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The incentive for working hard: explaining hours worked differences in the US and Germany

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Abstract

This paper seeks to explain the greater hours worked by Americans compared to Germans in terms of forward-looking labor supply responses to differences in earnings inequality between the countries. We argue that workers choose current hours of work to gain promotions and advance in the distribution of earnings. Since US earnings are more unequally distributed than German earnings, the same extra work pays off more in the US, generating more hours worked. Supporting this inequality–hours hypothesis, we show that in both countries hours worked is positively related to earnings inequality in cross-section occupational contrasts and that hours worked raises future wages and promotion prospects in longitudinal data. © 2001 Published by Elsevier Science B.V.

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1. Introduction

German employees work fewer hours over the year than American workers (OECD, 1997).[1] The difference in hours worked between Germans and Americans

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[1] The OECD estimates of US hours worked seem too high, given our analysis of CPS files, but even if we adjust the OECD figures downwards, Germans still work considerably fewer hours than Americans.

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developed in the past three decades. In 1970, Americans and Germans worked about the same number of hours per year, but between 1970 and 1997 Germans reduced their average annual hours worked per person in employment by 409 h while Americans raised their average annual hours slightly. Despite the huge difference in work time, moreover, surveys of desired work time show that Germans want to reduce their time at work while Americans want to increase their time at work (Bell and Freeman, 1995).

What explains this strikingly different allocation of time and desired allocation of time between persons in relatively similar advanced Western market economies?[2]

In Bell and Freeman (1995), we suggested that one reason for the difference in hours worked is that earnings inequality is considerably lower in Germany than in the US. The argument that greater inequality generates more hours worked rests on three relations: (1) that greater hours worked raises a worker's position in the percentile distribution of earnings, either because the person gets promoted more rapidly, avoids being laid off in recessions, or gains larger salary increases; (2) that current hours worked depends on the expected future earnings that the hours worked will generate; (3) that greater inequality in the distribution of earnings implies larger marginal changes in earnings from similar changes in a worker's position in the percentile distribution. The implication of these three factors is that, all else the same, workers in a country with a more unequal distribution of earnings like the US will have a higher return to hours worked than workers in a country with a more equal distribution of earnings like Germany, and will accordingly work more hours.

This paper examines this "inequality–hours" relation using longitudinal and cross-section data on hours worked and earnings within Germany and the US. We use inequality in earnings by **occupation** to measure the inequality that motivates work hours—persons in occupations with greater inequality in hourly pay are more likely, by our argument, to work long hours than workers in occupations with less inequality. We take as given the differences in inequality in earnings across countries and occupations. We use longitudinal data for individuals to examine the extent to which future earnings and the chance of promotion depend on current hours worked.

For Germany, we rely on the German Socio-Economic Panel (GSOEP) files for the period 1985–1995. These data are compiled and distributed through Syracuse University and Deutsches Institut fur Wirtschaftsforschung (DIW)-Berlin. We restrict our sample to West Germans. This gives us observations on approximately

[2] Germany is not the only country where hours worked differ greatly from US hours worked. Sweden and France also have relatively low hours worked and most EU countries show lower hours than the US. Germany is at one extreme and the US at the other extreme in hours worked and while annual hours are steady in the US they have been falling in Germany since 1970.

3000 persons over each of the 11 years of our data. For the US, we use data from the National Longitudinal Survey of Youth (NLSY) for the period 1989–1996. This is a relatively young sample of US workers—ages 24 to 39 over the sampled years and cohorts. The longitudinal aspect of the NLSY and GSOEP data allows us to examine directly the key relation between hours worked in one period of time and hourly wages in the future that underlies the analysis. In addition, both the GSOEP and NLSY data ask questions about promotion which allow us to measure the relationship between hours worked and promotion.

Our results support the view that labor supply decisions are forward looking and incentive driven and that the wage–inequality hypothesis helps explain the US–German difference in hours worked over the year. Specifically, we find that:

1. Longer hours worked in one period improves the wages of workers in the future in both the US and Germany, with a somewhat larger impact in the US; and also improves the actual (US) or perceived (German) promotion probability of workers.
2. Workers who are full-time or who work 20 h a week or more work more hours in occupations with higher wage inequality in both countries. In addition, hours worked generally rises with hourly earnings in an occupation.

Taken together, these findings support the contention that the difference in wage inequality between the US and Germany is a major factor underlying the difference in hours worked between the countries. Since we have not taken into account differences in the level of social safety nets or taxation—which should make dispersion of living standards associated with hourly pay smaller in Germany than dispersion in hourly pay itself—our analysis probably understates the effect of inequality in economic rewards on work time. If our thesis is correct, and inequality is positively associated with hours worked, it will not be possible for European Union countries to increase the dispersion of wages toward American levels without giving up their relatively low hours worked; nor for Americans to reduce their “workaholic” behavior without first narrowing the distribution of earnings.

2. Hours worked and desired hours worked

We begin with the phenomenon under study—hours worked and the desire for work in Germany and in the US.

Table 1 records weekly hours for German workers who work at least 5 h a week and the number of weekly hours they desire to work[3] from the GSOEP. Our

[3] The GSOEP contains data on scheduled (contractual) and actual hours. We use actual hours in our analysis.

