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THE TIMING OF LABOR DEMAND

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Abstract

We examine the timing of firms' operations in a formal model of labor demand. Merging a variety of data sets from Portugal from 1995-2004, we describe temporal patterns of firms' demand for labor and estimate production-functions and relative labor-demand equations. The results demonstrate the existence of substitution of employment across times of the day/week and show that legislated penalties for work at irregular hours induce firms to alter their operating schedules. The results suggest a role for such penalties in an unregulated labor market, such as the United States, in which unusually large fractions of work are performed at night and on weekends.

Keywords: Labor demand; time use; wage penalty
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I. Introduction

The effect of labor costs on the number of workers that firms seek to employ and the intensity with which those workers are employed is one of the most-studied subjects in labor economics. The theory has proceeded from the theory of production to examining profit-maximizing behavior in the face of per-hour and per-worker costs that are assumed to be exogenous to the firm. Implicit in the entire literature are "t" subscripts—labor-demand functions and production functions are defined over particular intervals of time during which the factor inputs are assumed to be productive. While every economist knows that, with almost no exceptions (but see Stafford, 1980, and more broadly Winston, 1982) the theoretical discussion has treated time units as if they are all the same—one hour, or one week of labor inputs is the same regardless of the time of day or week of the year when it occurs.

Hours of the day are not the same to workers. In a relatively unregulated labor market like that in the United States, we observe, as one would expect from the hedonic model (Rosen, 1974), that those individuals performing work at unusual times (nights and weekends) tend to have relatively little human capital, and are workers for whom the attraction of a market-generated compensating wage differential makes work at these times relatively attractive (Hamermesh, 1999b). We may infer from the wage premium and the characteristics of workers observed on the job at different times that the timing of work matters to workers. Indeed, many countries impose wage penalties in the form of mandatory premium pay on worker-hours that are utilized outside of what are deemed to be standard hours. These are quite different from the overtime penalties that many countries also assess on total hours (usual weekly) that an employee works beyond a standard amount. Our focus here is thus on the timing of labor inputs, not their quantity.

Absent differences in input prices arising from workers' preferences and/or government mandates, employers' labor demand will vary hebdomadally. Some firms face greater product demand, and a greater derived labor demand, on weekends (e.g., golf clubs), while others may find their customers offering higher prices late on weekday evenings (e.g., take-out restaurants serving Wall Street law firms). For this reason any study of the demand for labor in time must account as carefully as the data allow for inter-firm differences in work-timing resulting from heterogeneity in the temporal pattern of product demand.

The most likely reason why there have, to our knowledge, been literally no formal analyses of the general question and of labor-market policies affecting high-frequency temporal differences in work-timing has been the complete absence of data that would allow examining these issues. Fortunately a variety of firm-level surveys conducted in Portugal can be combined to study the issue, with the crucial data set being one that shows the number of workers on the job at each hour of the week.

In what follows we therefore first outline the nature of legislative mandates on work-timing in a number of countries and in Portugal. We then describe the Portuguese data, discuss how we select the samples to use in the estimation and describe some broad patterns of time use across the week. In Section IV we discuss the models that we estimate—production tableaux and relative labor-demand equations—and describe how they can be used to generate estimates of the relevant parameters. Section V presents the estimates of these structural equations; as an interesting by-product it also examines how the impacts of various demographic differences on a firm's sales compare to estimates of their effects on wages. Section VI presents a few policy simulations using these estimates.

II. The Regulation of Work Timing

Work outside daytime weekday hours, especially night work, has long attracted regulatory attention. The International Labor Organization (ILO) alone has devoted eight conventions to night work, especially that performed by women and younger workers. The regulation of night work is typically justified on the grounds of concerns with workers' health, although their ability to meet family and social responsibilities is also a concern. Accordingly, most rules addressing the issue are targeted at night workers' health conditions and at the specification of workers' rights to being transferred to a similar daytime job if they are, for reasons of health, seen as unfit for night work. Existing rules also often call for compensation for night work, either in the form of a compensatory rest period or additional pay. ILO Convention No. 171, for example, calls for various benefits that recognize the "nature of night work." Many European nations and Japan (as well as many less developed countries) have followed this and similar recommendations and passed legislation that sets specific rules about the compensation of night workers.

Table 1 describes rules on night and weekend work in a number of developed countries and makes the point that wage penalties mandated on employers of night workers are of interest to many nations. In many more countries than Table 1 suggests, especially in Europe, night work is addressed by collective agreements rather than legislatively. For example, a survey of collective bargaining covering Spanish firms shows that 49 percent of collective agreements establish a specific pay rate for night work that is on average 23 percent above the pay rate for similar daytime work.[1]

Portuguese legislation, while allowing employers to organize working time as they see fit, sets a number of rules that may condition the timing of economic activity and whose impact is the focus of this study.[2] The duration of work is set by collective agreement, but the law stipulates the maximum length of both the workday (8 hours) and the workweek (40 hours), with these limits extendable up to 10 hours per day and 50 hours per week. Overtime work is permitted in cases of an exceptional workload or if there is the risk of an imminent economic loss by the firm, but even then it is limited to a maximum of 200 hours per year.[3] An overtime pay premium is due, varying from 50 to 100 percent of the straight-time wage rate depending on the number of consecutive overtime hours.

All night work (defined in 2003 as work performed between 8PM and 7AM) carries a wage penalty of 25 percent (DL 409/71, art. 30). A number of health and safety regulations, including mandatory regular medical check-ups especially designed for night workers, are also in place. Regular night work may or may not be integrated into a shift-work system. That

[1]Conducted by the *Confederación Española de Organizaciones Empresariales* (Eironline, 2003).

[2]The regulatory framework described in this section was in effect at the time the data used in the empirical part were collected (May 2003). In December 2003, the Portuguese Labor Law was heavily modified. Very unfortunately, no survey on the timing of work in firms has been conducted since the legislative changes occurred.

[3]By contrast, in 2007 in the U.S. the average worker in manufacturing worked 4.2 hours of overtime in a typical week (*Economic Report of the President*, 2008), which could not, given the annual maximum, have occurred in Portugal for any worker.

is likely to be the usual case, as the law also establishes that a shift system has to be organized whenever the length of the operating period exceeds the normal period of work. Work on weekends is also subject to a number of rules, as Saturday and Sunday are the default mandatory weekly rest days. The corresponding wage penalty is not set by law, but collective bargaining can and usually does stipulate one.[4]

It makes sense to consider four different pay regimes, each corresponding to work done at different times: Regular hours, 7AM-8PM Monday-Friday, with no wage penalty; night weekday hours, 8PM–7AM Monday-Friday, penalized 25 percent; daytime hours on weekends, 7AM-8PM Saturday and Sunday, penalized varying from 0 to 100 percent; and night weekend hours, 8PM-7AM Saturday and Sunday, penalized varying from 25 to 150 percent.[5]

III. Data, Concepts and Descriptive Statistics

A. Creating the Data Set

The data used in this study come from three sources: *Quadros de Pessoal* (henceforth *QP*) (Personnel Records)[6]; an Annex to the Portuguese contribution to the *European Union Company Survey of Operating Hours and Working Times and Employment* (*EUCOWE*); and the *Employment Survey (ES).*

The *QP* is an administrative matched employer-employee data set collected by the Portuguese Ministry of Employment. Reporting is mandatory for all employers with at least one wage-earner, excluding public administration and domestic work. It is thus basically a census of the private sector. The data refer to one reference week in October and include the worker’s wage (split into several components), age, gender, schooling, occupation, tenure,

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[4]Although this is by no means a general rule, since weekend hours are by no means necessarily overtime hours, the overtime pay premium for weekend work (100 percent) puts a *de facto* cap on what collective bargaining rules will stipulate. The absence of a unique well-defined penalty for work at any given time is analogous to the frequent absence of a well-defined overtime penalty noted for the U.K. by Hart and Ruffell (1993).

