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Operating Hours and Working Times

A Survey of Capacity Utilisation
and Employment in the European Union

With 4 Figures and 85 Tables

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1 The Value Added of Representative Comparative EU Data on Operating Hours, Working Times, Capacity Utilisation and Employment

Lei Delsen, Derek Bosworth, Hermann Groß and Rafael Muñoz de Bustillo y Llorente

1.1 Introduction

This book presents the descriptive findings and some first analytical results from the 2003 representative European Union Company survey of Operating hours, Working times and Employment (EUCOWE) in France, Germany, the Netherlands, Portugal, Spain and the United Kingdom. This innovative project was funded by the European Commission in its Fifth Framework Programme and started on October 1st, 2001. The EUCOWE project was conducted by the Institute for Research on Social Opportunities in Cologne (Dr. Frank Bauer, Dr. Hermann Groß, Lisgret Militzer-Schwenger, Georg Sieglen), the Institute for Work and Technology in Gelsenkirchen (Prof. Dr. Gerhard Bosch, Dr. Steffen Lehndorff, Dr. Sebastian Schief), the University of Marseille (Prof. Gilbert Cette, Yusuf Kocoglu, Arnaud Sylvain), the University of Nijmegen (Dr. Lei Delsen, Dr. Jeroen Smits), the Catholic University of Porto (Prof. Alberto Castro, Prof. José Varejão), the University of Salamanca (Prof. Rafael Muñoz de Bustillo y Llorente, Enrique Fernández Macías) and the University of Manchester (Prof. Derek Bosworth, Dr. Mark Smith, Marylin Carroll). This project was coordinated by Dr. Frank Bauer and Dr. Hermann Groß.

Comparative research on operating hours is very scarce. The work of Winston (1974) and Bosworth and Dawkins (1981) are two important references dealing with the different issues involved in the determination of capital utilisation. From an empirical point of view, the work of Foss (1963) on capacity utilisation of firms in the United States of America (USA) showed that a low level of capacity utilisation was very common in modern economies. Last, the work of Bautista *et al.* (1981) made clear that low operating hours were, paradoxically, also a characteristic of developing economies, where capital is by definition more scarce, and therefore in principle should be used with more intensity. In the Bautista *et al.* 1981-study capital operating time was calculated as a proportion of the maximum time machinery and buildings could be used (24 hours a day or 8,760 hours a year). Capital being used for one eight-hour shift a day, five days a week, 52 weeks a years oper-

ates 24% of its capacity. Their survey results of manufacturing enterprises in Colombia, Israel, Malaysia and the Philippines show capital utilisation rates between 43% and 79% in 1972-1973. These are higher than earlier studies based on electricity utilisation (15% and 18%). The study also confirmed that capital utilisation levels of less than 100% were intentional, even at peaks of business, except for continuous processes. Capital utilisation should not be viewed in isolation from, but in relation to other factors of production, notably labour and management. Bautista *et al.* (1981) found that in manufacturing the number of shifts turned out to be a poor indicator, as many plants extended their hours of operation by working more than eight hours a shift and by weekend work, as well as by multiple shifts. The capital-intensive sections of the plants were operated more intensive than the more labour-intensive sections. Determinants of the level of utilisation of capital include the capital-labour intensity (the most important determinant), economies of scale, fluctuations in demand and supply of inputs and outputs and forms of industrial organisation and institutional factors. Capital intensive industries tend to operate relatively long hours. Labour intensive processes often had low capital utilisation rates to avoid payment of higher costs of night and weekend shifts. Hence, the relative costs of capital and labour have a critical impact on the choice of product and production techniques and hence on the level of capital utilisation. The existence of economies of scale implies that smaller firms will generally have a low level of capital utilisation. Empirics confirm this: capital utilisation is more fully in large-scale plants than in small-scale plants. Daily and seasonal fluctuations in the supply of inputs were also a source of capital idleness. In general operations producing perishable goods have lower utilisation rates. Producers are forced to adjust utilisation short-term fluctuations in demand (Bautista *et al.*, 1981). More recently, Anxo *et al.* (1995), Groß and Dasko (1999) and Bauer, Groß and Sieglen (2002) explored with detail the issues involved in the measure of operating hours and its implication for work organisation in a group of industrialised countries, including among them some of the European Union (EU) countries of EUCOWE sample.