Table 1
West German[a] workers at work: German actual and desired work hours (German GSOEP data from various years)

Year	All workers			Male workers			Female workers		
	Usual weekly hours	Desired weekly hours	Hours[b] surplus	Usual weekly hours	Desired weekly hours	Hours[b] surplus	Usual weekly hours	Desired weekly hours	Hours[b] surplus
1985	40.3	35.3	5.0	44.0	38.9	5.1	34.4	29.5	4.8
1990	39.5	35.1	4.4	42.9	38.2	4.7	34.4	30.4	3.9
1991	39.3	34.5	4.7	43.1	38.2	4.9	33.7	29.3	4.3
1992	39.1	34.7	4.4	42.9	38.3	4.6	33.6	29.6	4.0
1993	38.8	34.6	4.1	42.9	38.5	4.4	32.9	29.2	3.6
1994	38.6	34.8	3.7	42.8	38.4	4.3	32.6	29.8	2.9
1995	38.5	34.0	4.4	42.9	38.0	4.9	32.3	28.5	3.6

[a] Data are for West German workers with at least 5 h of work per week.
[b] This is calculated as weekly hours minus desired weekly hours as given response to the following question: "If you could chose the extent of your hours at work, taking into account that your earnings would change corresponding to the time, how many hours would you work?"

hours measure is taken from the GSOEP question on actual hours worked per week; it includes overtime hours and does not adjust for vacation and holiday time, which are major contributors to the lower hours worked in Germany.[4] The data covers the period 1985 to 1995. Desired hours worked data is taken from the following question:

> If you could choose the extent of your hours at work, taking into account that your earnings would change corresponding to the time, how many hours per week would you like to work?

The table shows a drop in hours worked for all German workers over the decade and for men and women workers taken separately. In addition, however, the table shows that desired hours worked are markedly below the actual hours worked in every year. This produces a large "hours surplus"—a gap between actual and desired hours. If we divide workers by their preferences for work time into three groups: (i) those wanting to do about the same work time (within the range of 4 h per week around their current schedule), (ii) those wanting to work four or more fewer hours per week, and (iii) those wanting four or more additional hours per week, the vast majority of Germans fall into the first two categories. Forty-six percent of Germans in the 1985–1995 pooled sample are roughly satisfied with their hours worked; 47% would prefer fewer hours; while only 7% report that they desire more work.

[4] Data on vacation time are frequently missing and poorly reported in the GSOEP and are not included in our analysis.

How do German preferences for hours worked compare to American preferences? To what extent does the lower hours worked in Germany reflect a desire for less work time?

To answer this question, we have gone to the International Social Survey Data (ISSP) Work Orientation Modules for the years 1989 and 1997. The ISSP is a cross-country survey of attitudes toward various issues of social import. Although each individual country is responsible for administering its own Work Orientation Module, the survey seeks to maintain comparability across countries both in questionnaire and in sample design. For this reason, it is arguably the best instrument for comparing attitudes among countries. The Work Orientation modules asked workers in Germany and the US (among other countries) about their actual and desired working experiences: "Think of the number of hours you work and the money that you make in your main job, including regular overtime. If you had only one of three choices, which of the following would you prefer: (1) Work longer hours and earn more money; (2) Work the same number of hours and earn the same money; (3) Work fewer hours and earn less money?"

By specifying that the individual's choice of hours will affect weekly or annual pay, this formulation makes responses readily interpretable in standard utility/choice theory. A worker who chooses fewer hours is not simply preferring something that is good—leisure—but rather is making a calculation of the benefits of this change versus the cost of lower weekly or annual take-home pay.

Table 2 compares German and US responses to the question on the desire for more or less work hours. In both 1989 and 1997, the majority of German and US workers said that they wanted to work the same number of hours and earn the same money. This is what we would expect if workers had sufficient flexibility that most were able to equate, at least roughly, the marginal disutility of work with their wages. But there is a striking difference in the deviations of workers from this central tendency. In both years, more US workers than Germans prefer longer to shorter work hours. The difference in the proportion who want to work longer

Table 2
German and US preferences for more or less work (ISSP data for 1989 and 1997)

Would you prefer:	More hours/ more pay	Same hours/ same pay	Less hours/ less pay
Germany, All Workers 1997	21.0	68.7	10.3
US, All Workers 1997	32.0	57.7	10.3
Germany, All Workers 1989	13.5	76.4	10.1
US, All Workers 1989	32.7	61.8	5.5

[a]Responses to the following question asked of workers in both countries: "Think of the number of hours you work and the money that you make in your main job, including regular overtime. If you had only one of three choices, which of the following would you prefer: (1) Work longer hours and earn more money; (2) Work the same number of hours and earn the same money; (3) Work fewer hours and earn less money?"

hours falls between 1989 and 1997 as an increasing proportion of Germans seek to work longer hours, but even so, in 1997 more Americans than Germans wanted to work more hours (the gap is 11 percentage points). This is despite the fact that Americans were already working longer hours per week (Bell and Freeman 1995, 1997; OECD, 1997). Moreover, the data suggests that the long US work hours have not quenched the urge to work hard since the same proportion of US workers report wanting additional hours of work at more pay in both years.

3. Variation in hours and wages

To examine the relation between earnings inequality and hours, we need variation in work hours and pay along some measurable units. As our unit of observation, we have taken occupations, on the notion that workers compete for promotions and earnings increases with persons in the same occupation rather than across occupational lines. We exhibit in Table 3 the key data for our analysis of variation in hours worked and in hourly earnings among occupations in Germany and in the US. The table gives the standard deviation of the ln of usual hours worked per week and the standard deviation of ln hourly earnings per week for all workers and for male workers separately.

