maximizing income requires some combination of self-provision and market provision.[13] In other words, as long as the indifference curve is not a tangent to the household production function, the following very clear conclusions can be drawn from the above model:

1. The bigger the wedge, the more time will be spent in household production.
2. The higher the wage differential between the individual's own wage and the professional wage (the higher the ratio w_s / w_p), the less time will be spent in household production.
3. The lower the productivity advantage of professional provision (the greater the ratio A_s / A_m), the more time will be spent in household production.

13 As long as one can assume that households cannot be completely autarkic, the division of hours between self-provision and market work will be affected by indeterminate effects of the usual labor supply analysis.

For the specific case of the US and Germany, therefore, we can derive the following clear hypothesis for the division of time between self-provision and market work:

1. Individuals (households) with a high earning potential in markets will spend less time in self-provision but more time in gainful employment in both countries, i.e. the coefficient for the wage-wedge variable (ww) should be negative.
2. If the incentives summarized in the wage-curve capture the major economic incentives for the division of time between household production and market work, country dummies -representing variables such as cultural differences- should be insignificant.

III Time-use patterns in Germany and in the US

Average time-use patterns displayed in Table 1 are influenced by the time actually spent in activities and the share of persons participating in these activities. The low hours spent in market work for German women may therefore be the result of low average working hours for all women or of relatively long working hours for a small proportion of women participating in gainful employment. Indeed, whereas male participation in market work differs only by about 5 percentage-points between the US and Germany, the female participation rates differ by more than 10 percentage points. In terms of the model presented in section II, more women in Germany seem to have their indifference curves touching the productivity curve derived from household production (Figure 1). In other words, they undertake only household production rather than combining it with market work.

In the following analysis, the productivity functions are assumed to be similar, i.e. in both countries they have the same slope for a given amount of time spent in household production across individuals and countries. In other words, the ratio of productivity in self-provision (A_s) over productivity in market provision (A_m) is assumed to be identical for all individuals and possible effects of specialization in market or household activities (Becker 1965) are ignored.[14] This assumption, although probably crude, simplifies the analysis of time-use patterns identified by differences in the wage-wedge function between the two countries.

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[14] Briddle and Hamermesh (1990) argue that sleep affects productivity, i.e. sleep is subject to choice rather than biologically fixed. In this paper, however, the potential productivity effects of sleep are ignored..

For the empirical analysis, both the wage-wedge function and prices for market services need to be identified. Typical market services, which may substitute for household production are identified with the industries 'private household personal', 'eating and drinking places, hotels', 'personal services', 'retail trade', and 'other repair services'. The wages in these industries relative to the mean wage are remarkably similar (almost identical) in both countries (compare Freeman/ Schettkat 2000 and columns 1 and 5 in Table 2, which display the inverse of these wage ratios). Thus, the w_s/w_p-ratio is almost identical in both countries (for the mean wage earner 1.6) but taxes and non-wage labor costs differ substantially between Germany and the US.

In the US, many low-skilled, low-paid workers receive only the legal minimum level of social security and paid vacation is usually two weeks (about 4% of labor costs). This is much less than in Germany, where paid vacation is about 6 weeks (roughly 12% of labor costs, for details see Appendix II). However, paid vacation increases both labor costs and the 'net' wage. Therefore, social security contributions are most important for the wedge, which is estimated to be .68 in the US but .48 in Germany (see Appendix II for details). Assuming for simplicity's sake that profits and overheads are zero (or similar), the wedge is smaller in the US than in Germany. In other words, the slope of the wage-wedge curve is flatter in Germany than in the US, implying more hours spent in self-provision in Germany.

