European Foundation for the Improvement of Living and Working Conditions

Time and work: work intensity

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Foreword

Work intensity is on the increase in Europe. From 1995 to 2000, employees experienced an intensification of their jobs. This report, based on analysis of the results of the Third European Survey on Working Conditions carried out by the European Foundation for the Improvement of Living and Working Conditions, quantifies and describes the impact of this trend on the workers exposed to it.

The pace of work is subject to different constraints which can be grouped into two categories. Industrial constraints are related to a desire to standardise productive activity: production targets, speeds of automatic machine, automatic moving of products. Market constraints on the other hand arise from a concern to adapt to customer demand in the broadest sense. An increase in the pace of work can result in a deterioration of working conditions if it is not compensated by an increase in workers' autonomy.

We hope that this report will help to shed light on a complex debate, so that industry, employees and government bodies can together find solutions which reconcile for the better the interests and concerns of all those involved.

Raymond-Pierre Bodin,
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Willy Buschak,
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In recent years it has become evident that work is growing more intensive. The survey of working conditions undertaken in 2000 by the European Foundation for the Improvement of Living and Working Conditions shows no reversal of this trend. The survey also offers the basis for a better understanding of the detailed mechanisms of work intensity. Work intensification is associated with radical changes in company organisation and economic life. The constraints affecting employees' pace of work have an impact on the discomforts, risks and nuisances to which they are exposed. That impact depends on the precise nature of the constraints and, more generally, on quality of organisation.

The factors that determine the pace and intensity of work ('pace constraints') fall into one of two broad categories: industrial constraints and commercial constraints. Each of these two categories corresponds to one form of business organisation. Industrial constraints have most effect on blue-collar occupational groups and the activities of the secondary sector, while commercial constraints are more likely to be encountered among white-collar workers and in the tertiary sector.

However, a growing degree of hybridisation is apparent in the industrial and commercial forms of organisation; today, commercial patterns are becoming established at the very heart of industrial organisations, subjecting their workforces to new constraints associated with demand imperatives. Conversely, some commercial undertakings are industrialising their activities. This cumulative effect counteracts the strategies adopted by workers to deal with each level of constraint.

Pace constraints and organisation of undertakings

'Industrial' organisation and 'commercial' organisation

The way in which undertakings are organised has a powerful influence on the nature of the constraints affecting their employees' place of work. Schematically, a distinction is made between two principal forms of organisation: the 'commercial' undertaking and the 'industrial' undertaking (Eymard-Duvernay, 1987). In the first case, undertakings tend to adjust their production to market fluctuations, and, in the second, the pace of work is essentially determined by external demand. In the latter case, conversely, a greater effort is made to anticipate, by regularising and standardising production operations. Here, the pace of work is a function of the organisation and of the constraints of the production tools (automatic speed of a machine, etc.), the imposition of production targets, collective work organisation (dependence on colleagues' pace of work), etc.

In an industrial organisation, as in a commercial organisation, working speeds increase if the workforce is reduced while production remains constant, or if the workforce remains constant despite an increase in production. In the case of industrial organisations, this increase in speeds is brought about by raising the production targets set to employees. In addition, the elimination of non-production or 'soft' jobs will have the effect of increasing the proportion of the workforce exposed to the various pace constraints.

Undertakings are today undergoing far-reaching organisational changes, which give rise to a significant intensification of the pace of work. This is particularly true of 'lean production', a form of organisation which Philippe Askenazy (1998) calls 'neo-Stakhanovism'. In team-based lean production, the production operators are entrusted with the operations of maintenance, quality control and fault rectification, which enables the undertaking to eliminate production stoppages

associated with equipment maintenance or corrective measures, while avoiding the need for adjustments at the end of the cycle.

Hybridisation of the 'industrial' and 'commercial' patterns

These two organisational patterns, however, are 'ideal types', which are only rarely encountered in the pure form among specific undertakings: what is in fact taking place is an increasing hybridisation of the industrial and commercial forms of organisation. Commercial patterns have come to play a greater part in industrial organisations. The development of the manager–shareholder relationship, in particular, tends to encourage a short-term approach to management and increased adjustment to market fluctuations. Policies that involve the outsourcing of whole tiers of an undertaking's activity to subcontractors are converting intra-undertaking relations to inter-undertaking relations. Finally, organising the various departments of a single undertaking as separate profit centres, linked by a customer–supplier relationship, introduces commercial relations within the undertaking itself; the development of industrial organisations based on 'just-in-time' production tends to produce the same effect. Conversely, sectors that were traditionally organised on commercial lines, such as distribution, have become industrialised.

In actual practice, then, the pace-of-work constraints specific to each of these models – 'industrial' constraints on the one hand, 'commercial' constraints on the other – are frequently present simultaneously. This combination of constraints, which may be seen as a characteristic of new organisations, has increased considerably over the past 15 years (Gollac and Volkoff, 1996; Gollac and Volkoff, 2000). Moreover, it is a source of specific constraints. As noted by Serge Volkoff, 'an industrial constraint generates a pressure that is heavy and somewhat inflexible but quite stable and predictable. The operative exposed to this form of time pressure can deal with it, in essence, by way of individual and collective strategies of economy (of effort and/or time). A commercial constraint is more flexible but less predictable. In this case, the operative can rely upon strategies of anticipation and preparation, taking advantage of slack periods to ensure he is not caught off guard when busy periods arrive. If operatives are unable to adopt strategies of this type, they are reduced to a hasty approach which results in a deterioration of working conditions. When commercial constraints and industrial constraints are present simultaneously, the strategy suited to each level of constraint may be counteracted by the presence of the other: the industrial constraint restricts the availability of slack periods and leaves no room for periods of preparation; the commercial constraint increases the frequency of unexpected stresses and counteracts the established strategies of economy, leaving no alternative to the hasty approach and the damage this causes in the more or less short term. If this hypothesis is correct, the simultaneous presence of an industrial constraint and a commercial constraint will give rise to greater deterioration of working conditions than that generated by the more severe of the two.'[1]

Benchmarking the organisational determinants of intensity

An analysis of the Third European Survey on Working Conditions enables us to identify five of the main organisational determinants of work intensity:

[1] Comments by Serge Volkoff at the presentation by D. Cartron and M. Gollac of the paper entitled 'Fast-work et mal travail' at the 'Work Intensification' seminar held on 1 March 2001 (http://www.cee-recherche.fr).

- Automatic constraints associated with the automatic speed of a machine or the movement of a product;[2]
- target constraints, associated with the existence of numerical production targets;
- hierarchical constraints, associated with direct control by the boss;
- horizontal constraints, associated with the work done by other colleagues;
- demand constraints, associated with direct requests by customers and the equivalent (users, passengers, pupils, patients, etc.).

In modern organisations, however, work intensity is less and less capable of reduction to a quantitative effort (doing the same thing more times within a given period), and its qualitative aspects must be taken into account, whether they relate to the quality of a product (through the imposition of industrial quality standards) or the quality of a service (associated with more or less frequent contact with the customer or user, which involves a minimum level of quality in meeting his requests). The following will therefore be taken into account:

- quality constraints, measured by way of the existence of quality standards;[3]
- direct contact with customers or users;[4]

Among the determinants of the pace of work, then, we can define the following indicators:

- constraints of the industrial type in the strict sense: automatic constraints; numerical targets in the absence of automatic constraint (automatic constraints are rarely without targets);
- industrial constraints in the broad sense: relational constraints, associated with colleagues' work and control by managers;
- an industrial constraint in a still broader sense (since it has no direct effect on pace of work): quality standards
- a commercial constraint in the strict sense: constraint associated with demand.
- a commercial constraint in the broad sense: that which results from the presence of customers or users all or almost all (at least three-quarters) of the time.

We can also define two indicators of dual constraint (industrial and commercial) in the strict sense (industrial constraint in the strict sense and commercial constraint in the strict sense); in the broad sense (industrial constraint in the broad sense and commercial constraint in the broad sense); and in the broadest sense (industrial consent in the broadest sense and commercial constraint in the broadest sense).

Over and above these pace constraints, there are time constraints associated with interruptions of work in progress to make room for other, unforeseen tasks.[5] These constraints are specific and are dealt with separately in a section entitled 'Work interruptions: a particular form of work intensity' (see pp.11-15).

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[2] Q22 : The precise wording of the questions used in the survey will be found in the glossary annexed to this study.

[3] Q24_1: Generally, does your main paid job involve, or not, meeting precise quality standards?

[4] Q12_7: To what extent does your main paid job involve dealing directly with people who are not employees at your workplace such as customers, passengers, pupils, patients, etc. ('all the time', 'almost all of the time', 'around ¾ of the time', 'around half of the time', 'around ¼ of the time', 'almost never', 'never', 'don't know')?

[5] Q23a: How often do you have to interrupt a task you are doing in order to take on an unforeseen task (several times a day/a few times a day/several times a week/a few times a week/never)?

On the other hand, the Third European Survey on Working Conditions does not enable us to take account of event constraints (Valeyre, 2001), which occur in situations involving an emergency response to risks, malfunctions or critical problems. These are more particularly likely to affect continuous or semi-continuous working. The French surveys of working conditions show that they spread rapidly over the period 1984–98, in tandem with the growth of automation.

Diffusion and structuring of the various pace constraints

Analysis of the data has proved that the different industrial constraints are closely related to one another and form a coherent pattern. In the same way, the commercial constraints are closely linked to each other. However, there is no apparent contradiction between these two sets of constraints. They do not seem to be mutually exclusive. While there are clear oppositions noticeable in the case of industrial constraints – between, for example, blue-collar and white-collar workers and industrial and tertiary activities, these wide distinctions are not encountered in the case of commercial constraints, although certain constraints are more widespread among white-collar workers and in the tertiary sector. These facts confirm the fact that the world of industry has been influenced by commercial demands.

Pace constraints by occupations and sectors of activity

A study of the occurrence of the five main pace constraints (automatic, target, hierarchical, horizontal and demand) within the various occupational groups and sectors of economic activity reveals some radical disparities.

The most widespread pace constraints are demand constraints, which affect two-thirds of employees (27%). These are followed, in order, by horizontal constraints (48%),[6] hierarchical constraints (38%), target constraints (31%) and finally automatic constraints (21%) (see Table 1).

Disparities between pace constraints by occupational groups

The diffusion of the various pace constraints varies considerably between occupational groups (see Table 1). An analysis of these variations highlights three categories of pace constraint:

- Constraints of the 'industrial' type in the strict sense (automatic and target constraints), which primarily affect the various blue-collar categories (with particularly pronounced disparities):

  Automatic constraints affect more than half of industrial workers, and more than one third of craft workers and, conversely, at least one in six white-collar employees (especially among junior executives: 4%).

  Similarly, the target constraints are experienced by over half of blue-collar workers but only 16% of sales and service employees. It will be noted, however, that senior executives are equally affected (39%).

[6] For definitions of the various types of constraint, see above, 'Benchmarking the organisational determinants of intensity'.

Table 1 Pace-of-work constraints by occupational groups[7]

	Pace-of-work constraints				
	Automatic	Target	Hierarchical	Horizontal	Demand
Senior executives	14%	39%	26%	58%	83%
Junior executives	4%	2%	22%	41%	79%
Technicians	17%	24%	30%	46%	75%
Clerks	14%	22%	42%	46%	75%
Sales and service staff	11%	17%	34%	44%	85%
Agriculture and fishery workers	23%	38%	44%	47%	43%
Craft workers	35%	50%	50%	56%	52%
Industrial workers	52%	54%	50%	54%	47%
Unskilled workers	29%	30%	42%	42%	43%
Armed forces	8%	25%	54%	63%	53%
Total	**21%**	**31%**	**38%**	**48%**	**67%**

Over-representation
Under-representation

For example: 14% of senior executives are exposed to constraints of the automatic type.

- Constraints of the industrial type in the broad sense (hierarchical and horizontal constraints), where the disparities between groups are less pronounced:

  Hierarchical constraints primarily affect the armed forces (54%), blue-collar workers and, to a lesser extent, salaried employees. Executives and technicians are less affected by them.

  The horizontal constraints are more uniformly distributed. They reach their highest levels of frequency among the armed forces (63%), senior executives (58%) and blue-collar workers, and their lowest levels among junior executives (41%) and unskilled workers (42%).

- Constraints associated with demand principally concern the various white-collar categories, blue-collar workers being significantly less subject to them:

  They apply mainly to sales and service staff (85%) and senior executives (83%), to approximately 50% of blue-collar workers and only to 43% of unskilled or agricultural workers.

Disparities between pace-of-work constraints by sectors of activity

As in the case of occupations, the disparities between pace-of-work constraints by sectors of economic activity are very important (see Table 2).

- Once again, it is the industrial constraints in the strict sense that exhibit the widest disparities, showing a pronounced opposition between industrial activities, which are highly exposed, and tertiary activities which are relatively unaffected:

  The automatic constraints are very prevalent in industrial activities, especially in the wood, paper and cardboard industry (58%) and the manufacture of transport equipment (55%), and in the transport sector, but have much less effect on employees in the tertiary sector and reach their lowest level in domestic service and education (4%).

[7] Unless otherwise indicated, the tables contained in this report are derived from the data contained in the European surveys of working conditions.

A closely related sectoral hierarchisation takes effect with target constraints (very high levels in industrial activities, very low in tertiary activities).

Table 2 Pace-of-work constraints by sectors of economic activity

	Pace-of-work constraints				
	Automatic	Target	Hierarchical	Horizontal	Demand
Agriculture, fishing	23%	37%	42%	48%	45%
Mining and quarrying	45%	53%	23%	61%	62%
Manufacture of food products, beverages and tobacco	48%	57%	45%	50%	49%
Textiles, clothes	46%	62%	60%	57%	53%
Wood, paper, cardboard	58%	60%	41%	46%	40%
Publishing, printing	39%	55%	39%	49%	65%
Chemicals, plastics	47%	59%	52%	53%	39%
Metallurgy, mechanical engineering	45%	60%	42%	53%	50%
Electrical, electronic engineering	41%	61%	48%	52%	56%
Manufacture of transport equipment	55%	71%	51%	59%	36%
Miscellaneous industries	25%	42%	43%	48%	55%
Electricity, gas, water	10%	30%	35%	60%	60%
Construction	22%	38%	52%	60%	56%
Trade	16%	25%	35%	42%	83%
Hotels and restaurants	17%	21%	40%	60%	86%
Land transport	28%	29%	42%	43%	71%
Other transport	39%	23%	32%	55%	68%
Post and telecommunications	25%	41%	32%	50%	64%
Financial activities	12%	32%	40%	42%	81%
Business services	13%	25%	36%	50%	69%
Public administration	9%	15%	37%	46%	63%
Education	4%	14%	22%	29%	81%
Health and social work	8%	11%	28%	52%	84%
Private service	12%	16%	30%	37%	67%
Domestic service	4%	8%	31%	12%	39%
Total	**21%**	**31%**	**38%**	**48%**	**67%**

Over-representation

Under-representation

For example: 23% of employees in the agriculture and fishing sector are exposed to pace-of-work constraints of the automatic type.

Industrial constraints in the broad sense (hierarchical and horizontal) display considerably less pronounced sectoral disparities than is the case with industrial constraints in the strict sense, with less automatic opposition between industrial and tertiary activities:

Hierarchical constraints are slightly more common in industrial activities, particularly in sectors such as the textile (60%) and chemical (53%) industries, but are also relatively pronounced in the tertiary activities (land transport, hotels, financial activities, etc.). They are at their lowest level in health and education.

With the horizontal constraints, the opposition between industry and tertiary is, again, less automatic. Thus, the highest levels are reached in industries such as mining and quarrying (61%), construction (60%), manufacture of transport equipment (59%) and textiles and clothing (57%) but also in such tertiary activities as hotels and restaurants (60%) and non-land transport (55%). The proportions are lowest in other tertiary activities such as domestic service (12%) and, to a lesser extent, education (29%).

Unlike industrial constraints, constraints caused by demand have more effect on tertiary activities than on industrial activities:

They affect over 80% of employees in sectors such as hotels and restaurants (86%), trade, health/social work and education. At the opposite extreme, they concern less than 40% of employees in the manufacture of transport equipment (36%) and the chemical industry (39%).

However, they are still very prevalent in certain industrial activities such as publishing/printing (65%) and mining and quarrying (62%).

