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The Coming of the 24-hour Economy?

Changing work schedules in Belgium between 1966 and 1999

Ignace Glorieux, Inge Mestdag and Joeri Minnen

ABSTRACT. This study mapped the changes in the timing of working hours in Belgium as reported in workers' daily work schedules, obtained from the Belgian *Time-Use Surveys* of 1966 and 1999. A typology of working schedules was drawn up by means of a sequence analysis. This approach showed that work performed beyond the standard times, that is, in the evening, at night, or on weekends, did not grow in importance in the intervening years. In 1999, standard working hours clearly accounted for a larger share of the work schedules of the active population. Although the analyses did certainly not corroborate the often alleged trend towards a 24-hour society in Belgium, it could be shown that certain categories of the working population are more susceptible to flexible working hours than others. **KEY WORDS** • Belgium • non-standard work times • sequence analysis • time-use study • work schedules

The Coming of a 24-hour Society?

In the second half of the 20th century, Belgium, like the rest of Western Europe and several other countries (e.g. Canada and Australia), witnessed a steady reduction in the number of working hours (Lallement, 1995; Alesina et al., 2005). For the USA, there is some evidence that, during the same period, the

number of working hours remained stable (Presser, 2004). In Belgium, the decrease in working hours, from 45 to 38 hours a week between 1956 and 2001, was enacted by statutory laws (Maes and Van Rie, 1985). The early 1980s are generally recognized as a turning point in legislation concerning the length of the work week, as stronger emphasis was placed on work schedules while calls for a reduction in the number of work hours faded into the background. In other European countries as well, the topic of flexible working hours received high political priority during the last two decades of the 20th century (Strazdins et al., 2006). The flexibilization and individualization of the work schedule were increasingly considered as tools to improve economic competitiveness (Lallement, 1995). In Western Europe, the historic labour agreements that had been achieved by social partners in the preceding decades lost ground and, as a result, the temporal structuring of work schedules gradually lost its universal and rigid character (Garhammer, 1995).

Since the early 1980s, regulations concerning work time together with welfare-state policies have been reformed in most European countries. The promotion of new social arrangements has been aimed at making economic and labour markets more flexible (Fagan, 2001). In many countries, the flexibilization of work times has been recognized on a judiciary basis (Lallement, 1995; Masson, 1999; Alis et al., 2006). In Belgium, a collective agreement and a statutory law was passed in 1987 enabling companies to introduce new work schedules that relaxed the restrictions on night-time and Sunday work. This changing legislation has frequently been implicated as the starting point for a 24-hour society and economy, in which 'round-the-clock' production and consumption are increasingly considered as normal practices (Garhammer, 1995; Allan et al., 1998; Breedveld, 1998; Masson, 1999; Golden, 2001).

Generally speaking, the 24-hour society is believed to be driven by exogenous or macro-level factors (Allan et al., 1998; Hamermesh, 1999; Masson, 1999; Baker et al., 2003; Presser, 2005). Flexibilization and destandardization have often been understood as ways to accommodate changes in technology and the global market (Garhammer, 1995). The spread of information and communication technologies (ICT), along with a globalizing economy, have made it necessary for international companies to run 24 hours a day in order to respond and deliver (just) in time, to compete with different time zones, or to stay in contact with branch offices in different locations all over the world. Thus, besides the technical factor there is also the organizational factor. International competition in a poorly protected market demands that enterprises convert to flexible work-time arrangements (Lallement, 1995). In order to maximize profits on capital investments, employers will seek to extend operating times. For employers, the wage costs of shift work are lower than overtime payments to day workers, as there are strict rules on how to compensate workers for overtime (e.g. financial compensation and extra days off).

Another key element in the demand for more flexible work-time arrangements is the noticeable growth of the service sector, which in the last few decades has become the largest segment of many economies (Presser, 2004). Due to the preponderance of service work, the temporal boundaries instituted by industrial society are being questioned. Consequently, there is increasing interest in extended shopping and service hours. The remarkable expansion of the recreation and entertainment industries has also accelerated the need for paid evening, night-time, and weekend work, as the desynchronization of social time implies that free time for some becomes the work time of others (Lallement, 1995). This macro-economic factor favouring a 24-hour society is therefore also related to changes in the supply side of the labour market.

The growth of the service economy goes hand in hand with women's participation in the labour market, and these trends are mutually reinforcing. While women are easily employable within the service economy, their engagement in paid labour increases the demand for services and commodities, since part of what was formerly produced at home is purchased instead. The increasing number of dual-income families has strengthened purchasing power, but there are fewer opportunities to go out and buy goods and services during normal working hours. This, in turn, enhances the demand for extending the business hours of services and shops (Presser, 2005).

On the supply side of the labour market, demand for more flexible hours is also rising. Individualization, the emphasis on individual autonomy, and the numerous problems resulting from the individual's need to manage his or her time in a high-pressure society underline the need for work-time autonomy. In this respect, time sovereignty is an important factor since more temporal sovereignty leads to more temporal flexibility (Glorieux et al., 2004). Employees with more time sovereignty work longer days than employees with no or less time sovereignty and are therefore more likely than 'regular' full timers to carry out some of their paid work at non-standard times, such as in the evening or during the weekend (Dixon, 2002).