Given this information, an implied slope of the A_s/A_m-curve can be calculated (columns 2, 3, 6 and 7, Table 2). As long as the implied slope (A_s/A_m) of the productivity curve is greater than one, self-provision will be preferred to market provision. For the mean-wage earner, this will hardly ever be the case neither in the US nor in Germany, although the odds are slightly more in favor of market provision in the US (columns 2 and 6 in Table 2). Of course, the picture changes for the higher wage-groups. For those earning one-third above the median wage (columns 4 and 8 in Table 2), market provision is more attractive than for the mean-wage earner. The implied A_s/A_m-curve slopes are again more in favor of market provision in the US than in Germany, but the size of the groups earning 1.33 times the median wage are very different in the two countries. About 22% of American employees earn at least this amount, compared to roughly half that figure in Germany (13%). Moreover, 32% of that group in the US are women, compared to only 5% in Germany. Obviously, it is more attractive for a larger share of American women to participate in market work, compared with German women, who are under-represented among high-wage earners. Moreover, the proportion of women in this wage bracket has more than doubled in the US since 1970, whereas it remained unchanged in Germany (Freeman/ Schettkat 2002).

Table 2: Implied productivity ratios in the US and Germany

services	US				Germany			
	APW		APW * 1.33		APW		APW * 1.33	
	w_s/w_p 1	(A_s/A_m) 2	w_s/w_p 3	(A_s/A_m) 4	w_s/w_p 5	(A_s/A_m) 6	w_s/w_p 7	(A_s/A_m) 8
personnel priv. households	2.44	1.56	3.64	2.33	2.22	1.00	2.96	1.33
eating, drinking places	1.61	1.03	2.41	1.54	1.59	0.71	2.11	0.95
personal services	1.52	0.97	2.26	1.45	1.89	0.85	2.51	1.13
retail trade	1.43	0.91	2.13	1.36	1.67	0.75	2.22	1.00
other repair	1.11	0.71	1.66	1.06	1.39	0.63	1.85	0.83

Source: w_s/w_p derived from Freeman/ Schettkat 1999, for taxes and non-wage labor costs see Appendix II.

Using the merged American-German time-use data set, the following model has been estimated separately for men and women:

$$\ln\left(\frac{t_{s,i,j}}{t_{m,i,j}}\right) = \alpha_1 + \alpha_2 ww + \alpha_3 \sum controls + \alpha_4 county + \alpha_5 ww * country + \varepsilon_{i,j} \qquad (3.1)$$

where: $ww = \dfrac{w_{s,i,j}(1 - t_{s,j})}{w_{p,j}(1 + t_{m,j} + \mu_{m,j})}$, the controls are dummies of marital status, the presence of children, interaction of marital status and country, the country is a dummy (0=USA, 1=Germany). Subscript i indicates the individual wage class, subscript j indicates the country, subscript s indicates self-provision, and subscript m indicates market provision. Details are given in the appendices.

Time-use data refer to time-allocation on the day of the interview and thus the individual data will have many zeros because not all activities are performed every day. However, the major interest is in time-allocation over a week and therefore time-use studies create 'artificial weeks', i.e. they construct weekly time-use across several individuals. In this study, time-allocation was constructed as time-use in various activities for 800 cells per country, which were constructed from 200 wage percentiles, gender and the presence of children (below the age of 18). Time spent in household production encompasses 'housework', 'child care', and 'shopping and obtaining services', while market work includes hours spent actually working, commuting time, and work-related time, such as breaks at work. The ratio $\dfrac{t_{s,i,j}}{t_{m,i,j}}$ will take high values if market time is low and time in self-provision is high and vice versa.[15] The logarithm of this ratio, the dependent variable, may take values from -∞ to +∞.

The wage-wedge relationship has been computed for every of the 200 wage classes, with the imputed individual wage over the professional wage (see Appendix II). In other words, an imputed wage has been assigned even to individuals not participating in the labor market reflecting the endogeneity of time allocation. The wage-wedge variable 'ww' is expressed in relative terms and should capture the economic incentives influencing time-allocation, controlling for other variables like marital status and the presence of children. The wage-wedge relationship is expected to be comparatively high in the US but low in Germany and consequently the ratio $\frac{t_{s,i,j}}{t_{m,i,j}}$ should be low in the US and higher in Germany. The estimation has been performed for men and women separately because the majority of men participate in market work and because the major differences in market work between the countries occur among women. The coefficient for the country-dummy is expected to be zero if the observed differences in time-allocation depend on the wage-wedge relationship and the controls rather than on differences in other country-specific variables such as taste or culture. The results of the regression analysis are shown in Table 3.