[5]The exact starting and ending hours of night work may be set differently by collective agreement. The law stipulates that work done over an 11-hour interval that contains 7 consecutive hours within the 10PM–7AM interval may be considered night work if that is so agreed (art. 29-2).

[6]Some recent examples of uses of data from the *QP* are Portugal and Cardoso (2006) and Varejão and Portugal (2007).

skill level, normal hours of work, overtime hours of work, the industry and location of both the firm and the establishment, and firm sales.

The Portuguese contribution to the *EUCOWE* survey was also carried out in June 2003 by the Ministry of Employment, with questions referring to the week of May 5-11, 2003, during which there were no public holidays.[7] It was addressed to establishments in all industries (except agriculture and public administration) and all size classes. Besides extensive information on the length and organization of working hours and hours of operation, Portuguese respondents were asked to report the number of employees working at the establishment during each hour of the survey week. Only outside contractors, temporary agency workers and unpaid workers were excluded from this head-count. The questionnaire was administered to a sample that was stratified by size-class and industry and drawn from the universe of firms responding to the *QP*.[8] The initial sample included 6,002 establishments, 3,127 of which returned responses. Only 2,818 plants provided data that were internally consistent and validated by the Ministry of Employment.

The *Employment Survey* is a quarterly household survey standardized across European countries. It collects detailed information on individuals' demographic characteristics and labor-market status. From this sample we use individuals' self-reports on the broad outlines of their work schedules (daytime weekday, night, Saturday and Sunday work), gender, age, education, occupation, industry and location. The original sample contained 50,714 observations. After restricting the sample to those in employment (and with valid information on the variables selected), we obtained a sample of 19,448 individuals.

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[7]The survey was conducted in France, Germany, the Netherlands, Portugal, Spain and the United Kingdom as part of an EU-funded project on operating hours, working time and employment. A summary of the findings can be found in Delsen *et al* (2007). Although the same basic questionnaire was used in all countries, the annex we use was specific to Portugal. Because no other country that fielded the *EUCOWE* obtained information on the number of workers present at each hour of the week, currently the questions we ask can only be answered using Portuguese data.

[8]Four size classes and seven industry groups were considered for stratification of the sample. The four size strata are: 1-19, 20-249, 250-499 and 500 or more employees. The seven industry strata are: Primary sector, secondary sector, construction, distributive services, producer services, social services, and personal services.

Given our focus on productivity, it is crucial that our proxy for production (total sales) be measured at the same level as employment. Sales in the *QP* are, however, recorded only at the firm level. For that reason we restrict the data set to single-establishment firms (approximately 70 percent of the sample, 1,949 firms). Since annual sales for 2003 are reported in the 2004 wave of the *QP*, we use both the 2003 (for workforce characteristics) and the 2004 (for sales) waves of this data source. The requirement that the firm be present in both waves eliminated another 371 establishments, generating a sample of 1,578 establishments. We have furthermore dropped one-worker firms (60) and those that, although they responded, did not complete the table on the timing of work (554), resulting in a final sample of 964 firms.[9]

While the *EUCOWE* reports total employment at each time of the day, it does not contain any information on the composition of employment by skill level. Since the skill composition of the workforce at different hours will have an impact on the productivity of labor, we impute the time-specific composition of the workforce. Starting with the information in the *Employment Survey*, we estimate the probability that an employee works at night, Saturday or Sunday (which we will refer to as time t).[10] We used all the worker attributes X that are common to the variables in the *QP* and the *ES* (gender, age, education, occupation, industry and location), to estimate the determinants of p_t, the probability of work at time t.

We then apply the estimated coefficients from these probits to the vector X of worker attributes in the *QP* to obtain for each worker a prediction of the probability that s/he engages in daytime weekday, night, Saturday or Sunday work. Taking 0.5 as the cut-off, we imputed

[9]There are nearly 200,000 single-plant firms in the *QP*, making this sample potentially highly selected out of the population. A probit relating inclusion in our final data set to all the control variables used in the analysis suggests that, other than unexplained differences by industry, only firm size (sales) has an important impact, with doubling a firm's size increasing its chance of inclusion in our sample from 0.005 to 0.01. Given that the original EUCOWE sample was representative of the population, these probits suggest that non-response to the EUCOWE and our further restrictions have not altered the representativeness of the data set along most dimensions.

[10]We would have liked to go one step further and estimate the probability of work for the same time division as in the company survey. However, the *Employment Survey* only reports whether employees worked at different periods of the day and the week, not the specific hours when work took place.

for each individual worker in the *QP* employed by the firms answering the time-use survey his/her status as a night worker, Saturday worker and Sunday worker. It is possible that a worker in the *QP* could be classified in any from one to four of the work-timing categories.

B. Basic Facts about the Timing of Work

Here we provide a detailed representation of the process of putting labor to work over the course of one workweek. Dividing the workweek into 168 one-hour intervals, Figure 1 is a firm-based tempogram that represents the total number of workers present at work at each hour of the survey week.[11] The figure describes the rhythmic nature of the demand for labor services within a single week. It shows that the number of individuals working at nights is only a small fraction of the total present at work in daytime and that the same pattern is repeated from Monday to Friday. It also shows that daytime workers do not all arrive at work at the same time, but rather that they spread their starting hours from 7AM to 10AM, at which time the majority of all daytime workers are simultaneously present at the workplace. The same is true for the transition between daytime and nighttime, as workers start to leave at around 5PM, although the minimum level of employment is not reached before 10-11PM.

Another distinctive characteristic of intra-day employment variation is the abrupt reduction in the number of individuals working between Noon and 2PM, no doubt due to lunch breaks. The number working on weekends is also very small compared to the corresponding count on weekdays. The difference, however, is much more pronounced when we compare daytime hours than when we examine night hours. From Saturday to Sunday there is a slight reduction in the number of people working, independent of the hour of the day that we consider. Also on weekends, but especially on Sundays, there is a much smaller drop-off in the number of employees at work at lunchtime.

Because there are both technical and economic reasons behind the choice of the timing of the economic activity, it is worth looking at how changes in the number of workers at work over the week vary from industry to industry, as different industries face quite diverse technical and demand constraints. Very different patterns emerge across industries, as shown

[11] While the term tempogram, and figures for typical workdays, have been used in recent studies based on household time-diary surveys (e.g., Michelson and Crouse, 2004), unsurprisingly given the novelty of our data set none has been generated for establishments.

in Figure 2. Two sectors—construction, and finance and services to firms—stand out by their absence of weekend operations. To some extent this is also true for mining industries, except for a small amount of daytime Saturday work. The public utilities sector—typically associated with continuous operations—exhibits a very repetitive pattern over the week, high and above a constant baseline that corresponds to the level of employment necessary to guarantee emergency services/continuous production. This is also the case in the transportation and communications sector, although there the level of employment on weekends is significantly higher than during weekday nights. Manufacturing is the only sector (followed at a distance by personal services sector) to maintain a relatively high level of night work.

Some of the characteristics depicted in Figures 1 and 2 may appear unusual, especially to readers unfamiliar with the Portuguese economy. Of particular note is the relatively sharp drop-off in employees at work over the weekday lunch-hour and, as compared to the U.S., the relatively low intensity of work at night. As a check on this pattern Figure 3 reproduces a tempogram from the 1999 Portuguese Time Use Survey (INE 2001), which was based on diaries completed by individuals. This tempogram makes it clear that, if anything, our firm-based data give lower estimates of the decline in work intensity over weekday lunch hours than do household data, and they clearly do not overstate the rarity of night work relative to those data.[12]

The data presented in Figures 1 and 2 are the best descriptions of the burden of work at different times on the work force. They may not, however, describe firms' patterns of operation if there are differences in opening hours by size of firm, or if, conditional on being in operation, there are consistent differences in worker utilization rates at different times. To examine patterns of operation, in Figure 4 we present a tempogram showing the number of firms in our sample (out of 964) that are open at each hour of the week. Comparing the pattern to that in Figure 1, one sees that it appears to be somewhat thicker at irregular hours,

[12]Whether the firm-based or individual-based tempogram is more accurate is not clear. Part of the differences may be due to different coverage of workers by sector. Regardless, it has become standard in the literature on measurement error in labor-related data to assume that the employer-provided information is correct (e.g., Bound *et al*, 1994).

suggesting that firms that operate at those times are either smaller than average and/or use fewer employees than they do at other times.