Table 3
West German and US work hours and hourly wage variation[a] (GSOEP, 1985–1995; NLSY, 1989–1996; CPS Outgoing Rotation Group Files, 1985–1995)

Year	German GSOEP data				US NLSY data			
	Variation log usual hours		Variation log hourly wage		Variation log usual hours		Variation log hourly wage	
	All	Male	All	Male	All	Male	All	Male
1985	0.422	0.321	0.627	0.590				
1986	0.397	0.290	0.638	0.619				
1987	0.398	0.305	0.638	0.623				
1988	0.406	0.320	0.643	0.624				
1989	0.375	0.253	0.599	0.578	0.350	0.293	0.640	0.616
1990	0.384	0.284	0.586	0.552	0.344	0.276	0.695	0.682
1991	0.380	0.252	0.556	0.531	0.358	0.291	0.611	0.607
1992	0.383	0.254	0.538	0.511	0.349	0.290	0.635	0.636
1993	0.404	0.237	0.537	0.503	0.350	0.269	0.638	0.625
1994	0.405	0.260	0.514	0.483	0.328	0.257	0.588	0.585
1995	0.427	0.279	0.555	0.511				
1996					0.374	0.309	0.649	0.665

[a] For German and US workers reporting greater than or equal to five usual hours work per week and less than or equal to 90 usual hours work per week.
[b] Variation calculated as standard deviation in ln of usual hours.
[c] Variation calculated as standard deviation in ln of hourly earnings.

For Germany, the hours data consist of actual hours worked per week and specifically include overtime hours beyond the agreed working week. To compute hourly wages, we divide monthly gross income by hours worked per week times 4.3 (weeks per month). Because nearly 30% of Germans who work overtime self-report receiving compensatory time (lower hours in some other weeks) rather than overtime pay, there is some error in these imputed wage data. Similarly, the assumption that everyone works 4.3 weeks in the income period is likely to be erroneous, particularly for short-term or part-time workers. This suggests that there is considerable measurement error in our estimated hourly wages and a negative "ratio bias" correlation between hours worked and hourly pay, though not necessarily between measures of dispersion of wages and hours worked.

For the US, the hours data consist of usual hours worked per week at all jobs. The NLSY reports hourly earnings for hourly exempt employees. For workers who report weekly, monthly, or annual earnings, we divided reported earnings by the appropriate number of hours (using usual weekly hours and weeks worked). This produces a similar negative "ratio bias" correlation between hourly earnings and hours worked in the US data as well.

The table shows that there is considerable variation in work hours and hourly wages in the German GSOEP and US NLSY data. For both countries, the variation in hours worked is less than the variation in hourly wages. Among male workers, hours worked varies more in the US than in Germany but among all workers hours worked varies more in Germany. This reflects the greater use of part-time female workers in Germany than in the US. In the 1990s, about 30% of German women worked part-time compared to about 20% of US women (OECD, *Employment Outlook*, 1997, Table E). Since our analysis will be based on within-country relations, that we extrapolate to explain aggregate cross-country differences, we forego any detailed analysis of these differences. The variation in earnings is higher in the NLSY data for the US than in the German GSOEP data, consistent with the general finding that earnings inequality is higher in the US than in Germany.[5]

4. The inequality–hours hypothesis

Standard labor supply analyses link individual hours of work decisions to wages and non-labor income. Changes in market wages have an ambiguous effect on work time or effort because they embody both a substitution and income effect. Non-labor income has an unambiguous negative effect on hours worked. The

[5] We note that the variation in earnings in the US cross-sectional Current Population Survey Data (Bell and Freeman 1995, 1997) is not uniformly higher than the variation in the German GSOEP. The CPS dispersion figures are higher than the GSOEP dispersion figures for the 1990s but not for 1985–1989. We attribute this anomaly to the comparison of two different data sets and measurement error problems associated with the computation of hourly earnings in the GSOEP.

distribution of earnings, which lies at the heart of our proposed explanation for the difference in the hours of Germans and Americans, does not enter the standard labor supply decision in any obvious way.

But making inequality a key variable in labor supply analysis is consistent with many recent studies of the labor market. Analyses of incentive contracts and efficiency wages place great stress on the shape of the opportunities frontier facing workers and on the inequality in pay distribution. Indeed, the goal of these models is to find a contract (through piece rates, stock options, profit sharing or whatnot) that yields highly unequal rewards between desirable and undesirable acts. Tournament pay schemes link rewards directly to relative outcomes (Lazear and Rosen, 1981). These models show that inequality (potential inequality) in pay should affect work effort/hours, with the effect depending on the degree of inequality and the worker's relative risk aversion. Rat-race models (Landers et al., 1996) posit a relationship between current effort and future promotion/success that is driven by the unequal outcome in success versus failure.

Consistent with these models, the inequality–hours hypothesis posits that the best measure of incentives in a labor supply equation is not the current wage used in many empirical studies but the derivative of the lifetime income stream with respect to greater hours/effort. The key operating assumption linking work hours to inequality is the notion that pay inequality provides a good indicator or measure of that derivative. The work hours/effort of a worker raises his position in the earnings distribution in all settings, but the incentive is greater when the earnings distribution is wider, since in that situation the wage difference corresponding to a given change in the workers' percentile position in the earnings distribution will be greater. Expressed somewhat differently, the argument is that a mean-preserving spread of wages raises effort/hours. The effect of inequality on effort/hours presumes that there is considerable earnings mobility in the economy, with workers moving up or down the earnings distribution, a fact supported empirically for six major OECD countries (OECD, 1997).[6]

The application of the wage–inequality hypothesis to the difference in hours worked between Americans and Germans can be put simply in terms of the incentives facing two comparable workers, Hans and Hank. Hans works in Germany where pay differences within his firm and among firms is small, where job security is high, and where unemployment benefits and national health care produce a fairly high unemployment safety net. Hank works in the US where pay differences are high, where unemployment benefits are limited and of modest duration, and where job security is limited and loss of job threatens loss of health insurance. Hans and Hank have the same preferences toward work and leisure.