The temporal organization of work is a lively topic in many European countries and in the USA (Hinrichs et al., 1991; Boulin et al., 1993; Breedveld, 1998). The development of a 24-hour society has been mostly inferred from figures on the increasing number of people who work non-standard hours (Presser, 2000). Current population study data have shown that there has been a gradual trend towards a non-standard work day and work week in the USA. Results from the *European Labour Force Survey* (ELFS) also revealed that a substantial percentage of workers are employed during non-standard work times (Evans et al., 2001). The ELFS included data on employees who 'usually' work in shifts, during the evening, the night, or on Saturdays or Sundays. In 1998, 12.6 per cent of the Belgian active population usually worked during the evening, which is a somewhat smaller proportion than in most other European

countries. For night-time work, Belgium ranked in the middle, with 5.2 per cent of its workers employed at night. According to the ELFS, Belgium had the lowest percentage of Saturday workers (only 18.8%) and it also ranked in the bottom three countries for Sunday work (9.6%). Finally, 16.5 per cent of Belgium's workers were engaged in shift work, which is relatively high for that type of work. Overall, the data suggested that the Nordic countries had the most flexible workforce in Europe. Finland scored high for work during the evening (26.8%) and night (9.8%). Finland (18.6%) and Denmark (20%) led all other European countries studied with respect to Sunday work, while Finland (24.5%) and Sweden (25.2%) had higher rates of shift work. Southern European countries, including Italy (39.6%) and Spain (36.3%), had the highest percentages for work on Saturdays.

Although the USA is generally considered to be the 24-hour society *par excellence*, the organization of work in Belgium and other European countries appears to be moving in that direction. Despite this general belief, there has been little scientific research on the topic. As far as labour market conditions are concerned, similar demographic and economic trends can be discerned in Belgium as in the USA, but these do not necessarily result in a similar increase in non-standard working schedules. In this study, we put the thesis of the '24-hour society' to the test by comparing working hours in Belgium in 1966 and 1999. The former may rightly be considered as the apogee of the standardization of labour legislation, while the trend towards flexibilization is often believed to have culminated at the end of the 20th century.

Time-use Data to Map Historical Changes in the Organization of Work

Changes in work schedule arrangements were determined from data derived from two time-use studies (TUS). TUS meticulously register people's daily time use and are therefore suitable to map societal changes. The flexibilization of work schedules has mostly been inferred from questionnaire data; however, to ascertain the importance of work performed outside standard working hours, information other than workers' subjective assessment of the type of shift they work is needed (Hamermesh, 1999; Dragstra and Tijdens, 2007). Time-use data allow the different times throughout the day at which paid work is carried out to be very accurately identified. As a result, not only the prevalence of night or weekend work, but also the prevalence of work during the fringes of the working day, that is, early in the morning or later in the evening, can be assessed (Allan et al., 1998). Moreover, time-use data from different years could prove to be very useful in analyses of social changes from a historical perspective. This is of particular relevance since work-time arrangements are often investigated

by means of highly different measures, which hinders chronological comparisons (Presser, 2004).

The time-use data that form the basis of this study were gathered in 1966 and 1999. The Belgian time-budget study of 1966 was part of the *Multinational Comparative Time-Budget Research Project*,¹ in which 2077 Belgians, between 19 and 65 years of age, kept a one-day diary. The second national TUS in Belgium was conducted in 1999 by the *National Institute for Statistics*, following EUROSTAT guidelines (Eurostat, 2000; Glorieux and Vandeweyer, 2002). In that survey, 8382 Belgians between the ages of 12 and 95 years and representing 4275 households kept a diary on two days: one weekday (Monday through Friday) and one weekend day (Saturday or Sunday). In order to make both datasets representative for the entire Belgian population for the respective years, the data were weighted.² The 1966 dataset included time-use and questionnaire information from 1345 working respondents. The 1999 dataset consisted of time-use and questionnaire information from 1866 working respondents.

The questionnaire and time-use data from both datasets were standardized to a common format and merged. For purposes of comparison, only information from respondents between 19 and 65 years of age were retained and only one respondent per household was selected from the 1999 dataset. The resulting merged database comprising data from 1966 and 1999 provided a unique record for studying changes in work patterns in the last trimester of 20th-century Belgium, although the restricted background variables in both studies confines investigations into the effect of structural changes between the two years.

Working During Non-standard Hours: Changes between 1966 and 1999

In order to study deviations from standard working hours, the definition of standard must be clearly established. Here, we distinguished between four types of non-standard work times: (1) *evening work*, from 7:00 pm till 10:00 pm on any day of the week; (2) *night work*, from 10:00 pm till 6:00 am on any day of the week; (3) *Saturday work*, from 6:00 am till 7:00 pm on Saturdays; and (4) *Sunday work*, from 6:00 am till 7:00 pm on Sundays. Standard work times refer to weekdays between 6:00 am and 7:00 pm and thus corresponds to a work week of 65 hours, or 38.7 per cent of a week. Non-standard times correspond to 103 hours, or 61.3 per cent of a week. Night time comprises the largest share of non-standard work times.³

