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ABSTRACT

This paper aims to describe and analyse the use of flexibility clauses instead of overtime to adapt work time to demand in the automotive industry in continental Europe. Flexibility to adapt to demand has become critical in the automobile manufacturing industry. Variability of the number of hours worked by existing staff is an indispensable component of manufacturing flexibility. Outside continental Europe, work time flexibility is obtained basically by using overtime. In continental Europe, the desire of governments and unions to maintain staff, and even to distribute the work more, strongly limits the possible accumulation of work time by the same workers. Due to the global nature of the automotive industry, this disadvantage has to be compensated. This has been achieved by the simultaneous use of several flexibility clauses, particularly average working time accounted and working time accounts. These clauses are designed to respect and even favour the interest of workers. National collective agreements of two outstanding cases, Volkswagen in Germany and Renault in France, are analysed. Numerical internal variability generated by the combination of clauses is calculated. Equal or greater flexibility is seen than with the use of overtime, considering intervals of one or several years, depending on the case. It is concluded that flexibility clauses are effective substitutes for overtime.

Introduction

The automotive industry has changed dramatically. The number of models and options has increased sharply and the car has become an almost personalised product. Stocks are reduced, so flexibility becomes critical. New work planning schemas are required, since the work supply cannot be stable. The automotive industry of today is not like the service sector, in which it is necessary to adapt the presence of workers to the needs of each hour of the day. But it is also different to traditional industry, where stocks allow stable worked plans that could be known long in advance.

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Working time conditions depend on the law and on collective agreements. Although these collective agreements can be characteristic of each company, collective negotiation is conditioned by the general policies of unions and employers. Thus, although the automotive industry is essentially global, working time conditions are strongly related to the pattern of labour relationships in each country or area of the world. There are profound differences in the number of working hours, the base on which working time is accounted (daily, weekly, monthly, annually or multi-yearly), the type of work day (day, night, on working days or during public holidays and weekends, continuous or not), in shifts with or without rotation) and the regularity or irregularity of the working day, among other factors.

The automotive industry is present in all developed areas of the world. The United States, East Asia and Europe contain headquarters and operations of huge corporations in the industry automotive industry that compete around the world. The products of these companies are hard to distinguish. In contrast to these similarities, working time around the world is extremely varied. There is a general tendency towards more flexible schemas, but differences at the moment in which a pattern is adopted, in clauses and even in the immediate reasons for changes make it hard to view the process as a whole. An analysis of the final consequences of the often complicated regulations under different laws and agreements has to be made to determine the real situation.

The automotive industry needs to be flexible, as do production factors. Working time is not an exception. Production follows sales, thus the adaptation of the volume of work becomes indispensable. In the United States overtime is mandatory and not limited, providing an immediate tool to increase production considerably. Dismissals and factory closures are not limited by law. Working time flexibility in theory is unlimited. In Japan and Korea labour relations are more regulated but allow significant flexibility, essentially through the use of overtime.

In continental Europe, by contrast, overtime is strongly limited. Labour regulations exist aimed at protecting workers and reducing unemployment, with a wider distribution of jobs. The companies often undertake in collective agreements to maintain jobs or to implement only minimal reductions. The goal, then, is that all staff can be assigned to a task, and any overtime runs contrary to this notion. In any case, the need to compete in global markets remains in all industries and, in particular, in the automotive industry. Pressure from non-European competitors obliges the European automotive industry to develop work time flexibility schemas. Even with different legislations, previous arrangements, countries and company situations, most European automotive factories have comparable flexibility schemas to compensate for the non-use of overtime.

The solutions adopted in different European countries and companies are often apparently very diverse, but an analysis of the final flexibility obtained shows a general tendency. In fact, the similarity between solutions in companies with government participation and in European branches of US companies, for example, was not expected at the beginning of this study. Significant flexibility to increase and to decrease working time is a common trait. Restrictions on how personal life is affected are also generally present. A specific

European solution to the need for flexibility in the automotive industry is defined by the common elements of the different cases.