[6] The OECD Study used longitudinal data for both Germany (GSOEP) and the US (PSID) and found similar overall levels of mobility between countries. The OECD study suggests a higher degree of mobility within sex, age, education, and occupational cells than the German data.

Who will work more hours or put in more effort? If Hans does not work all that hard, he may not be promoted or be given a pay increase, but this will not greatly affect his living standard. If Hank does not put in the hours and effort, he may lose his job or fall in a very wide wage distribution. But if he works hard, he may be rewarded by great increases in pay. So Hank works more than Hans does. This is the inequality–hours hypothesis.

The inequality–hours hypothesis does not, we note, make any normative statement about the observed levels of inequality or hours worked. Greater inequality may generate more hours or effort, as we argue, but the additional hours induced by these incentives could be "excessive hours", per signaling models of labour market behaviour where labor markets are imperfect or information is asymmetric. The Hanks of the world might be happier working fewer hours, but may feel pressure to put in long hours because working long hours is the most significant way to signal that you are a good worker. Such a situation would be inefficient in that it would result in reduced "consumer surplus" from work (see Landers et al. (1996) for a discussion of this type of rat race for US lawyers), with perhaps a less socially valuable increase in output.

On the other hand, greater inequality that leads to greater effort could produce higher levels of income for all workers and a more rapidly rising level of productivity. Incentive models of pay focus on the problem faced by the employer in determining the incentive structure (i.e. level of inequality) to encourage effort and hours worked, but the resultant incentive pay structure must make some workers better off than a more egalitarian wage structure or it would not persist in a competitive economy. Inequality that induces more work effort can thus benefit the entire society.

But nothing in our analysis allows us to judge whether the US level of inequality is at a socially desirable level for generating work, or is too high (or, less likely too low); or similarly whether the German level of inequality is at a socially desirable level or is too low (or high). The inequality–hours hypothesis simply links the two outcomes together. It predicts that you could not have US level wage inequality and German hours or German wage inequality and US hours.

5. Structure of the analysis

To test whether inequality of pay induces greater hours worked in the GSOEP and NLSY files, we group workers into categories of non-competing markets and estimate the dispersion of pay for those categories. Ideally, the categorization would reflect "exogenous" variation in earnings inequality, due, say, to the nature of work or different modes of compensation for the groups. In this study, we take the observed variation for defined occupational groups. We use 78 occupation cells in the GSOEP files and 42 two-digit occupation cells in the NLSY files, eliminating agricultural and non-civilian occupations.[7] We calculate the standard deviation of ln hourly earnings for each of these cells in each year and then regress the mean of the distribution of ln hours worked in an occupation in each year on the mean and standard deviation of the distribution of ln wages in the occupation in each year:

$$\ln H_o = a\,\sigma \ln W_o + b \ln W_o + u_o \tag{1}$$

where $\ln H_o$ is the mean of ln weekly hours worked in an occupation cell; $\sigma \ln W_o$ is the standard deviation of ln hourly earnings; and $\ln W_o$ is the mean of the natural log of hourly earnings; and where u is an error term that we postulate is uncorrelated with the mean and standard deviation of earnings. The o subscript relates to occupation.

This equation links the first moment of the hours distribution to the first and second moments of the earnings distribution. The key coefficient for our purposes is the term that relates hours worked to inequality of pay. If our analysis is correct, this coefficient will be positive. By contrast, our model has little to say about the coefficient on the level of wages, although it would complement our argument if it were positive so that there was a strong substitution effect linking pay to hours.

Eq. (1) makes occupation the unit of observation. Since occupations provide the variation in the data that generates the measure of inequality, it is natural to organize the data by occupations. In addition, by averaging data by occupations, we have eliminated the ratio bias problem that affects individual labor supply analyses where the wage rate is obtained by dividing weekly or monthly earnings by weekly or monthly hours worked. Since mismeasurement of any variable in a regression is likely to bias the estimated coefficients of other (correlated) variables, this problem could affect the coefficient on the inequality term in which we are interested. But since much of the labor supply literature examines individuals rather than occupations, we also estimate Eq. (2), given as:

$$\ln H_i = a\,\sigma \ln W_{io} + b \ln W_i + c Z_i + u_i \tag{2}$$

where the i subscript refers to the individual, and where Z refers to specific individual characteristics.

The measure of inequality in Eq. (2) is still the wage in the occupation in which individual i works but wage and hours now vary among persons within an occupation. This procedure allows us to control for other individual factors that

[7] The alternative would be to use CPS occupational codes at the three-digit level. These cells are far more detailed than either the German occupational cells and are probably too specific to measure the individual's labour market that we want to capture.

might affect hours worked, but the key explanatory variable remains the measure of inequality by occupation.

6. Inequality–hours regressions

6.1. Analysis by occupation

Table 4 presents our primary analysis of the relation between inequality of earnings and hours worked among occupations in Germany and the US for three groups of workers—all workers, those who work more than 20 h per week, and those who work more than 35 hours. We present this analysis for all workers and for male workers as a separate group. The regressions are based on a pooled sample of 10 years of German data and 7 years of US data. The mean hours worked within an occupation, mean occupational earnings and the standard deviation of occupational earnings are calculated for each year, and thus vary over time as well as across occupations. However, since we want to focus on potentially long-term cross-section differences among occupations rather than year-to-year variation, we include year dummy variables in each regression. The estimated coefficients are thus an average cross-section effect across the years.