Table 1 shows that the share of standard work time increased in Belgium after 1966. In contrast to what is often believed, the share of work performed during non-standard work times decreased from 19.6 to 13.8 per cent in the last third of the 20th century. In 1999, more than 86 per cent of the total work time in

Belgium occurred between 6:00 am and 7:00 pm, on Mondays through Fridays. Night-time and evening work were the exceptions in both research years. The smaller share of working hours beyond standard times was due to the decrease in Saturday work, from 9.2 to 4.3 per cent. Work on Saturday morning was common in Belgium until the early 1970s, when the 45-hour week assumed an 8-hour work day from Monday to Friday and another 5 hours on Saturday morning. This was corroborated by the 1966 time-use dataset, in which the average work time on Saturdays was reported to be 4h30'. The five-day work week was instituted gradually, beginning in the late 1960s and early 1970s, such that a 40-hour work week became reality for almost all workers in 1975 (Maes and Van Rie, 1985). Table 1 further establishes that in both years Sunday was considered as a rest day. Since Sunday work was forbidden by law in 1905, it became and has remained an exceptional practice.

TABLE 1
Percentage of work performed during standard and non-standard times with respect to the active Belgian population, aged 19 to 65, in 1966 and 1999 (calculations on aggregate level)

Time period	Number of hours in time period	Share of time period in full week	TUS 1966 Share of time period in total working time	TUS 1999 Share of time period in total working time
Evening work	21	12.5%	5.4%	3.9%
Night work	56	33.3%	3.2%	2.7%
Weekend work	26	15.5%	11.0%	7.2%
<i>of which on Saturday</i>	13	7.75%	9.2%	4.3%
<i>of which on Sunday</i>	13	7.75%	1.8%	2.9%
Non-standard working times	103	61.3%	19.6%	13.8%
Standard working times	65	38.7%	80.4%	86.2%
Total week	168	100.0%	100.0%	100.0%

Figure 1 corroborates the findings provided in Table 1. This tempogram shows the proportion of the active population that actually worked at any given moment of the week (from Monday till Friday). The figure clearly illustrates the absence of an expansion of work during non-standard working times. More people were engaged in paid work at the same time in 1966 than in 1999. This holds true for the mornings as well as the afternoons. The reason for this may be the increase in the number of holidays and statutory holidays and the surge in part-time employment as a result of the entry of women into the labour market.

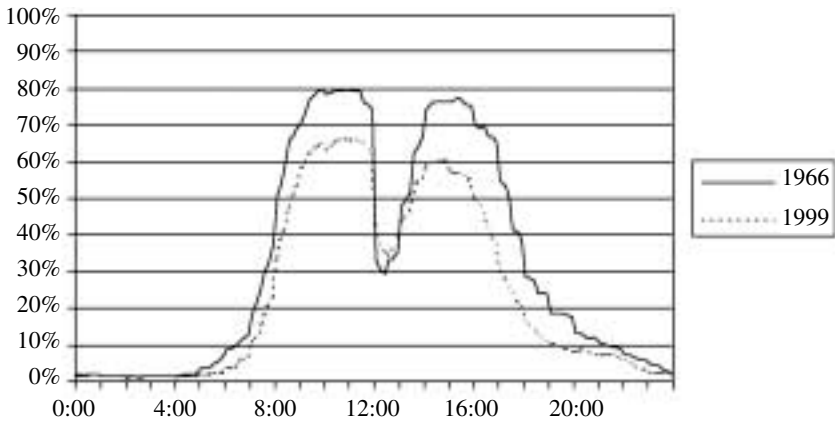


FIGURE 1
Tempogram for paid work performed by the active population on a
weekday in 1966 and in 1999

A Typology of Work Schedules on Weekdays

The average tempogram, as exemplified in Figure 1, may conceal several different patterns of work schedules. To gain further insight into the changing character of work schedules during weekdays, we identified sub-rhythms within the collective work schedule. Individuals with similar work schedules on a particular work day were therefore identified by sequence analysis and grouped together in order to create a typology of work schedules that applied to the combined active working populations of 1966 and 1999.

In this approach, only active respondents who filled out a time-budget diary for a weekday and registered at least 10 minutes of paid work on that day were eligible for inclusion.⁴ Accordingly, the study was based on data from 964 respondents in 1966 and 1472 in 1999. The aim of sequence analysis is to assess the difference between individual sequences, in this case individual work schedules, by means of distance. This type of sequence analysis is called the *dynamic Hamming distance analysis* and was designed by Richard Hamming (1950), who defined the distance between two sequences as the number of substitutions required to convert one sequence into another. Substitutions assume that one value is replaced by another, leaving the temporal structure of the sequence untouched. This approach is ideal for finding contemporaneous similarities (Lesnard, 2005). However, in order to detect similar work schedules, the analysis must take into account more than just the number of work to non-work

substitutions necessary to equate work-day schedules since some substitutions are more probable than others, given their timing. The cost of substituting work by non-work or vice versa 'should reflect the likelihood, proximity, of two events occurring at the same time' (Lesnard, 2005: 11). As work is much more probable than non-work at 11 o'clock in the morning, a substitution by non-work will entail a high substitution cost. Conversely, as many people stop working between 4 and 5 pm in the afternoon, work and non-work are equally prevalent, which is reflected in a low substitution cost.⁵ The dynamic Hamming distance procedure, performed using SAS, results in a dissimilarity list containing the distances between all possible pairs of sequences. This dissimilarity list was read into Clustan Graphics to distinguish between various clusters. Twelve clusters were thus established,⁶ analogous to the study of work schedules in France by Lesnard (2005). Not only was the number of clusters manageable, but, as the following analysis shows, this typology allowed for adequate variation while preserving most of the original information. Moreover, the best validation for a cluster solution is the fact that the groups are quite homogeneous with regard to background characteristics, that is, characteristics not taken into account when the clusters were constructed (Table 2).