This paper first presents the competitive and industrial reasons that have led the European automobile companies to adopt work time flexibility clauses. Then, the use of overtime in the major automobile-producing countries is analysed, and the increasing use in continental Europe of flexibility clauses as an alternative to overtime is described. The origins and the more usual characteristics of these clauses are explained. Finally, two relevant cases are presented: Volkswagen in its German plants and Renault in its French sites. In both, flexibility is achieved by combining several flexibility clauses. The variability in working time generated by the clauses is analysed. Work time accounted on average provides flexibility in intervals of less than one year and working time accounts in any interval, but in this latter case only while limits have not previously been reached. Total flexibility available is similar to the flexibility obtained outside continental Europe by using overtime, but flexibility lowers as the interval considered decreases, as is observed.

Flexibility in manufacturing

To adapt production to sales has always been a central issue in manufacturing. If a product has strong and continuous sales a certain volume of stocks is the answer. This is extremely rare in today's manufacturing industry. An increasing number of products, very competitive markets and uncertain demand lead to low stock policies. Working hours often become the only acceptable source of flexibility.

Three groups of working time variability practices can be considered:

1. Functional flexibility. Multiskilling allows workers or teams to participate at different points in a process and in different processes. Reallocating workers from one task to another is a source of flexibility. When line workers have maintenance and improvement responsibilities, the use of low demand periods for these tasks is a supplementary source of flexibility.
2. External flexibility. Staff reduction, with temporary measures or through dismissals, and new hired workers, can certainly allow a continuous adaptation to the needs at a given moment. This can involve closing shifts or opening new ones. This mechanism cannot be applied to meet short-term needs when a long initial training period is necessary and when accumulated knowledge and experience form an important part of the work.
3. Internal flexibility. Internal flexibility is derived from shorter or longer work hours according to the needs. This flexibility is usually advantageous: flexibility is attained without changes to staff or tasks. Legal problems and the potential effects on the private life of the workers limit its use.

Variations in demand can also be divided into several cases:

1. Seasonal demand. Here, demand is changeable but foreseeable. Industries affected by this phenomenon have developed practices to deal with it. Workers are aware of this characteristic of their work and accept the consequences.
2. Non-seasonal demand changes that can be foreseen. For example, when activity includes campaigns, special events, shows and so on. Unlike seasonal work, the non-regularity of the successive situations adds uncertainty to these industries. Also, in these areas workers are usually well aware of this characteristic of the work.
3. Unforeseeable demand changes. Unexpected reactions of clients, natural phenomena and other factors generate unforeseeable situations. These types of demand are increasingly important. In fact, agile manufacturing, an approach to cope with these cases, has attracted a remarkable amount of interest (James, 2005).

The automotive industry in particular has developed practices to cover – as far as possible – a changing and partially unforeseeable demand. Changes in individual working times are increasingly used as a source of flexibility. This paper deals with the types of internal flexibility adopted by the automotive industry in continental Europe and the comparison with equivalent practices in the rest of the world.

The need for flexibility in the automotive industry

Flexibility has become a major issue in the automotive industry. One reason is in the product itself: diversity of models and options increases continuously. In 2002 in the United States, the leading market in the world, as many as 270 models of automobiles and vans were sold, each with their corresponding versions, options and motor specifications. Only 50 of these sold more than 100,000 units (Wilson, 2003).

This variety of models makes it difficult to use stocks to cope with the uncertainty of demand. Competition also leads to low stocks. Toyota has an inventory turnover of 12.5, against 6.7 of Volkswagen, 6.8 of Daimler-Chrysler and 7.3 of Honda, according to data from the 2004 annual reports of each company. The high turnover achieved by Toyota, industry leader in market capitalisation, obliges its competitors to restrict the use of stocks.

Dominant management tendencies emphasise the advantages of low stocks. Honda has reached high benchmarks of flexibility with the use of programmable robots (Wall, 2003). The organisation of production at Toyota has inspired the methodology named lean production (Womack and Jones, 1996). Another approach, agile manufacturing, looks for an immediate reaction to an unforeseeable situation (Gunasekaran, 1998).

Flexibility cannot be obtained by using stocks, so carmakers need flexibility in manufacturing capacity. A system has to be developed that is flexible as a whole and also in its constituent parts. Production lines able to produce different models and all the respective variations, multiskilling of workers and outsourcing cover a good extent of the necessary flexibility. Flexibility in the labour supply remains in any case indispensable.