C. The Composition of the Workforce by the Timing of Work

Based on our procedure to infer the composition of work at night, Saturday and Sunday, we find that 7.5 percent of workers perform some night work, 18.6 percent some Saturday work and 5.1 percent some Sunday work. Table 2 traces the profile of this workforce and compares it to the total workforce in the surveyed firms.[13] Men are dominant in all three irregular periods of work, and women are especially rare among night workers. Night workers are also younger and more skilled than weekend workers. The same is true for Saturday workers compared to Sunday workers. In general working at these irregular hours disproportionately involves men, individuals with intermediate levels of education and skilled workers. This seems different from what has been observed for the U. S. (Hamermesh, 1999a) and may be the result of the high penalties imposed on hours employed at irregular times in Portugal.

The legal setting considers blocks of work times (night versus day, weekday versus weekend) as homogeneous units, subject to the same wage compensation scheme. That is one factor suggesting lumping specific times of the week into groups of working hours. Also, fitting the legal setting, the *Employment Survey* only asks individuals whether they work at nights, Saturdays or Sundays and not at which specific hour of the week, so that we can only get information on workers' characteristics for large blocks of work times. Moreover, if we were to consider each single hour of the week, a majority of firms would show no workers for many of them, which poses problems for estimation. For these reasons we aggregate the timing of work into two blocks, distinguishing between times of the week with no pay penalty and those subject to a penalty, i.e. daytime weekday hours (regular hours) and night or weekend work (irregular hours).

[13]Even though the firm time-use survey gives us the number of workers at every time of day-week, we cannot from there trace the identity or characteristics of individual workers across each hour of the week. Indeed, knowing that the firm has, for example, 20 workers from midnight to 4AM is compatible with having just 20 workers at that time, or having 80 workers, each working one single hour (or any situation in-between). The firm-based survey does not identify individual workers.

IV. Production and Demand Models

The simplest model that we estimate imposes a Cobb-Douglas technology and divides time into D (65 hours per week), 7AM–8PM, Monday through Friday, and the rest N (103 hours per week). Implicitly we assume for simplicity's sake that all irregular work time is linearly aggregable. The Cobb-Douglas specification assumes the usual unitary elasticity of substitution between worker-hours employed at these two times of the day/week. In order to obtain better estimates of the demand elasticities on which any policy that might affect the timing of work should be based, we thus also relax the Cobb-Douglas assumption and estimate the following translog approximation to a general function:

(1) $\ln(Y_k) = a_0 + a_D\ln(D_k) + a_N\ln(N_k) + .5\{a_{DD}[\ln(D_k)]^2 + a_{NN}[\ln(N_k)]^2 + a_{DN}\ln(D_k)\cdot \ln(N_k)\} + \xi_k$,

where k denotes the firm, D is 1 plus the number of worker-hours employed during normal hours, and N is 1 plus the number employed during irregular hours. Testing the overall significance of the vector a_{ij}, i, j = D, N, allows us to test the validity of imposing the Cobb-Douglas technology. With the translog approximation, and assuming constant returns to scale, the parameter estimates can be readily transformed (Hamermesh, 1993) and combined with estimates of the shares of D and N in total labor costs to obtain estimates of elasticities of demand for labor at the two times.

One might ask whether the application of production theory makes sense in this context. While we can and do obtain measures of substitution between daytime weekday and irregular hours, the theoretical basis of production functions lies in the idea of cooperating factors. Since weekday and other hours are by definition not used simultaneously, the notion of cooperation here cannot be the usual one.

An alternative approach avoids assuming cooperation by labor-hours used at different times and assumes instead that the firm chooses how much to produce during daytime weekday hours and how much during others.[14] It faces an exogenous hourly wage w for daytime weekday hours, and a wage of $[1+\theta]w$ for other hours, where θ is the legislated or

[14]In a sense this approach is like the less formal examination of shift work by Bresnahan and Ramey (1994) and Mayshar and Halevy (1997) .

bargained penalty rate. In addition to wage costs the firm has fixed costs V of employing a worker. If we assume that workers employed at daytime weekday and irregular hours work the same total hours per week, then we can denote the per-hour fixed costs of employment as v per worker for both types of workers. Thus the cost of an hour of daytime weekday labor is w + v, while each irregular hour costs $[1+\theta]w + v$.

The relative price of irregular compared to normal hours can thus be written:

$$R = [1 + \varphi + \theta]/[1 + \varphi] ,$$

where $\varphi = v/w$. Then $\partial R/\partial\theta = 1/[1 + \varphi]$, so that an increase in the penalty rate θ raises the relative price of an hour of labor at N relative to D in inverse relationship to the ratio of fixed costs to the hourly wage rate. We cannot observe any cross-section variation in θ in the sample, but the theory of factor demand predicts that, where fixed costs of employment are relatively more important for workers with the same hourly wage, we will observe relatively more work occurring at irregular hours. We can therefore write:

(2) $\{\ln(N) - \ln(D)\}_k = \gamma_0 + \gamma_1\varphi_k + \gamma_2 X_k + \psi_k ,$

the relative demand equation for worker-hours at the two mutually exclusive and exhaustive time periods of the workweek, with a vector X of control variables, parameters γ and disturbance ψ.

A long literature (beginning with Rosen, 1968, and Ehrenberg, 1971) has argued theoretically and demonstrated empirically that, where the fixed costs of employment are higher relative to hourly wages, overtime hours will be used more intensively. We can thus write:

$[OH/H]_k = f(\varphi_k), f' > 0$,

where OH are overtime and H total hours. Linearizing, taking the inverse function and adding an error term, we obtain:

(3) $\varphi_k = \alpha_0 + \alpha_1[OH/H]_k + \upsilon_k$.

Substituting (3) back into (2) we derive the estimating equation:

(4) $\{\ln(N) - \ln(D)\}_k = \beta_0 + \beta_1[OH/H]_k + \beta_2 X_k + \mu_k , \beta_1>0.$

In Portugal, as in many other southern European countries, concerns about labor-market rigidity led to increased permission for firms to employ workers on fixed-term contracts. These contracts presumably lower the fixed costs of employment, particularly firing costs. Another proxy for φ^{-1} is thus λ, the fraction of workers on fixed-term contract, which as a proxy will lead to a relative reduction in the use of work at irregular hours. Adding this term to (4) we thus obtain an alternative estimating equation:

(5) $\{\ln(N) - \ln(D)\}_k = \delta_0 + \delta_1[OH/H]_k + \delta_3\lambda_k + \delta_2 X_k + \omega_k$, $\delta_1>0$, $\delta_3<0$.

V. Estimates of the Cobb-Douglas, Translog and Relative-Demand Models

We estimate all models for all the single-plant firms on which we have data, and then separately for two groups of industries: Manufacturing, mining, and utilities; and services, trade, and transportation. In every case, the regressions include two-digit industry fixed effects to account for some of the unmeasurable differences in production technologies across firms. Also included in all the estimates are variables designed to account for differences in the efficiency units of labor of various types. Thus we include indicators accounting for three age groups (under 35, 35-49 and 50 plus), four levels of education (<9, 9-11, 12, and >12 years), and gender.