Mean sequences were constructed to reflect the typical behaviour of a cluster. The mean sequence of a cluster is the sequence with the smallest average distance to all other sequences in the same cluster. It allows horizontal visualization of the homogeneity within a cluster. In this study, the mean sequence provided a general idea of the work times included within a particular cluster. Mean sequences were retrieved through a calculation provided in the statistical software package SPSS. To describe the clusters in general, tempograms were used. These display the vertical homogeneity of activities within the classes and the share of respondents in a given cluster who are engaged in work at a given moment of the work day. The tempograms presented in Figure 2 take into account both research years to the same extent. In addition, the clusters were characterized on the basis of calculations of the average duration of work per cluster and the share of the total work performed during non-standard times (between midnight and 6:00 am and between 7:00 pm and midnight).

The 12 clusters were grouped into five types of work schedules: standard work days, long work days, shift work, part-time arrangements and fragmented work schedules. In both research years, standard work schedules accounted for the majority of work schedules. Moreover, this percentage increased between 1966 and 1999 due to the considerable growth of the typical 9-to-5 work schedule. The 8-to-4 work schedule also became somewhat more prevalent, and the average 8-to-4 work day shortened from 8h49' to 8h12'. By contrast, the prevalence of the long version of the standard work day (9-to-6) decreased. Of the respondents with standard work schedules, almost no work (< 1%) was performed during non-standard times. Thus, in general, the prevalence of the

TABLE 2
Twelve types of work schedules on working days and their share in 1966 and 1999, including timing, average work duration, and percentage of work at non-standard times

Type of work schedule with mean sequence	Share of active population		Work duration			Percentage of work at non- standard times			
	1966	Sig. 1999	1966	Sig. 1999	1966	Sig. 1999	1966	Sig. 1999	
Standard	55.6%	**	62.7%						
1 Standard 9 to 6 8:30–12:30 & 13:30–18:00	22.6%	***	14.3%	8h54	ns	9h04	0.5%	ns	0.5%
2 Standard 9 to 5 8:30–12:10 & 13:00–17:00	18.3%	***	30.7%	7h22	ns	7h18	0.5%	ns	0.2%
3 Standard 8 to 4 7:30–12:00 & 12:30–16:30	14.7%	ns	17.7%	8h49	***	8h12	0.0%	ns	0.1%
Long working day	12.4%	***	6.4%						
4 Long working day 8:00–12:30 & 13:00–20:00	7.4%	***	2.4%	10h14	*	9h30	12.6%	ns	11.7%
5 Long working day with evening extension 8:20–12:30 & 13:20– 18:00 & 19:50–22:20	5.0%	ns	4.0%	11h25	ns	11h09	26.4%	ns	23.4%
Shifted	12.8%	ns	11.2%						
6 Morning shift 5:40–14:00	6.2%	**	3.7%	8h23	**	7h26	7.9%	ns	13.7%
7 Afternoon shift 14:00–21:30	5.6%	ns	6.0%	7h33	ns	7h16	30.0%	ns	33.9%
8 Night shift 22:00–5:50	1.0%	ns	1.5%	8h36	ns	7h34	96.4%	ns	96.7%
Part-time	10.5%	***	16.1%						
9 Part-time morning 8:30–12:00	3.6%	***	9.8%	3h41	ns	3h55	4.9%	**	1.1%
10 Part-time afternoon 14:10–16:30	6.9%	ns	6.3%	4h58	***	3h27	4.0%	**	14.9%
Fragmented	8.7%	***	3.8%						
11 Fragmented working day 7:00–12:10 & 15:30–18:40	7.5%	***	2.8%	9h58	**	8h40	9.3%	*	5.8%
12 Fragmented late working day 18:50–24:00	1.2%	ns	1.0%	8h06	ns	8h02	70.6%	ns	71.5%

ns statistically non-significant ($p \geq 0.05$); * statistically significant at $p < 0.05$; ** statistically significant at $p < 0.01$; *** statistically significant at $p < 0.001$.