The principle means of extending the period of daily productivity are shift work and – as the EUCOWE project will show – staggered working times and overtime. Shift work may be motivated by technical requirements in continuous process industries, for essential safety and maintenance work or to maintain the availability of a public service, such as hospital or transport services. Increasingly significant too is the development of shift working to maximise utilisation (Blyton *et al.*, 1989: 117). In the post-war period, shift work has steadily increased in industrialised countries. It is estimated that the number of workers engaged in shift work doubled between 1950 and 1974. Central to shift work is the question of night working; being more disruptive of

physiological rhythms than other shifts. Although Blyton *et al.* (1989), mention in their work that there were some indication that the extent of night working was declining, the analysis of the data available for the period 1992-2004 (EUROSTAT) does not show any clear pattern, with growth in night work in countries like Spain, Ireland, Italy or the United Kingdom (UK) among others, and reductions in Belgium, Denmark, Sweden or the Netherlands. In 2005 the incidence of night work was above average in the UK, Portugal, Germany and France and below average in Spain and the Netherlands. Both shift work and night work show the highest level of dispersion among the European countries. Working on Saturdays is most frequent in France, Spain and the Netherlands, and below average in Germany, Portugal and the UK. Also the incidence of Sunday working is high in the Netherlands and France and low in the UK, Portugal and Germany. Overtime is above average in the Netherlands and the UK and below average in Spain (EC, 1995: 19). In Europe, the number of overtime hours is relatively high in France and relatively low in the Netherlands; partly due to legislative restrictions. Part of overtime is systematic in nature. Management weights extra costs of premia against the flexibility gain and the avoidance of costs of hiring additional labour (Blyton *et al.*, 1989: 114).

With regard to methodological issues, in empirical research it is often stated that capital utilisation cannot be directly observed, and reasonable proxies have to be found (see Chapter 2). In macro-economic models unemployment is used as a proxy for the utilisation rate of capital (see Driehuis *et al.*, 1988). Material inputs are probably a better proxy for capital utilisation. For there is no intensity margin associated with adjusting materials inputs. Materials and gross output are much highly correlated than output and labour (see Basu, 1996; Baxter and Farr, 2001). A third proxy for capital utilisation is energy input (see Bosworth, 1985). Finally, the workweek of capital is a good measure of capital services (Shapiro, 1996).

In the EU countries only a small proportion of the capital invested in manufacturing is used at full capacity. This “waste” can be explained from preferences: workers and managers do not like to work in the early morning, late afternoon, at night, on weekend, or on holidays, and high income countries can afford the costs of such preferences, expressed as premia for work outside regular hours. In earlier models an *ad hoc* relationship between the workweek of capital, individual hours and employment is assumed, without any clear micro-foundation. Choices by organisations regarding capital utilisation should be related to the choices by workers regarding leisure. The premia for unsocial schedules and shift working explain why the capital stock remains unused during large fractions of the week. Empirical results indicate that the higher the overtime and shift work premia, the lower the level of

capital utilisation (see Bautista *et al.*, 1981; Dupaigne, 2000; 2001). In empirical research it is often assumed that disutility of work is higher during early morning, late evening and night, than during the bulk of the day or during weekends. Labour on unsocial schedules is a different good from labour on office hours, hence its equilibrium price is different. This explains premia (Bautista *et al.*, 1981).

The present work follows on from two international surveys on operating hours in 1989 and 1994, in which the European Commission tried to provide comparative data on operating hours within the European Union for the first time (EC, 1991; EC, 1995). However, both surveys showed a range of methodological and analytical problems, which gave rise to problems of empirical reliability (Bosch, 1999). Thus, there was a need to collect reliable comparative and representative data on operating hours and, moreover, a need to understand what is meant by capital operating hours, direct service times and opening hours.

The main objective of the EUCOWE project was the collection and analysis of comparative and representative data on the relationship between operating hours and working time arrangements, and their consequences for employment in the six EU-member countries. On the basis of clear hypotheses and a rigorous methodology, the project intended to improve the quality of the available data in terms of method, in particular with respect to representativeness, international comparability and reliability. The EUCOWE project is the first representative and standardised European company survey on the relation of operating hours, working times and employment, which covers all categories of firm size and all sectors of the economy. Up until now, research on operating hours has concentrated mainly on manufacturing in establishments with 20 and more employees. Considering the increase in importance of the service sector and establishments with less than 20 employees, both service sector and small establishments (with 1-19 employees) were included in the project design. A standardised questionnaire was constructed. The gross sample consisted of about 12,000 establishments per country and the net sample was, in total, 17,442 establishments across all countries covered by the study.