Labour market structure and recruitment and training costs determine the policy to be applied to labour flexibility. In the United States employers can fire workers freely. Consequently, external flexibility is more frequently used than in areas where dismissals are strongly regulated, such as Germany (Houseman and Abraham, 1995). In any case, the need for highly trained staff limits the use of external flexibility. Today, shop-floor work in the automotive industry is largely based on the responsibility and self control of line workers. Training is critical and teams have a central role. Temporary work must therefore be severely limited and turnover maintained at low rates. Flexibility of working time of existing workers is consequently the only source of capacity flexibility that can be widely used (European Commission, 2000). Overtime is the more common source of internal flexibility. It is widely used in the United States, Japan, Korea and the United Kingdom. In continental Europe, on the contrary, severe restrictions on overtime lead to the use of the alternative formulas of flexibility described here.

Overtime regulation in the major automobile-producing countries

Overtime is customary in the United States and appears not to be limited, even in the case of mandatory overtime. A worker can be fired if refusing to work overtime (Golden and Jorgensen, 2002). Internal overtime regulations usually deal only with the right to choose to do it. Detailed regulations about the distribution of overtime are established. The 1999 national contract between General Motors and UAW (Union of automotive workers) in the United States is an example of this strict regulation. Overtime is, then, extensively used. In 2004, the average standard working hours per week for production workers in the automotive industry was 37.4, while average overtime per week was 6.1 hours (BLS, 2005). Working time accounts are not used in the US automotive industry and flexibility is obtained through external flexibility and overtime.

In Japan, overtime is also commonly used. In 2000, the average overtime among industrial workers was 175 hours (JILPT, 2005). More overtime is possible when necessary, providing an important level of flexibility. In Toyota, overtime in 1989 exceeded 300 hours, while no overtime was done in 1993, due to a demand crisis (Cho, 2004).

Overtime is also common practice in Korea. Flexibility clauses are included in the Labor Standards Act of Korea. Standard hours are 44, but 56 can be reach (40 and 52 in large companies). This is possible with voluntary paid overtime or by using the Flexible Working Hour System, which allows the calculation of work hours on a two-week basis and, if an agreement with the workers' representative is reached, up to three months.

In the United Kingdom, in spite of very different labour regulations, the situation regarding extra hours is similar. The companies plan the production and the workers the earnings, keeping in mind overtime, so that it is difficult for the unions to contest the decisions taken. The only limit is 48 hours per week and not less than 11 hours of rest between work days (EIRO, 2003).

In continental Europe, however, overtime is strictly limited. A central idea of labour regulation has long been the distribution of work in order to combat unemployment. In fact,

according to the literature, this policy is not clearly effective (Bauer and Zimmermann, 1999). Effective or not, this policy does result in the restriction of overtime. Otherwise, the reduction of standard work time could be compensated by extra hours, and total worked hours would remain similar. Specifically, overtime is limited to 180 hours a year in France and to 80 hours a year in Spain, the lowest national limit (EIRO, 2003). Very often, collective agreements limit overtime even more. In some countries, as in Germany, overtime is not limited by general regulations, but the commitment often established in collective agreements to maintain jobs limits it in practice. These limitations go against not only the interest of the companies but often the willingness of the workers to work long hours to increase their earnings or to improve their career prospects (Bosch, 1999). But in most cases, the focus of negotiations between unions and companies is to maintain or create employment (Lehndorff, 2000).

Due to the limitations on the use of overtime, hiring temporary workers and closures have been used to adapt to demand. Capacity can be increased with a third, fourth and even fifth shift, not common in countries where overtime is not so limited. These mechanisms have several inconveniences. Temporary workers have to be recruited and trained. The personal life of people that work on night shifts or at weekends is affected. Breaks in activity have a cost and are also limited by law. Flexibility is very limited.

To overcome these problems an increasing number of European automobile factories have agreed on a combination of flexibility clauses. These clauses have bounds and restrictions to limit the negative effects on workers' lives and even offer them new opportunities.

Description of flexibility clauses

The agreements to make labour relations more flexible are not circumstantial. As has been said, current European labour relations are disadvantageous for the companies with respect to other parts of the world. There is a wide-reaching process in continental Europe to obtain more flexibility while respecting the essential traits of European labour relations. The process consists of adopting different flexibility clauses with different bounds and restrictions but with the common goal that, by combining them, enough flexibility is achieved and workers' interests are preserved.