Industrial constraints and commercial constraints: specific but not mutually exclusive universes

An analysis of the correlations (Table 3) between the various types of constraints that influence the pace of work confirms the relevance of classifying constraints as either industrial or commercial: the various industrial constraints (in the strict sense and in the broad sense) show a positive association with one another, as do the various commercial constraints.

On the other hand, the link between industrial constraints and commercial constraints are not statistically significant, which may be explained by the coexistence of purely commercial organisations, purely industrial organisations and hybrid organisations. Furthermore, the opposition between industrial constraints and commercial constraints tends to become less marked over the course of time (see Table 16). The two patterns are not mutually exclusive and the hybridisation of industrial and commercial forms of organisation may result in the cumulative presence of the constraints associated with each.

Table 3 Links between the various determinants of work intensity

	Automatic constraint	Target constraint	Horizontal constraint	Hierarchical constraint	Quality standards	Demand constraints	Customers present at least ¾ of time
Automatic constraint	–	+ 0.39	+ 0.19	+ 0.20	+ 0.21	– 0.13	– 0.15
Target constraint	+ 0.39	–	+ 0.18	+ 0.20	+ 0.25	– 0.04	– 0.12
Horizontal constraint	+ 0.19	+ 0.18	–	+ 0.20	+ 0.16	+ 0.08	– 0.04
Hierarchical constraint	+ 0.20	+ 0.20	+ 0.20	–	+ 0.12	– 0.02	– 0.08
Quality standards	+ 0.21	+ 0.25	+ 0.16	+ 0.12	–	0	– 0.05
Demand constraints	– 0.13	– 0.04	+ 0.08	– 0.02	0	–	+ 0.33
Customers present at least ¾ of time	– 0.15	– 0.12	– 0.04	– 0.08	– 0.05	+ 0.33	–

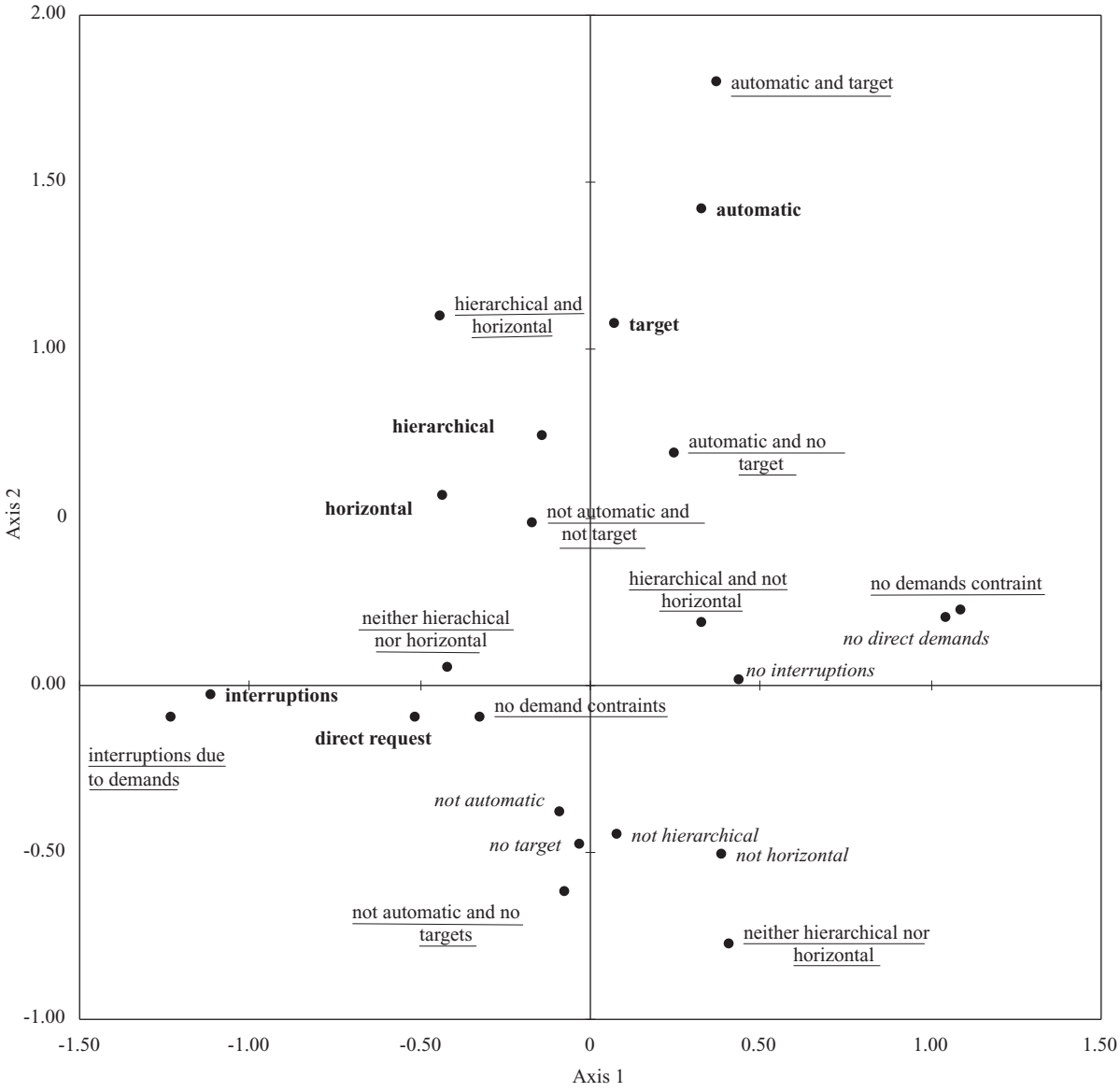
For example: the correlation measured by the coefficient j is 0.39% between automatic constraints and numerical targets.[8] The statistically stronger the correlation between the variables, the higher the coefficient. The sign of the coefficient indicates whether the correlation is positive or negative. For example, an obligation to comply with numerical targets is more common among employees who are subjected to automatic constraints than among those whose are not. It is, however, less frequent among those whose pace of work is dictated by customer demand.

[8] The formula defining this coefficient is

$\varphi = \frac{p_{xy} - p_x p_y}{\sqrt{p_x q_x p_y q_y}}$ where Px is the individual proportion for which item x is verified and where $q_x = 1 - p_x$

The various dimensions of the way in which the different time constraints of pace of work and work interruption take effect can be artificially highlighted using multiple correspondence analysis of the employee population (see Figure 1).[9]

Figure 1 Multiple correspondence analysis of pace-of-work constraints (first factorial plane)



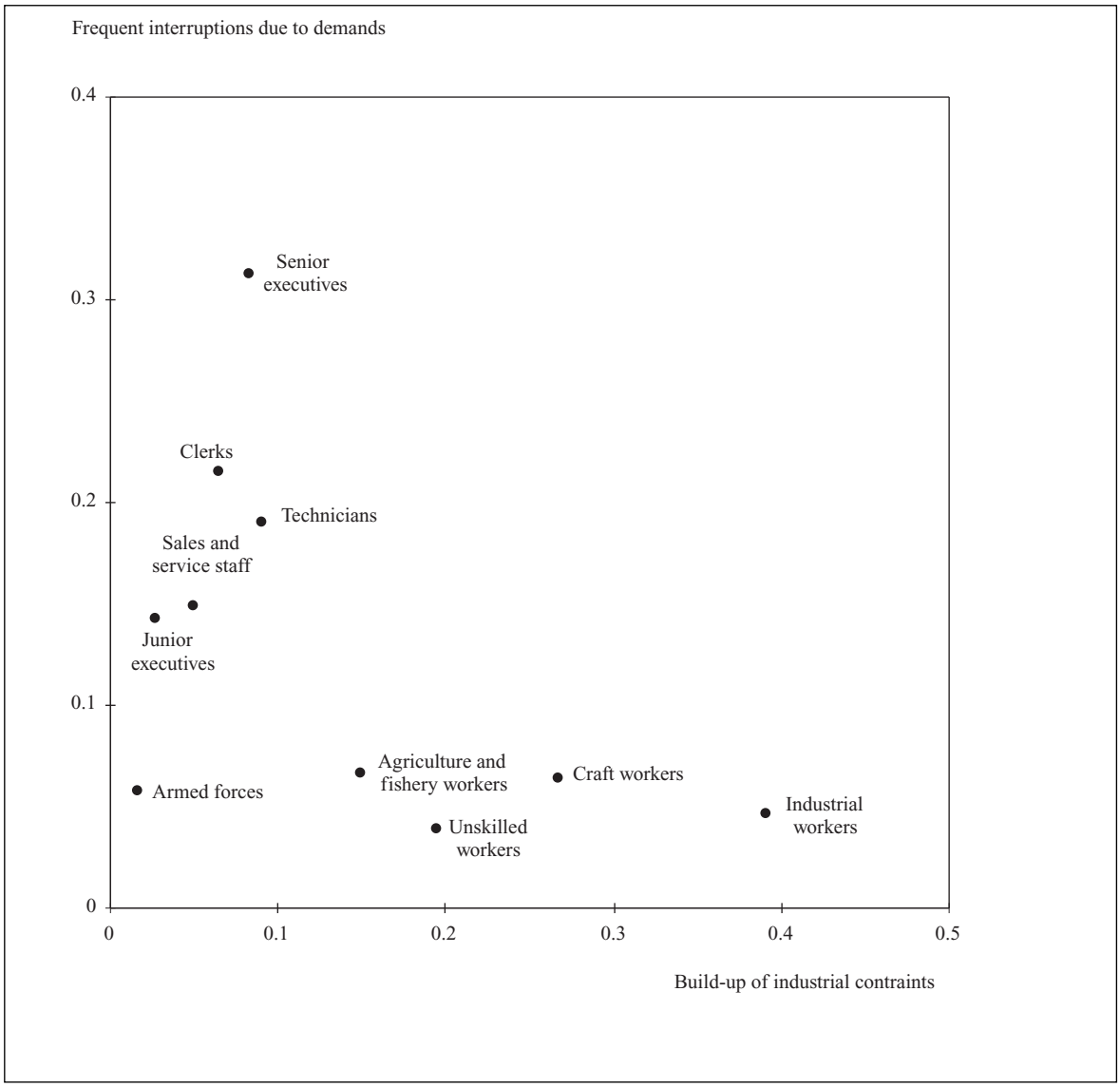
Key: the active variables are shown in the figure: positive modalities (presence of the measured constraint) **in bold** and negative modalities (absence of the constraint) *in italic*. The supplementary variables are underlined.

[9] The analysis of the multiple correspondences is performed on six variables of time constraints: the five pace-of-work constraints (automatic, target, hierarchical, horizontal and demand) and the constraint of frequent interruptions of work. The first two axes of the analysis contribute 49% of the total variance (28.4% in the first case and 20.6% in the second). Furthermore, additional variables are introduced into the analysis. These are combinations of time constraints on work, intended to clarify the determination of the most discriminatory components: three variables of composed time constraints are introduced as additional variables into the multiple correspondence analysis of pace-of-work constraints: one variable of industrial constraints (automatic and target/automatic and without targets/targets and not automatic/not automatic and without targets); one variable of relational constraints (hierarchical and horizontal/hierarchical and not horizontal/horizontal and not hierarchical/neither horizontal nor hierarchical) and one variable of demand constraints (due to frequent interruptions associated with external demand/other pace constraints imposed by demand/others).

As demonstrated by the first factorial plane of the analysis, the first axis is very largely structured by industrial, automatic or target constraints and, to a lesser extent, by relational, hierarchical or horizontal constraints. The second axis is mainly structured by demand constraints and by the constraints of frequent interruptions of work. The factorial analysis thus confirms the structuring of the pace constraints around two principal poles: industrial constraints and commercial constraints. However, being subjected to one of these two types of constraint neither implies nor excludes exposure to the other; again, therefore, the factorial analysis confirms the tendency towards hybridisation of the two patterns discussed above.

The projection of variables combining pace-of-work constraints as supplementary variables in the first factorial plane allows a more detailed analysis. It shows, in fact, that two types of constraint are particularly discriminatory. On the one hand, there are cumulative industrial constraints, both automatic and target (according to the first axis), and on the other hand constraints of frequent interruptions of work by demand (according to the second axis).

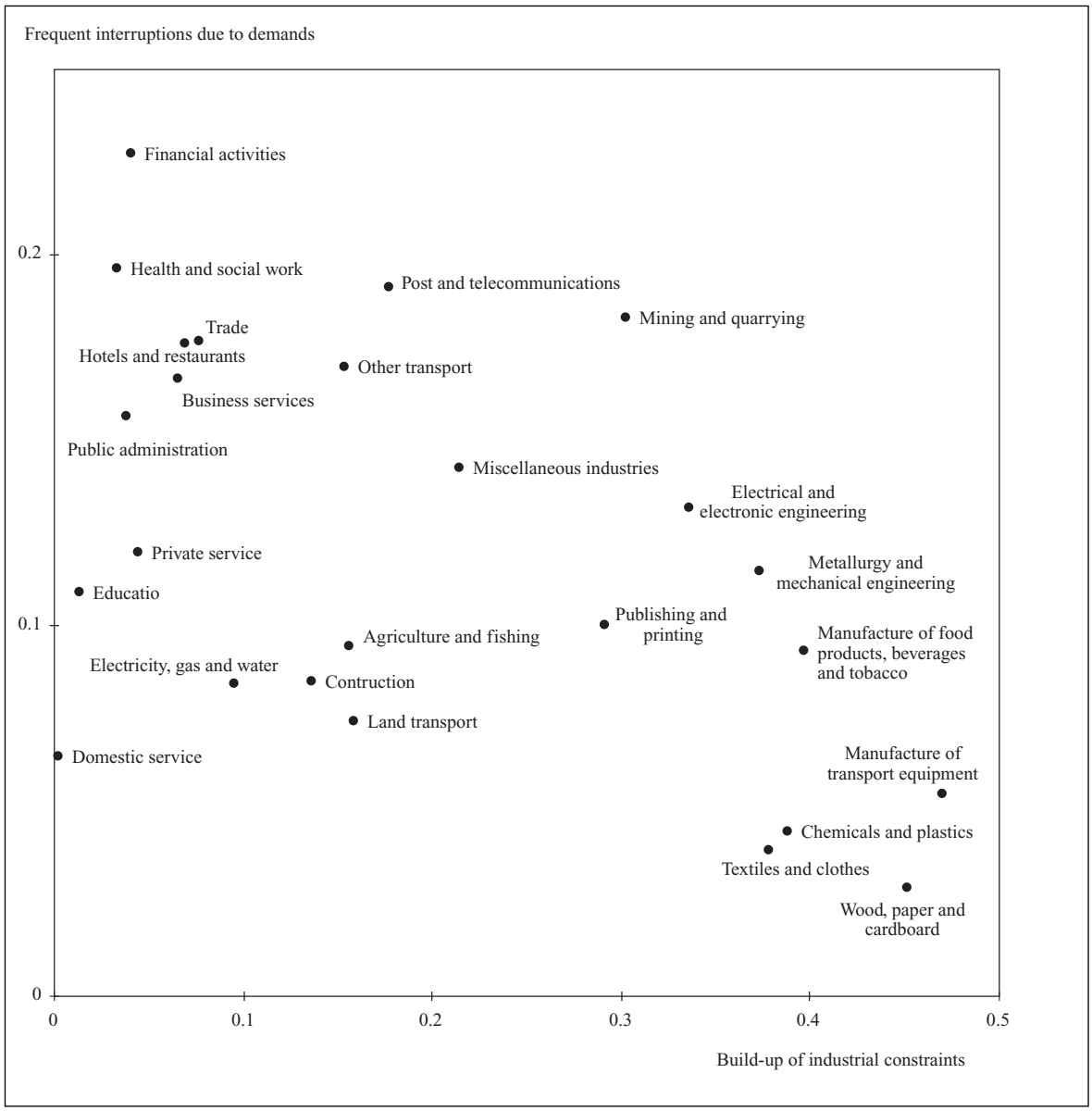
Figure 2 Pace-of-work constraints by occupations



The two most discriminatory types of constraint (cumulative industrial constraints, combining automatic constraints and target constraints, and urgent demand constraints, corresponding to frequent interruptions of work caused by external demand) can serve as a basis for establishing typologies of occupations and sectors of activity.