In empirical macro-economics the accurate measurement of factor utilisation, the utilisation of capital in particular, is considered crucial for the measurement of productivity. Operating hours and working time management are considered crucial for economic competitiveness and organisational performance and are closely linked to job security, job creation and thus social welfare as well. Moreover, the decoupling of operating hours and working times – a necessary condition for the extension of operating hours – is the driving factor of the flexibilisation of working times, which affects social cohesion directly. The increase in competition forces firms to improve produc-

tive efficiency. Productive efficiency refers to the optimal use of available capital and labour in the production process, and can be improved by eliminating under-utilisation of capital and labour by firms. Longer operating times are considered to be particularly important: higher output can be achieved with the same capital resources, expanding growth opportunities more quickly than would be possible by increased investment activity alone. The capital utilisation decision provides the firm with an extra margin to change output (Baxter and Farr, 2001). In establishments and economic sectors with comparable low operating hours there is considerable potential for flexible working time patterns (for example, staggered working times or working time accounts) which could be used to extend plant operating times and improve competitiveness. A greater use of production potential brings down the effective¹ capital/output ratio, increases average capital productivity and ultimately increases profitability and reduces unit costs. However salient these issues are today in the EU, particularly given the increased levels of competition in a global economy, there is a great lack of information. Up to the start of the EUCOWE project there were no comparative data available to ascertain the linkage between operating hours, working time and employment. With the uniform EUCOWE survey in six EU-countries, consisting of comparative and representative data for all sectors of the economy and all firm sizes, the data and information gap is closed to an important extent.

The conceptual work that preceded the empirical analysis of the EUCOWE project led to a homogenous concept of operating hours for all sectors of activity (industry, private services and public service sector). In our study we have used two different procedures to measure operating hours. The first, a “direct measure”, is just the actual number of hours of operation of the establishment during a given period of time, usually a week. In our survey the direct measure is calculated from the answer given by managers to the question of how many hours do they operate in a usual week. This is by far the easiest way to measure operating hours, but it does not capture the different levels of work intensity along the operating hours of the firm. The second measure of operating hours, the “indirect measure”, takes into consideration not only the number of hours the establishment is open, but also the intensity of the production process at different hours of the working day. The innovation of the EUCOWE survey is not only the fact that these consistent measures are applied to all economic sectors and all size classes of establishments in the six countries,

¹ In this respect, as is common in economic analysis, it is important to distinguish between the technical capital-output ratio defined as the level of capital needed to produce a unit of output, and the effective or actual capital-output ratio, defined as installed capital (whether used or unused), divided by total output.

but also that shift work, staggered working times and actual individual working times (contractual working times plus overtime hours) are included in the indirect calculation of operating hours. On the basis of the collected data, it is possible to analyse operating hours, working times and employment in the different branches of the service sector as well as in small and medium sized establishments (SMEs). For the first time analyses of operating hours, working times and employment in “micro” establishments with less than twenty employees is available. This should enable an analysis of whether SMEs really are the driving force for securing and creating employment. The project was designed as a prototype, which was intended to lay the foundations for an EU-wide data collection and data analysis. As the developed instruments proved successful they can be regarded as “tested” and suitable for an additional wave of research.

In this introductory chapter the value added of the EUCOWE project (*i.e.* the scientific and policy relevance of the representative comparative data on operating hours, capacity utilisation, working times and employment, as well as the innovative approach applied) are demonstrated through a review of the theoretical and the empirical literature on the relationship between operating time and employment. The chapter concludes with the structure of the book.

1.2 Theoretical considerations on capacity utilisation in the producing industries and the service sectors

The discussion in this section is divided into two parts: the first deals with the “production model”, relevant to the manufacturing and other production sectors; the second outlines the “service model”, which, as its name suggests, relates to the service sectors. The key differences in the stylized models that lie at either end of the spectrum are:

Production model – the importance of capital stock in the production sector, which is expensive, and the fact that work in progress and final outputs can be stored at relatively low cost, which means that production can be carried out at times of day, week or year when labour costs are relatively low;

Services model (private sector) – capital is relatively unimportant, but work in progress and final output cannot be stored – if the buyer is not provided the service at the time they specify, the demand is lost and the buyer goes to another supplier.

Of course, these are extreme examples. For example, there are some manufacturing firms where the costs of holding stock are high, particularly if the stock

deteriorate or go out of fashion. There are clearly also manufacturing firms which adopt labour intensive production processes and the cost of capital is low. Equally, some service firms can supply their output “by appointment”, although the longer the waiting list, the more likely they are to lose customers. There are other, specialised services which are relatively highly capital intensive. Finally, a model of the service sector needs to take account of differences between the private and public sectors, where the latter tends to be more regulated with regard to opening hours even in very market oriented states, and operating hours and working times are determined not only (and sometimes not at all) on economic grounds.