Germany has led the use of new formulas of flexibility that respect as far as possible the interest of the workers. It is said that the German model of employee relations is changing. The model is based on centralised sector agreements. An increasing number of enterprise level agreements and a certain number of companies, mainly in the service sector, do not subscribe to more the agreement in their sector. But the essential schema remains unchanged for now (Tüselmann, 2001).

Flexibility clauses have been in general use in German automobile factories for more than 20 years. A 1984 agreement between IG Metall and the metalworking employers' association (Gesamtmittel) about the establishment of working time accounts was a major boost to these practices (Lehndorff, 1999). After this agreement the automotive companies, like Volkswagen, Opel, DaimlerChrysler and BMW, adopted working time flexibility

clauses (Lehndorff, 2000). The agreements have been very diverse, even between plants belonging to the same companies, but they all contain clauses to the effect that working time is accounted on average, usually over a year, as well as some kind of working time account. Both clauses have strict restrictions and limits to preserve workers' interests.

The application of flexibility clauses obtained successes but also failures that led to their reformulation (EIRO, 1999). The restrictions and bounds changed with time. Social consensus was not always reached. Successive rounds of negotiations and agreements between representatives of the German federal government, unions and employer associations (called National Alliance for Jobs, Training and Competitiveness) did not obtain substantial agreements in this field (EIRO (2000)). At European level, the European Commission promotes the schemas defined by Wilthagen (2004) as flexi-security. Flexi-security aims to provide labour flexibility to companies and long term employment and social security to workers. It is a policy that can be applied by governments but also at company level through collective negotiation.

Even with difficulties and complex processes of negotiation, flexibility schemas have been maintained where they were implemented and have been adopted more and more frequently around Europe. A very flexible schema has been agreed in the new Leipzig factory of BMW, inaugurated in 2005. There, it is possible to change operating hours in a week from 60 to 140 hours without hiring or adopting special measures (Weernink, 2002). In France, Renault adopted working time accounts by collective agreement in January 1996. Peugeot Citroen introduced annual accounted working time and working time accounts in March 1999. In this case the number of hours that workers can owe to the company at the end of the year was limited to only 5 days. In Spain, several plants adopt flexibility schemas, following policies introduced in the countries where the companies are based. Working time accounts are used in the factories of Renault in Valladolid (from June 1999), Opel in Zaragoza and Seat (Volkswagen group) in Barcelona. This also happens in Austria, where the BMW plant in Steyr has operated flexible working time formulas since May 1999, and in the United Kingdom, in the Oxford plant of Mini (BMW Group). In Italy, a June 1999 sector agreement introduced working time accounts to the private metal industry.

Flexibility clauses used by the automotive industry in continental Europe have been classified according to what has been observed in these cases. The clauses that allow an increase or decrease of work hours to adapt to demand in the European automotive industry are:

1. Work time accounted on average. This typically consists of establishing the volume of working time as an annual average of weekly working hours, for example 35 weekly hours in an annual average. It is possible to use an average from intervals other than one year and also establishing the time as a total of hours in the year. This clause is very useful for adapting work hours to predictable variations in demand during the interval considered, whether these be due to seasonality, product life cycle or other reasons. If this clause is not used in conjunction with other flexibility clauses, at the end of the interval the number of work hours are fixed and unforeseeable changes cannot be taken into account.

2. Working time accounts. A working time account is a tool that records differences between regular hours and hours worked by an employee that has to be balanced in the future. In working time accounts there is no point at which the balance between contractual hours and hours worked has to be zero. They have upper and lower bounds. When these bounds are reached, flexibility in the direction of this limit disappears, but regular hours are not affected. This provides long term flexibility since there is no point at which the account must be balanced.

In the more simple case, the accounts are credited or debited only by time worked over or under regular working hours, but it is common to include other compensations. Positive balances can be used to generate sabbaticals, early retirement, training periods or free days for personal issues. In these cases, overtime work is totally or partially voluntary, or the personal preferences of the workers are taken into account, so that workers interested in these opportunities can generate positive balances. To manage these formulas, several working time accounts are used. Distinctions can be made between individual and collective accounts and between general accounts and accounts applied to particular purposes, such as retirement or training.