As Figure 2 shows, the typology of occupational groups according to these two axes highlights two classes subjected to heavy and contrasting constraints: on the one hand, industrial workers and, to a lesser extent, skilled workers who are subject to high levels of industrial constraint combining automatic constraints with production target constraints; and on the other hand, senior executives, who are subjected to severe demand constraints corresponding, in particular, to frequent and unexpected interruptions cause by external demand. On the other hand, no occupational group is simultaneously exposed to cumulative industrial constraints and urgent demand constraints.

Figure 3 Pace constraints by sectors of economic activity



The typology of sectors of economic activity (Figure 3), constructed on the same principle, shows that industrial constraints have a very pronounced adverse effect on industrial activities apart from energy and construction and tertiary activities other than communications. On the other hand, this clear-cut opposition does not recur in the case of demand constraints, even though they are higher, overall, in the tertiary sector than in industry; this again confirms how commercial patterns have penetrated the industrial sector.

The greatest contrast arises between, on the one hand, industries such as the manufacture of transport equipment, wood, paper and cardboard, textiles, clothing and leather or chemicals, typified by high industrial constraints and very low demand constraints, and, on the other hand, services such as financial institutions and health/social work, which, conversely, are typified by very low industrial constraints and substantial demand constraints.

Work interruptions: a particular form of work intensity

Interruptions of work in progress caused by the need to begin another, unforeseen task are more frequent and widespread in commercial organisations, but the industrial/bureaucratic organisation and the constraints that derive from it certainly do not eliminate such interruptions, even though industrial organisation is based on attempts to predict and control work situations.

Econometric analysis confirms that commercial constraints increase the risk that an employee will be exposed daily to work interruptions, but that industrial restraints do not reduce that risk. Furthermore, the combining of constraints has little specific effect. To put it another way, the appearance of commercial aspects within an industrial organisation increases the risk of interruptions as much as if the organisation were a purely commercial one, and the occurrence of industrial elements that impose regularity on a commercial organisation does not reduce that risk.

When asked about the causes of these interruptions, employees tend to attribute them to the very 'nature' of their work. Otherwise, responses confirm the econometric results; thus, interruptions seem to be mainly associated with the requests of customers, colleagues or bosses.

Even though these interruptions are frequently perceived as 'natural', they are in most cases experienced as disruptive, or at best as having no impact. The disruptive nature of interruptions is particularly felt by industrial workers.

Being forced to break off work in order to perform a new, unforeseen task[10] is something that happens, at least occasionally, to the vast majority of employees. The percentage that are not affected is even lower than that of employees to whom it happens several times a day (29%). Half of employees experience such interruptions 'several' or 'a few' times each day, and more than 20% do so several or a few times each week.

This problem appears to occupy an intermediate position between organisational determinants of work intensity, on the one hand, and perceived working conditions on the other. It cannot be

[10] Q23a: How often do you have to interrupt a task you are doing in order to take on an unforeseen task (several times a day/a few times a day/several times a week/a few times a week/never)?

entirely ascribed to the organisational determinants, in so far as such interruptions may have different causes, nor to working conditions in the strict sense, because the interruptions may be experienced in different ways.

We will begin by studying the link between the various pace-of-work determinants and interruptions at work. We will then see how employees account for the origin of those interruptions and, finally, how they judge their impact on their work.

Organisational determinants

By means of simple cross-tabulations, it can be established that routine interruptions ('several' or 'a few' times per day) are positively linked to virtually all the constraints but especially to the commercial constraints; 54% of employees whose pace of work depends on demand claim to suffer from such interruptions as compared with only 35% of others (in cases where customers are present for at least three-quarters of the time, the variation is 54% against 45%).

In the case of industrial constraints in the strict sense, the variations are more minimal: 48% against 47% for numerical targets. The correlation is even reversed in the case of constraints of the automatic type: 45% against 48%. If the concept of industrial constraint is extended, the only strong correlation is found in the case of dependence on colleagues (53% against 43%), but the variation is narrower if control by bosses (51% to 46%) or quality standards (49% against 44%) is taken into account.

Frequent work interruptions are therefore more widespread in commercial organisations, but the industrial/bureaucratic organisation certainly does not eliminate them. In fact, the combination of industrial and commercial constraints (in the broadest sense) is accompanied by a considerable increase in the frequency of daily interruptions: 54% against 37%.

However, in view of the statistical links between the various pace constraints, it is appropriate to try to isolate the effect of each of them. To do this, we undertook a logistic regression analysis, the results of which are shown in Table 4.[11]

The commercial constraints, all other things being equal, significantly increase the risk that an employee is exposed to daily interruptions of his work, which seems logical in so far as the commercial organisation is based on constant adaptation to fluctuations in demand.

However, it is notable that, with the possible exception of automatic constraints (where the result is not statistically significant), industrial constraints do not reduce the risk of interruptions, even though industrial organisation is based on attempts to predict and control work situations. Indeed, there are several constraints of the industrial type that actually increase the risk of interruptions; this is true of dependence on colleagues and dependence on bosses and, to a lesser extent, numerical targets. Dependence on colleagues' work is especially frequent in organisations based on just-in-time production, which introduces elements of commercial organisation into industrial systems. However that may be, this dependence on colleagues' work is the sign of a more flexible form of industrial organisation than is the case with targets or automatic constraints.

[11] In view of the extremely heterogeneous nature of the sampling rates, especially as a function of the Member State, we have used weighted regressions, the overall population still being that of the sample, which allows comparable tests.

Finally, the combination of constraints has little specific effect. To put it another way, the appearance of commercial aspects in an industrial organisation increases the risk of interruptions as much as if the organisation were a completely commercial one, and the impact of industrial elements on a commercial organisation does not reduce that risk.

Table 4 Effect of the pace-of-work determinants on the risk of routine interruptions: results of a logistic regression analysis

Constraint	Effect
Automatic constraint	-0.06 (0.04)
Numerical targets (without automatic constraint)	+0.02 (0.04)
Dependence on colleagues	+ 0.32 (0.03)
Control by the boss	+ 0.21 (0.03)
Quality standards	+ 0.17 (0.04)
Customer demand	+ 0.54 (0.05)
Customers present at least ¾ of time	+ 0.45 (0.04)
Customers present ¼ to ½ of time	+ 0.64 (0.05)
Combination of industrial constraint + commercial constraint (broad sense)	+0.00 (0.05)

For example: the effect of being subject to automatic constraints is estimated by a coefficient which is interpreted in terms of deviation from the reference population: employees who are not subject to automatic constraints. The standard deviation of the estimation of the coefficient is indicated in parentheses. The significant effects at the 5% level are in bold.

Causes identified by employees

The Third European Survey on Working Conditions explores the causes of interruptions as explained by the employees.[12] No fewer than 45% of employees consider that the 'nature' of their work compels them to break off in order to undertake an unforeseen task. This is a substantial percentage, considering that approximately 70% of employees are confronted by such interruptions. In fact, the nature of work is felt to be the cause in 75% of cases where interruptions occur several times a day and in 62% of cases where they occur a few times a day, the percentage still being greater than 50% when interruptions are less common. However, the logistic regression analyses set out above show that the interruptions have quite specific causes. Rather than attributing them to characteristics that are truly specific to the work, then, it may be concluded that

[12] Q23b: Are these interruptions mainly due to the nature of your work/bad organisation of work/requests from colleagues or superiors/external requests (clients, etc.)/machines or equipment working badly/bad design of workplace or work station/other (spontaneous)? This question is not easy to use: the accepted cause of the interruptions is 'the nature of the job'. Even though the reply 'yes' is very common, that nature remains a mystery. Clearly, in many cases, it includes the other items. After all, what remains of the nature of a job once organisation, colleagues, superiors, customers, equipment and the workplace have been removed? In fact, employees no doubt frequently feel that such interruptions are normal in their occupation, but this can only be a presumption.

the employees are inclined – even though the questionnaire did nothing to prompt that inclination – to regard the work interruptions to which they are exposed as natural.

Nevertheless, employees are equally capable of relating interruptions to specific causes, and their statements tend rather to confirm the econometric findings. The reasons most frequently mentioned are requests by colleagues and bosses (30% of employees and 45% among those subject to daily interruptions) and, with almost equal frequency, customer requests (29%; 44%). The other reasons are mentioned significantly less often – in descending order, they are: bad organisation (8%; 11%), though the use of the adjective 'bad' means this result has little evidential value; machines or equipment working badly (7%; 9%), where the same remark applies to some extent; bad workplace or work station design (3%; 4%); and other reasons (3%; 3%). In addition, requests by customers, superiors and colleagues are associated with frequent interruptions (as is bad workplace design), whereas failures of organisation and equipment only more rarely give rise to interruptions.

The frequency of interruptions and their causes vary greatly, depending on the occupational situation (see Table 5); thus the likelihood of daily interruptions is 75% for senior executives as opposed to 28% for industrial workers.

Table 5 Percentage of employees exposed to interruptions

	Percentage of employees exposed to daily interruptions of all kind							
	All kinds	Daily	Due to nature of work	Due to bad organisa-tion	Due to colleagues, bosses	Due to customers	Due to machines	Due to workplace
Senior executives	90%	75%	66%	9%	46%	46%	6%	4%
Junior executives	73%	48%	55%	7%	32%	31%	4%	2%
Technicians	78%	57%	50%	9%	37%	38%	6%	3%
Clerks	75%	57%	48%	7%	39%	41%	5%	2%
Sales staff	67%	53%	46%	4%	22%	31%	2%	1%
Agricultural workers	57%	29%	38%	6%	20%	19%	13%	3%
Craft workers	71%	39%	40%	12%	30%	22%	13%	4%
Industrial workers	52%	28%	29%	10%	18%	11%	16%	4%
Unskilled workers	54%	31%	32%	6%	21%	14%	8%	2%
Armed forces	57%	45%	46%	9%	38%	11%	15%	4%
Total	**70%**	**48%**	**45%**	**8%**	**30%**	**29%**	**7%**	**3%**

Over-represented
Under-represented

For example: 90% of senior executives are exposed to interruptions of all kinds.

As might be expected, blue-collar workers report most interruptions caused by machinery problems. They also report the highest number of complaints arising from bad work organisation and bad workplace design; more surprisingly, however, senior executives rank second in these areas. The latter also very frequently cite requests from customers, colleagues and bosses, and the nature of their work, these causes of interruption being rarely mentioned by blue-collar workers, especially industrial workers.

Men are more likely than women to cite machinery malfunctions; although women make extensive use of computerised machinery, mechanical and electromechanical machinery is undoubtedly more often used by men. Surprisingly, the same applies to organisational malfunctions; there is no suggestion that women might work in better organisations. The answers are probably attributable both to the problems encountered and to the requirements of the different social classes and sexes.

How do employees feel about interruptions?

Even though the interruptions are frequently perceived as normal, the majority of employees find them disruptive or, at best, as having no effect.[13] In this section we will consider employees who are exposed to daily interruptions. Among them, 37% find that the interruptions disrupt their work and only 11% rate them as positive (giving a balance of 11 - 37 = -26). Forty-four percent find them without consequence and 7% have no opinion.

Interruptions caused by bad workplace design, bad organisation and machinery malfunction are found to be the most disruptive, with balances of -65, -61 and -47 respectively. However, the sense of causality is far from being obvious, because the more damaging the effects on the employee, the more likely workplaces, organisations and equipment are to be rated 'bad'. Interruptions caused by colleagues or bosses show a balance of -30 and those caused by customers 'only' -25; reference to the customer justifies many constraints (Cartron, 2000). In terms of interruptions, it seems the nature of the work is as much a reason for complaint as the customer.

The judgments formed by men and by women are very similar. By contrast, there are significant differences between social categories (Table 6). Industrial workers and, to a lesser extent, technicians and craft workers are notable for a heavily negative balance. That balance, however, is only moderately negative in the case of commercial employees and agricultural workers, but many of them actually find that the interruptions have no effect. Senior executives also have some tolerance (all relative) of interruptions, though their views on the subject are generally clear-cut.

Table 6 Perception of interruptions by employees exposed to them daily

	Percentage of employees exposed to daily interruptions who find them ...			
	Disruptive	Without consequence	Positive	BALANCE
Senior executives	40%	27%	20%	–20%
Junior executives	43%	32%	15%	–28%
Technicians	43%	43%	10%	–33%
Clerks	35%	47%	10%	–25%
Sales staff	26%	54%	14%	–12%
Agricultural workers	24%	57%	8%	–16%
Craft workers	38%	46%	9%	–29%
Industrial workers	46%	38%	7%	–39%
Unskilled workers	34%	54%	7%	–27%
Armed forces	31%	55%	6%	–25%
Total	**37%**	**44%**	**11%**	**–26%**

For example: 40% of senior executives exposed to daily interruptions find them disruptive (balance = % positive - % negative)

[13] Question Q23c: For your work, are these interruptions disruptive, without consequences or positive?

2 Intensity as perceived by employees

The work intensity reported by employees may be experienced through exposure to high working speeds, tight deadlines or insufficient time to complete the job. This intensity varies widely as a function of the characteristics of the site (sector of activity, status, size) and the employees (occupation, employment status, sex, age).

Thus, some categories of employee are particularly exposed to high work intensities. This is true of the blue-collar groups, who are frequently exposed to high working speeds and tight deadlines, but also of senior executives, confronted by tight deadlines and shortage of time at work. Work intensity also varies considerably from one economic sector to another, though the greater exposures to high working speeds and tight deadlines are to be found in industrial activities. Work intensity can also be seen to increase with the size of the undertaking, at least up to a threshold of 100 employees, above which the level of intensity becomes stable. Finally, work intensity tends to decrease with age and older employees (over the age of 45) are less frequently affected by high speeds or tight deadlines. Finally, assuming equivalent occupational status, women are more likely than men to be confronted by intensive work speeds and tight deadlines.

Simultaneous membership of highly exposed categories very significantly increases the likelihood of being compelled to work very intensively. Thus, young female blue-collar workers in the mass-producing industries constitute a category of the workforce that is particularly exposed to high speeds of work or tight deadlines.

Indicators used

The Third European Survey on Working Conditions enables us to measure work intensity, as perceived by the workers, in three dimensions: exposure to high working speeds, exposure to very rigid and very short deadlines, and shortage of time to complete the job.[14]

Several indicators of intensive working are constructed on the basis of the frequency of high working speeds and the frequency of tight deadlines: indicators of continuously intensive working (all the time) or almost continuous intensive working (all the time or almost all the time) and indicators of intensive working at peak periods (half or three-quarters of the time). Furthermore, these two questions enable us to define two synthetic indicators of average temporal frequency of intensive working, which estimate the average proportion of working time spent working at high speeds or to tight deadlines.[15]

No question can rank as a completely objective measurement, irrespective of the employee questioned. For example, subjected to a hierarchical control that is not reflected by effective

[14] Q21b_1: And, does your job involve working at very high speed ('all the time', 'almost all of the time', 'around 3/4 of the time', 'around half of the time', 'around 1/4 of the time', 'almost never', 'never', 'don't know')?
Q21b_2: Does your job involve working to very tight deadlines ('all the time', 'almost all of the time', 'around 3/4 of the time', 'around half of the time', 'around 1/4 of the time', 'almost never', 'never', 'don't know')?
Q26_5: Do you have enough time to finish your job (yes/no)?

[15] These synthetic indicators of temporal frequency are constructed by assigning a numerical temporary frequency coefficient to each mode of reply in accordance with the following scale: 'all of the time' = 1, 'almost all of the time' = 9/10, 'about three quarters of the time' = 3/4, 'about half of the time' = 1/2, 'about a quarter of the time' = 1/4, 'almost never' = 1/10, 'never' = 0, 'don't know' = 1/2.

sanctions, Employee A may consider that his speed of working depends on the supervision of his boss (since such supervision exists) whereas his colleague, Employee B, will believe the opposite (because the effect of the supervision is insignificant). However, it is likely that these replies will be associated with the fact that A is actually trying to comply with his boss's requests while B is not. Consequently, their different responses reflect different objective situations. As far as pace-of-work determinants are concerned, problems of interpretation associated with the existence of processes for objectivising or denying working conditions (Gollac, 1997; Gollac and Volkoff, 2000) are limited. Knowing that one's work involves demands means that you are subject to variations in demand. Believing that you are unaffected by the rules does in fact mean being independent of them. The figures therefore have some evidential value.[16]

By contrast, the replies to the questions regarding 'high speeds' and 'rigid and short deadlines' clearly depend on what employees regard as 'high' speeds or 'rigid and short' deadlines. These are measurements of psychological comfort or suffering (and, as such, their subjective nature is not necessarily a defect).