15 The reverse ratio was also used to check whether zeros in the time-use categories may affect the results. However, the regression models below are stable with respect to the definition of this ratio.

Table 3: OLS estimations of $\ln\left(\frac{t_{s,i,j}}{t_{m,i,j}}\right)$ on the wage-wedge relationship, combined US-German data

independent variables	women					men				
	I	II	III	IV	V	I	II	III	IV	V
wage-wedge (ww)	-0.82	-0.79	-0.98	-0.95	-1.03	-0.23	-0.23	-0.20	-0.19	-0.18
	(0.174)	(0.175)	(0.168)	(0.169)	(0.182)	(0.193)	(0.193)	(0.196)	(0.197)	(0.201)
age	0.02	0.02	0.03	0.03	0.03	0.02	0.02	0.02	0.02	0.02
	(0.004)	(0.004)	(0.005)	(0.005)	(0.004)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)
marital status	0.93	1.22	0.41	0.88	0.87	-0.30	-0.14	-0.20	0.09	0.09
	(0.155)	(0.338)	(0.168)	(0.328)	(0.327)	(0.158)	(0.411)	(0.186)	(0.458)	(0.459)
marital status * country	1.05	0.67	0.99	0.39	0.38	0.46	0.28	0.47	0.17	0.17
	(.146)	(.402)	(140)	(0.3870	(0.387)	(0.158)	(0.461)	(0.159)	(0.472)	(0.475)
child			0.643	0.66	0.66			-0.11	-0.13	-0.13
			(0.094)	(0.094)	(0.094)			(0.113)	(0.117)	(0.117)
country		0.31		0.51	0.13		0.16		0.27	0.31
		(0.316)		(0.304)	(0.415)		(0.384)		(0.398)	(0.565)
ww * country					0.52					-0.05
					(0.393)					(0.515)
constant	-0.49	-0.79	-0.74	-1.23	-1.1	-1.41	-1.56	-1.38	-1.64	-1.65
	(0.181)	(0.352)	(0.177)	(0.343)	(0.357)	(0.171)	(0.419)	(0.174)	(0.425)	(0.437)
summary statistics										
n	535	535	535	535	535	514	514	514	514	514
Prob > F model	0	0	0	0	0	0	0	0	0	0
R2-adjusted	30.46	30.45	35.99	36.21	36.31	8.37	8.22	8.37	8.27	8.09
RESET test for specification	not sign.	not sign.	not sign.	not sign.	not sing.	sign.	sign.	sign.	sign.	sign.
Cook-Weisberg test for heteroscedasticity	not sign.	not sign.	not sign.	not sign.	not sign.	sign.	sign.	sign.	sign.	sign.

standard errors in parentheses

In the case of men, the models are significant but individual coefficients do not affect men's time-use patterns significantly; most importantly, time-use is not affected by the wage-wedge relationship and does not differ significantly between the US and Germany. The mean of $\ln\left(\frac{t_{s,i,j}}{t_{m,i,j}}\right)$ for men is negative in both countries, that is that men spent more hours in market production than in household production.[16] However, as labor supply studies have found in general (Killingsworth 1983), women's time-allocation is more sensitive to wages and wedges. Most importantly, the coefficients for the wage-wedge relationship show the expected negative sign, and are both significant in all models and stable across the models. A bigger wedge leads to a flatter wage-wedge curve (a lower ww value) and raises time in household production over time in market work. The coefficient for the wage-wedge variable remains at similar values if the models are restricted to individual countries. Marriage increases the time women spend in self-provision relative to market work in both countries but does so more substantially in Germany. This may be the result of the fact that the German social security system discourages married women from working (see Appendix II). The presence of children increases time spent in self-provision in both countries. Most importantly, the country dummies are not significant in any of the models shown in Table 3. In other words, the differences in labor force participation and market provision observed between the US and Germany are actually likely to be substantially influenced by differences in the incentive structure rather than by differences in culture or taste.