3. Overtime to be compensated by free time. Overtime compensated by free time is similar to average accounted time or working time accounts, but in this case extra hours and the compensation awarded are dealt with individually. In these cases, a number of hours worked over regular work hours give the right to free time in the near future, and the rest of the programmed hours of work are not affected.
4. Paid overtime. Overtime compensated by payment, at the regular rate or increased by a certain proportion, remains possible when a combination of flexibility clauses are used, even though it is generally preferred and agreed not to use this system.
5. Closures. A key reason for agreeing flexibility clauses is to adapt to demand while preventing closures. In any case, when the other mechanisms are not sufficient, temporary closures with subsidies for jobless workers are used.

The flexibility obtained in each case is the result of a combination of different clauses. As important as clauses are their bounds and restrictions. These limits and the participation of unions in determining working hours are intended to guarantee work times schemas suited to the personal needs and the interest of workers. Below, flexibility achieved by the combination of clauses is analysed.

Measure of work time variability provided by the combination of flexibility clauses

Flexibility implies having a range of alternatives at a given moment, which depends on regulations and agreements, on the one hand, and on particular situations such as public holidays, summer holidays, time worked up to that point, anticipated reaction of workers and so on, on the other. A hypothetical year without holidays and the other particular situations are considered in order to calculate the numerical internal variability made possible by flexibility clauses. Calculations are made for two outstanding cases:

Volkswagen in Germany and Renault in France. Regulations and agreements affecting working time are taken in account. In both cases the effect of averaged work hours and the combined effect of averaged work hours and working time accounts are obtained separately. Results are compared with the use of overtime.

National agreements made by Volkswagen in Germany are taken as the first example. Volkswagen established a collective agreement in 1993 based on a four-week interval and 28.8 hours of work per week. After several amendments (1996, 1997) the system consisted of the following stipulations: (1) average working time of 30 hours per week, including a non-paid “work contribution” of 1.2 hours; (2) work from 28.8 to 38.8 hours (30 to 40 hours with the contribution) is not subject to additional remuneration, and beyond these limits is considered overtime; (3) work other than standard hours has to be agreed with the works council two months in advance; (4) working time account with a 200 hour limit in both directions; (5) positive balances of working time accounts are paid or compensated with free time (Lehndorff, 1999). In total, net annual hours came to 1440 (Lehndorff, 2000).

Although the schema was maintained, in 2004 a new collective agreement changed some of the bounds. Working time account limits increased to 400 hours and decisions about the use of working time accounts have to be made between the company and the workers, but no notification period is established. Extra pay for overtime (30%) is now applied after 40 hours of work in a week if the balance of account is positive and after 35 if it has reached 400 hours. In this last case, time over 30 hours in a week is possible by establishing an averaged working time of 30 hours for an interval greater than a week. The 2004 agreement also includes the possibility for workers to save up to 66 hours a year for early retirement, even if this means a negative balance of the working time account or renouncing overtime payments. This is not a source of flexibility because the worker decides individually and according to their wishes.

To know what numerical internal flexibility is really available, all the conditions have to be considered together. The working days in each month depend on the number of days and public holidays during the month, as well as the allocation of annual holidays. To evaluate the flexibility without these factors, a model year with 12 months of 4 working weeks is considered. In this model year the maximum and minimum working hours from the beginning of the year and during several intervals, from 3 months to 3 years, are calculated. It is supposed that changes take a month to be implemented, and that the first month is therefore rigid. Table 1 shows the results. The “hours accounted on average” clause generates considerable flexibility up to 3 and 6 month intervals. Extra hours reach approximately 30%. When hours accounted on average and the use of the working time account are considered together, the same level of possible overtime is maintained up to an 18 month interval. In addition, a significant reduction of working hours is also possible. In all of these cases, flexibility is clearly greater than when working a fixed number of hours and overtime when necessary, as is common practice outside continental Europe. The schema for the combination of flexibility clauses applied at Volkswagen’s German plants fulfils its aim. Considering a three year interval, the flexibility is lower. The possible increase over the lower bound is calculated to obtain a suitable comparison with overtime. An increase of 20.4% over a minimum of 4729 hours is possible. This represents around