Table 3 presents the estimates of these expanded production functions. The first thing to note is that there is some evidence of increasing returns to labor (not long-run, as we do not include measures of capital stock, not having such data). This might be viewed as evidence for the familiar short-run increasing returns to labor (noted by, among others, Morrison and Berndt, 1981) observed in the estimation of standard production frameworks. Even with the measures of workers' characteristics with which we expand the basic production model there are significant differences across detailed industries: In all the estimates we reject the hypothesis that the two-digit industry fixed effects are jointly zero. Finally, it is also worth noting that tests of the Cobb-Douglas restrictions are soundly rejected: In the overall sample and the two sub-samples the three higher-order terms are jointly statistically significantly different from zero at conventional levels.

The parameter estimates on the control variables all make economic sense (even though not all are individually statistically significant). Thus productivity appears to be related to age, although the inverse-U shaped pattern with experience appears quite flat. Examining the role of formal investment in human capital, the education effects are substantial, so that productivity would be 23 percent higher in a firm with all workers who had completed grade 9 compared to one composed entirely of workers who had not gone beyond grade 8. The effects of having completed secondary education on productivity are huge, which is usual in studies of the Portuguese labor market (OECD, 2006), and the impact of having attended university is even more immense.[15] (This is not surprising, given that in Portugal at this time half of the labor force had not attended high school at all.) Finally, for whatever reason productivity falls as the share of women in a firm rises from zero to one.

A few studies for the United States have used matched worker-firm data to compare estimates of the sizes of effects of demographic characteristics on sales (in a production-function framework) to estimates of their effects on earnings (e.g., Hellerstein *et al*, 1999, Haltiwanger *et al*, 2007). To replicate this exercise for a less developed economy, we digress and present estimates of log-earnings equations based on individual workers in the same firms included in the estimation of the production functions in Table 3.

The second column of Table 4 shows estimates of plant-level wage equations. The dependent variable is the total gross monthly wage bill, and the independent variables are the same used in the re-estimation of the Cobb-Douglas function that we present in the first column of Table 4. These estimates render the coefficients in the earnings equation directly comparable to the estimates of the production function.[16] Both equations also include two-digit industry fixed effects.

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[15]The share of employees who have completed each level of education is clearly endogenous at the firm level, with it possibly being the case that inherently more successful entrepreneurs attract unobservably more productive workers. This potential difficulty pervades this little literature, and we see no obvious solution with the data that we have available.

[16]The total gross monthly wage bill includes all regularly paid components of remuneration. To facilitate the formal test on equality of coefficients across equations, we have estimated a seemingly unrelated regression model, with the (log) wage bill and the (log) sales as dependent variables. Because the wage data were not available for 10 plants used in estimating the production functions, to maintain exact comparability the SUR model excludes those firms.

As one might expect, unobservable intra-industry differences that have a positive impact on the sales of the firm also have a positive impact on its wage bill, with the correlation between the residuals of the two equations being 0.58. Interesting results emerge as we test the equality of coefficients across the equations in the first two columns of Table 4. Starting with the gender coefficients, we cannot reject the hypothesis that a change in the share of female employees leads to a similar variation in the firm's production as in its wage bill. Quantitatively, if the share of females in a firm increases by 10 percentage points, the firm's production would decrease by 2.6 percent, and its wage bill would decrease by 2.2 percent. A similar result holds when we compare the coefficients on most variables (for example, the shares of workers in different age groups, and the share of workers with 9 years of schooling).

The notable exceptions to the similarity of wage and productivity effects occur for workers with a high school or university degree. Their remarkable contribution to the production of the firm is not matched by the returns to their extra schooling. If the share of workers in the firm with a university degree increased by 10 percentage points, the firm's wage bill would increase by 11.2 percent, but its production would rise by 18.6 percent. For workers with a high-school diploma the results are equally striking: A 10 percentage-point increase in the share of these workers in the firm's workforce is associated with a 4.3 percent increase in the wage bill but a 10.8 percent increase in production.

For comparison purposes the final column of Table 4 presents estimates of the wage equation estimated over the 60,000 individuals employed by the firms in our sample, as reported in the *QP*. The estimated impacts of being female, and of various education levels, are quite similar to those generated by the establishment-level equations. That is not true for the estimates of the impact of age: The individual-based estimates are quite consistent with the large human-capital literature, while the establishment-based estimates are not. This could arise if, as seems likely (Haltiwanger *et al*, 1999), the share of employees aged 50 or above is positively correlated with the age of the firm relative to others in its industry, and older firms are inherently less productive than others within an industry. Finally, the variables ln(D) and ln(N) in this equation essentially measure firm size; as such, the estimated impacts on workers' wages mirror those found in the literature (Idson and Oi, 1999).

As noted above, the translog tableau describes the data better than the restrictive Cobb-Douglas form, so we concentrate on it in discussing the structural parameters. They can be transformed into elasticities of complementarity and, as noted, with the assumption of constant returns to scale they are transformable into elasticities of substitution.[17] Multiplying by the shares of earnings at the two sets of times, we then obtain the elasticities of factor price, ε_{ij}, and the price elasticities of demand, η_{ij}, shown in Table 5.[18] The first thing to note about them is that these calculations, which combine the parameter estimates with the factor shares, yield estimated structural parameters that do have the expected signs: The own-price demand elasticities are negative, and the cross-price elasticities are positive, none of which was imposed on the estimation.[19]

Concentrating on the cross-price demand elasticities, since they are more familiar than the factor-price elasticities, we see that the estimates for the entire sample and for the larger sub-sample of manufacturing, etc., suggest reasonable responses to changes in the relative price of operating at different times of the day/week. The estimates for services, etc., are astronomically high, a result of the near-zero estimated elasticities of factor-price that were generated from the translog parameters that we estimated for that sub-sample. In the end, one might interpret our results as showing in a formal model that there does appear to be substitution between using labor during daytime weekday and irregular work times; but possibly because of the apparent short-run increasing returns to scale, possibly because the

[17]The own-quantity elasticity of complementarity is $[a_{ii} + s^2_i - s_i]/ s^2_i$; the cross-quantity elasticity is 1 + $a_{ij}/s_i s_j$., where s is the share of the input in total labor cost.

[18]To obtain the share of earnings at times D we multiply weekday night hours by 1.25, daytime weekend hours by 2, and weekend night hours by 2.5, and compare the result to its sum with daytime weekday hours.

[19]One might be concerned that many (nearly 2/3) of the observations show no hours worked outside weekdays between 7AM and 8PM. To examine whether our results are sensitve to their inclusion, we re-estimated the Cobb-Douglas and translog models without them. The results do not change qualitively: The translog model clearly dominates the Cobb-Douglas; and the elasticities of factor price for weekday-time work are -0.20 and 0.07, for other work 0.20 and -0.27—little different from what are shown in the Table.

concept of cooperation does not make sense in this context, or possibly just because of noise in the data, the sizes of some of the estimated effects do not seem believable.[20]

Equations (4) and (5) specify the relative demand for labor at irregular and regular hours as a function of control variables and proxies for v/w. We measure the first of these, OH/H, as the average ratio of overtime to total hours over the years 1995-2002. These data are reported in the *QP* only for October in those years. Using data from only one month of the year, and from years before May 2003, from which the data on work timing come, obviates any problems that might arise if this forcing variable were measured at the same time as the outcome. The second proxy, the share of fixed-term workers in the firm, is from the *QP* of October 2003, rather than from the *EUCOWE*. Portugal and Varejão (2008) show the high rate of fixed-term contract hires in Portugal, especially for unskilled jobs.