Finally, the question 'Do you have enough time to get the job done?' is relatively objective, even if the answer relates to some extent to the ability of the employee questioned: that ability is a determinant of a working condition which is no less real as a result. However, we preferred to equate it not with the 'objective' determinants of pace of work but, rather, with the working conditions perceived by the employees as a result of these constraints. The point is that one cannot know, from the reply to this question alone, the reasons why the employee does or does not succeed in finishing his job; therefore we obtain information on a level of work intensity but not on its reasons or forms. Furthermore, we believe that the terms 'enough time' and 'get the job done' are vague. 'Getting the job done' may, then, have a different meaning depending on whether or not quality requirements are taken into account. Similarly, 'enough time' may or may not include non-working time.

Ultimately, then, work intensity is recorded by reference to nine indicators:

- the average temporal frequency of high working speeds and the proportions of workers exposed to high speeds continuously, almost continuously or at peak periods;
- the average temporal frequency of working to tight deadlines and the proportions of workers exposed to tight deadlines continuously, almost continuously or at peak periods;
- the proportion of workers short of time at work.

These indicators of work intensity are studied as a function of a number of structural characteristics such as occupational groups, the demographic characteristics of the workers (sex and age), their employment status (unlimited contract, fixed-term contract, temporary, etc.) or sectors of economic

[16] There are also some reasons to believe that these questions may be less sensitive to possible artefacts affecting the comparability of the surveys. However, the interpretation of econometric results obtained with French data on computerised working suggests that, in surveys of working conditions, certain pace constraints that have no effect on the discomfort of work are not reported (by executives, for example), whereas they would be if the survey related to organisation (Gollac, 1998).
In addition, it is possible to demonstrate very close correlations between the evolution of pace constraints at sector level and that of economic values measured entirely independently, such as the productivity of labour (Valeyre, 2001); this correlation would have no prospect of occurring if the replies regarding pace-of-work determinants were affected by fluctuations in opinion unassociated with actual economic and organisational trends.

activity, the legal status of the undertakings (government service, state-owned company, private company) and their size. Details of findings for each of these indicators will be found in Tables 18 to 24.

Work intensity among different categories of employees

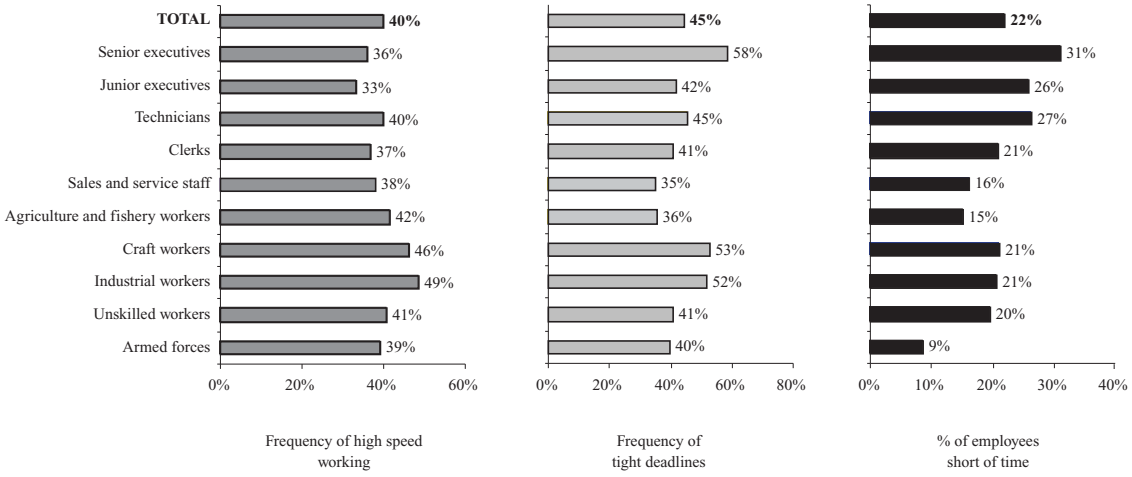
In the year 2000, for all countries in the European Union, 25% of employees stated that they were exposed to almost constant high working speeds and 30% to almost constant tight deadlines. Finally, 22% said that they were short of time at work. Thus, more than one in five employees are exposed to high work intensities, whether caused by speed, deadlines or shortage of time at work.

An analysis of work intensity as a function of various structural variables is carried out by focusing more specifically on identifying the most exposed categories of workers. The hypothesis formed, in fact, is that highly intensive working has adverse repercussions on the working conditions experienced by the workers exposed to it.

Work intensity by occupational groups

Two occupational groups are particularly exposed to intensive working: first, blue-collar industrial or craft workers, who report both high working speeds and tight deadlines; and secondly, senior executives, exposed to tight deadlines and shortage of time at work.

Figure 4 Work intensity by occupational groups



For example: among senior executives, average temporal exposure to high speeds is 36%, and 58% in the case of tight deadlines. Furthermore, 31% of them say they are short of time at work.

Overall, the average temporal frequency of high-speed working is greatest among blue-collar workers in industry (49%) or crafts (46%) and, to a lesser extent, among unskilled workers, agricultural and fisheries workers and technicians. Conversely, the lowest average temporal frequencies are to be found among junior executives. This overall view, however, conceals slight disparities between groups; thus, the categories most exposed to 'almost continuously' high working speeds are industrial and craft workers and unskilled workers, whereas those most exposed at peak periods are craft, agricultural and fisheries workers and technicians.

The findings are significantly different when we come to examine exposure to tight deadlines. The synthetic indicator of average temporal frequency of working to tight deadlines identifies senior executives as the most exposed category (58%), followed by workers in craft-type occupations (53%) and industrial workers (52%). These three groups are also those most exposed to almost continuously tight deadlines. On the other hand, the categories most exposed to tight deadlines at peak periods are different. They are the same categories as were listed for high working speeds: workers in craft-type occupations, agriculture and fisheries workers and technicians.

The indicator of shortage of time at work introduces a ranking order which is again different from the previous ones. This shortage of time is, in fact, more apparent among the occupational groups at the top of the social scale, principally among senior executives (31%) but also among junior executives (26%) and technicians (27%). The blue-collar groups are rather less exposed to this, and the armed forces are the least affected by it.

The occupational ranking orders of work intensity thus diverge significantly, depending on whether the reference is to high speeds or to tight deadlines (see Figure 5). Furthermore, the ranking orders produced by the indicators of shortage of time and tight deadlines display analogies, but diverge radically as far as the blue-collar categories are concerned.

Work intensity by type of job

Overall, temporary workers more frequently report high working speeds and shortage of time to complete the job, whereas tight deadlines have more effect on those employed on unlimited contracts.

As in the case of socio-professional positions, different types of employment contracts have a contrasting effect on work intensity and disclose the many facets of work intensity (see Table 19). Temporary workers, in fact, seem to be more frequently exposed to high working speeds and shortage of time at work; 30% of them experience almost continuously high working speeds as opposed to 25% among other employees (on open-ended or fixed-term contracts). Furthermore, 26% of them say they are short of time to complete their jobs as compared with 22% among those on open-ended contracts and 20% on fixed-term contracts. Conversely, the situation is reversed when we consider work intensity associated with tight deadlines; temporary workers have significantly less sense of being exposed to this than those on open-ended contracts (average temporal frequency of 38% among temporary workers versus 45% among those on open-ended contracts).

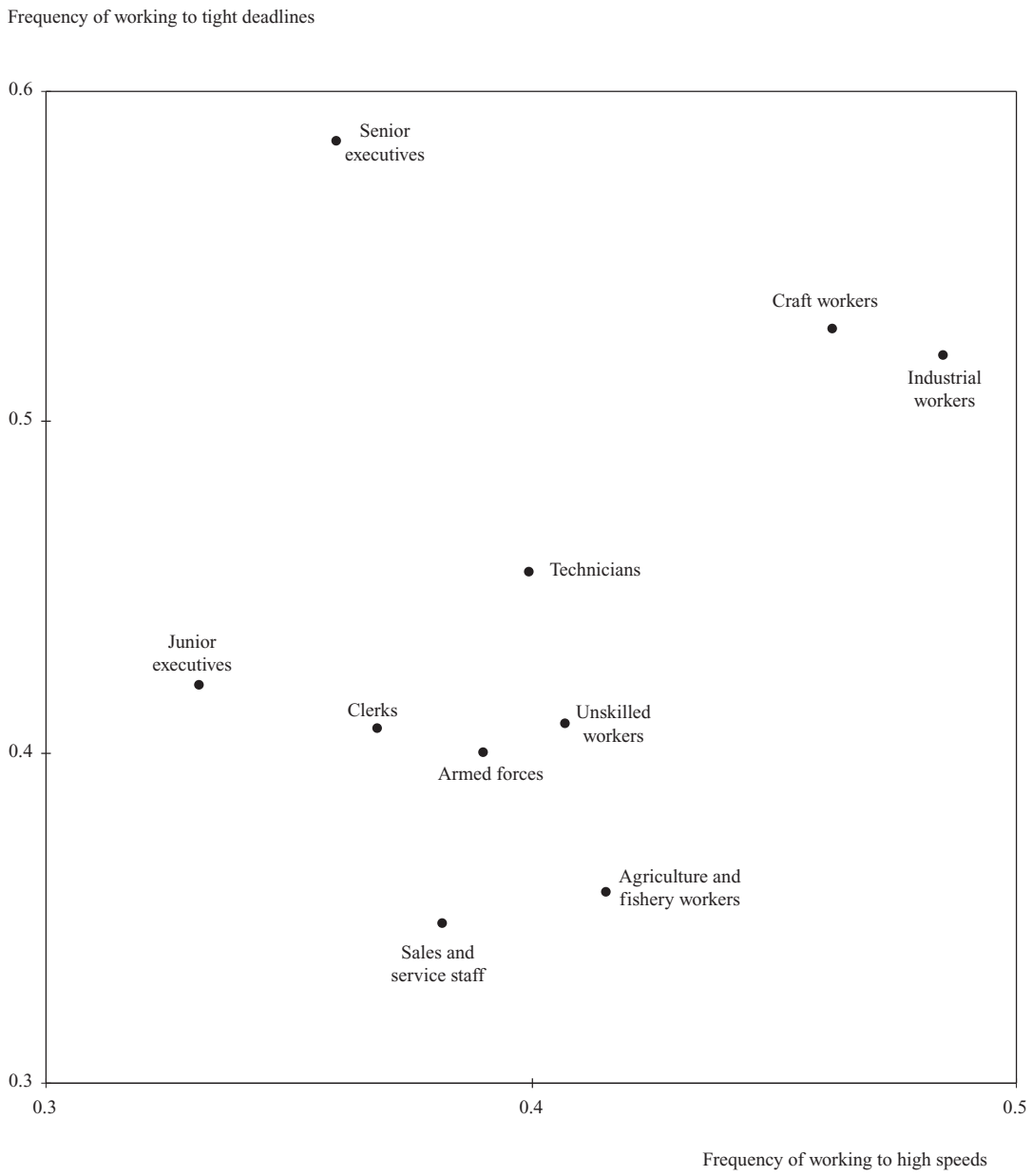
Work intensity by gender

When it is assessed in terms of high working speeds or in terms of shortage of time at work, there is virtually no difference in work intensity between men and women (see Table 20). Only intensity relating to tight deadlines introduces a distinction, male workers being more exposed to this than female workers (significantly higher average temporal frequency among men: 48% versus 41%).

However, these findings are to a large extent associated with differences in the social makeup of groups of male and female employees. Women are more numerous in the low-work-intensity occupations (salaried staff, for example), whereas men are in a great majority among the blue-collar occupations and in management, where work intensity is high. Neutralising the effects of occupational composition may therefore lead to different results. Thus, a study of the blue-collar

groups (industrial or craft) shows that, contrary to the results obtained for employees as a whole, female blue-collar workers claim to be significantly more exposed to high work intensities than male workers (46% of female workers report almost continuously high speeds as compared with 29% of male workers, and 43% report almost continuously tight deadlines as compared with 35%).

Figure 5 Work intensity by occupation



Work intensity by age

Work intensity tends to decrease steadilywith age when it is related to high speeds. On the other hand, when exposure to tight deadlines or shortage of time at work is considered, the reduction is observed only from the middle of working life onwards; moreover, among young employees, the shortage of time increases with age.

Figure 6 Work intensity by age group

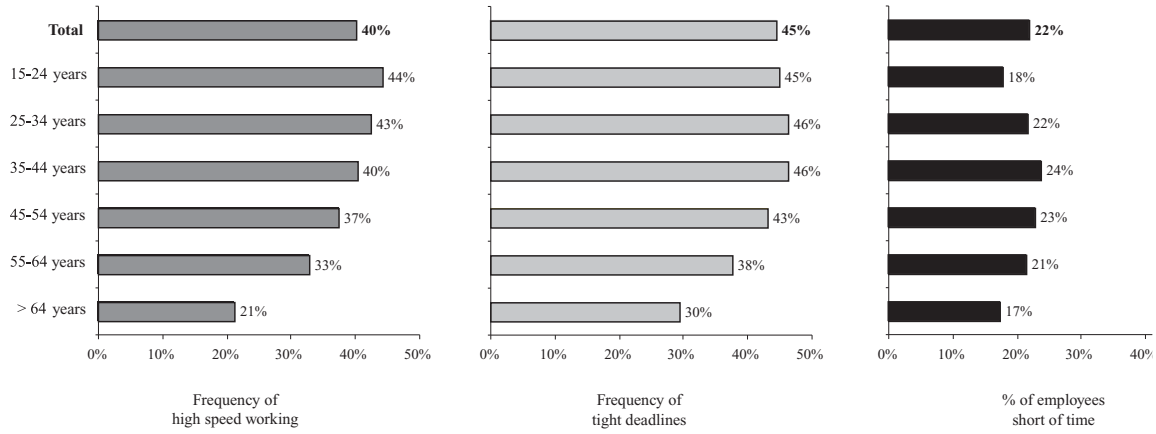


Figure to be read similarly to Figure 4.

Work intensity by sector of economic activity

Overall, employees in the industrial and construction sectors are exposed to greater work intensity than those in the service sectors, and this applies to both working speeds and deadlines. Apart from this underlying trend, there are some significant differences between sectors: some service activities, such as hotels and restaurants, are greatly affected by high working speeds, while others, such as transport and communication services, frequently experience tight deadlines.

By contrast, shortage of time at work is not confined to industrial activities, since it is also encountered in industries such as wood, paper and cardboard and in services such as health and social work and business services.