Production model

According to what is probably the most quoted definition, economics is: “the science which studies human behavior as a relationship between ends and scarce means which have alternative uses” (Robbins, 1932: 16). We live in a world of scarcity, where the ever scarce productive resources, including capital and labour, are insufficient to meet our unlimited wants. It is not surprising then, that economics became known as the “the dismal science”. According to this understanding, we would expect that societies would use as much as possible their productive factors, both capital and labour, in order to produce the highest quantity of good and services. But all we need to do is to look around to see that the actual use of labour and capital is far from the maximum.

In the case of labour, unemployment and underemployment are present in almost all economies, regardless of their level of development. Unemployment can be considered to be one dimension of the underutilisation of available manpower. Furthermore, in most societies, people choose freely to work fewer hours than possible, so even in economies with full employment, the use of labour is clearly below its maximum. Maddison (1980) went a step further giving a major impulse to the development of the labour market utilisation accounts, to overcome the underestimate of unemployment by official figures of registered unemployment that neglect other dimensions of labour slack, including free Sundays and Saturdays, public holidays and days of vacation, time lost through incapacity, bad weather, industrial disputes etc, basic hours of full time workers and part time employees, overtime and short-time (see also de Neubourg, 1988). In contrast, the issue of the level of unemployment or under use of the other scarce resource *par excellence* in economics, capital, has received much less attention. In this sense, the aim of this study is to investigate in depth and from an empirical approach to what extent developed

market economies use their available capital (*i.e.* the operating hours of their productive facilities).

The concentration of part time jobs in services partly reflects the organisation of production: predictable short-run variations in demand, for example, require part time workers as a back-up for full time staff. In general, mass-production and capital intensive industries rely much more on full time employees. However, supply factors and working time preferences of employees also play a role. Recent *endogenous capital utilisation* theory shows that capital utilisation not only concerns the firms' organisational choices but also labour supply behaviour. Unlike in earlier studies, more recent studies confirm that capital utilisation and shift working are endogenously determined: capital utilisation and working conditions are linked; capital and labour are complementary production factors in the short run. Because labour and capital services are short-run complements in production, increases in labour input and capital services should coincide. An increase in hours worked (economic boom) increases marginal product of capital services resulting in a greater utilisation of capital stock or in increased capital accumulation (Baxter and Farr, 2001). In the literature it is often assumed that longer operating times require longer hours worked by households or an increase in the number of shifts worked. Shift working does not decrease leisure time, but changes its timing (see *e.g.* Dupaigne, 2000; 2001). An increase in the working week of capital means that the equipment will be operated longer: earlier in the morning, later in the evening, at night, and/or at weekends. Operating capital longer may essentially be achieved by either having everybody working longer hours or by adding new shifts, accompanied by higher labour costs, overtime and shift premia (Anxo *et al.*, 1995). Because of biological and social factors, this change in work and leisure patterns generally diminishes the welfare of leisure and raises the wage rate for unsocial lengths or times of work (see Hamermesh, 1996; 1998). Thus, it is costly to work labour around the clock. Underutilisation is the justification of an increasing cost of factor utilisation. Two relevant questions that will be answered based on the EUCOWE-results in this book are: are longer operating hours and longer working times positively associated and how do premia relate to operating time?

The trend towards higher factor utilisation may actually be offset by a change in workers' preferences. In a boom, when full employment is approached and there is upward pressure on the hours individuals work, higher premia must be paid to compensate the reduction in leisure hours. The rising marginal cost of labour hours stems the increase in capital utilisation. Moreover, in developed countries wage increases may be accompanied by income effects that are larger than the substitution effects. On balance leisure time is preferred. When wages rise above some level, workers could respond to even

higher wages by cutting on the hours they work, resulting in a backward-bending hour supply curve.² In the Western world, for more than a hundred years, the trend in working hours *per* employee clearly has been downwards, while wages have risen steadily and significantly (Maddison, 1995). Over the past decades Europe experienced waves of weekly working time reductions resulting in a decrease in the average annual working hours of full-timers. Moreover, an increase in the number of part time jobs has also occurred (see Delsen (1995) and Contensou and Vranceanu (2000) for an overview). A relevant question that will be answered based on the EUCOWE-data is: do reductions in individual or collective weekly working time have a detrimental effect on operating hours?

The capital utilisation decision is the mirror image of labour utilisation. Idle capital is conceptually identical to the unemployment of labour. Idleness of capital may be intended, because it is rational, because of economies of scale, variable demand patterns for perishable products or services, or anticipation of rhythmic changes in product demand or in input supply (*ex ante*). Idleness of capital may also be unintended, resulting from unwanted accidents and adversities that occur after the plant is built (*ex post*) (see Winston, 1974). Building flexibility into a plant means sacrificing the lowest achievable unit costs (*e.g.* uncertainty reduces optimal utilisation of capacity).