The first three columns of Table 6 present the results for the proxy OH/H, with the parameter estimates on the control variables presented in the Appendix. In addition to the controls used before, we added the firm's average workweek, H, to avoid any possible mechanical relationship between irregular work and hours that might arise because a few firms have unusually long workweeks. In addition to examining the timing of the relative demand for all workers, we disaggregate and present estimates for skilled and unskilled workers separately. As with the production functions, here too the significance of the fixed effects suggests that there are shifts in this relative labor-demand function across two-digit industries.

Remembering that the dependent variable is defined as employment at irregular hours relative to daytime weekday hours, the estimates of the impact of overtime relative to total hours, our first proxy for relative fixed employment costs, are generally positive (except for skilled workers in services, etc.). For the entire sample and for manufacturing, etc., they are highly significant statistically. In general, in those firms within narrowly-defined industries where overtime forms a larger share of total hours, more work is performed outside normal

[20]None of our data sets allows for the construction of the capital stock at the plant level, nor are any other data available that could be matched to our data sets. We know (Hamermesh, 1993) that capital and skill are complementary, so that this absence could bias the estimated parameters. By including as controls all the proxies for skill, e.g., educational attainment and age, and by estimating all the models including industry fixed effects, these biases are likely to be minimized.

hours. This is not a mechanical relationship: 1) As we noted above, the overtime data are measured over a long period of time preceding the week for which working timing is reported; and 2) In any case, given that a worker's weekly hours cannot exceed 50 and that there are 65 daytime weekday hours, we could well have observed the opposite relationship. That we do not suggests that the underlying behavior is consistent with our theory.

A comparison between the estimates for skilled and unskilled workers provides additional support for our approach. In all cases the semi-elasticities for the former group are smaller. Under the assumption that α_1 is uncorrelated with skill level, this result is consistent with a massive body of evidence (Hamermesh, 1993, Ch. 3) that elasticities of labor demand generally decrease in absolute value with skill. The results here show that the general finding also applies to the temporal responsiveness of labor demand to incentives.

The final three columns of Table 6 present estimates of (5). Although the parameter estimates are not statistically significant except at a very low critical value, they all have the expected negative sign. Moreover, as we would expect, given the much greater utilization of fixed-term contracts among unskilled than among skilled workers, λ is a much better proxy for the effects of the ratio of fixed to variable costs on the timing of labor demand among unskilled than among skilled workers. It is also worth noting that this additional proxy for v/w hardly changes the estimated effect of our first proxy.

Although not the focus of this study, the relation of irregular hours to firm size implied by the estimates is also interesting: Smaller firms are more likely to use labor outside daytime weekday hours. Moreover, this effect is especially pronounced in services, trade and transport, suggesting that within narrowly defined industries in that sector smaller firms survive by providing service at niche times. In manufacturing, mining and utilities, there are less likely to be niche times, so it is unsurprising to find a smaller and statistically insignificant effect of scale on the temporal distribution of labor demand.

While the theoretical derivation says nothing about differences between behavior at the intensive and extensive margins, it is interesting to consider the possibility. We thus re-estimated (4) and (5) excluding those observations for which $\ln(N) = 0$ or $\ln(D)=0$. The scale effect is unchanged, but the impact of OH/H is only one-third the size when we examine the intensive margin alone (but still highly significant statistically), while the impact of temporary contracts is slightly smaller. Implicitly the impact of the penalty for irregular hours is bigger at the extensive than the intensive margin.

Because of the limitations imposed by the absence of company-wide sales data, all of the analyses have been restricted to single-plant firms. These firms are inherently incapable of taking advantage of yet another margin as the relative price of hours at different times of the week changes, but multi-plant firms may be able to substitute production among plants that differ temporally in the technology of production. With this possibility in mind we might conclude that our estimates may understate the average extent to which intemporal substitution in labor demand is possible.

VI. Some Policy Simulations

The estimates that we have developed here are the first available to allow the evaluation of the potential impact of policies that might shift the timing of work. The applications in this Section are fairly mechanical, but they are worth illustrating given the potential importance of such policies and of international differences in work timing. Applying the estimates directly to Portugal, we can ask what would happen to the distribution of work-hours between daytime weekdays and irregular hours if the existing penalties on the latter were abolished. The starting point is the sample average penalty rate on irregular hours that we observe in the data, $\theta = 0.44$.[21]

Clearly, working irregular hours is a disamenity, and one doubts that employers could avoid some penalty rate absent a legislative mandate. What would θ be absent the mandate? A variety of estimates of this parameter have been produced for the (along this dimension) unregulated U.S. labor market, including by Kostiuk (1990), Shapiro (1995) and Hamermesh (1999a). Estimates have ranged from 0 (or even negative) to above 0.2, but a fair reading of the literature suggests using $\theta = 0.1$ is a reasonable estimate. Taking this penalty as the benchmark for what an unregulated Portuguese market would generate, the change in the

[21]As Trejo (1991) shows for overtime penalties, some, in this case unknown amount of any change in tbe penalty would be dissipated as workers' supply decisions adjust to changing incentives. To the extent that this would be important we thus overstate the impacts of the policy changes discussed here.

wage differential between irregular and daytime weekday hours would be 31 percent. Applying the cross-price elasticity that we estimated using the translog approximation suggests that deregulation of work timing might lead to an increase of perhaps 2 percent in the total number of worker-hours observed outside daytime weekday slots.

The Portuguese labor law that became effective in 2004 changed the default starting boundary of night work from 8PM to 10PM. This effectively reduced the average penalty rate on irregular hours by some unknown amount from the 0.44 observed in our sample. In particular, 10 of the previously 55 nighttime weekday hours were converted to daytime weekday hours, clearly abolishing the legislated 25 percent penalty on nearly 20 percent of irregular weekday hours. Our results imply that this change would have caused a spreading out of the workday—a substitution of hours between 8PM and 10PM for hours between 7AM and 8PM.

It is clear (Burda *et al*, 2008) that more night and weekend work occurs in the United States than in other industrialized nations. Some of the reasons may be the absence of government policy on this subject, the small extent of trade unionism and the absence of any extension of trade-union policies on work-hours beyond the unionized sector. While the estimates for Portugal obviously cannot be applied perfectly to evaluate policy changes in the U. S., one might use our estimates as a first approximation to how work-hours might be reallocated in the U. S. if it legislated a penalty on night/weekend work. We are not aware of any explicit legislation embodying this proposal, but general calls for policies to reduce and reallocate hours have been made (Burda *et al*, 2008; Nickell, 2008).

Assume as above that the current penalty for work at irregular times averages 0.1 in the U. S. Assume also that we are evaluating a proposal to impose a 50 percent penalty on work outside daytime/weekdays, so that the relative price of an hour of work at irregular times is increased by 36 percent. Then taking the estimated cross-price elasticity from Table 5, one calculates that the policy would result in a decrease of 2.5 percent in labor input during irregular hours. Not a huge effect, but a small step toward reducing America's standing as an extreme outlier in the employment of labor at unusual times.

VII. Conclusion

In this study we have provided the first examination of the facts about and determinants of employers' demand for labor at different times of the day and week. We must stress that the question of the timing of work is logically independent of the question of the amount of work—hours per time period—that employees are on the job. While substantial research has been conducted on the latter, no empirical research had previously been offered on the former based on evidence from employers. Our study has taken advantage of a new data set that, in conjunction with other data sets, has allowed us to illustrate hourly/daily fluctuations in the number of employees at work and to examine the role of pay penalties for work at irregular times of the day and week in affecting these fluctuations.

Our results suggest that employers are able to substitute work at one time of the day/week for work at another time—the t-subscripts on the arguments of production functions need to be taken seriously, as technology does allow firms to alter work timing in response to incentives. Indeed, our findings indicate that employers do exactly that—variations in the fixed costs of employment, and in penalties for employment outside usual hours, induce shifts in employment across hours within the day and days within the week. The results show that both legislated and collectively-bargained penalties on work at different times of the day/week alter work timing. Such penalties can thus be a tool for social policy on work time, which may be especially important given our evidence on the demographic characteristics of the distribution of work at irregular times in a regulated labor market (Portugal) compared to its distribution in an unregulated one (the U.S.).