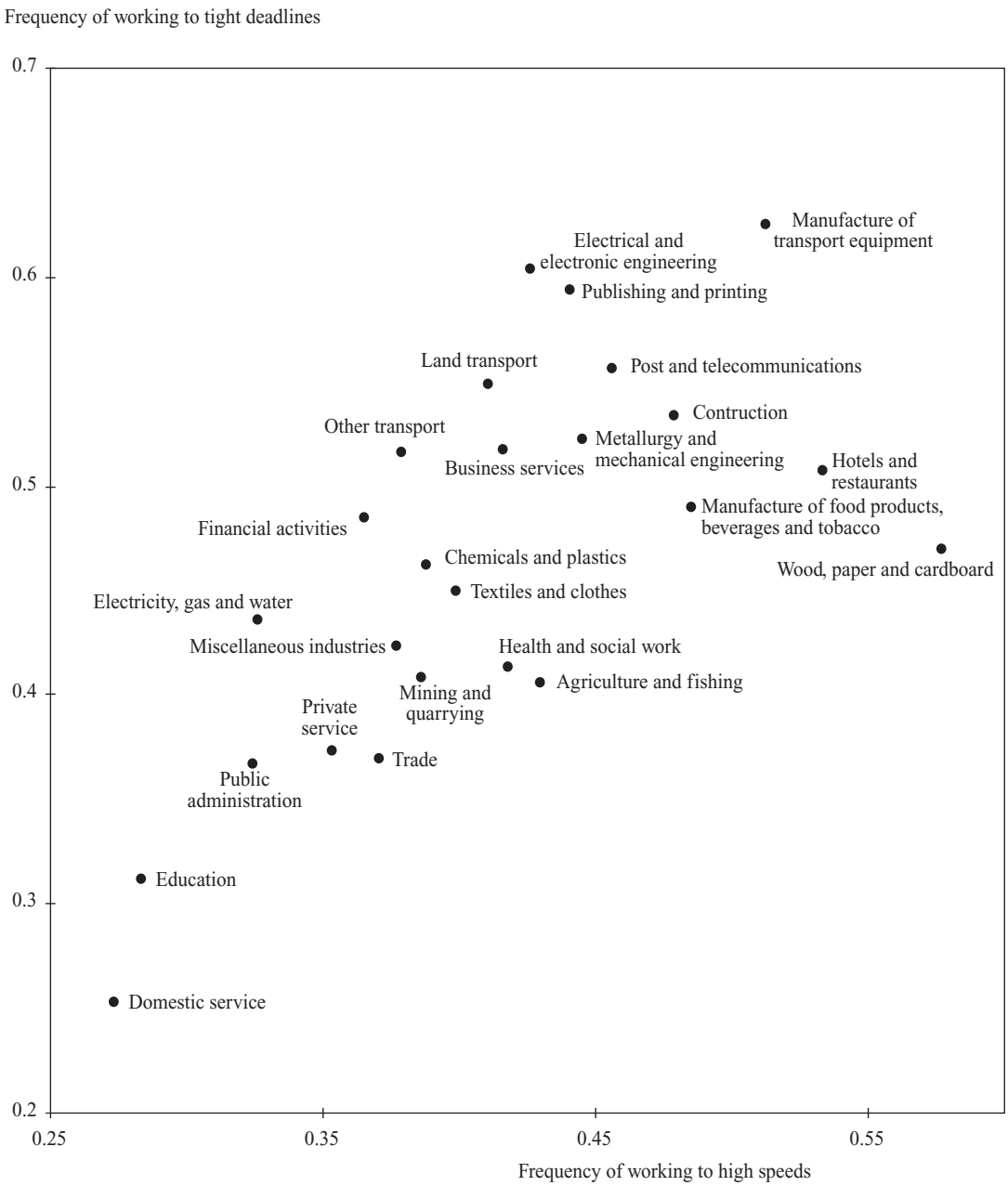
The intensity of work varies considerably between sectors of economic activity. Workers in industry are generally more exposed to high working speeds, as are those in hotels and restaurants, construction, and post and telecommunications. Four sectors (wood, paper and cardboard manufacturing; manufacture of transport equipment; manufacture of food products; hotels and restaurants) are particularly affected, with a very high proportion (more than 36%) of employees required to work at almost continuously high speeds (see Table 22).

A sectoral analysis of work intensity based on exposure to tight deadlines leads to somewhat different results. While the industrial sectors are still among those most affected, they are matched here by sectors of transport and communication services. The proportion of employees exposed to almost continuously tight deadlines reaches 50% in electrical and electronic manufacturing and the manufacture of transport equipment, and is over 40% in publishing and printing, land transport services, and post and telecommunications. The average temporal frequencies of working to tight deadlines are also higher in those sectors. The lowest frequencies are to be found in domestic service and education, as is the case with the analysis of work intensity based on high working speeds.

Overall, work intensity based on high speeds and work intensity based on tight deadlines prove to be fairly closely linked, as is demonstrated by Figure 7. However, a comparison of the average

temporal frequencies of working at high speeds or to short deadlines highlights various significant sectoral peculiarities, which reflect specific forms of work intensity. Thus, among the high-work-intensity sectors, there is a contrast between wood, paper and cardboard manufacture, and hotels and restaurants, on the one hand, which tend to be more exposed to high speeds, and electrical and electronic manufacturing and publishing and printing on the other, which are more exposed to tight deadlines.

Figure 7 Work intensity by sectors of economic activity



Measuring work intensity in terms of shortage of time to complete a job generates a ranking order of sectors of activity without the marked differences evident in those considered so far and relatively different from them. Among the sectors most affected, alongside the manufacture of wood, paper and cardboard and of electrical and electronic equipment, we now have sectors such as health and social work, services to business, and construction. In these sectors, the problem affects at least one quarter of the employees. Conversely, the hotels and restaurants sector shows the lowest proportion of employees who are short of time at work, although it is among the sectors most exposed to high working speeds.

Work intensity by status of undertaking

Working at high speeds or to tight deadlines is more frequent among private companies. Conversely, shortage of time at work especially affects employees of government services.

Figure 8 Work intensity by status of undertaking

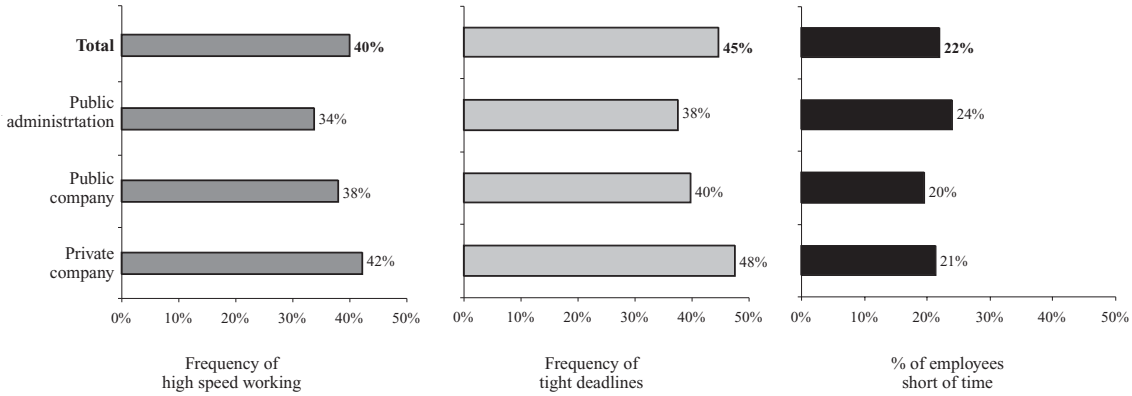


Figure to be read similarly to Figure 4.

Work intensity by size of undertaking

In its various forms, work intensity increases with the size of undertaking up to the threshold of 100 employees, beyond which it levels out.

Combined effects of the structural variables on work intensity and categories of the workforce most exposed

The use of econometric models to test the influence exerted by the various structural variables on the work intensity indicators generally confirms the results of the above analyses by separate variables. The only substantial differences relate to the effects of the variables of gender and employment status; econometric analyses reveal that women are more exposed to working at high speeds or to tight deadlines. In addition, they do not confirm the greater exposure of temporary workers to high-speed working.

Figure 9 Work intensity by size of undertaking

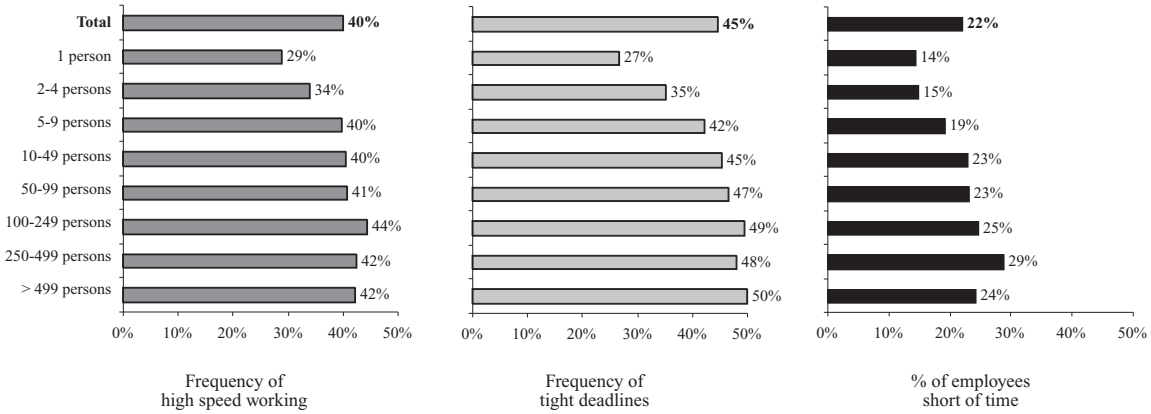


Figure to be read similarly to Figure 4.

Belonging to more than one highly exposed category very greatly increases the risk of being compelled to work at high intensity. Young female blue-collar workers in the manufacturing industries are thus one category of the workforce that is particularly affected by high speeds or tight deadlines. Senior executives in many sectors of activity are also very exposed to tight deadlines and shortage of time to complete their work.

Methods used

The structural variables whose effects on various work intensity indicators have been analysed are not all mutually independent. Making allowance for interdependencies between variables may change the findings, as was the case with the analysis of work intensity by gender, neutralising the effects of occupational makeup. In order automatically to neutralise the effects of interdependence between structural variables, the study uses econometric methods on qualitative variables of the logit type. These methods make it possible to measure the specific impact of each of the structural variables taken into consideration (occupation, employment status, gender, age, seniority within the organisation, activity sector, status of the organisation and size of undertaking)[17] on the probabilities of working at almost continuously high speeds, to almost continuously tight deadlines or without enough time to get the job done.

Furthermore, cross-validations of variables were undertaken to measure the combined effects of the various factors influencing the probability of working at high speeds or to tight deadlines, or being short of time to complete a job. These cross-validations, however, cannot be taken too far, because the populations concerned would become too small and comparisons would lack statistical significance. The combinations of factors have therefore been studied on the basis of the cross-validation of four particularly discriminatory variables: occupation, economic activity, gender and age.[18] Ultimately, they make it possible to identify certain particularly exposed categories of the workforce.

[17] The introduction of countries as additional explanatory variables does not substantially change the results of the econometric analyses given here without taking them into account.

[18] Since the highest levels of exposure affect categories of employees who are more often employed in private undertakings and large establishments, the introduction of variables comprising status of organisation and size of establishment would probably do little to change the results but would reduce their scope because of the small size of the samples on which they would be based. Moreover, the categories of precarious and temporary workers and those on limited term contracts have also not been introduced into the combinations of variables because they are too little exposed to working at high speeds or to tight deadlines and are too few in number to be suitable for cross-analysis.

Combined effects of structural variables on working at high speeds

Econometric analysis shows that the majority of the structural variables exercise important effects on the probability of working at almost continuously high speeds (see Table 25). These effects are particularly important in the cases of occupation and sector of activity, and to a lesser extent those of gender, age, status of organisation and size of undertaking. On the other hand, employment status seems to have no significant influence and seniority only a very weak influence.

Overall, the results of the econometric analysis confirm the majority of those established previously on the basis of cross-tabulation analyses: the highest probabilities of experiencing almost continuously high working speeds will thus be found among industrial workers and, to a lesser extent, craft and unskilled workers, hotel and restaurant employees, those working in the wood, paper and cardboard, food products and transport equipment industries, and those employed in health and social work, post and telecommunications, and construction. The statements made by older workers confirm that they are less exposed to high working speeds (which would very adversely affect their working conditions). Finally, working for large undertakings (over 100 employees) or private undertakings increases exposure to high-speed working.

The only important differences introduced by the econometric analysis relate to the effects of two variables: gender and employment status. In fact, female workers are found to be more exposed to high-speed working, a difference that was not apparent in the comparison based on cross-tabulation. However, a high level of exposure for women had been noted when comparing the sexes within homogeneous occupational groups (for example, female and male blue-collar workers). By neutralising the structural interdependencies, particularly those relating to membership of socio-professional groups, econometric analysis thus generalises this type of result for all employees.

Conversely, the greater exposure of temporary workers to high working speeds, which was apparent from the cross-tabulations, does not recur with the econometric analysis. This apparent overexposure, then, is not specifically related to their employment status but derives from their simultaneous membership of categories of the workforce that are heavily exposed to high-speed working. The reason is that temporary workers tend to be young blue-collar and white-collar workers in the industrial sector, all these being categories that are frequently exposed to intensive working speeds.

Membership of more than one highly exposed category very significantly increases the probability of being required to work at high speeds. On this basis, certain particularly exposed categories of the workforce can be identified: industrial workers, who are greatly affected as a whole, are even more so when they work in the most affected sectors such as the manufacture of electrical and electronic equipment or food products or in the wood, paper and cardboard industry. In those same sectors, female industrial workers are even more affected than their male equivalents, and especially the youngest among them. Ultimately, young female workers in the manufacturing industries are among the most exposed categories of the workforce (with frequencies of exposure to continuously high speeds that can be as high as 70% or 80%).[19]

[19] For a more detailed analysis of the most exposed categories of the workforce, see Annex II.

Combined effects of the structural variables on working to tight deadlines

The econometric analysis shows that all the structural variables exert an influence on the probability of working to almost constant tight deadlines (see Table 25). However, sex and employment status contribute only to a low level of statistical significance, and the effects of seniority within the undertaking are not significant.

Once again, these results generally confirm those obtained by cross-tabulation: exposure to tight deadlines is more apparent among senior executives and blue-collar industrial and craft workers, among young people (under the age of 35), and in certain sectors of economic activity – post and telecommunications, manufacture of electrical and electronic or transport equipment, land transport, publishing and printing, and hotels and restaurants – and in large concerns and private undertakings.

The only important difference, once again, is the role of gender: econometric analysis shows that women are slightly more exposed, whereas overall comparisons show the reverse.

Using the same method as for high-speed working, it is possible to highlight certain categories of the workforce that are particularly exposed to working to tight deadlines; particularly notable examples are senior executives in the hotel and restaurant business, electrical and electronic equipment manufacture and financial institutions. As is the case with high-speed working, young female industrial workers in the mass-producing industries are very exposed to working to tight deadlines.

Combined effects of the structural variables on shortage of time

As shown above, econometric analysis shows that most of the structural variables have a significant influence on the probability of being short of time to complete a job (see Table 25). The demographic variables are the only exceptions. Contrary to what was noted in the case of working at high speeds or to tight deadlines, gender has no statistically significant effect and age only a negative effect of little significance for mature workers (aged 35 to 44). In fact, taking account of seniority very largely neutralises the effects of age. The lower risk of exposure to shortage of time at work encountered among young employees (under 25) is attributable more to their lack of seniority (three years or less) than to their youth as such.

Here again, the results of econometric analysis are very close to those noted above on the basis of cross-tabulation. Shortage of time more particularly affects senior executives, particular sectors (the wood, paper and cardboard industry; health and social work; construction; services to business), larger undertakings (from 250 to 499 employees) and temporary workers. The very high level of exposure of temporary workers may be explained by their lack of time to learn how to work quickly at a job that is often occasional. Since this is a category of the workforce that is vulnerable as a result of its status, it is necessary to pay attention to the repercussions this may have on the working conditions and health of the employees in question.

The most exposed categories of the workforce are senior executives in the post and telecommunications sector, manufacture of electrical and electronic equipment and services to business. They also include junior executives in the manufacture of metal products and machinery, technicians in electrical and electronic manufacturing and unskilled workers in the wood, paper and cardboard industry.

3 Determinants of pace of work and subjective intensity

Exposure to almost continuously high-speed working is particularly characteristic of conventional industrial organisations, where the employees' pace of work is determined by automatic constraints and targets. Some constraints of a commercial type, such as the almost constant presence of customers and, particularly, frequent interruptions to work also increase the probability of working at high speeds.

Almost continuously tight deadlines are also to be found in the most conventional industrial organisations, but also in more flexible industrial organisations where the pace of work is determined by horizontal or hierarchical constraints or by quality requirements. Commercial constraints also have a significant impact on the feeling of being subject to tight deadlines and, ultimately, dual constraint situations – industrial and commercial – prove particularly adverse in the evaluation of deadlines.

Finally, it is the cumulative effect of industrial and commercial constraints, and frequent work interruptions, a common effect of *ad hoc* organisation, which can be seen as the main causes of the sense of being short of time at work.

Procedural autonomy and social support make a significant contribution to reducing the perceived intensity of work. Conversely, the cognitive load of work and its repetitive nature are aggravating factors.

Perceived intensity of work and determinants of pace of work

Table 7 clearly shows that exposure to constraints of the industrial type, especially to the most rigid of those constraints (automatic constraints, numerical targets), has a very clear impact on the perceived intensity of work, both when measured in terms of high speeds and, even more so, when measured in terms of tight deadlines. Thus, 18% of those subject neither to an automatic constraint nor to numerical production targets report almost continuously high speeds, as compared with 30% of those who are subject to numerical targets and 39% of those who undergo an automatic constraint (21%, 41% and 44% respectively in the case of almost continuously tight deadlines). Similar trends may be observed with exposure to quality standards or to hierarchical or horizontal constraints (with much more pronounced variations as regards the sense of working to tight deadlines).