Columns 1–6 of the table record the coefficients on the mean and standard deviation of ln hourly earnings distribution for German workers. The coefficient on the inequality of earnings variable is insignificant positive for the entire sample and insignificant negative for the sample of all male workers, but the coefficient becomes positive and significant when the samples are restricted to workers who work more than 20 h—that is when we eliminate part-timers who arguably will not have the same long-term career motivation as full-time workers. The coefficient on the level of hourly earnings is also positive in these regressions. For workers working full-time (more than 35 + h) the estimated effect on hours of a change in inequality is two to three times as large as the effect of the mean of hourly earnings.

Columns 6–12 present the results of similar calculations for the US NLSY for the period 1989–1996, again pooling the data across the 7 years of data and adding year dummy terms. The results are similar to those for Germany. The relationship between the standard deviation in hourly earnings and mean hours worked by occupation is weak among all workers but becomes strong as we limit the sample to include workers who work only greater than 20 or greater than 35 h per week. And, as with the German calculations, the coefficient on the standard deviation of earnings is larger than that on mean of earnings for workers reporting at least 20 h of usual work per week. It is smaller though positive for all workers.

There are several possible reasons why inclusion of workers who work relatively few hours weakens the inequality–hours relation that stands out for full-time workers. As noted, part-timers may not be attached to the occupation so

Table 4
Work hours and earnings inequality regressions at the occupation level for West German and US workers[a] (GSOEP Merged Files for Germany, 1985–1995; NLSY Merged Files for US, 1989–1996)

Independent variables	All German workers			Male German workers			All US workers			Male US workers		
	(1) All	(2) 20+ h	(3) 35+ h	(4) all male	(5) male 20+ h	(6) male 35+ h	(7) all	(8) 20+ h	(9) 35+ h	(10) all male	(11) male 20+ h	(12) male 35+ h
Std. ln Hourly	0.032	0.124	0.096	−0.026	0.087	0.103	0.069	0.118	0.127	0.021	0.077	0.071
Earnings	(0.034)	(0.024)	(0.017)	(0.022)	(0.019)	(0.019)	(0.035)	(0.023)	(0.017)	(0.023)	(0.020)	(0.016)
Mean ln Hourly	0.158	0.144	0.045	−0.032	0.012	0.032	0.176	0.093	0.025	0.079	0.068	0.038
Earnings	(0.020)	(0.014)	(0.011)	(0.016)	(0.014)	(0.013)	(0.021)	(0.012)	(0.009)	(0.017)	(0.014)	(0.011)
R^2	0.073	0.130	0.046	0.001	0.026	0.042	0.178	0.168	0.165	0.090	0.099	0.070
N	762	752	741	672	669	665	322	322	322	318	318	316

All regressions include year dummies.
Dependent variable: mean of ln weekly hours in detailed occupation cell (mean of hours, wages, and standard deviation of wages calculated across a maximum of 78 occupational cells in each of 10 years of data in Germany, and across a maximum of 42 occupational cells in each of 7 years of data in US).

[a] Data are for West German and US non-farm civilian workers with greater than 5 and less than 90 h of work per week.

that the inequality measure does not reflect well the incentives facing them. Part-timers are also more likely to be motivated by different factors than advancing in their careers, for example, working part-time because of child-care or other responsibilities. In any case, we find the anticipated relation solely among workers who work 20 or more hours. As the excluded group constitutes only 5% of the German sample and 4.5% of the US sample, the inequality–hours model fits the pattern of behavior for the vast bulk of the West German and US work force and for the group in both countries with the strongest labor force attachment.

While our hours–inequality argument does not require that the link between earnings inequality and hours worked in the two countries be similar, the hypothesis offers a much cleaner interpretation of US–German differences if this were to be the case. Comparing the coefficients on the inequality measures in the two countries, we find that the pattern of supply response to inequality (assuming that is the correct interpretation of these relations) is in fact quite similar between the countries.

6.2. *Individual level analysis*

We turn next from grouped occupation data to explore the link between inequality and hours worked using data for *individuals* who work 20 or more hours. In these calculations each individual is given one occupation level variable —the standard deviation of ln hourly earnings—and his/her own estimated hourly earnings.

Table 5 gives our results for Germany and the US. In the odd-numbered columns, we estimate a model analogous to the regressions for occupation averages, with no other covariates, for all workers and for men separately. Estimated standard errors are robust and corrected for the grouped structure that can lead to correlated errors within groups (Moulton, 1986). In all even-numbered columns, we add controls for education and marital status (and sex in the all workers regression). Note that the standard deviation of ln wages in the occupation cells is calculated in each year.

The first four columns give the German results. The standard deviation measure has a positive significant effect on hours worked in the all worker German sample, but is insignificant in the male only sample. The hourly earnings variable obtains a negative effect in three of the four columns, presumably reflecting the effect of ratio bias upon inclusion of key determinants of the permanent component of wages.

Columns 5–8 of the table present the analysis for the US. Both the hourly earnings and standard deviation of ln wages in the occupation cells obtain positive and sizeable coefficients. The coefficient on the standard deviation of ln pay on hours worked is significantly greater in the US regressions than in the German regressions. These results suggest that US workers may be more responsive to the

Table 5
Work hours and earnings inequality regressions at the individual level. Individual level data for West German and US workers[a] (GSOEP Pooled Data for Germany, 1985–1995; NLSY Pooled Data for US 1989–1996)

Independent variables	All German workers		Male German workers		All US workers		Male US workers	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
ln of hourly earnings	0.033 (0.005)	−0.017 (0.005)	−0.004 (0.005)	−0.023 (0.006)	0.034 (0.003)	0.012 (0.003)	0.014 (0.003)	0.007 (0.004)
Standard deviation of ln wage in occupation cell[b]	0.078 (0.011)	0.066 (0.017)	0.013 (0.017)	0.018 (0.017)	0.170 (0.020)	0.139 (0.019)	0.225 (0.027)	0.216 (0.026)
Educational controls[c]		YES		YES		YES		YES
Female dummy		−0.211 (0.007)				−0.119 (0.003)		
Married dummy		−0.039 (0.006)		0.040 (0.006)		−0.009 (0.002)		−0.022 (0.003)
N	25,441	25,441	16,501	16,501	50,368	50,368	27,195	27,195
R^2	0.008	0.184	0.004	0.018	0.016	0.084	0.016	0.022

All regressions include year dummies.
Dependent variable: ln usual weekly hours.