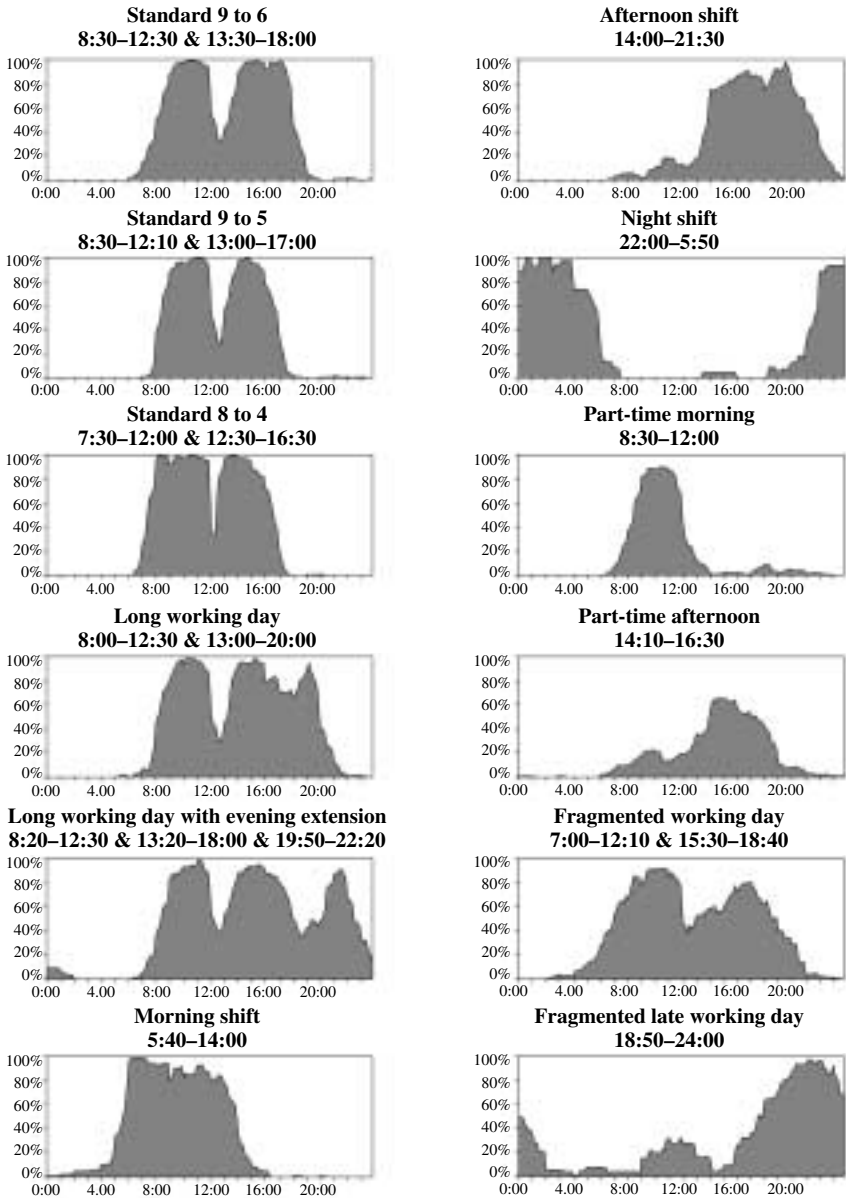


FIGURE 2

Tempograms and mean sequences for paid work carried out on weekdays for 1966 and 1999 for all 12 types of work schedules

standard work schedule, in which work is performed exclusively during office hours, increased from 1966 to 1999 and the standard work day became shorter.

Conversely, long work days were more exceptional in 1999 than in 1966. Both the 8-to-8 work day and the long work day extending into the evening became less common in Belgium during the study period. The average duration of work on long work days decreased, although the decrease was only significant regarding the evening extension. On long working days, about 12 per cent of the total work time was performed during non-standard hours. When a long work day was extended into the evening, the percentage of non-standard working hours increased to account for one-quarter of the daily hours worked.

Shift work was also less prevalent in 1999 than in 1966, although the decline was statistically not significant. The average duration of a morning shift was significantly shorter in 1999, while the average durations of afternoon and night shifts did not change significantly. The morning shift was characterized by a small percentage of total working hours occurring during non-standard hours. One-third of the total work time of people employed in afternoon shifts was performed during non-standard hours, mostly in the evening. Those working night shifts had the highest percentage (96%) of total work time occurring beyond standard times.

Due to the large number of part-time work arrangements, short working days have become more widespread. Nonetheless, in this study, the increase affected morning employment only, while the percentage of respondents engaged in afternoon part-time employment remained stable. The average duration of an afternoon part-time job also decreased significantly between 1966 and 1999. There was a significant decrease in the percentage of total work performed during non-standard times by workers with part-time morning employment, while a trend in the opposite direction was determined for part-time afternoon employment.

Finally, two types of fragmented work schedules could be distinguished. The first one consisted of a large amount of work performed before noon, followed by a long break in the early afternoon, and a recommencement of work in the later afternoon until the evening. In this pattern, the average number of working hours was lower and a smaller share of those working hours was performed beyond the standard time. Contrary to popular belief, this type of fragmented working pattern did not grow in importance. The second type of fragmented timetable was the fragmented late work day. From an analysis of the mean sequence, it was clear that this schedule was centred on evening work hours, although the tempogram showed a second, smaller peak around noon. Workers in this cluster performed a large share (more than 70%) of their total work in the evening and at night; for example, a person working as a cashier, waitress, or in some other service-related job that demands the employee's presence when most other workers are off. In this respect, it was useful to examine the relation-

ship between a respondent's work schedule and other characteristics of his or her job.