Our theory implies that a relative increase in fixed costs will, in addition to increasing the amount of overtime work, increase the amount of work at non-standard hours if employers are penalized for using them. Our empirical results suggest this is what we observe in the data. Given the secular rise in fixed costs of employment, one might be led to expect an increase in the amount of work performed in some economies at non-standard times.

We hope that this study will help to launch investigations that take advantage of the recent creation of employer-based surveys of work timing in other countries that could be matched with other employer-employee data sets to shed light on other aspects of decisions about timing. Indeed, since our discussion has recognized the role of workers' preferences in affecting firms' decisions about the timing of operating hours, one could well go further and hope for a data set matching firms' opening times with their workers' time diaries that might permit the development of a complete structural model of the timing of work. Finally, it should be possible to combine some of these surveys with detailed information on collectively-bargained penalties on work timing, or with the differing application of statutory penalties across firms, to infer directly the impact of penalties on timing.

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Figure 1. Tempogram of Total Employment in Portuguese Firms

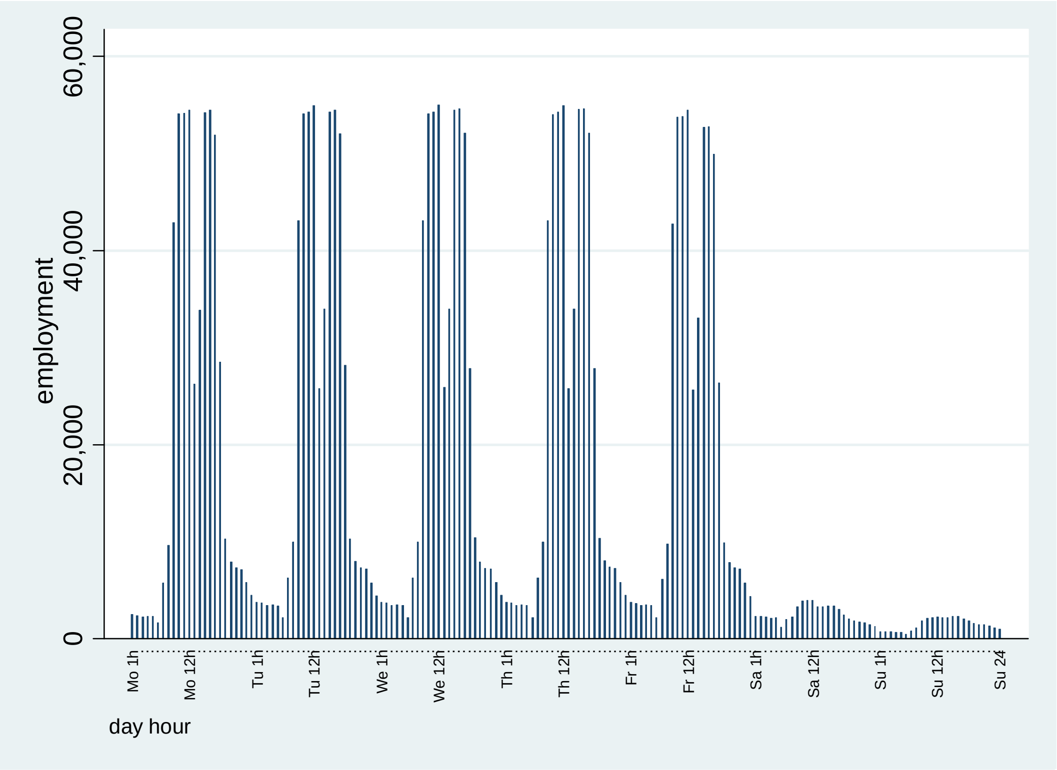

Figure 2. Tempogram of Total Employment by Industry

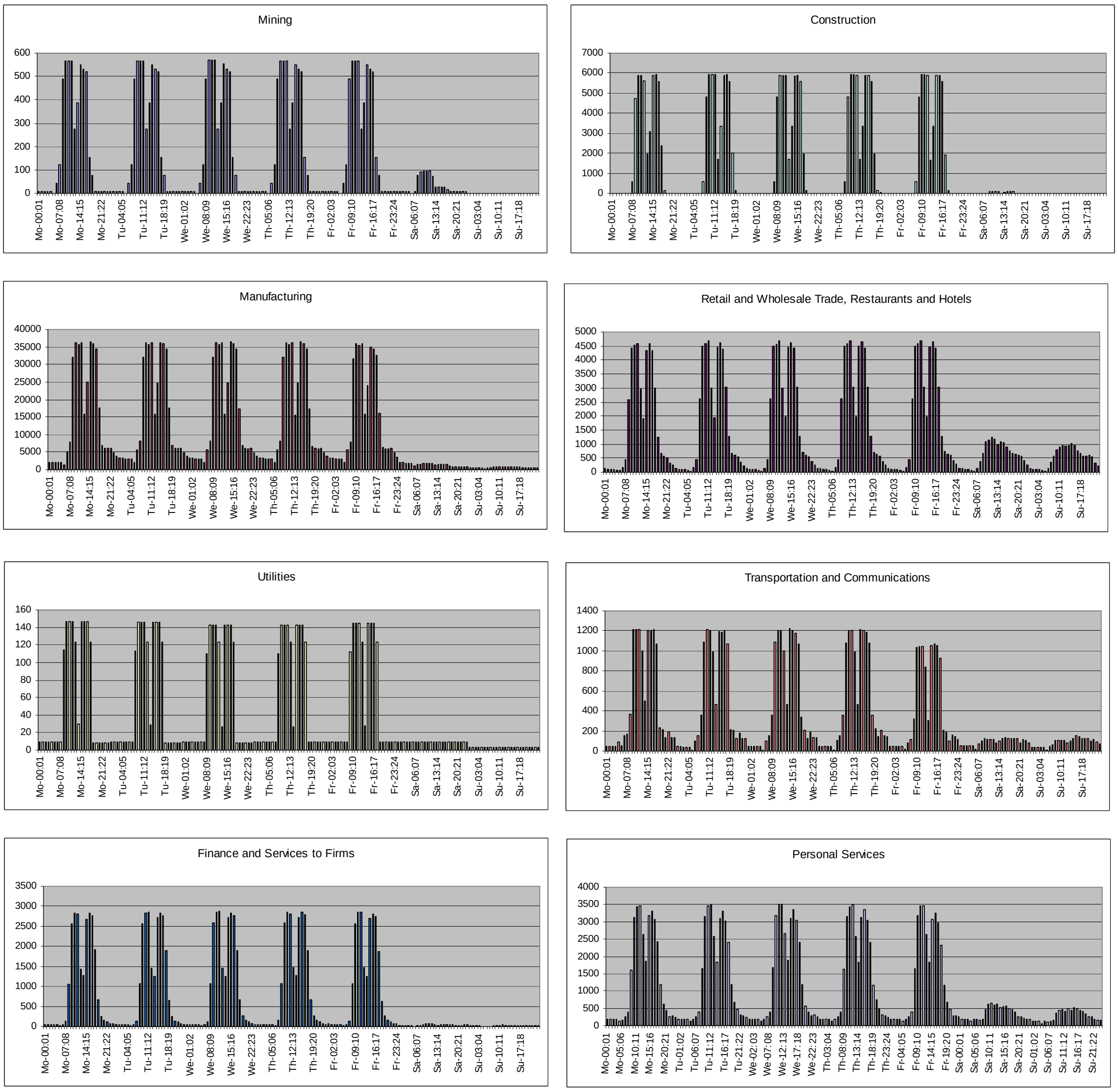

Figure 3. Tempogram of Work Timing from the 1999 Portuguese Household Time-Use Survey