300 hours a year per worker – a considerable amount. As larger intervals are considered, the flexibility decreases, due to the fact that the clauses dealt with changes to when work hours would be done, but not the total hours. Problems of excess or lack of capacity are only solved temporarily.

| | | 3 months | 6 months | 1 year | 18 months | 3 years |
|--|--------------------|-------------------|-------------------|--------------------|--------------------|-------------------|
| clauses | standard | 360,0 | 720,0 | 1440,0 | 2160,0 | 4320,0 |
| hours accounted on average | lower limit | 166.0 (-18.6%) | 480.0 (-33.3%) | 1440.0 (0.0%) | 1920.0 (-11.1%) | 4320.0 (0.0%) |
| | upper limit | 460.0 (27.8%) | 940.0 (30.6%) | 1440.0 (0.0%) | 2380.0 (10.2%) | 4320.0 (0.0%) |
| hours accounted on average and working time account with initial value 0 | lower limit | 60.0 (-83.3%) | 80.0 (-88.9%) | 1040.0 (-27.8%) | 1120.0 (-48.1%) | 3920.0 (-9.3%) |
| | upper limit | 460.0 (27.8%) | 940.0 (30.6%) | 1840.0 (27.8%) | 2780.0 (28.7%) | 4720.0 (9.3%) |
| | % over lower limit | 666.7% | 1075.0% | 76.9% | 148.2% | 20.4% |

Table 1. Flexibility of Volkswagen in Germany, under 2004 contract and 1 month to apply changes.

Next, the case of national agreements made by Renault in France is considered. Renault is a senior player in European industry and is taken here as a second example of the use of flexibility formulas as an alternative to overtime. A first agreement including working time accounts was signed in January 1996. In April 1999 Renault and unions signed a broader agreement that introduced three working time accounts: individual, collective and for training, the *Accord Renault S.A. sur l'emploi, l'organisation et la réduction du temps de travail*. The French law “*relative à la réduction négociée du temps de travail*” (determining a 35 hour working week) approved in January 2000, did not require changes to the Renault agreement. Adaptations were made in a new agreement in February 2000. The general rules applicable to working time in Renault’s French sites as of January 2006 were completed by a June 2002 agreement regarding holiday days and the *code du travail* in force at that moment.

The collective agreements mentioned here establish the following rules: (1) an average working week of 35 hours; (2) the reduction of working time will result in new days off, in theory seven collective and three individual; (3) the company can establish periods of maximum activity (long weeks), due to seasonality or increases in demand, up to a maximum of four months per year, (4) the minimum period of notification for changes to the work schedule is 15 days; (5) a collective working time account is created, with a maximum of 35 days owed by workers to the company and 5 days owed by the company to workers, where these 5 days can only be used when most of the other workers have balances in favour of the company and when extra days to compensate these balances are worked; (6) individual working time accounts exist to generate holiday and training periods; (7) paid overtime will exist, according to legal regulations, and will be compensated either with time off or with payment at 25% over the regular rate; (8) 5 weeks of holidays, 4 of these in the period from 15 July to the first Sunday of September.

The general regulations, summarised in the *code du travail*, establish besides these rules: (1) work hours limited to 48 in a week and 1607 hours in a year; (2) overtime is limited by bounds established by the government (in December 2004 this became 220 hours or whatever was determined by collective agreement); (3) working time over 12 weeks has to be on average no more than 44 hours. Exact annual working time is conditioned by the fact that public holidays may or may not coincide with working days.

These conditions are the framework of the negotiation to be carried out in the different establishments, according to their particular situations. As in the first case analysed, a model year is supposed to evaluate the flexibility generated by the combinations of clauses. Here, a working year of 48 weeks and 1600 hours is considered, not accounting for public and summer holidays. In fact, during summer holidays both sales and production decrease, and public holidays are single days spread over the year, so this model year is not very different to reality. The lower bound of working time accounts is 35 days (considered here as equivalent to 245 hours) and the upper bound is zero, due to the limitations of the use of positive values. The other conditions are applied directly. Maximum and minimum working hours when using the flexibility clauses have been calculated. Table 2 shows the results.