The under-utilisation of capital can be explained by the rhythmic movement of input prices and factor ownership institutions (see Winston, 1974; Stigler and Kindahl, 1970; Blyton, *et al.*, 1989; Marris, 1964). Marris (1964) showed that idle capital is justified by the characteristics of inputs, even if product demand is constant. Labour and management prices are higher at night and on weekends, because people typically prefer to do regular work at socially “normal” times. Electricity may be cheaper at certain off-peak periods, sun light and warmth may be available cheaply (or even for free) during the day, but be expensive to create at night (Stigler and Kindahl, 1970). The actual utilisation rate chosen will depend on the relative factor prices, the amplitude and timing of the input price rhythms, the capital intensity of production and the elasticity of factor substitution. Hence, if capital is expensive relative to labour, high capital utilisation will be required to reduce the average costs of capital per unit of output. If unsocial hours premia (*e.g.* overtime and shift

² From our point of view this process of reduction of working time has to be understood in terms of a social process driven by collective agreements more than as the result of individual choice. More often than not individual workers face a discontinuous labour demand, *i.e.* the jobs are offered for specific hours, collectively set, and the worker seldom can adjust his or her labour supply to his/her desires or needs.

premia) are high, firms have an incentive to operate only at low cost periods, thereby planning to run with low levels of capital utilisation. The capital intensity argument is similar to the high relative costs of capital argument. The possibility of factor substitution reduces the influence of relative factor prices in determining capital utilisation level. Hence, *optimal utilisation* is not *maximum utilisation*: balancing *ex ante* capital cost savings of higher utilisation (lower unit capital costs) and the increase in rhythmic costs results in optimum level of utilisation generally being (far) less than the maximum. Hence, the optimum itself is an economic variable. Productivity of the capital stock is variable too. "Excess capacity" concerns the *unintended* departure from full capacity, in other words, the extent to which the enterprise fails to attain the intended (desired, optimal) level of utilisation. Since the utilisation of capital is an economic variable, there can be no unique relationship between a capital stock and output or employment (Winston, 1974: 1310). The relationship between operating hours (capital utilisation) and employment depends on the opportunity for substitution of capital services for labour services (which, in the stylised extreme production model of operating hours are treated as perfect complements).

Below average operating hours say nothing about competitiveness of individual industries and firms. It reveals however, shortcomings in the operating and work organisation of plants. The latter may be important as international competition becomes keener. The European Commission is in favour of tailor made solutions that take into account the justified needs of workers on the one hand and enable the fixed assets to be better utilised. The social partners, plant management, works council, workforce and unions should cooperate here (see EC, 1995). According to Hahn and Matthews (1964) the optimal use of equipment presupposed in neo-classical growth theory may never be realised in reality. For the entrepreneur will be unable to distinguish the best possible way of acting and realise it promptly. It will be the case that he constantly looks in an uncertain situation and only very gradually and rather defectively knows to improve his way of acting based on ever increasing experience. Under-utilisation of capital is a reality. Idle capacity may also be a rational economic decision, depending on the costs of using the plant and the demand for products.

Capital intensive processes tend empirically to have higher levels of utilisation (Winston, 1974). The extension of operating hours: as plants become increasingly capital-intensive and the rate of technical progress accelerates, firms seek to reduce unit capital costs by increasing operating hours. At the same time, fixed capital can be amortised more quickly, thereby reducing the increased investment risk caused by the internationalisation of competition (Anxo *et al.*, 1995). Even in the service sector, there are examples of expen-

sive plant and equipment being used more extensively through longer utilisation and opening hours, such as theatres, hospitals or aircrafts and other means of transport. However, opening and operating hours in many service activities are often determined not on economic but on social grounds.

Services model

The developed European economies are characterised by a secular development of tertiarisation and, today, a clear majority of jobs and of establishments are allocated in the service sector. Analysing the producing industries and especially manufacturing therefore means concentrating on a minority of jobs and enterprises. Moreover the development of the service sector is conceived as one of the most promising solutions for the employment crisis of the members of the European Union; Member States with a big share of service jobs tend to be doing well with regard to employment. Economies with a high share of service employment also tend to have a high share of female employment and again a comparably good performance in the fight against mass unemployment. But it is not only this development which makes the service sector of interest; in a lot of European countries lately there have been legal interventions, which strongly influence operating hours in this sector. Shop opening hours have been changed in the Netherlands, Spain, Portugal and Germany, and collective working time reduction in France certainly influences operating hours in services as well as manufacturing.