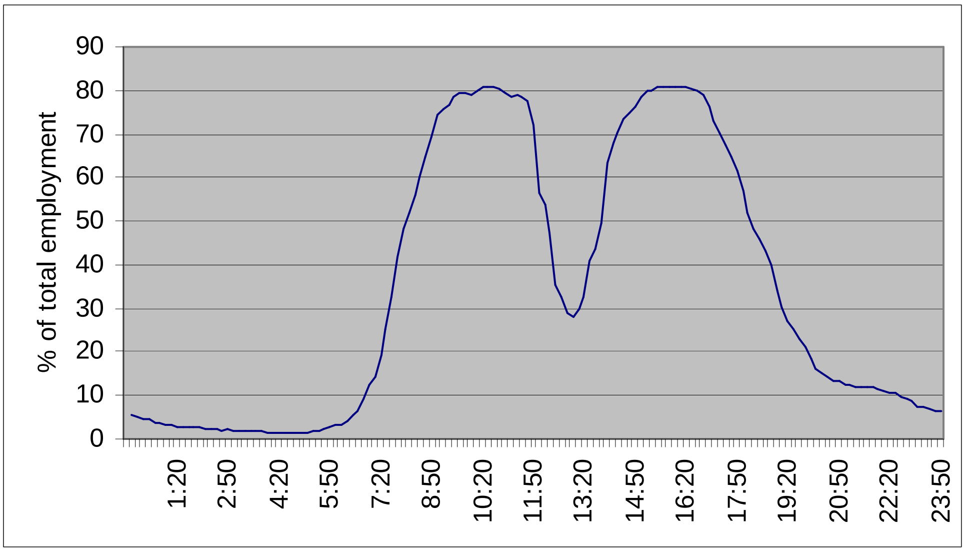

Figure 4. Tempogram of the Number of Portuguese Firms in Operation (Maximum 964)

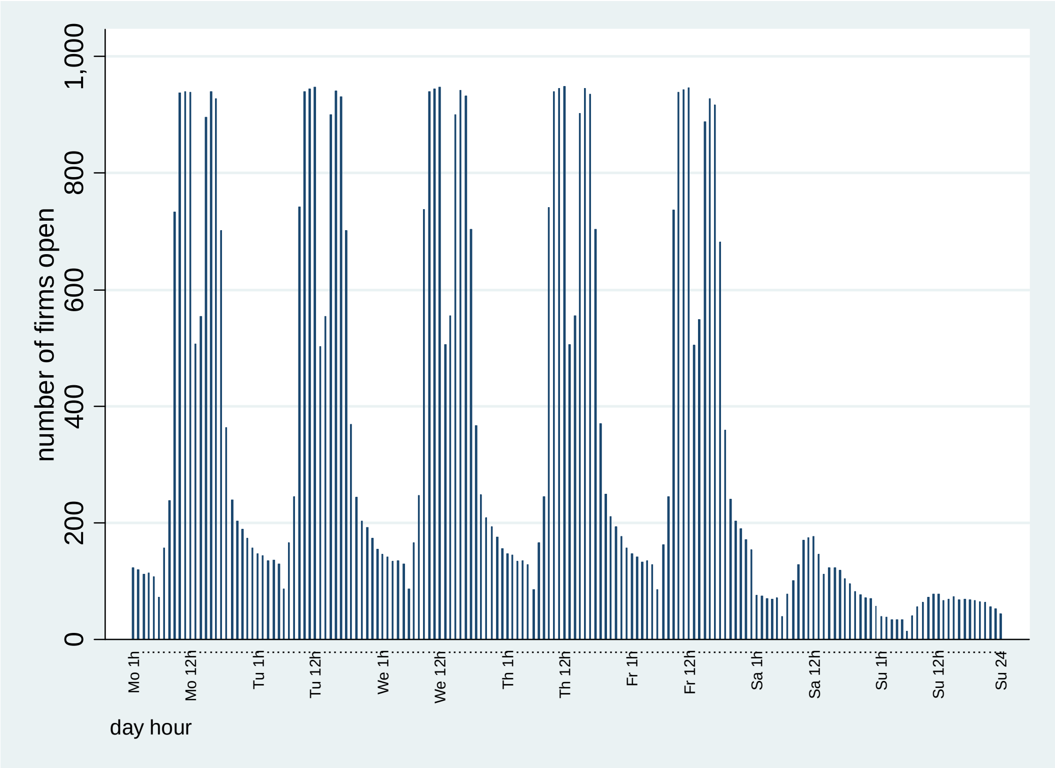

Table 1. Provisions Regarding Irregular Hours in Selected Countries

	Criteria for Nightwork	Limits	Rest periods	Compensation	Health & Safety	Transfers	Rights to Equal Treatment	Prohibitions	Special Categories
Austria						✓			
Belgium	✓								
Czech Republic					✓	✓		✓	
Denmark					✓	✓			
Finland	✓	✓							
France				✓	✓	✓			✓
Germany				✓	✓	✓	✓		
Greece	✓			✓					
Ireland						✓			
Italy				✓		✓			
Latvia						✓			
Luxembourg		✓		✓					
Netherlands		✓	✓			✓			
Portugal				✓	✓	✓			
Romania				✓	✓	✓			
Slovakia				✓					
Spain						✓			
UK					✓	✓	✓		
Japan				✓					

Source: ILO – Database of work and employment

✓ indicates that the country has an entry on the ILO database for the corresponding column heading

Table 2. Composition of the Workforce, by Timing of Work (Imputed)

Characteristic:	Night	Saturday	Sunday	All hours
Gender (percent male)	93.4	77.9	60.6	58.8
Age (avg. in yrs)	36.3	37.2	38.5	37.8
Education (percent):				
≤6 yrs of school	33.1	53.9	46.1	56.8
6-9 yrs of school	32.2	22.9	21.2	17.9
9-12 yrs of school	27.3	15.9	20.9	16.1
>12	6.8	6.5	10.8	8.9
Skill-level (percent skilled workers)	73.7	63.1	54.9	56.9

Note: The percentages for the different schooling levels do not add up to 100 because a small number of observations (0.3 percent of the total) have missing information on schooling.

Table 3. Estimates of Production Functions with Work Timing (Dep. Var. ln(Sales))

	All Industries		**Services, Trade and Transport**		**Manufacturing, Mining and Utilities**	
	Cobb-Douglas	Translog	Cobb-Douglas	Translog	Cobb-Douglas	Translog
ln(D)	1.0293 (0.0252)	0.5490 (0.1890)	0.9764 (0.0556)	0.8716 (0.4080)	1.0333 (0.0270)	0.5080 (0.2113)
ln(N)	0.0823 (0.0137)	0.2179 (0.0601)	0.0645 (0.0335)	0.2915 (0.1368)	0.0846 (0.0140)	0.2080 (0.0652)
$[\ln(D)]^2$		0.0403 (0.0139)		0.0148 (0.0307)		0.0427 (0.0154)
$[\ln(N)]^2$		0.0377 (0.0083)		0.0475 (0.0018)		0.0347 (0.0089)
ln(D)·ln(N)		-0.0510 (0.0101)		-0.0704 (0.0248)		-0.0471 (0.0102)
Controls:						
Share age 35-49	0.0689 (0.1798)	0.1044 (0.1770)	-0.2435 (0.3407)	-0.1298 (0.3407)	0.1561 (0.2054)	0.1792 (0.2017)
Share age 50+	-0.2231 (0.1856)	-0.0926 (0.1844)	-0.3769 (0.3550)	-0.1428 (0.3591)	-0.1292 (0.2111)	-0.0379 (0.2082)
Share ED 9-11	0.2119 (0.1709)	0.2720 (0.1680)	0.1948 (0.3175)	0.2209 (0.3160)	0.0790 (0.1999)	0.1823 (0.1957)
Share ED 12	1.0200 (0.1901)	0.9905 (0.1867)	0.6126 (0.3007)	0.6207 (0.2974)	1.3515 (0.2774)	1.2699 (0.2719)
Share ED>12	1.7978 (0.2719)	1.8692 (0.2668)	1.3799 (0.3835)	1.4583 (0.3811)	3.1239 (0.5240)	3.2976 (0.5122)
Share female	-0.3014 (0.1412)	-0.2436 (0.1395)	-0.6939 (0.2557)	-0.6395 (0.2556)	-0.3205 (0.1688)	0.0269 (0.1656)
Adjusted R^2	0.763	0.773	0.664	0.672	0.811	0.820
N =	964	964	314	314	650	650
df Industry fixed effects	(40, 915)	(40, 912)	(17, 288)	(17, 285)	(22, 619)	(22, 616)
p-value on F-statistic	<.001	<.001	<.001	<.001	0.001	0.001
p-value on translog terms'		<.001		0.02		<.001