Given that working hours are established on average, it is possible to accumulate the working time at the beginning or the end of the year. Only the 15-day term to announce changes and the bounds on weekly and 12-weekly working hours limit these accumulations. This flexibility clause naturally has no effect on the hours worked during the entire year. On the other hand, working time accounts provide variability to the number of hours worked over the year. At Renault, only balances favourable to the company are possible as a general rule and, then, if initial balances are 0 only changes that involve working fewer hours are possible. This is because the goal of the working time account is to maintain jobs. To obtain maximum flexibility without using overtime, balances of time accounts situated in the middle of the bounds are preferable. The results of each situation are presented in Table 1. To compare the flexibility obtained to the flexibility possible by using overtime, the variation as a percentage of the lower bound is included. The last row shows these values.

The results obtained shows that flexibility up to an interval of a year is similar to or greater than that which could be obtained using overtime. For intervals of 4 weeks, and even more so for those of 3 months, the flexibility is very high. However, this level of flexibility is not really applicable. Other factors, such as supplies, that limit flexibility, and effects over the rest of the year and the reaction of workers also have to be taken in account. The analysis shows in any case that working time accounted on average and working time accounts allow, in this case, almost unlimited flexibility for intervals of 4 weeks and three months. For intervals of a year there is less flexibility, but the possible increase over the minimum (16.6%) is similar to that which is usually obtained with overtime in the automotive industry in countries like the USA, Japan or Korea, as cited above. In wider intervals the variability reduces proportionally. In the case of Renault's French operations, the substitution of overtime by other flexibility clauses that allow staff to be maintained is effective up to intervals of a year.

| | | 4 weeks | 3 months | 6 months | 1 year |
|---|------------------|------------------|------------------|--------------------|--------------------|
| clauses | standard | 140 | 401.8 | 803.5 | 1600 |
| hours accounted on average | lower limit | 70.0 (-50.0%) | 70.0 (-82.5%) | 544.0 (-32.0%) | 1600.0 (0.0%) |
| | upper limit | 166.0 (18.6%) | 518.0 (29.5%) | 1054.0 (31.18%) | 1600.0 (0.0%) |
| hours accounted on average and working time account with initial value 0 | lower limit | 70.0 (-50.0%) | 70.0 (-82.5%) | 299.0 (-62.4%) | 1355.0 (-15.3%) |
| | upper limit | 166.0 (18.6%) | 518.0 (29.5%) | 1054.0 (31.18%) | 1600.0 (0.0%) |
| hours accounted on average and working time account with initial value -200 | lower limit | 70.0 (-50.0%) | 70.0 (-82.5%) | 421.0 (-47.4%) | 1477.0 (-7.7%) |
| | upper limit | 166.0 (18.6%) | 518.0 (29.5%) | 1054.0 (31.18%) | 1722.0 (7.6%) |
| | % over low limit | 137.1 % | 640.0 % | 150.4 % | 16.6% |

Table 2. Flexibility of Renault in France, at January 2006.

Conclusions

In the automotive industry, an increasing number of models and worldwide competition between several companies with scarcely differentiated products create a need for fast reaction to demand and low inventories. Flexibility is critical. An indispensable element is variability of hours worked by existing staff. In the United States, Japan, Korea and the United Kingdom, overtime is an important source of working time flexibility. In continental Europe overtime is strictly limited by law, collective agreements and the maintaining of staff commitments. Due to the need to compete with manufacturers that are able to use overtime, alternative solutions are necessary. Working time accounted on average and working time accounts have been increasingly adopted by European automotive plants. This results in combinations of flexibility clauses – with different bounds and restrictions in each case, but with similar goals – compensates for the limitations of overtime and takes into account the interest of workers.

Two outstanding cases have been analysed in detail, Volkswagen national collective agreements in Germany and Renault collective agreements in France. Flexibility is higher in Volkswagen, but in both cases the flexibility obtained without using overtime is comparable to the flexibility obtained outside Europe with overtime. As long as the interval considered increases, the flexibility obtained is lower. Contrary to overtime, flexibility clauses applied by European companies change when the work is completed, but not the total number of hours worked. Capacity problems cannot be solved using these clauses.

Further analysis is proposed about the diffusion of flexibility clauses in different countries, between suppliers and in other industries such as aeronautics or computer services. Studies of the relation between flexibility clauses, variability of demand and bounds and restrictions are also considered to be of interest.

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