By contrast, constraints of the commercial type have little impact on the sense of working at almost continuously high speeds, but a very significant impact on the sense of working to tight deadlines; the proportion of employees reporting almost continuously tight deadlines is 32% among those whose pace depends on demand (as compared with 25% of other employees) and 35% among those who experience at least daily interruptions of their work (as compared with 25%). Ultimately, it is not surprising that tight deadlines are a particular feature of situations where there is a dual constraint, industrial and commercial (34% versus 22%), even though these dual constraint situations have only a reduced impact on the sense of working at high speeds.

Table 7 Perceived intensity of work as a function of its determinants

Determinants of pace of work	Percentage of employees reporting: Almost continuously high speeds	Almost continuously tight deadlines	Shortage of time to complete the job
Automatic constraint	39%	44%	24%
Numerical targets without automatic constraints	30%	41%	27%
Neither targets nor automatic constraints	18%	21%	20%
Dependence on colleagues	29%	37%	25%
No dependence on colleagues	21%	23%	19%
Supervision by the boss	30%	38%	24%
No supervision by the boss	22%	25%	21%
Quality standards	28%	35%	23%
No quality standards	18%	18%	19%
Customer requests	25%	32%	24%
No customer requests	24%	25%	18%
Customer present 3/4 of time or more	26%	30%	23%
Customer present 1/4 or 1/2 of time	19%	27%	23%
Customer present less than 1/4 of time	26%	30%	20%
Daily interruptions	22%	35%	29%
Interruptions less than once a day	29%	25%	16%
Industrial + commercial constraint (in broadest sense)	27%	34%	25%
No dual constraint	22%	22%	17%

For example: 39% of employees whose pace of work is determined by an automatic constraint report being exposed to high working speeds all or almost all the time.

Finally, all constraints, industrial and commercial, increase the sense of shortage of time at work, but minimally so. In the last analysis, shortage of time is particularly common in situations of dual industrial and commercial constraint (25% versus 17%), and even more so among employees exposed to at least daily interruptions of their work (29% versus 16%).

Perceived intensity, pace constraints, scope for decisions and social support

In order to identify more precisely the respective effects of these various organisational determinants of pace of work on perceived intensity, and over and above that on working conditions, due account has to be taken of the personal and occupational characteristics of the employees, and of other aspects of work organisation:

- the degree of control allowed to employees over their choice of how and when they work and, over and above that, how they manage their working hours, which may *a priori* enable an employee to tolerate intensive working better by giving him a choice of a way of working that enables him to progress quickly;
- the intensity of the cognitive load of the work;
- the degree of social support on which employees can rely when doing their work, which again may be thought, *a priori*, to help improve their tolerance of working problems and, especially, intensity of work;
- the repetitive nature of the job, often regarded as an aggravating factor.

R. Karasek has shown in his studies of occupational stress that, in order to appreciate the risks of mental tension and disorders associated with working conditions and work intensity, it is important

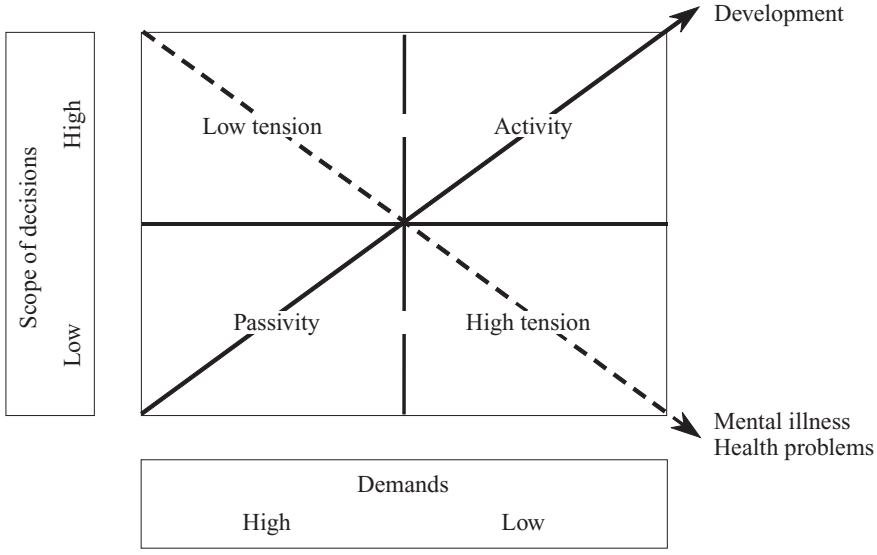
to take two separate aspects into account: the requirements of the job, where related time pressures are a major component, and scope for decisions, which incorporates autonomy into working (possibility of choosing how and when work is done and capacity to influence decisions) and the cognitive scope of the job (possibility of learning and developing skills, high level of skill, variety and creativity of the job, etc.).

Karasek thus presents his model schematically in the form of a graph plotting the requirements of the job (on the abscissa) against the scope for decisions (on the ordinate). The first diagonal of the graph, which contrasts the most 'active' occupational situations (heavy requirements and broad scope for decisions) with the most 'passive' situations (reduced requirements and scope for decisions), corresponds to the opportunities for development offered by the job. Karasek shows that the most occupationally 'active' workers benefit from more active and diverse leisure activities and are more involved in social life. Monitoring a population over the course of time confirms that progressing from passivity to activity in occupational life brings a richer personal and civil life.

The second diagonal contrasts situations typified by low mental tension (reduced requirements and broad scope for decisions) and situations involving high mental tension (high requirements and reduced scope for decisions); the transition from one to the other involves the under-use of skills and an increase in stress, and causes increased frequency of cardiovascular and osteoarticular disorders and mental problems (see Figure 10).

Karasek, in collaboration with Theorell,[20] emphasised the part played by a third aspect: the social support provided at work, whether technical or emotional. Other things being equal, inadequate social support increases the risks of deteriorating health (increase in cardiovascular and mental disorders).

Figure 10 Work situations and their effects in Karasek's model



From R. Karasek and T. Theorell, *Healthy Work: Stress, Productivity and the Reconstruction of Working Life* (Basic Books, 1990).

[20] See in particular *Healthy Work: Stress, Productivity and the Reconstruction of Working Life* (Basic Books, USA, 1990).

Effects of pace constraints on perceived intensity

We have therefore tried, using logistic regressions, to clarify the respective effects of each of these pace of work determinants on the perceived intensity of work.

We have related perceptions of working speeds, deadlines and shortage of time at work to the following explanatory variables:

- the various organisational determinants of work intensity (pace constraints);
- the degree of procedural autonomy, measured by way of three indicators: control over order of tasks, work methods, periods of working;[21]
- the degree of temporal autonomy (control over breaks, holidays or working hours);[22]
- the repetitive nature of the job;[23]
- the intensity of the cognitive load of the job[24] (solving unforeseen problems, performing complex tasks and learning new things);
- the degree of social support an employee receives at work[25] (assistance from colleagues and discussion of working conditions or work organisation);
- sex, age, occupation and economic activity;
- the Member State, to eliminate the biases of translation as far as possible.

The logistic regressions (see Table 8) essentially support the observations based on cross-tabulation, but do introduce a few additional shades of meaning.

It is confirmed that almost continuously high speeds of working are characteristic of organisations of the industrial type, and especially the more traditional among them, where the employees' pace of work is determined by automatic constraints or numerical production targets; the effects of these constraints on working speeds is particularly notable. The effect of dependence on colleagues and that of quality standards are also very clear. Quality standards can therefore be seen as an indirect factor in work intensity: the obligation to comply with them makes speeds more difficult to maintain. Finally, the effect of hierarchical controls is more tenuous but still statistically significant.

As far as constraints of the commercial type are concerned, although demand-based constraints have little impact, the almost continuous presence of 'customers' does have a very significant effect on the perception of working speeds (logically, the non-continuous presence of customers has a converse effect, in so far as it might be expected that the effect of that presence on working speed

[21] The indicators of procedural autonomy at work are constructed on the basis of question Q25 of the survey, which relates to workers' ability to choose or change their order of tasks, their methods of work or their speed or pace of work.

[22] The indicators of temporal autonomy at work are constructed on the basis of sections 2, 3 and 4 of question Q26 of the survey relating to freedom to take breaks, choice of when to take time off or influence on working hours.

[23] Based on question Q21a: Does your job involve short repetitive tasks of less than ... (5 seconds/30 seconds/1 minute/5 minutes/10 minutes)? All employees involved in repetitive tasks lasting less than 10 minutes are taken into account here.

[24] The indicators of the cognitive scope of the job are constructed on the basis of sections 3, 5 and 6 of question Q24 of the survey, relating to the solving of unforeseen problems, performance of complex tasks or learning of new things in the context of the job.

[25] The indicators of social support at work are constructed on the basis of subquestion 1 of question Q26, relating to the possibility of getting assistance from colleagues if one requests it, and question Q30a, relating to the ability to discuss working conditions in general or the organisation of work when changes take place.

is not continuous). Logistic regressions therefore suggest that, at the end of the day, certain commercial constraints, such as the almost constant presence of customers, may create almost continuously sustained speeds of working. This also applies to frequent interruptions, the impact of which is much more clearly apparent from logistic regressions than from cross-tabulation. Their effect is almost as pronounced as that of numerical production targets. When – as often happens – the employee cannot anticipate the interruption, it disrupts the interrupted job, which will have to be resumed later with an increased time constraint; at the same time, the job that replaces it, unexpectedly and without proper preparation, has to be performed urgently and requires greater effort.

Table 8 Effects of the pace-of-work determinants on perceived work intensity: results of a logistic regression

	Effect on the sense of:			
	Working at almost continuously high speeds	Working to almost continuously tight deadlines	Shortage of time at work	Undergoing daily, disruptive interruptions
Automatic constraint	**+ 0.74** (0.05)	**+ 0.68** (0.05)	**+ 0.16** (0.06)	**+ 0.27** (0.05)
Numerical targets (without automatic constraint)	**+ 0.58** (0.05)	**+ 0.62** (0.05)	**+ 0.29** (0.05)	**+ 0.19** (0.05)
Dependence on colleagues	**+ 0.22** (0.04)	**+ 0.28** (0.04)	**+ 0.21** (0.04)	**+ 0.25** (0.04)
Supervision by the boss	**+ 0.13** (0.04)	**+ 0.25** (0.04)	**+ 0.03** (0.04)	**+ 0.36** (0.04)
Quality standards	**+ 0.21** (0.06)	**+ 0.36** (0.05)	**– 0.08** (0.05)	**– 0.02** (0.05)
Customer demand	**+ 0.08** (0.05)	**+ 0.15** (0.07)	**+ 0.02** (0.07)	**+ 0.17** (0.07)
Customers present at least 3/4 of time	**+ 0.28** (0.05)	**+ 0.22** (0.05)	**– 0.05** (0.05)	**+ 0.03** (0.05)
Customers present 1/4 to 1/2 of time	**– 0.29** (0.06)	**– 0.21** (0.06)	**– 0.03** (0.06)	**+ 0.16** (0.05)
Daily interruptions	**+ 0.44** (0.04)	**+ 0.47** (0.04)	**+ 0.77** (0.04)	
Combination of industrial plus commercial constraint (in the broad sense)	**+ 0.00** (0.07)	**+ 0.18** (0.07)	**+ 0.30** (0.07)	**+ 0.16** (0.06)

For example: the effects of the various constraints are estimated by coefficients which are interpreted in terms of deviation from the reference population: employees not subject to the constraint in question. The standard deviation of the estimate is shown in parentheses. The significant effects at the 5% level are in bold. The coefficient of 0.74 shows that employees subject to automatic constraints have a greater probability of reporting almost continuously high speeds than those who are not.

There is also confirmation here that almost continuously tight deadlines are even more characteristic of industrial organisation than high working speeds, and that this form of intensity also affects traditional Taylorist/Fordist industrial organisations (with their automatic or target constraints) as well as more flexible industrial organisations where the constraint may come from

colleagues, the hierarchy, quality requirements or the introduction of commercial elements into the organisation. Industrial constraints in the strict sense have a very pronounced impact on deadlines, but the 'broad' industrial constraints (horizontal and hierarchical constraints, quality standards) have a much more pronounced effect here than in the case of working speeds. The mechanism that converts quality standards into tight deadlines may be that cited in connection with working speeds, though it may be wondered why its impact is so pronounced. It may be that it is overestimated because new management tends to regard compliance with deadlines as a form of quality. More generally, quality standards and just-in-time delivery are often introduced simultaneously, on the occasion of management reforms. As for the effect of commercial constraints, it is close to that observed in the case of working speeds, and at least as pronounced. The effect of dependence on demand becomes significant. In particular, the combination of an industrial and a commercial constraint increases the probability that deadlines will always, or almost always, be perceived as very rigid and very short.

Finally, logistic regressions completely confirm that the sense of being short of time at work, a situation generally considered as psychologically unpleasant, is caused primarily by the combination of industrial and commercial constraints and by the frequent interruptions that result from *ad hoc* organisation practices. The effect of these interruptions is very considerable. Purely commercial constraints, however, to judge from the logistic regressions, have no significant effect. As for the impact of purely industrial constraints, it is not negligible, as least as far as automatic constraints, numerical targets and dependence on colleagues are concerned, but it is still clearly lower than that of daily interruptions.

Effect of autonomy, social support and cognitive load on perceived intensity

The elements of work organisation other than the objective determinants of pace of work do indeed, as had been assumed, have an effect on perceived intensity.

Procedural autonomy, temporal autonomy and social support greatly reduce the risk that an employee will find his working speeds almost continuously high or his deadlines almost continuously tight, and they reduce even more significantly the likelihood that he will consider himself short of time to complete his work. It seems, however, that control over one's work and social support may alleviate but not entirely offset the intensity generated by work organisation; other logistic regressions have shown that control over one's own work and social support increase the probability that speeds will be considered high or deadlines tight for only a part of an employee's working time.

A heavy cognitive load constitutes an aggravating factor, and does so whatever the subjective intensity indicator adopted. It may therefore be assumed that the cognitive intensity of work helps to make work more intensive in the short term, even though, as Karasek has shown, that cognitive intensity represents in the long term one of the opportunities for development offered by the job. The same finding applies to repetitive working, though this does not increase the sense of being short of time to complete the job.

Effect of pace constraints on disruptive interruptions

According to a logistic regression model similar to the previous one, we tried to clarify the causes of disruptive interruptions.

The results are unequivocal (Table 9). All the constraints that affect work intensity increase the likelihood of interruptions that will be perceived by the employee as disruptive. The only exception as far as industrial constraints are concerned are quality standards, and indeed it is difficult to see how these could in themselves cause disruptive interruptions. As far as commercial constraints are concerned, the presence of customers for most of the time has little effect, no doubt because in this case the interruptions are regarded as 'natural' and not disruptive.

Interruptions that disrupt work are caused at least as much by industrial constraints as by commercial constraints, and the dual industrial and commercial constraint is clearly an aggravating factor. A comparison of this result with that for the occurrence of daily interruptions (see Table 4), suggests that the commercial organisation fosters the occurrence of interruptions and that the industrial organisation does not allow them to be incorporated into the normal course of work. The hybridisation of the two forms of organisation is thus particularly unfavourable.

Table 9 Effect of pace-of-work determinants on the likelihood of disruptive interruptions: results of a logistic regression

Constraint	Effect on the likelihood of disruptive interruptions
Automatic constraint	+ 0.27 (0.05)
Numerical targets (without automatic constraint)	+ 0.19 (0.05)
Dependence on colleagues	+ 0.25 (0.04)
Supervision by the boss	+ 0.36 (0.04)
Quality standards	– 0.02 (0.05)
Customer demand	+ 0.17 (0.07)
Customers present at least ¾ of time	+ 0.03 (0.05)
Customers present ¼ to ½ of time	+ 0.16 (0.05)
Combination of industrial plus commercial constraint (in the broad sense)	+ 0.14 (0.06)

For example: the coefficient 0.27 indicates that employees subjected to automatic constraints have a greater probability of stating that they experience disruptive interruption than those who are not. Other explanatory variables: degree of procedural autonomy, degree of temporal autonomy, repetitive nature of the job, intensity of the cognitive load, extent of social support, sex, age, occupation, economic activity, Member State.