Table 4. Estimates of Sales, Wage Bill and Earnings, All Industries

Dependent Variable:	Firms ln(Total Sales)	Firms ln(Total Wage Bill)		Workers ln(Earnings)
Independent Variable:			**Independent Variable:**	
ln(D)	1.0309	1.0394	ln(D)	0.0380
	(0.0244)	(0.0171)		(0.0016)
ln(N)	0.0823	0.0666	ln(N)	0.0072
	(0.0132)	(0.0092)		(0.0006)
Share age 35 - 49	0.1049	0.1277	Age 35-49	0.2051
	(0.1763)	(0.1235)		(0.0035)
Share age 50+	-0.2375	-0.1036	Age 50+	0.2934
	(0.1798)	(0.1260)		(0.0047)
Share ED 9-11	0.1940	0.1376	ED 9-11	0.1901
	(0.1674)	(0.1173)		(0.0045)
Share ED 12	1.0840	0.4263	ED 12	0.4033
	(0.1869)	(0.1310)		(0.0048)
Share ED>12	1.8618	1.1188	ED >12	1.0057
	(0.2632)	(0.1844)		(0.0062)
Share female	-0.2640	-0.2199	Female	-0.2126
	(0.1374)	(0.0962)		(0.0036)
Adjusted R^2	0.778	0.870		0.518
N=	954	954		60573
Industry fixed effects	Yes	Yes		Yes

Table 5. Estimates of Elasticities of Factor Price and Demand, All Industries

	ε_{ij}		η_{ij}	
Hours:	7AM-8PM M-F	Other	7AM-8PM M-F	Other
All Industries				
7AM-8PM M-F	-0.062	0.037	-11.436	0.679
Other	0.196	-0.364	3.627	-0.068
Service, trade and transport				
7AM-8PM M-F	-0.134	0.0001	-5.141	26.224
Other	0.0006	-0.271	1106.148	-0.107
Manufacturing, mining and utilities				
7AM-8PM M-F	-0.054	0.043	-13.281	0.554
Other	0.236	-0.397	3.022	-0.060

Table 6. Estimates of Relative Demand Functions for Hours at Different Times (Dep. Var is ln(N/D))

		All Industries				
	All Workers	Skilled Workers	Unskilled Workers	All Workers	Skilled Workers	Unskilled Workers
ln(Sales)	-0.1030 (0.0445)	-0.3092 (0.0370)	-0.4080 (0.0519)	-0.0924 (0.0459)	-0.2659 (0.0380)	-0.1872 (0.0521)
Overtime Hours/Total Hours	0.2557 (0.0427)	0.1409 (0.0341)	0.2136 (0.0509)	0.2556 (0.0430)	0.1400 (0.0339)	0.2244 (0.0475)
Fraction Fixed-Term				-0.4451 (0.3018)	-0.1658 (0.24501)	-0.4685 (0.256)
Adjusted R^2	0.349	0.405	0.256	0.345	0.398	0.271
N =	964	964	964	936	909	814
df Industry fixed effects p-value on F-statistic	(40, 914) <.001	(40, 914) <.001	(40, 914) <.001	(40, 885) <.001	(40, 858) <.001	(40, 763) <.001

		Services, trade and transport	
ln(Sales)	-0.1523 (0.0714)	-0.1885 (0.0630)	-0.2709 (0.0867)
Overtime Hours/Total Hours	0.0972 (0.0836)	-0.0064 (0.0712)	0.1933 (0.0946)
Adjusted R^2	0.435	0.532	0.173
N =	314	314	314
df Industry fixed effects p-value on F-statistic	(17, 287) <.001	(17, 287) <.001	(17, 287) <.001

Table 6, cont.

		Manufacturing, mining and utilities	
ln(Sales)	-0.0695	-0.3784	-0.4484
	(0.0576)	(0.0467)	(0.0664)
Overtime Hours/Total Hours	0.2761	0.166	0.2279
	(0.0505)	(0.0393)	(0.0610)
Adjusted R^2	0.278	0.230	0.218
N =	650	650	650
df Industry fixed effects	(22, 618)	(22, 618)	(22, 618)
p-value on F-statistic	<.001	<.001	<.001

[1]All the estimating equations include the same control variables that were included in Table 3.

Appendix Table 1. Parameter Estimates for Control Variables Included in Table 6.

	All Industries			**Services, trade and transport**			**Manufacturing, mining and utilities**		
	All Workers	Skilled Workers	Unskilled Workers	All Workers	Skilled Workers	Unskilled Workers	All Workers	Skilled Workers	Unskilled Workers
Control Variable:									
Average weekly hours	-0.0132	-0.0113	-0.0267	-0.0192	-0.0221	-0.0086	-0.0060	0.0007	-0.0472
	(0.0192)	(0.0144)	(0.0152)	(0.0242)	(0.0191)	(0.0190)	(0.0288)	(0.0212)	(0.0235)
Share age 35-49	-0.2467	-0.4453	-0.1489	-0.5116	-0.8567	0.3954	-0.1410	-0.1823	-0.3386
	(0.4331)	(0.3610)	(0.5000)	(0.6166)	(0.5466)	(0.7313)	(0.5831)	(0.4729)	(0.6720)
Share age 50+	-0.0225	-0.3272	0.3270	0.2630	-0.0506	0.4108	-0.3441	-0.4755	0.3207
	(0.4466)	(0.3736)	(0.5159)	(0.6396)	(0.5680)	(0.7644)	(0.6013)	(0.4884)	(0.6896)
Share ED 9-11	0.0590	-0.1316	0.2588	-0.7735	-0.6511	0.6171	0.5264	0.1380	0.0629
	(0.4142)	(0.3458)	(0.4770)	(0.5692)	(0.5040)	(0.6786)	(0.5708)	(0.4646)	(0.6542)
Share ED 12-14	-0.0731	-0.1041	1.6484	-1.0683	-1.3075	1.4018	1.2097	1.3581	2.0806
	(0.4630)	(0.3844)	(0.5351)	(0.5412)	(0.4776)	(0.6449)	(0.7921)	(0.6422)	(0.9124)
Share ED 15+	-1.2100	-1.4778	3.202268	-1.5949	-2.4032	3.0142	-1.8267	-0.6967	3.1169
	(0.6650)	(0.5549)	(0.7696)	(0.6979)	(0.6186)	(0.8334)	(1.5211)	(1.2343)	(1.7488)
Share female	-0.3502	0.1827	-1.8094	0.1620	0.3645	-0.9376	-0.9511	0.0778	-2.2323
	(0.3385)	(0.2824)	(0.3920)	(0.4655)	(0.4117)	(0.5566)	(0.4754)	(0.3862)	(0.5480)