As noted in the introduction to this section, the way of looking at operating hours in the producing industries needs to be quite different from the way of looking at operating hours in the service sectors (Bauer and Groß, 2005). We noted in the final report to the EC (EUCOWE, 2004: 73):

“Astonishingly operating hours in the service sector have not been paid a lot of attention to up to now. Research on the topic was focussed on the producing industries conceptually and empirically. On the international level there are no data available on operating hours in the service sector at all.”

First consider private services, such as retail, wholesale, transport, etc. The stylised model is that, in many instances, the “product” has to be delivered in real time (the *uno actu* principle). Rather than give one stylized model, it is possible to provide a number of examples that can be observed in the real world.

Retail

If there are a sufficiently large number of potential customers who want to shop before going to work, say at 7.00, or after leaving from work, say at 19.00, then it will pay one firm to open (assuming legal regulations allow). If no shops open other than 9.00 to 17.00, then they do not lose any customers, however, if just one shop opens, they take all the customers that prefer early and late shopping, other things being equal. This can be made economically viable in a number of ways: (i) although most retail outlets find it difficult to set different prices at different times of the day (or week), those that, say open longer hours can charge more than those that open shorter hours, as they have greater monopoly power outside the normal working day; (ii) some retailers (such as bars and pubs) can set different prices at different times (*i.e.* so-called “happy hours” during periods of low demand); (iii) manning levels can often be set to reflect the volume of trade during unsocial hours, subject to managerial overheads (*i.e.* needing a fixed volume of management input irrespective of the number of counter or checkout staff); (iv) if trade is brisk enough, although wages may be higher during unsocial hours for traditional staff, lower margins may be off-set by higher volumes of trade per employee; (v) opening at unsocial times can open up new, lower cost sources of labour, including part time workers and students; (vi) output per unit of capital (*e.g.* the premises) rises, so unit capital costs fall. There is a dilemma here in that, if too many shops open at more unsocial times, the additional trade may not be sufficient to make the longer operating hours economically viable. However, certain locations may be better than others and more favourable to longer operating hours, in addition there may be a first mover advantage.

Wholesale and business-to-business suppliers

Historically, wholesale markets have tended to open outside of shop hours, for example, early in the morning, so fish shows and fruit and vegetable shops can buy before they open. More recently, with just-in-time processes being used by both manufacturing and retail firms, the times at which inputs are to be delivered are imposed upon or negotiated with suppliers. The large supermarkets in the UK specify the delivery of new stock at times which suit them; the producers or suppliers and the transport firms that they utilise are assigned specific time windows for delivery at specific locations. If these windows are missed, the goods may be turned back to their original location (which has a major cost in terms of transport) and can give rise to penalty payments and a delay in receiving payment for the goods. The situation is even worse where the goods have fixed and, particularly, short shelf lives. Delivery from a given

location to another location for a given time slot may determine the times at which the product is produced, especially if perishable, and the time at which the transport will set off and arrive. Transport is also governed by laws about the length of time an individual driver can work and the length and timing of their breaks.

Transport

In the case of transport, there are times of the day when large numbers of individuals want to travel, again, often linked to getting to work and back home again. Thus, there are peaks and troughs in demand that, again, may fall outside of the normal 9.00 to 15.00 period. The precise response will depend upon how the different forms of travel are regulated. In the case of travel, unlike shops, it is easy to discriminate between the price of tickets to travel at different times of the day, week or year. Thus, a stock of capital just large enough to meet the minimum demand, will leave demand outstripping supply at peak times, causing the price of travel to rise. This also forces individuals to either find other forms of transport at peak times or to shift the time of their movement to off-peak periods. If all forms of travel experience the same peak times and overall supply is not sufficient to meet overall demand, even given some substitution between forms of transport and times of travel then prices will remain higher at peak times and lower during the troughs. If, at the peaks, the marginal revenue from travel exceeds the marginal cost, then there is an incentive to invest in more capital stock, even if this is not fully utilised at off-peak times (which has to be built into the marginal cost calculation). Regulation in the various States has something to say about how these operating hours can be delivered, both in terms of the regularity or continuity of services and in terms of the length of working day or week for operatives, especially drivers.