4 Intensity, autonomy and social support at work

A generally negative correlation is established between industrial constraints in the broad sense and autonomy at work; conversely, constraints associated with demand are often accompanied by a high level of procedural autonomy. In more general terms, two fundamental aspects differentiate between work situations: time pressures at work, which are expressed by the constraints that determine the employees' pace of work; and the autonomy and social support employees enjoy at work. Severe time pressures at work, and low levels of autonomy and social support are factors likely to cause tension at work and generate a high level of dissatisfaction with working conditions. The occupational groups most exposed to tension at work are clearly the blue-collar groups and especially industrial workers, who experience a combination of heavy constraints, low autonomy and low social support. Workers in textiles and clothing, food products, wood, paper and cardboard, the manufacturing of transport equipment and land transport, and hotels and restaurants are in a similar situation.

The autonomy available to workers in choosing the ways in which they work and the times at which they do so differ between organisations, occupations and economic activities. Most frequently, this procedural autonomy at work varies in inverse proportion to the time pressures affecting the job, whether in terms of work intensity or in terms of pace-of-work constraints. However, the automatic opposition between procedural autonomy and time pressures tends to be called into question by the organisational changes experienced by undertakings during the 1980s. That change was the result, in particular, of radical changes in the forms of work supervision, which now came to apply less to imposed procedures and working hours and more to the objectives and results to be achieved. This resulted in some decentralisation of workers' operational power of decision and, at the same time, an increase in the time pressures to which they were subjected by the objectives to be achieved and the deadlines to be observed. Hence, procedural autonomy and time pressure may be combined.

The Third European Survey on Working Conditions is a useful source of data for studying the relations established between procedural autonomy and time pressures at work. Time pressures at work have been dealt with above on the basis of numerous work intensity indicators and pace-of-work constraints. The argument presented in the remainder of this chapter will be based on a synthetic indicator of cumulative industrial constraints.[26]

The survey also addresses the possibility of workers choosing or changing the order of their tasks, their working methods or their rate or speed of working. Three indicators of procedural autonomy can thus be defined:

- procedural autonomy relating to order of tasks (Ao);
- procedural autonomy relating to working methods (Am);
- procedural autonomy relating to working hours (At).[27]

On this basis, a synthetic indicator of procedural autonomy is defined.[28]

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[26] Which is defined by average exposure to automatic, target, hierarchical and horizontal constraints.

[27] Q25: Are you able, or not, to change ... (your order of tasks/your methods of work/your speed or rate of work)?

[28] (Ao + Am + At)/3

Procedural autonomy and pace constraints

Procedural autonomy and time pressures at work are not necessarily in opposition. Overall, although procedural autonomy decreases with industrial constraints (automatic, target-based, hierarchical and horizontal), on the other hand it increases with demand-based time constraints (pace constraints associated with demand and frequent interruptions of tasks).

Overall, nearly half of employees (47%) enjoy extended procedural autonomy, covering all the three forms defined above. One employee in three has only partial procedural autonomy, relating to one or two forms, and one employee in five is delegated no form of procedural autonomy (see Table 10).

Table 10 Procedural autonomy by intensity and pace constraints

		Procedural autonomy (%)		
		Number of criteria		
		0	1 or 2	3
Automatic constraints	yes	36%	35%	29%
	no	16%	32%	52%
Target constraints	yes	27%	35%	38%
	no	17%	32%	51%
Hierarchical constraints	yes	28%	36%	36%
	no	16%	31%	54%
Horizontal constraints	yes	22%	35%	43%
	no	19%	31%	51%
Demand constraints	yes	16%	34%	50%
	no	28%	31%	41%
Combination of pace constraints (number of constraints)	5	34%	36%	30%
	4	32%	37%	31%
	3	23%	35%	42%
	2	19%	34%	47%
	1	15%	31%	55%
	0	18%	25%	58%
Frequent interruption constraints	yes	13%	30%	57%
	no	23%	34%	43%
Automatic and target constraints		40%	34%	26%
Automatic constraints without targets		29%	36%	35%
Target constraints without automatic constraints		15%	36%	49%
No automatic or target constraints		16%	31%	53%
Hierarchical and horizontal constraints		29%	36%	35%
Hierarchical without horizontal constraints		26%	36%	38%
Horizontal without hierarchical constraints		16%	34%	51%
No hierarchical or horizontal constraints		16%	29%	55%
Frequent interruptions caused by demand		9%	29%	62%
Other pace constraints caused by demand		18%	35%	47%
No demand constraints		29%	31%	39%
Average reference situation		**20%**	**33%**	**47%**

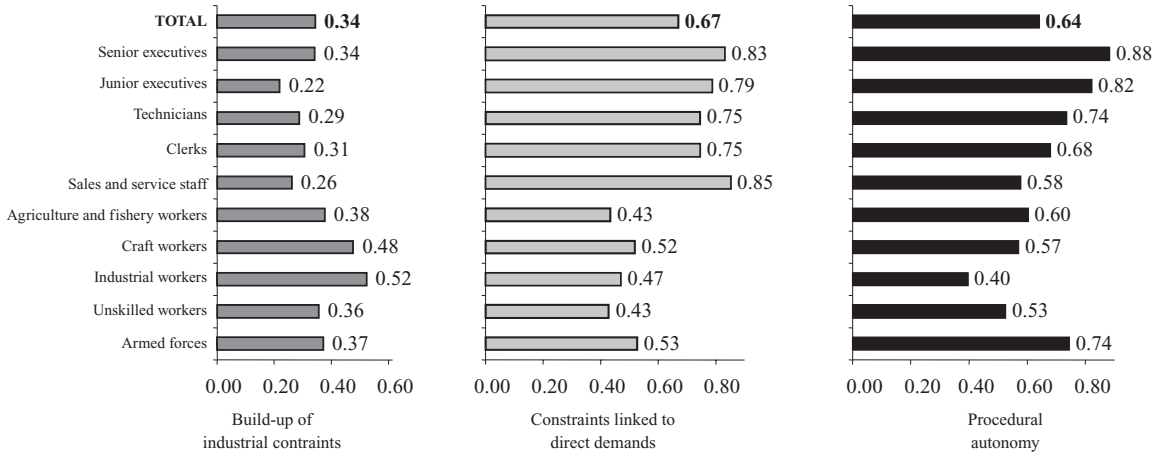
For example: 36% of employees exposed to an automatic constraint have no form of procedural autonomy in accordance with the criteria defined earlier.

Procedural autonomy is significantly more restricted in situations involving exposure to industrial pace-of-work, automatic, target, hierarchical or horizontal constraints. It is at its lowest in

situations combining automatic and target constraints, which are very specifically typical of Taylorist or Fordist work organisations (26% of employees subjected to this combination enjoy extended procedural autonomy, as compared with 53% when these two constraints are absent). This negative overall relationship between procedural autonomy and industrial constraints is to be found in all occupational groups (see Figure 11); there is thus a contrast between groups typified by severe exposure to industrial constraints and low procedural autonomy (mainly blue-collar workers) and other groups in the opposite situation (low industrial constraints and a high level of autonomy (executives, technicians and clerks).

The ratios of demand-related constraints and those associated with frequent interruptions to procedural autonomy at work are very different – often the reverse of those observed for industrial constraints. Thus, the proportion of workers enjoying broad procedural autonomy is higher when they are subjected to demand-related constraints (50%) or frequent interruptions (57%), and higher again in the case of frequent interruptions caused by demand (62%). These positive correlations between procedural autonomy and time constraints associated with demand are symptomatic of the spread of new forms of organisation that combine downstream just-in-time production, in other words an increase in demand constraints, and decentralisation of operational decisions, in other words an increase in the workers' procedural autonomy. This generally positive correlation between procedural autonomy and demand constraints can be established for most occupational groups (see Figure 11); thus, blue-collar and unskilled workers are notable for a low level of exposure to demand constraints and a low level of autonomy; conversely, executives and technicians work under heavy demand constraints and, at the same time, with extensive autonomy. Two special cases must be mentioned, however. Sales and service staff are the group most exposed to demand constraints but have only relatively reduced autonomy. Conversely, while the armed forces experience relatively little in the way of demand constraints, they nevertheless have extensive autonomy.

Figure 11 Constraints and autonomy by occupation



For example: among senior executives, the average rate of exposure to cumulative industrial constraints is 0.34, the rate of exposure to constraints associated with direct demand is 0.67 and the average rate of procedural autonomy is 0.64.

The main stress factors at work

The health risks resulting from exposure to severe time pressures are often greater when it is also necessary to work with a low degree of procedural autonomy. Epidemiological studies (R. Karasek and T. Theorell, 1990) have shown the importance of taking account of two distinct aspects when assessing job satisfaction and the risks of psychological stress and disorders associated with working conditions: the requirements of the job, the time pressures of which constitute a major factor; and scope for decisions, which is a broader aspect than procedural autonomy, in so far as it also incorporates the cognitive scope of the job (opportunities for learning and developing skills, high level of competence, variety and creativity of the job, etc.). Furthermore, these studies emphasise the role of a third aspect to be taken into account in the analysis of stress risks at work, i.e., the social support that workers receive. Specifically, it is argued that inadequate social support aggravates the risk of job dissatisfaction and deteriorating health associated with situations involving working under severe time pressure and with limited scope for decisions (see Figure 10).

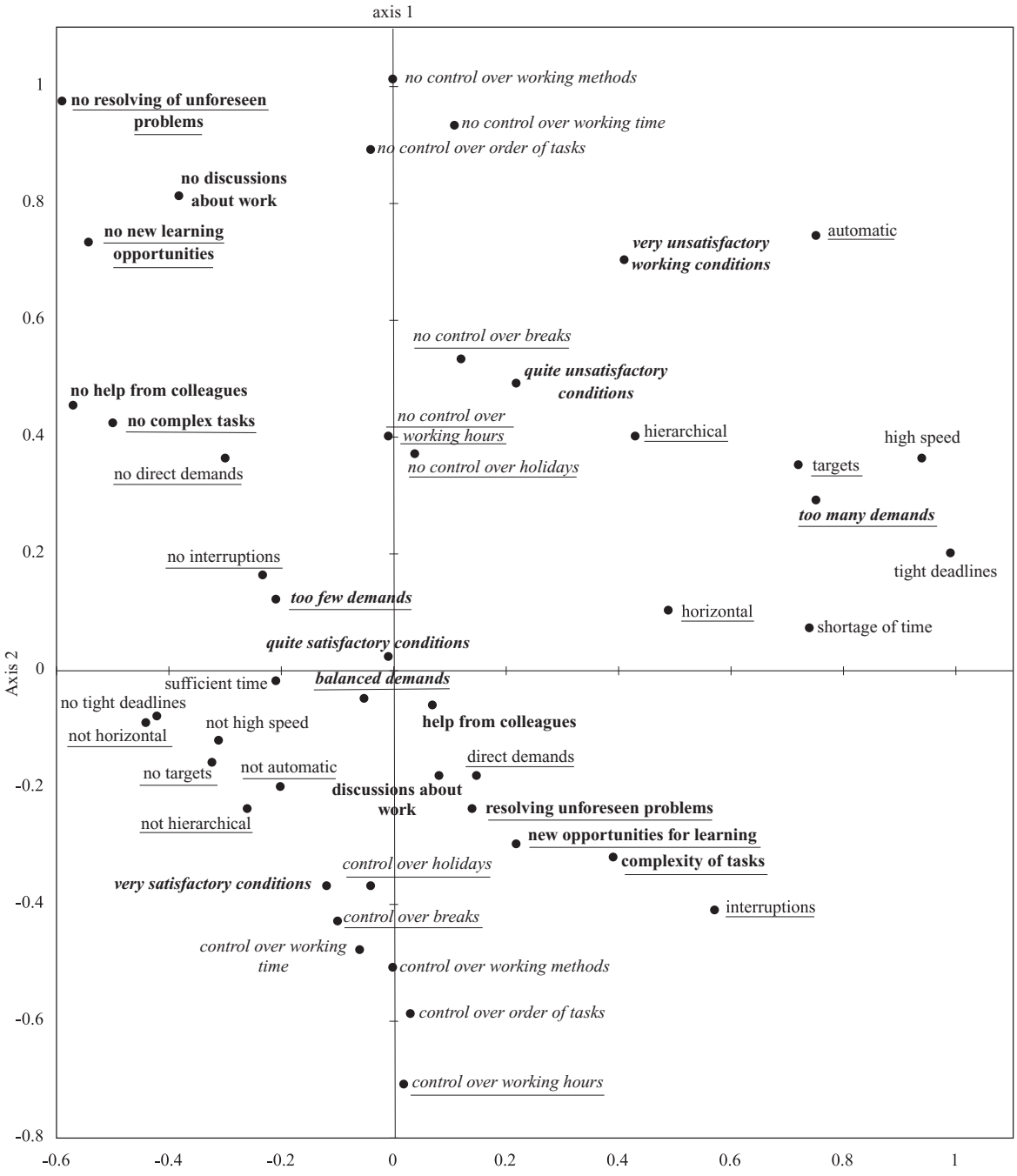
To highlight the various dimensions in which stress factors take effect at work, the study is based on factorial analysis of multiple correspondences.

The active variables of the analysis are:

- the three indicators of perceived work intensity;
- the five indicators of pace-of-work constraints;
- the indicator of frequent unforeseen interruptions of work;
- the three indicators of procedural autonomy at work (control over order of tasks, methods of working and working hours);
- the three indicators of temporal autonomy at work (control over breaks, holidays and working hours);
- the three indicators of cognitive scope of work (solving of unforeseen problems, performance of complex tasks and learning new things);
- the two variables of social support at work (aid from colleagues and discussion of working conditions or work organisation).

Two additional variables have been added, since they are closely associated with risk and stress factors at work: satisfaction with working conditions (question Q38) and perceived proportionality between the demands made by the job and aptitudes (question Q28).

Figure 12 Analysis of the multiple correspondences of time pressures, autonomy, cognitive scope and social support (1st factorial plane)



Key:

- Perceived intensity: standard type
- Pace constraints: underlined
- Procedural autonomy: *italics*
- Proportionality of demands to skills: ***bold italics, underlined***
- Social support: **bold**
- Cognitive scope: **bold, underlined**
- Satisfaction with working conditions: ***bold italics***
- Temporal autonomy: *italics, underlined*

The factorial analysis highlights two major aspects of differentiation of working situations by time pressures, autonomy, cognitive scope and social support at work (see Figure 12).[29] The first dimension is structured by the variables of procedural and temporal autonomy, following the north–south axis of the plane. The second dimension is structured by variables of time pressures, relating both to work intensity and to industrial or relational pace-of-work constraints, following the west-south-west–east-north-east axis. The variables of cognitive scope of the job, which also make a significant contribution to the first two factors of the analysis, are in the intermediate position, in the south-east part of the plane, as are the variables of pace constraints associated with demand or with frequent unforeseen interruptions at work. The social support variables also appear in the south-east part of the factorial plane, lying close to the axis of autonomy at work.

The projection into this factorial plane of the variable of proportionality of the demands of the job to aptitudes confirms the relevance of representing the demands made by the job by means of time-pressure variables, such as work intensity or industrial and relational pace-of-work constraints. Those workers who consider that the demands of the job are too great for their aptitudes are to be found in the east-north-east part of the factorial plan, in the vicinity of the axis of time pressures demonstrated by the analysis.

Furthermore, the projection of the variable of satisfaction with working conditions confirms the hypotheses regarding risk configurations; those workers who report being 'not at all satisfied' or 'not very satisfied' with working conditions are to be found in the north-east part of the factorial plane, where heavy time pressures and low autonomy combine to indicate the risk areas.

Categories most exposed to stress at work

The factorial analysis given above makes it possible to identify the two most discriminatory aspects relating to stress risks at work: time pressures at work on the one hand, and autonomy and social support on the other. These two aspects approximately correspond to those defined in the model used by Karasek and Theorell (see Figure 10). The cognitive scope of the job, which according to that model is one of the components of scope for decisions and thus contributes to the attenuation of the effect of time pressures, is shown by the factorial analysis to be in an intermediate situation between autonomy and time pressures; we therefore preferred not to include it in the set of indicators that make it possible to identify the categories most exposed to severe stress at work.