Different Work Schedules for Different Types of Employment?

One of the reasons for the expected increase in work during non-standard times was the expanded participation of women in the labour market during the study period. Between 1961 and 1999, the activity rate of Belgian women aged 15 to 64 increased from 26.7 to 50.4 per cent.⁷ The time-use data corroborated this trend: in 1966 only 29.3 per cent of the active population consisted of women, whereas in 1999 women comprised 42.4 per cent of the active population. Nevertheless, women's entry into paid labour did not result in more work performed beyond the standard working hours; rather, for women and men the status quo regarding the share of non-standard times between 1966 and 1999 was maintained. Yet, the share of time worked during non-standard hours was larger for men than for women (8.2 vs. 5.9%, respectively). As such, the average share of work performed during non-standard times declined, due to women's large-scale entry into the labour market and their small share of work performed during non-standard working hours. Men were more likely than women to have work schedules with a relatively large number of non-standard hours, that is, long work days, fragmented work days, and shift work in the morning or at night. In fact, in 1966, night shifts, which accounted for the largest share of work during non-standard times, were an exclusively male affair, since a law dating from 1889 completely prohibited night work for women. Only in 1968, by means of a Royal Decree, was night work for women permitted, albeit under very restricted conditions. Since 1997, the same restrictions on night work have held for men and women.

Women were more likely than men to work a standard 9-to-5 schedule, and thus a very low share of their work occurred during non-standard times. Women were also over-represented regarding part-time work, which is often considered as non-standard work compared to the standard 38-hour work week. However, as shown in Table 2, part-time work is not necessarily characterized by a large amount of work performed beyond standard times. The time-use data revealed that in Belgium the share of work beyond standard times increased for those working part-time in the afternoon. This was particularly the case for women working part time in the afternoon, for whom the share of work performed at non-standard times during weekdays increased significantly, from 5 to 16 per cent between 1966 and 1999; however, only 9.2 per cent of women worked under this arrangement in 1999. It may thus be concluded that the rise in the number of women participating in the labour market did not lead to a massive increase of work performed beyond standard times.

The increase in the flexibilization of work times has been attributed to the massive expansion of the service sector. In the early 1960s, the secondary and tertiary sector employed equal parts of the Belgian population, each about 46 per cent. The decrease in the secondary sector accelerated in the 1970s due to the economic crisis. By 2003, industrial employment had fallen to less than a quarter of total employment in Belgium. As industrial employment decreased, the service industries and the government sector grew. Between 1970 and 2004, the percentage of the active Belgian population employed in the service sector increased from 52.9 to 73.1 per cent (De Grauwe, 2003). The time-use data confirmed this massive expansion. According to our definitions, the percentage of the active population engaged in the service sector increased from 57.8 to 73.8 per cent between 1966 and 1999, while the percentage engaged in the production sector has decreased from 39.5 to 25.1 per cent. All types of services underwent an expansion, except for retail and distribution. In 1966, 22 per cent of the active population worked in the retail and distribution sector. In 1999, this sector accounted for 14.5 per cent of the active population. Those who worked in retail and distribution in 1966 were mainly small-business traders, whereas in 1999 four-fifths of those working in this sector were wage earners employed in large distribution chains.

Other than expected, the amount of work in the Belgian service sector during non-standard times did not increase, at least not on weekdays. In 1966, 8.1 per cent of service-sector work was done outside regular working hours. In 1999, there was a non-significant decrease to 7.1 per cent. In 1999, 62 per cent of those who were active in the service sector worked according to a standard schedule, with 34 per cent working a 9-to-5 schedule. Another 10 per cent worked part time in the mornings including a small share of work beyond standard times. Work in the service sector performed outside the standard time was more likely for those who worked part time in the afternoon. In 1966, service workers with this type of schedule performed only 3.4 per cent of their work time beyond the standard time, but this increased to 15.8 per cent in 1999. This finding confirms that the increase in the size of the service economy was manifested by an increase in part-time employment, extending especially into the evening to meet the increased demand for services at that time. Léonard considered the extended shifts of part-time workers in the hospital and retail sectors in Belgium as evidence of the compressed schedules that have become characteristic of part-time work (Léonard, 1994; Masson, 1999).

Although between 1966 and 1999 there seemed to be no change in the percentage of non-standard work time in the service sector, this general trend may have masked a number of contradictory trends regarding the timing of work in the different sub-sectors of the service industry. The largest share (10%) of weekday work beyond standard times occurred among those employed in technical services, such as water, electricity, health, social services, transporta-

tion, and communication. Although this share remained essentially the same during the study period, the sector itself experienced a significant growth between 1966 and 1999, such that by 1999 it employed one-fifth of the active Belgian population (15.4% in 1966). In the sub-sectors of culture, education, science, and socio-cultural and personal services, a considerable share (9%) of work during non-standard times was registered in the two study years. The significant expansion of this sub-sector (from 6.0% in 1966 to 13.1% in 1999) also explains the relatively high level (7.1%) of work beyond standard times in the service sector in general. The only service sub-sectors that registered a significant change in the share of work time performed beyond the standard work hours was public administration, the police, and the army, increasing from 1.5 per cent in 1966 to 6.2 per cent in 1999. Nonetheless, this is still a very modest level of work beyond standard times.