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16 In both countries the mean of the log of time-use ratio $\ln\left(\frac{t_{s,i,j}}{t_{m,i,j}}\right)$ is negative for men but positive for women with substantial inter-country differences in the latter case. In other words, German and American women spend on average more time in household production than in market work but for American women these two categories almost balance.

	men			**women**		
Variable	**Obs**	**Mean**	**Std. Dev.**	**Obs**	**Mean**	**Std. Dev.**
	US					
$\ln(t_s/t_m)$	252	-1.20	1.12	275	0.05	1.05
Ww	290	1.14	0.39	296	0.99	0.31
	Germany					
$\ln(t_s/t_m)$	270	-0.74	0.92	267	0.76	1.19
Ww	279	0.78	0.15	281	0.68	0.16

IV Conclusions

This analysis of time-use data in the US and in Germany has shown that the opportunity costs of time have a significant influence on the time-allocation for women. A lower wedge and a wider wage dispersion makes market work more attractive and this may actually be the key variable explaining transatlantic differences in time-use. In addition, women are represented a much higher share among the high-wage earners in the US than in Germany, that is that for relatively more women the decision will be made in favor of market work and market provision rather than housework and self-provision in the US.

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Appendix I: The data

The data used in this study is based on time budget surveys. The German data are derived from the scientific use file (Statistisches Bundesamt 1999) 'Wo bleibt die Zeit?'. The data used covers the former West Germany because the special situation in East Germany (in 1991/ 1992) may be not representative for time-use. The data is representative of German households only; i.e. households of non-Germans living in Germany were not included. The data was collected by means of diaries and personal interviews between autumn 1991 and summer 1992 and covers about 32,0000 diaries, representing about 16,000 individuals (each person kept diaries for 2 consecutive days). In the present study, only the adult population (18 to 64 years) is included. This left 17,998 diaries.

The US data (for details, see Triplett 1995) was collected by the Survey Research Center at the University of Maryland and covers the period from September 1992 to October 1994. The data was collected by means of telephone interviews. Each quarter of data collection was an independent random sample but multiple chances of selection across quarters were avoided. Weekend and weekdays were distinguished. The interviewees had to list all their activities for the day before the interview in a 24-hour diary with detailed activity and location coding together with information on demographic background. In households with more than one adult, the interviewee was selected at random. A total of 9,386 interviews were conducted, 6,316 representing weekdays and 3,070 representing weekends. The present study has used only the time of adults (18 years to 64 years), leaving us with a sample size of 6,062.

The two data sets have been made compatible with respect both to the time-use categories and the period covered (in both countries, the whole year). The US data did not provide information on wages and the German data provided only data on net household income in the preceding month. For this reason, we estimated the wages used in this analysis from wage information available in the CGAS (Comparable German American Structural Database, see Freeman/ Schettkat 1999). Although wages are only estimated, the advantage of this procedure is that potential wages are assigned to those persons who are not actually in employment. The correlation between the estimated wage and the net household income for those households with a single income was .64 (significant at 1%).

Appendix II: Tax and social security systems in the US and in Germany (sources: CPB 1995, OECD 1995)

United States

In the US, contributions to the pension system are shared between employer and employee (15.3%) but other contributions (unemployment insurance, which has a ceiling for contributions of around $ 7,000 and varies by state but is on average about 2.5%, and industrial injury insurance at 2.4%) are paid by employers entirely. In addition, there may be non-compulsory health insurance, usually covered by the employer but often not applying to low-paid workers. Paid vacation is usually about 2 weeks per year, which represents about 4% additional labor costs and a similar amount of the gross wage.

Married couples are partly taxed at a lower rate compared to a single person with the same income, but the US taxation system is not as generous as an income splitting system. For example, in 1995 singles and couples with incomes between $ 89,000 and $ 115,000 were both taxed at a rate of 31% (OECD 1995). By comparison, a splitting system would lead to a tax rate of about 15.5% for a couple but 31% for singles. Since the tax rates for singles and married couples largely overlap and do not differ substantially, tax rates independent of marital status are applied. The tax base in the US includes social security contributions. Individual states and cities levy additional income taxes (e.g., in New York State between 4 and 7.9% and in New York City between 2.5 and 4.6%).