[a] West German and US non-farm civilian workers with greater than or equal to 20 and less than or equal to 90 h of work per week.

[b] Standard deviation of wages calculated across a maximum of 78 occupational cells in each of 10 years of German data and across a maximum of 42 occupational cells in each of 7 years of US data.

[c] Categorical Education Dummy Variables given for US as: (1) less than high school; (2) some high school; (3) high school graduate; (4) some college; (5) college graduate; (6) post-college education, for US. Education Dummy Variables for Germany are: (1) no school degree; (2) secondary-school degree; (3) non-classified degree; (4) technical degree; (5) high school degree; (6) other degree.

incentive component of wage variation than their West German counterparts, in contrast to the occupation-level regressions, which showed a similar level of response in the two countries.[8]

7. The pay-off to more hours worked

At the heart of the inequality–hours hypothesis is the claim that labor supply decisions are forward looking—that workers choose hours today to improve their promotion and employment position and to win larger wage and salary increases in the future. It is this claim that motivates the use of measures of inequality as explanatory factors in the hours equation. Thus far, however, we have not examined whether working more hours today in fact improves the position of workers in the distribution of earnings in the future. A direct way to test this interpretation would be to ask workers about their perceptions of the marginal payoff of working long hours—something like "If you work more (less) hours this year, what do you think will happen to your earnings (promotion possibilities) in the future?" and then to use these subjective estimated returns as independent explanatory variables in an hours equation. The virtue of this procedure would be that it would provide estimates of marginal returns to hours worked by individual, which would presumably be more accurate than our occupation-level measures of dispersion of earnings.

The 1989 and 1997 ISSP surveys do not ask the precise question that we would like but do provide some evidence for the claim that differences in effort are likely to produce greater income differences for Americans than for Germans. The 1989 survey asked workers whether the quality of their work was important in determining pay. Eighty-seven percent of American workers said it was important compared to 47% of German workers. And those Americans who thought that the quality of their work was important in determining their pay were more likely to want to work harder (Bell and Freeman, 1997). The 1997 ISSP survey asked a different question: how important quality *should be* for determining pay. In this case, 49% of US workers said it should be essential compared to 38% of German workers. Finally, the 1997 ISSP data show that US workers are more likely to

[8] It is of course true that inequality may turn into a disincentive to work hard if it is accompanied by distributional rigidity (Hart, 1983). Evidence from the OECD (1997) suggests that this is not a factor, and regressions presented in this paper using promotion suggest the same. Similarly, we have evaluated the mean individual level variation in hourly earnings and hours worked in the two data sets. Earnings mobility would imply a relatively high degree of variation in individual earnings over time in both data sets. Indeed, individual earnings variation is significant in both countries—in magnitude greater than 1/3 the overall variation from Table 3 for both the German and US samples.

believe that their opportunity for advancement in their current job is high (31%) than German workers (19%).

7.1. Earnings

As neither the GSOEP nor NLSY asked this type of more qualitative questions, we employ a different strategy to test the link between the hours that individuals work and future earnings. We exploit the longitudinal aspect of these data sets to examine whether in fact workers who work longer hours in one period of time obtain higher earnings in the future. Assuming that expectations reflect reality at least crudely, such a relationship is a necessary component of our argument, although it is not sufficient to establish the inequality–hours hypothesis, since even with this relationship, some other factor that we have not explored might be a more important determinant of differences in hours worked. In any case, we have examined the link between hours worked in one period of time on earnings in a future period, conditioning on earnings in the early period and other covariates. Our specification is:

$$\ln W_i = a + b \ln H_{-1,i} + c \ln W_{-1,i} + Z_i \tag{3}$$

where W is the individual's average hourly earnings in the most recent year of data (1995 for Germany and 1996 for the US); ln H_{-1} is the individuals average of hours worked in a past years (1989–1993 in the US and German data); ln W_{-1} is the individuals average earnings in past years (1989–1993); and Z_i is a vector of covariates.

Table 6 shows the results of these calculations for German and US workers from the two longitudinal data sets. Columns 1–4 record estimates of the effect of average hours worked in past years on ln hourly earnings in 1995 in Germany under differing specifications. Columns 5–7 give results from regressions of ln hourly earnings in 1996 on average hours worked in the US.[9]

All of the computations show a strong link between past hours worked and current wages. Workers who worked more hours in 1989–1993 had significantly higher wages in 1995 or 1996. The magnitude of the coefficient on hours is, moreover, similar between countries, which implies that all else the same, an increase in hours worked in Germany has about the same impact on earnings as in the US. But not all else is the same in the regressions: the coefficients on lagged earnings are markedly higher in the US than in Germany, suggesting that once US workers get on a wage trajectory they gain more over time.[10] In addition, the

[9] All results for Germany are robust to specifications that include only age-comparable (ages 24–39) German workers.