However, the expansion of those sub-sectors (technical services and culture and education) with a relatively large share of work during non-standard times was counteracted by the decreasing importance of another sub-sector. In the retail and distribution sector, there was a significant decrease in the share of non-standard work times. In 1966, 9.6 per cent of the work occurred during non-standard times, with long work days (sometimes with an evening extension) being very prevalent among small-business traders. By 1999, only 6 per cent of the working hours took place during non-standard times as long work days increasingly gave way to the standard schedules of workers employed by the distribution chains. All this clearly reveals that the retail and distribution sector, which is often named as the typical example of work on non-standard times, was the main reason for work on non-standard times within the service sector in the 1960s, while nowadays it only accounts for a very small share of work on non-standard times in the service sector, at least on weekdays.

The increase in the service sector was strongly connected to the increase in the educational level of the Belgian population. The percentage of the active population with a higher education degree increased from 7.8 to 34.9 per cent between 1966 and 1999, while the percentage of those employed in the service sector with a higher education degree increased from 10.4 to 40 per cent. Individuals with a higher education degree still performed a smaller share of work during non-standard working hours than those without, although this difference was not statistically significant in either study year. In both years, standard work schedules of 9 to 6 and 9 to 5 were more prevalent among the higher educated, while the early version of the standard work schedule (8 to 4) prevailed among the less well educated. The percentage of work during non-standard times did not increase significantly between 1966 and 1999 among the highly educated, but the time-use data did not reveal any significant evolution among the middle and lower educated either. However, maintenance of the status quo regarding the share of work performed outside standard times by

people of various educational levels and the small, non-significant difference between those levels may be indicative of a number of contradictory trends within the various educational levels themselves. In this context, the relationship between the type of job and the nature of the work schedule provided several interesting insights. For example, there was a significant increase in the amount of work performed outside standard times by semi-skilled and skilled manual workers. In 1999, these workers spent almost 16 per cent of their work time during non-standard hours, compared to only 8.7 per cent in 1966. Clerical workers also registered a significant increase in work beyond standard times, from 2.9 to 5.7 per cent, which, broadly speaking, still represented a relatively low level of flexibilization. The self-employed, by contrast, registered a significant decrease in working hours at non-standard times. In 1966, almost three-quarters of the self-employed worked in the retail and distribution sector, and their small shop or other independent activity often demanded long working hours. By 1999, however, the self-employed were much less likely to be engaged in commerce and distribution, which explains the lower likelihood of the self-employed to work long hours beyond standard work times. Instead, in 1999, long days were predominantly worked by managers and professionals (62%), whereas in 1966 this was more prevalent among craftsmen. The latter accounted for 39 per cent of all long working days with an evening extension in 1966 but only 25 per cent in 1999. Still, in both research years, craftsmen were over-represented in this type of work schedule compared to their proportion in the active population.

The time-use data did not reveal a relationship between workers' ages and their likeliness to work non-standard schedules. Household situation did not affect the work schedule either. Unfortunately, the available data did not allow in-depth explanations of the timing of work. The sample of workers was too small to assess the evolution of work times within particular subgroups of the active population, for example women in the retail and distribution sector. Other background variables that might have affected paid work hours were not included in the questionnaire. It may very well be that the urbanization level of a worker's place of residence, the level of time sovereignty, and the predictability of the end of the working day are important in understanding the prevalence of non-standard work schedules. Such information was lacking from the available dataset.

The 24-hour Society Reconsidered in Belgium

Contrary to expectations, the decline in the number of weekly working hours in Belgium was not offset by an increased share of work occurring beyond standard times. As was the case for total work time in general, the number of

non-standard hours decreased mainly due to a decline in work on Saturday. Of course, in 1966, Saturday morning was not considered as a non-standard work time, since 65.5 per cent of the active population worked at that time. Evening work, night work and Sunday work were exceptional in 1999 as was true in 1966.

Sequence analysis allowed us to create a typology of work schedules on weekdays that was derived inductively from the data rather than coded for *ex ante*. The results revealed an increase in the proportion of standard work schedules (9 to 5 and 8 to 4) such that in 1999 they accounted for the work pattern of almost half of the active population compared to only one-third in 1966. Work schedules characterized by a considerable share of work performed during non-standard times, such as long work days and fragmented work patterns, became less prevalent during the study period.

Belgium witnessed more or less the same macro-level changes during the second half of the 20th century as occurred in the USA. During that time, the participation of women in the labour market doubled, which contributed to making the service economy by far the largest economic sector. Nonetheless, these changes did not result in a larger share of work taking place at non-standard times; rather, almost two-thirds of the population working in service jobs had standard schedules, including one-third with 9-to-5 jobs. Most of this group was made up of women, who were more likely than men to work standard hours. The expansion of the service economy and the massive entrance of women into the labour market were accompanied by the growth of part-time work, mainly performed during standard times. Developments in the various industries and the evolution of working times within them did not result in a general increase of non-standard work hours, at least not on weekdays. It is, however, possible that some sub-sectors of the service industry witnessed an increase in work performed on Saturdays and Sundays. Unfortunately, we were unable to test this hypothesis due to the small samples.