The discussion now turns to public sector services. The introduction to this section noted that a distinction has to be made between the private sector and parts of the public (and perhaps the not-for-profit) sector. The EUCOWE survey reveals that 35% of the employees of the service sector in Germany are working in establishments which belong to the public sector (or non-profit organisations). In France the figure is 32%, in the UK, 25%, in the Netherlands, 35%, in Portugal, 10%, and in Spain, 10%. The extent that the opening and operating hours of the associated establishments are determined by economic or social factors in part depends on the national welfare regime.³ At

³ An interesting example is the struggle between national legislation and European legislation concerning the working times of medical practitioners in Germany. The

the extreme, however, a proportion of these establishments in all countries will be determined wholly on social grounds, as in the case of fire services or accident and emergency (A&E) facilities. However, the manner of their delivery, for example, by full time staff *in situ* or by staff on “standby” may still differ, as in the case of fire services and some medical staff.

Health services

The last example is of general interest in the context of the services model of operating hours. A public hospital is subject to a duty of care: central services such as A&E and hospitalised patients have to be available for 24 hours a day and for 365 days a year, so hospitals providing these facilities have the maximum operating time of 8,760 hours a year. This implies that resources have to be available and in sufficient quantities to meet any peaks in demand, either by staff being present or available at very short call, although some queuing of patients will take place (*i.e.* triage). Thus, the term “emergency service” indicates that this duration of the operating hours does not mean that such activities are carried out continuously for 8,760 hours a year. It is almost certain therefore there are “slack times” that are included systematically, just because the service has to be provided also to a potential customer, client or patient, who is actually not present, but might be arriving soon.⁴ This mixture of the provision of a service in principle and its actual performance is not restricted to hospitals, it more or less holds true for the whole the service sector.⁵ A lot of service activities are dealing with the absorption of risks, with coping of crises and emergencies, with monitoring and controlling.

Clearly, it is highly unlikely some form of peak load pricing can be applied in the case of emergency services or recovering in-patients. However, hospitals will face higher wages and related labour costs in manning unsocial

German “Arbeitszeitgesetz” conceives emergency services of doctors in clinics as non-working times, which are consequently not paid as working times and taken into consideration when maximum working days are defined. The European law, in contrast, understands emergency services as working times, which means that the GPs have to leave the service earlier and the hospital has to deploy more practitioners to maintain the service. This, of course, might lead to higher labour costs for the hospitals on the one hand; on the other it could be in favourite of the doctor’s and the patient’s health, since overworked and exhausted practitioners could turn out to be a risk for the patients.

⁴ This creates a crucial measurement problem of operating hours in the service sector for the indirect measure of operating hours (see Chapter 2).

⁵ In addition to A&E there are the stand-by services of the police and fire workers, as well as alert situations in the army.

lengths and times of work. In the case of nurses in the UK, for example, permanent nightwork generally attracts more money than the corresponding day work (Croft, 1999). Even so, this has not been sufficient to compensate a proportion of the nurses for the combined disadvantages of nightwork in the UK: the disutility of nights for most individuals; the fact that permanent night nurses are treated as second class citizens and the associated lack of career progression they experience. Such factors have given rise to significant turnover and recruitment costs for the UK National Health Service – a non-pecuniary labour cost of unsocial hours. Thus, although some services must be provided on a continuous basis, others are compressed as far as possible into more social times of the day and week.

In the case of continuous activities, it is clear that the 8,760 hours are not worked by each available employee of the respective institution, but requires the adoption of work patterns that decouple individual hours from operating hours. As Buchan states in the case of nursing staff,

“As a service which is essentially 24-hour in nature, with often unpredictable fluctuations in workload, the NHS requires the majority of clinical nurses it employs to work some form of shift pattern.” (Buchan, 1995)

Historically, UK shift patterns for nurses were rigid and inflexible, irrespective of workload or staff preferences, often involving split shifts and split days off (Croft, 1999). As the domestic lives of nurses changed, such rigid systems gave rise to problems of recruitment and retention of staff. As a consequence, many hospitals have phased out permanent night duty and out-patient departments have attempted to resolve the competing requirements of the patient workload with the needs of nurses using flexible shift systems. The replacement of permanent nights by compulsory internal rotation (with the exception of the high technology areas of Intensive Care and A&E) produced little improvement. However, solutions involving changes to the start and finish time of the night shift (Barton, 1994) and the introduction of twilight shifts (Fereday, 1997), as well as flexible rostering systems (Darlison, 1994; Findlay, 1994), particularly when accompanied by annualised hours (Vernengo, 1996) and allowing the nurses to decide how to cover the shifts – “self rostering” (Humm, 1996; Paget-Wilkes, 1997; Donoghue, 1997) – have proved more positive.⁶

⁶ In a review of shift systems in England and Wales 122 out of 182 hospitals reported different shift systems and of these no two shifts were identical (Barton, 1994). However, the systems did not vary greatly, with the main differences associated with start and finish times.