The net wage is therefore calculated as:

$$w_{net} = w_s\,(1 - sc_s - t_s)\,(1 + vac)$$

$$w_{net} = w_s\,(1 - .25)\,(1 + .04) = w_s * (.78)$$

Gross labor costs are calculated as:

$$glc = w_p\,(1 + sc_p)\,(1 + vac)\,(1 + \text{sales tax})$$

$$glc = w_p\,[1 + .077 + .025 + .025)]\,(1+ 0.04)\,(1 + .05) = w_p * 1.14$$

Germany

In Germany, social security contributions are shared between employers and employees (each paying 19% of the gross income for compulsory pension, unemployment and health insurance). In addition, employers have to cover 6 weeks of paid vacation (equivalent to 12% of the gross income). Social security contributions reduce the tax base in Germany, which is levied at 19% for a tax base between DM 5,600 and DM 8,150, and between 19 and 53% (continuously rising) for a tax base of between DM 8,150 and DM 120,000. For married couples an income-splitting system applies with double the tax brackets for a single. In other words, married couples are taxed at roughly half the rate as a single person with the same income. According to OECD estimates (OECD 1995, jobs study), a single-earner married couple pays less tax than a dual-earner married couple with the same income (the difference can be up to 8% for low-income couples where both partners have the same gross income). This effect is due to the inclusion of spouses without an income in social security. Thus, the German tax and contribution system inhibits incentives for married women not to work. Under German tax laws, social security payments are exempt from taxation. Paid vacation in Germany is about 6 weeks per year, i.e. one hour worked represents a value of the net wage times the vacation, which is about 12%.

The net wage is therefore calculated as:

$$w_{net} = w_s\ (1 - sc_s)\ (1 - t_s)\ (1 + vac)$$

$$w_{net} = w_s\ (1 - .35)\ (1 + .12) = w_s * .73$$

Gross labor costs are calculated as:

$$glc = w_p\ (1 + sc_p)\ (1 + vac)\ (1 + VAT)$$

$$glc = w_p\ (1 + .189)\ (1 + .12)\ (1 + .15) = w_p * 1.53$$

Wage-wedge function

The major difference in the wage-wedge function between the US and Germany is caused not so much by the opportunity costs as by the market equivalent costs. The wage-wedge function as displayed in Figure 1 was calculated as:

$$ww = \frac{w_{mean}}{w_p} * \frac{w_s}{w_{mean}} \frac{(1 - t_s)}{(1 + t_m + \mu)}$$

where $\frac{w_{mean}}{w_p}$ = 1.6 in both countries as derived from Freeman/Schettkat (1999), $\frac{w_s}{w_{mean}}$ is the individual wage divided by the mean wage, and the data above produces for the wedge $\left(\frac{(1-t_s)}{(1+t_m+\mu)}\right)$, a value of .68 for the US, and .48 for Germany.

Since the German social security system favors single-earner married couples, the decision to work may be influenced by the additional social security contributions, estimated to reduce the second income by about 6%. This is taken into account in the estimation by reducing 'ww' by 6% for married women in Germany $(ww*.94)$.

Appendix-Table 1: Income taxes and social security paid by employees as % of income

household type	income in % of APW income				income in % of APW income			
	66	100	133	200	66	100	133	200
	USA				Germany			
Single no kids	23.8	25.9	29.0	33.7	31.6	36.4	39.3	41.0
single-earner couple no child	18.8	22.5	24.4	26.9	25.0	29.8	32.3	32.4
single-earner couple 2 children	8.1	18.8	21.6	24.4	21.3	24.0	30.0	30.6
dual-earner couple no child	24.4	24.4	25.6	26.9	32.8	32.8	35.1	36.4
dual-earner couple 2 children	21.6	21.6	23.3	24.4	30.5	30.5	33.0	34.5

source: OECD 1995

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