The Belgian findings stand in stark contrast to what is found in the USA, where an increase in work at non-standard times occurred during the last decades of the 20th century (Presser, 1995; Hamermesh, 1999; Beers, 2000). However, the findings from the USA are often misunderstood. Hamermesh (1999), for instance, pointed to the fact that the incidence of evening and night work declined sharply in the USA between the early 1970s and the early 1990s, while the fraction of work performed at the fringes of the traditional working day grew. The increase in work performed at non-standard times was not due to more workers employed in evening, night, or weekend work but rather to an increased propensity for the work day to start at around 6 or 7 am and/or end around 5 or 6 pm. Consequently, the increase in non-standard work schedules in the USA was the outcome of a broader dispersion of what might be viewed as standard working hours, and not a vast increase in the incidence of work at

uncommon times (nights and Sundays). The Belgian data revealed neither an increase in night, evening, or weekend work nor an augmentation of work at the fringes of the regular working day. This may have reflected the general decrease in the amount of work time in Belgium, and the increase in the proportion of part-time work. In the USA, a decrease in the time spent working was not as clear as in most European countries. Also, the varying institutional contexts, together with differences in the strength and presence of labour unions, certainly explain part of the difference in the duration and timing of the work schedules of many European countries and the USA.

All studies cited in this article claiming an increase in work performed at non-standard times were based on surveys in which the respondents reported on the prevalence of their working times. In time-budget studies, respondents registered their activities on the day(s) selected by the researchers. Most workers at least occasionally work during non-standard times and this can be reported in a questionnaire. However, since work is usually performed during standard work hours, it is that information which is reported for most of the randomly assigned days in time-budget studies. Thus, time-budget studies might be more conservative but also more realistic in registering non-standard work times. Our findings are supported by the conclusions reached by the authors of a detailed study of work times in The Netherlands, based on time-use data collected in five-year intervals since 1975: the amount of work done at atypical work times decreased rather than increased in the last decades of the previous century (Breedveld, 1999).

Notes

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1. These data were collected by Philip J. Stone and are available through the archive of the Henry A. Murray Research Center of the Radcliffe Institute for Advanced Study, Harvard University, Cambridge, Massachusetts. This data set was made accessible in 1983.
2. To bring the 1966 sample in line with the national population, we calculated new weighting coefficients based on the respondents' sex, age, and educational class. The census data from 1961 were used as a base for constructing the weighting coefficients. These ranged from 0.27 for men aged 40–65 with a higher education degree, to 2.33 for men age 19–39 with a lower level degree. To bring the 1999 sample in line with the national population, the data were weighted on an individual level, taking into account region, sex, age, educational level, season, and day of the week. Weighting coefficients ranged from 0.08 (women from the Brussels region aged 70–74 years with a higher education (non-university) degree who registered their time use in

- December) to 7.38 (women from the Flemish region older than 75 years with a lower-level degree who registered their time use in July).
3. To gauge the evolution of the importance of work done at non-standard working times, we calculated the proportion of work performed at standard and non-standard working times for both research years on an aggregate level. To do so, the amount of time spent working at the different time periods (day, evening, or night) for every day of the week were determined separately for the active population in each research year. These durations were then weighted using the individual weighting coefficients and summed up for each time period of a given day separately. Subsequently, these aggregate durations were weighted for every weekday in order to be equally represented. These weighted aggregate durations represent the number of hours of work performed during a particular time period on a particular day of the week. By means of these aggregate durations, the share of working hours performed on typical and non-standard times was calculated.
 4. It was not necessary to include active respondents who did not work on that particular day in an analysis that tries to identify work schedules. Each of the respondents in the sequence database had a sequence of 144 10-minute intervals, representing the 24 hours in a day (1440 minutes). Each interval was assigned code 1, when the respondent was working at that time, or code 2 otherwise.
 5. The dynamic Hamming distance was implemented by means of a macro in the SAS programme that also calculated the dynamic substitution cost. Accordingly, datasets from the two study years were taken into account to the same extent and within each year each respondent was taken into account according to individual weight (as discussed in Note 2). Theoretically, substitution costs vary between 0 and 4. Four is the base from which all four possible probabilities (ranging between 0 and 1) of transition at moment T are deducted. As such, very high transition probabilities from a and b, or in the reverse order, between T-1 and T and between T and T+1, result in a very low substitution cost. Very low transition probabilities between states a and b at moment T imply that the substitution cost will be close to four and thus relatively high (see also Lesnard, 2005).
 6. A hierarchical clustering procedure was used, since the exact number of clusters to be created was not known. The Beta-flexible clustering algorithm was implemented with beta set at -0.25, as this clustering procedure has performed well in different circumstances. Other social researchers analysing time-budget data with sequence analysis applied the same algorithm with satisfying results. Clustering is a heuristic procedure and there are no real statistics supporting the method. It is impossible to decide on a statistical basis how many clusters should be maintained to give the best representation of the sub-rhythms, that is, the work schedules, present in the data.
 7. Source for 1961: Census on 31 December 1961 (excluding 14-year-olds and retired persons). Source for 1999: *Labour Force Survey 1999* FOD Economie-Afdeling Statistiek.

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