1.3 Some concluding comments

It is clear that work patterns are not only the result of forces of supply and demand at the micro level, but also influenced by collective agreements, national and international regulations, as well as by historical precedent. When left to the market, the outcome will reflect the power of the buyers and suppliers of labour services and, thus, will also depend on the degree of monopoly and monopsony power. A single dominant employer in a given area may be able to specify work patterns close to their productive optimum, while a single dominant supplier in an area (*e.g.* a strongly unionised work force faced by medium sized enterprises) may be able to specify work patterns close to the socially most acceptable.

Outside of the extreme cases, however, there are market forces and more macro influences at work. In general, if an employer specifies too unsocial a working arrangement, with insufficient pecuniary and non-pecuniary compensation, workers will transfer their labour to employers with better working conditions, other things being equal. Likewise, if workers impose too rigid restrictions on working unsocial lengths or times of work, this will increase the firm's costs and prices. As a consequence, consumers will switch to other producers or products.

The discussion has outlined stylized models of both the production sector and the services sector. There are clear distinctions between the two, although these are not present in every case, which largely revolve around the storability of the product (mainly storable in production model has made it clear that the model needs to accommodate the private and the public but not in services). Thus, in the main, workers have to be present when consumers demand the service, but production workers do not. It has been argued that this is further complicated by a degree of unpredictability of the demand for services, which often leads to over-manning in a strictly technical sense in services. A distinction was also made between which can and cannot "peak-load price", which helps to redistribute demand to lower cost times of the day or week. While the ability to peak load price is more generally possible in the private sector and particularly in private services, it is not a key distinguishing feature between private and public sectors or between production and services. Both transport and electricity supply (which may be privately or publicly owned, which span the production and service sectors) apply peak load pricing. However, in the main, key public services are more regulated and their time patterns of demand are mainly not subject to normal pricing rules.

There are some further missing pieces of the jigsaw, not covered in the earlier discussion. First, the need to meet demand outside of "normal" hours tends to generate higher labour costs. This results in an incentive to invent and

adopt new technologies that save on labour at these times. The demand for banking outside of normal banking hours was initially met by lengthening operating times, but then by the widespread adoption of ATM technologies (Bosworth, 1995). Second, the work patterns set for one sector impact on those of other sectors. The classic example is where school hours are set, for example, in the UK, from 9.00 to around 16.00. Given that parents generally need to prepare their child for school and, often, to take them to school and pick them up again, this sets times when at least one parent cannot be at work, unless other provision is made for the child. When one sector, say manufacturing, works 9.00 to 5.00 Monday to Saturday, their demand for services will be outside of the normal working day and at weekends. Given the diversity of work patterns today, it is very difficult to pin down how changes in one sector affect other sectors, as well as the knock-on effects of such changes.

1.4 The structure of this book

With this background, the present volume addresses four main questions. First, what are the operating hours of the different European countries that form the six country studies of our research? Second, what are the differences between sectors of activities and establishment sizes? Third, by means of what type of working time organisation are those operating hours accomplished? Fourth, what is the relationship between operating hours and employment?

The next chapter (Chapter 2) reviews the methodology that underpins the design of the EUCOWE survey, conducted to produce the data used in the analysis of operating time. Chapter 2 also explains in detail the direct and indirect measurements of operating hours used in the study.

Chapter 3 presents a cross-country comparison of the results on operating hours, working time and employment of the six EU countries covered by the EUCOWE survey. Data are presented about the operating hours and the working time patterns in the respective countries, by sector and size of establishment. Information regarding the decoupling of operating hours and contractual working times is presented. Finally, the last section of the chapter analyses the extent to which establishments in the different countries are exposed to fluctuations in their business activity, their causes and the strategies followed by the establishments in coping with those fluctuations.

Chapters 4-9 report the national results for the six countries covered by the present study: France (Chapter 4), Germany (Chapter 5), the Netherlands (Chapter 6), Portugal (Chapter 7), Spain (Chapter 8) and the United Kingdom (Chapter 9). These country chapters have a common structure. Each chapter reports two measures of weekly operating hours, and data are presented on the

length of daily and weekly operating hours and weekly operating days, by sector and firm size. The developments in operating hours and employment over the period 1998 to 2003 are considered, broken down by sector and establishment size. The discussion shows how operating hours are linked to key establishment characteristics. The differences between economic sectors and size classes in the use of part time work, shift work, staggered working times, Saturday and Sunday work, overtime, temporary work and on-call labour are addressed. The relationships between operating time, the working time patterns and employment are established. Each chapter also investigates the relationship between fluctuations in demand and establishment activity levels with the measures taken by the establishments to cope with these fluctuations.

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