[10] An approximation of the lagged effect of hours worked on wages is the coefficient on past hours worked divided by one minus the coefficient on past wages. This coefficient is larger for the US.

Table 6
The effect of hours worked in the past on current hourly earnings. NLSY data for US workers and GSOEP data for German workers[a]

Independent variables	German workers				US workers		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Average ln hours 1989–1993	0.149 (0.022)	0.106 (0.023)	0.091 (0.025)	0.070 (0.038)	0.136 (0.019)	0.111 (0.019)	0.105 (0.019)
Average ln hourly earnings 1989–1993	0.640 (0.015)	0.587 (0.018)	0.538 (0.019)	0.598 (0.030)	0.768 (0.012)	0.649 (0.012)	0.622 (0.013)
Promotion variable[b]				−0.017 (0.029)		0.081 (0.011)	0.079 (0.011)
Ln tenure with current employer		−0.002 (0.009)	−0.003 (0.009)	−0.035 (0.014)		0.048 (0.004)	0.045 (0.005)
Female dummy		−0.097 (0.019)	−0.088 (0.022)	−0.082 (0.033)		−0.038 (0.012)	−0.025 (0.013)
Married dummy		−0.002 (0.017)	−0.004 (0.018)	0.023 (0.027)		0.052 (0.012)	0.051 (0.012)
Educational controls[c]		YES	YES	YES		YES	YES
Occupation dummy			YES	YES			YES
Industry dummy			YES	YES			YES
N	2015	1948	1948	954	7142	6872	6872
Adjusted R^2	0.502	0.546	0.564	0.576	0.420	0.466	0.481

Dependent variable: ln hourly earnings, 1996 (US) or 1995 (Germany).

[a]All German and US workers with reported hours in one or more years 1989–1993 and 1995 (Germany) or 1996 (US). West German and US workers with weekly hours of work greater than or equal to 5 and less than or equal to 90.

[b]In Germany, workers were asked whether they will likely be promoted in 1993. In the US, workers were asked whether they were promoted in 1996.

[c]Categorical Education Dummy Variables given for US as: (1) less than high school; (2) some high school; (3) high school graduate; (4) some college; (5) college graduate; (6) post-college education, for US. Education Dummy Variables for Germany are: (1) no school degree; (2) secondary-school degree; (3) non-classified degree; (4) technical degree; (5) high school degree; (6) other degree.

estimates for Germany were less robust to modest changes in specification than the estimates for the US.[11]

How large is this estimated effect of hours worked on future hourly earnings? For the US the effect is substantial. Assume an average person in the US works 2000 h per year. With an elasticity of future wages to hours of about 0.10 an increase in hours by 10% to 2200 per year would lead to a 1% increase in future wages, even if we do not trace out the impact through the lagged wage term in the equation. This is a fairly high return if we consider that an additional year of full-time schooling increases earnings by around 5% in the US. While it is hard to assess how many hours students work at their studies, they probably spend about 1000 h a year studying (15 h a week in class and 15 h of homework in a college year of 30 weeks). This comparison suggests that working an extra hour pays off as much or more than an extra hour of schooling.

7.2. Promotions

The hours–inequality hypothesis also predicts that past hours worked should increase promotions. The GSOEP and NLSY allow us to investigate this prediction using somewhat different questions. The GSOEP asked German workers in 1993 to predict the likelihood of their receiving a promotion in their current job. We coded respondents who said that they were certain or likely to receive a promotion as one and coded those unlikely to get a promotion as zero. Twenty percent of German workers expected a promotion in the future. The 1996 NLSY asked workers whether they had been promoted in their current job in the last 2 years. We coded workers who had been promoted in the past 2 years as one and gave the others a zero. Ten percent of American workers reported having had a promotion in their current job in the last 2 years. The difference in the two questions allows us to evaluate the consequences of hours worked on workers perceptions about promotion (Germany) and the consequences of past hours on actual promotion. (US).

Table 7 presents the results, from a logistic analysis of the dichotomous promotion variables. The odd-numbered columns include only past hours worked and past hourly wages. The even-numbered columns give results with the inclusion of the specified covariates. The specifications for Germany and the US are somewhat different, because of differences in covariates in the two surveys. The table gives two sets of coefficients for each calculation. First, we report the

[11] The calculations for German males produced results that were sensitive to lag specification. For example, the 1989–1993 lag and its effect on current 1995 wages led to insignificant albeit positive coefficients on past hours worked for German men, but a longer lag structure of 1985–1990 produced positive and significant coefficients on past hours worked in all specifications that exceeded the magnitude of the impact for workers overall. The US results were robust to changes in lag structure and specification of group in all cases.

Table 7
The effect of hours worked in the past on the probability of promotion. NLSY Data for US Workers[a], GSOEP Data for German Workers[a]

Independent variables	German workers				US workers			
	(1)	(1′)	(2)	(2′)	(3)	(3′)	(4)	(4′)
Average ln hours 1989–1993	0.606 (0.098)	0.162 (0.026)	0.360 (0.109)	0.093 (0.028)	0.187 (0.052)	0.037 (0.010)	0.183 (0.056)	0.035 (0.011)
Average ln hourly earnings 1989–1993	−0.209 (0.057)	−0.056 (0.015)	−0.287 (0.067)	−0.074 (0.017)	0.135 (0.029)	0.027 (0.006)	0.030 (0.035)	0.006 (0.007)
Educational controls[b]			YES	YES				
ln AFQT test percentile							0.067 (0.020)	0.013 (0.004)
Female dummy			−0.417 (0.074)	−0.103 (0.017)			−0.030 (0.037)	−0.006 (0.007)
Married dummy			−0.217 (0.068)	−0.058 (0.018)			0.236 (0.036)	0.046 (0.007)
N	2427		2427		10,082		9588	
Log likelihood	−1162.2		−1114.5		−3670.4		−3402.7	

Dependent variable US: = 1 if individual received a promotion in main job since last interview year, 1996; = 0 otherwise.
Dependent variable Germany: = 1 if individual indicated that they expect a promotion in 1993; = 0 otherwise.

[a]All US and German workers with reported hours in one or more of years 1989–1993 and in 1995 (Germany) or 1996 (US). West German and US workers with weekly hours of work greater than or equal to 5 and less than or equal to 90.

[b]Categorical Education Dummy Variables given for US as: (1) less than high school; (2) some high school; (3) high school graduate; (4) some college; (5) college graduate; (6) post-college education, for US. Education Dummy Variables for Germany are: (1) no school degree; (2) secondary-school degree; (3) non-classified degree; (4) technical degree; (5) high school degree; (6) other degree.

estimated logistic coefficients and their standard errors. Then in the column with primes above the number, we give the probability of the promotion evaluated at the mean characteristics of worker, from the same logistic equation.

The results for Germany support our model strongly. In both calculations, workers were more likely to expect a promotion at their current job if they put in long hours in the past and if they had lower than average base wages, presumably reflecting some form of regression to mean phenomena. The link between promotion expectations and past effort is consistent with the hours–inequality hypothesis, and suggests that German workers anticipate that more hours worked will indeed pay off for them at their workplace.

The US results, where workers were asked about actual promotion in their current job in the last 2 years, also support our model. The impact of past hours on the chance of promotion is smaller in the US than in Germany, but in the US there is an incremental positive effect of past earnings on promotion that precludes direct comparisons of the coefficients. If good workers are good workers over a lifetime of work, then the likelihood of promotion today should be positively linked both to past wages as well as past hours since past wages are cumulative and based on preceding events. In sum, the estimates suggest that 10% more hours worked in the past leads to 4% greater probability of promotion today.

8. Conclusion

This paper has documented that greater inequality in pay among occupations is associated with greater hours worked for all but part-time workers in the US and Germany. It has also shown that greater hours worked raises future earnings and raises the likelihood of promotions or perceived likelihood of promotions. Both of these results are consistent with the argument that greater inequality generates additional hours worked, but they do not prove that this is the correct interpretation of the observed empirical patterns. To judge how much weight we should put on the inequality–hours interpretation, it is necessary to compare it to other possible reasons for the observed correlations.

One alternative interpretation of the link between the dispersion of wages and hours worked is that it reflects some form of measurement error. Random measurement error in hours worked produces a bias in the estimated correlation between wages and hours at the individual level, but it has no clear effect on the relation between occupation means, much less between the level of hours and the dispersion of earnings. We therefore doubt that our results reflect measurement error. Still, there remain measurement problems—we have taken the variance of the ln of earnings as our indicator of inequality but have not examined residual variances that control for various characteristics of workers within occupation. Given the usual relatively low explanatory power of the ln earnings equation generally, we doubt that forming residual variances would affect the results substantively.

Another possibility is that the results reflect more employer behaviour than labour supply behaviour. If, as seems reasonable, the more hours someone works allows a supervisor to judge better the quality of their activity, firms will have greater information about workers who put in more hours and thus will be more able to differentiate their pay. This scenario does not deny that supply is responding to inequality but complicates the relationship, much as signaling models of information and schooling lead to more complicated stories about labor market effects of schooling. If workers know that their supervisors will be better able to judge them if they work more hours, then the better workers will work more hours while the less able workers will work fewer hours. Hours worked will still be positively associated with higher earnings and promotions and greater inequality will induce more hours from more able workers, but not from less able workers. This line of analysis suggests that the dispersion of hours as well as the level of hours will be affected by earnings inequality. It is also conceivable that the cross-occupation results may reflect some link between risk preferences and work attitudes—those who choose occupations with greater variances in pay could be less risk-averse, which may in turn be related to their desire to work more hours.

There are two competing explanations for the work hours–future earnings/promotion results shown in Tables 6 and 7—incentive/tournament models, which underlie our labor supply interpretation, and human capital models, in which hours worked are an investment in future earnings.[12] We believe that the link is more likely a tournament/incentive effect than a human capital effect, but need new information from different sources to differentiate the two effects. Our support of the tournament/incentive model is based on the following. While the link between past hours worked and current wages is consistent with both incentive and human capital explanations, the results for promotion and those linking work effort/hours to wage inequality are not. Human capital theory would not necessarily produce a link between the probability of promotion and effort, but incentive/tournament models do. Similarly, human capital theory would not predict a link between hours worked and wage inequality, but incentive/tournament models are built on this link.

In sum, the empirical evidence offered here on the link between inequality of earnings and hours worked and between hours worked and future earnings seems to best fit the hours–inequality hypothesis and the incentive/tournament view of the determination of hours. This in turn supports the view that labor supply behavior should be analyzed in a more dynamic model that incorporates worker's

[12] A third possibility is that the relationship we are finding is spurious—people who put in more hours are better workers (higher ability) in ways that we cannot control for.

expected future return for current hours worked into the desire to work more or less hours today. If our analysis of the cross-section and longitudinal data within countries is correct, moreover, we have a relatively clean explanation for the phenomena which motivated our study: the cross country difference in hours worked in Germany and in the US. Put simply, our analysis suggests that the lower hours worked in Germany than in the US is not an isolated fact about German and US behavior, but rather is part of the difference between economies with very different levels of dispersion of earnings.

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