We have therefore positioned the occupational groups and sectors of economic activity in relation to two structuring aspects: a synthetic indicator of pace constraints[30] and a synthetic indicator that combines procedural autonomy, temporal autonomy and social support, three factors which are such as to attenuate the effects of time pressures at work (see Figure 13 and Figure 14).[31]

An analysis of the configurations of time pressures at work on the one hand and autonomy and social support on the other by occupational groups indicates those most exposed to risks of stress

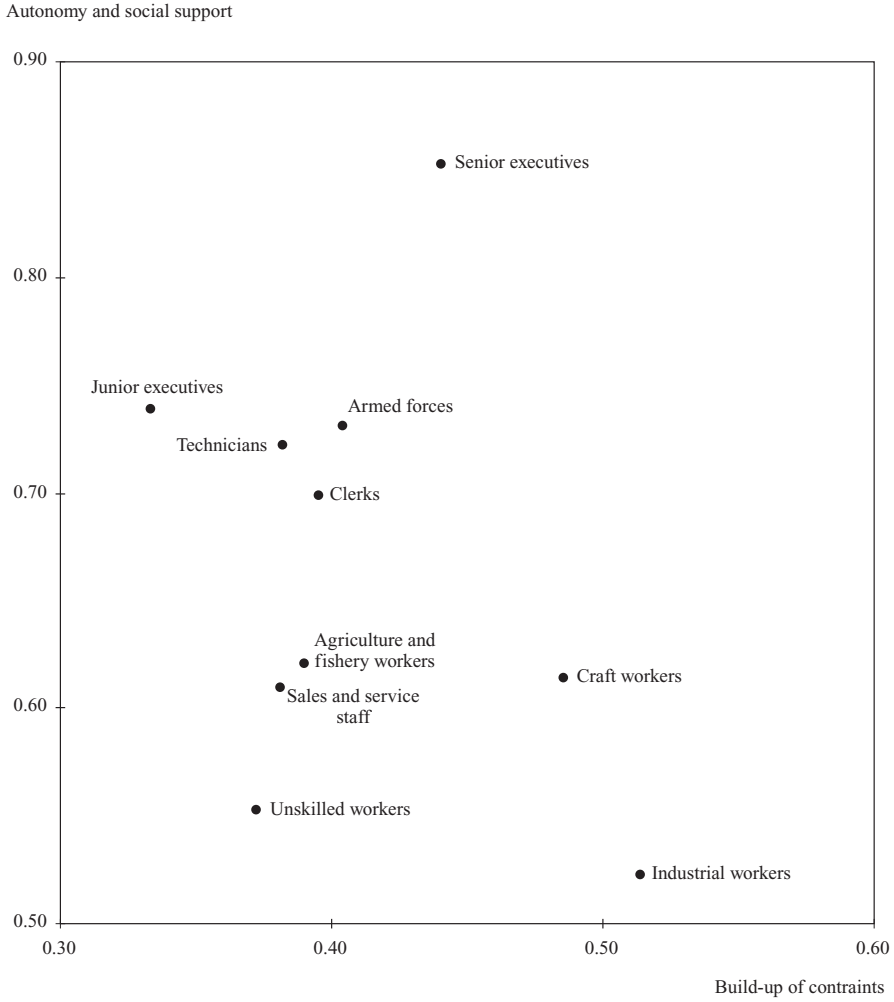
[29] The first two axes of the analysis contribute 28% of the total variance, 17% in the first case and 11% in the second.

[30] Average of exposure to industrial constraints (automatic, target, hierarchical and horizontal) and constraint linked to demand.

[31] This is the average of three synthetic indicators: the synthetic indicator of procedural autonomy defined above, a synthetic indicator of temporal autonomy (average exposure to the three indicators of temporal autonomy) and a synthetic indicator of social support (average of the two social support indicators).

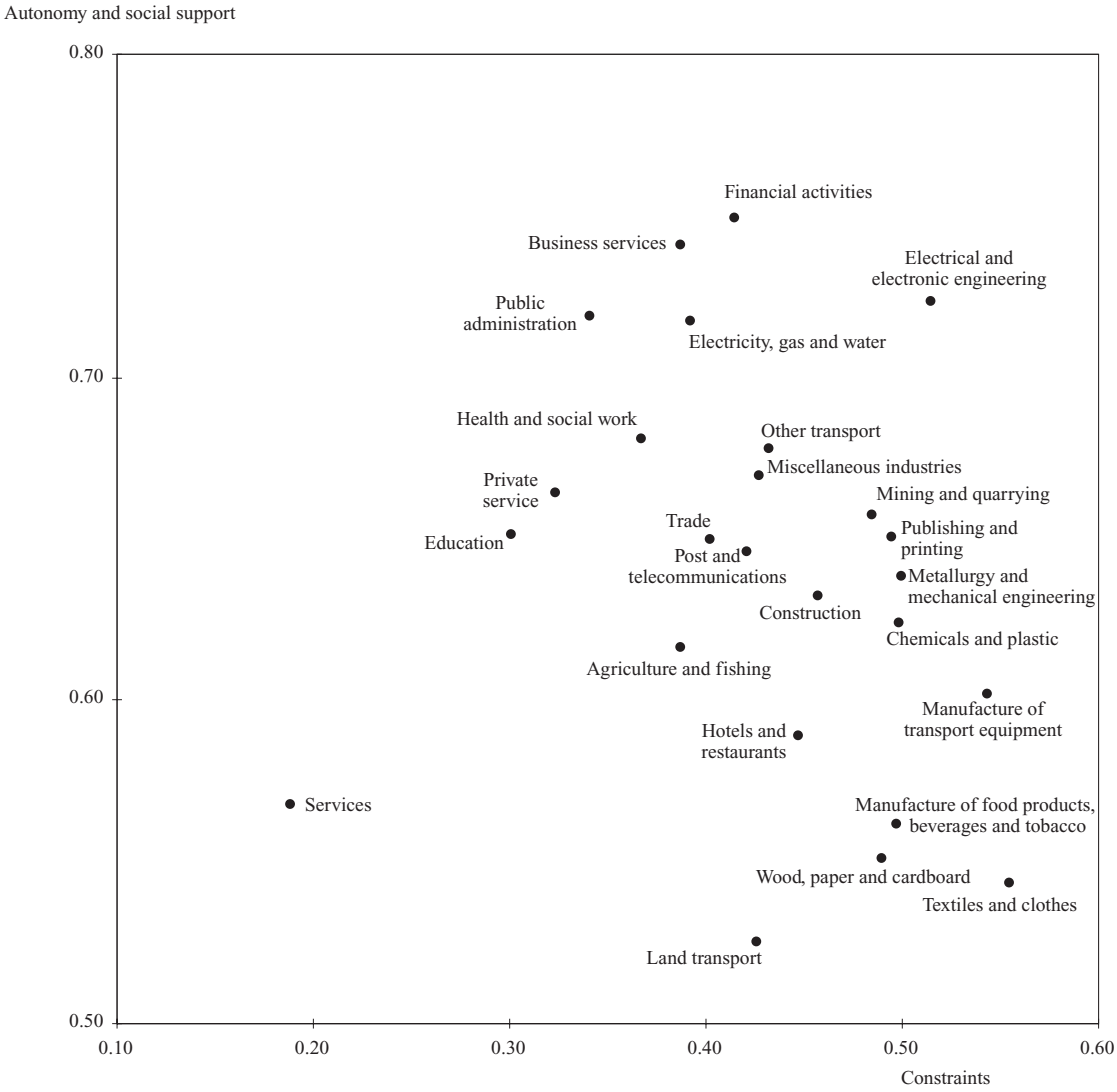
at work (see Figure 13 and Table 26). This is especially the case with industrial workers, and to a lesser extent with craft workers, who combine heavy pressures, low autonomy and low social support. Although subjected to severe time pressures, senior executives partially escape the risks of stress at work, in so far as they do their jobs with a very broad degree of autonomy and substantial social support.

Figure 13 Time pressures, autonomy and social support at work by occupational groups



The same type of analysis undertaken at the level of sectors of economic activity (see Figure 14 and Table 27) makes it possible to identify six sectors of activity that are exposed to substantial stress risks: textiles and clothing; the food industry; wood, paper and cardboard; manufacture of transport equipment; and the land transport and hotel and restaurant sectors. These combine heavy pressures and low autonomy/social support. The industrial sector of manufacture of electrical and electronic equipment is one type of exception, with a very high level of autonomy and social support combined with exposure to high pace constraints.

Figure 14 Time pressures, autonomy and social support at work by sectors of economic activity



Pace of work and working conditions 5

Time pressures at work have an obvious impact on the working conditions experienced by the employees. Exposure to constraints of the industrial type brings about a significant deterioration in working conditions, whether they be measured in terms of physical discomfort, nuisance or exposure to hazardous occupational situations. The same applies to the commercial constraint when it takes the form of the physical and almost permanent presence of customers or users.

Autonomy at work, especially temporal autonomy, has the reverse effect: the probability of reporting exposure to poor working conditions is less significant in work situations where the degree of autonomy is high.

The intensification of work clearly affects working conditions (Gollac and Volkoff, 2000) in varied and complex ways. For example, it may be reflected by an increase in the number of identical operations to be performed in a given time (Bennett, 1999), which may make the effort necessary to perform those tasks an unpleasant one. 'Stress' also tends to increase with time pressure at work; urgency is in itself a poor working condition. The internal aggression brought about by time pressure is exacerbated when combined with the need for sustained alertness, which gives rise to an exaggerated and often painful contraction of the muscles (Laville et al., 1973): working postures are more quickly perceived as uncomfortable. A combination of the commercial and industrial/bureaucratic forms of organisation increases the number of situations involving repetitive work under severe time constraints, demanding alertness.

In the car industry, adjustment to demand is leading to a considerable increase in the range of models on offer because of the combination of numerous options. Every vehicle, or almost every vehicle, produced is different from its predecessor. Although their work remains essentially repetitive, assembly line workers have to be constantly alert to read the specifications and select the components to be fitted; this uncertainty about the next task makes their work more difficult to anticipate and prepare. The resulting loss of time, albeit slight, exacerbates the time pressure.

The combination of repetitive working + time constraints + sustained alertness is also spreading in the tertiary sector. This is particularly so with the computerisation of administrative forms or in the case of check-out staff in major retail outlets (Alonzo, 1997; Prunier, 2000): the use of the scanner makes the job more repetitive; the need to coordinate movements with those of the customer focuses alertness; time constraints are increased by concern with limiting waiting times at check-outs, administering the workforce as fairly as possible and imposing production targets. In most occupations exposed to this type of work there is an increase in the occurrence of muscular skeletal disorders (MSDs) and other 'repetitive strain injuries'.

One of the most harmful consequences of the intensification of work is that it calls into question the compromise arrived at by every worker between the objectives of production, the skills available to him and the desire to protect his health. Urgency leads workers to adopt the fastest though not always the most comfortable way of working, and so makes discomfort less avoidable.

For a worker fitting a car seat, the postures that enable him to work quickly are not always those that avoid excessive pain in the back or elsewhere. In hospitals, the intensification of work often leads assistant nurses to abandon the use of patient lifts, which take too long to install; in addition, their tight schedules focus their activities on purely technical actions, whereas handling the patient enables them to have contact with him (Villatte et al., 1993).

Unpredictable working further exacerbates the impact of intensity on working conditions; delivery drivers, for example, more and more frequently find that endless changes are made to their planned routes, forcing them to handle their loads more often. As they are almost always in a hurry, these handling operations are not necessarily undertaken in the most beneficial way as far as health is concerned (Hamelin, 1993).

These examples carry a general message: the intensification of work makes it difficult, if not impossible, to institute practices that are essential to the preservation of health: changing position, taking a 'breather', organising one's workplace, selecting the right tool or document, obtaining correct information, securing useful assistance at the right time, anticipating problems in order to avoid them and preparing for emergency situations, etc.

The effect of pace constraints on working conditions: methodology

We have tried to analyse the link between working conditions and time pressures on the pace of work. Of course, working conditions are extremely dependent on the profession carried out; even though we accept a large number of explanatory organisational factors, we feel it is important to argue, as far as possible, on the basis of an unchanged occupation. The reason is that only organisational changes even more radical than those we are seeing at present could cause the working conditions of a bricklayer to resemble those of a secretary, and vice versa. We have therefore tried, using logistic regressions, to control the effect of occupation and of other variables such as socio-demographic data (age, sex, etc.), or again the effects of organisational data. The use of econometric methods must not be allowed to conceal the fact that the scope of our work is essentially descriptive: the underlying hypothesis that the influence of organisation and personal characteristics is, all things considered, identical in every occupation is open to criticism. For example, it is indeed likely that, in some occupations, certain working conditions are either constant or very variable.

Some aspects of working conditions have been disregarded because of calculation problems. We have taken into account the frequency of exposure to:

- vibrations from hand tools, machinery, etc;
- noise so loud that you need to raise your voice to talk to people;
- high temperatures which make you perspire even when not working;
- low temperatures whether indoors or outdoors;
- breathing in vapours, fumes, dust, or dangerous substances such as chemicals, infectious materials, etc;
- handling or touching dangerous products or substances;
- radiation such as X-rays, radioactive radiation, welding light, laser beams;
- painful or tiring positions;
- carrying or moving heavy loads;
- repetitive hand or arm movements;[32]

[32] The variables relating to working conditions are obtained from questions Q11 and Q12 of the survey.

We have carried out logistic regressions where the explained variables are the health problems that the employees report and associate with their work, and where the explanatory variables are:

- constraints on working pace; automatic type of constraint; numerical production targets (without automatic constraint); dependence on colleagues' work; direct supervision by the boss; direct requests from customers;
- the presence of customers;
- the obligation to comply with specific quality standards;
- frequent job interruptions (several or a few times a day);
- the combination of industrial and commercial constraints in the broadest sense;
- working hours;
- the degree of procedural autonomy and temporal autonomy;
- the repetitive nature of the job;
- the intensity of the cognitive load;
- the degree of social support;
- gender and age;
- occupation, which defines certain elements of conditions of working at a given intensity and also provides an indication of a worker's position in the social structure (apart from occupation, no indications are available on educational level – whether a degree is held, age at which education ended, for example);
- Member State, because national public health systems and national cultures have an impact both on the state of health and on awareness of it and its association with work.[33]

Effects of work organisation on working conditions

Industrial pace constraints worsen working conditions

Pace constraints of the industrial type seem to be associated with a general deterioration of working conditions (Table 11). Other things being equal, the constraints increase, to a statistically significant extent, the probability of all of the discomforts, risks and nuisances recorded in the survey. Quality standards have a similar impact. The effect of numerical production targets is less marked and not always significant but follows the same tendency.

[33] In a variation, we also introduce economic activity as an explanatory variable, because it too determines some of the specific working conditions. In this case, there are a few technical problems with the practical estimation of logistic regressions. In the case of some of the explained variables, the convergence of the algorithm has not been achieved, despite a large number of iterations, and the estimate is thus lacking in accuracy. In other cases, the information matrix is singular and the quality of the estimate is again problematical. This is why we have not reproduced here the table showing the detailed results of these regressions. In general terms, they confirm those given here.

Table 11 Effects of work organisation on working conditions experienced by employees: results of a logistic regression

	Automatic constraint	Numerical targets without automatic constraint	Dependence on colleagues	Supervision by the boss	Quality standards	Requests from customers	*Customers present at least 3/4 of the time*	*Customers present 1/4 or 1/2 of the time	Multiple daily work interruptions	Industrial + commercial constraint in broadest sense
Physical possibilities										
Painful or tiring position	+	(+)	+	+	+	(-)	+	(+)	+	(-)
Moving heavy loads	+	(+)	+	+	+	+	+	(-)	+	(-)
Repetitive movements (hand or arm)	+	+	(+)	+	+	(-)	+	(-)	+	(+)
Vibrations	+	+	+	+	+	(-)	(-)	-	+	(-)
Risk factors										
Inhaling fumes	+	(+)	+	+	+	(+)	+	(-)	+	(-)
Handling dangerous substances	+	+	+	+	+	(+)	(+)	+	+	(+)
Exposure to radiation	+	(-)	+	+	+	-	(+)	+	+	+
Nuisances										
Often or always hot	+	(+)	+	(+)	+	-	-	(-)	+	+
Often or always cold	+	+	+	+	+	(-)	+	-	+	(-)

For example: employees exposed to industrial pace constraints are more likely than those not exposed to such constraints to be forced to adopt painful or tiring positions for at least a quarter of their working hours.
A + or a – indicates a coefficient that is significant at the 5% level, a (+) or a (–) indicates no association for a level below 5%.
Other explanatory variables: gender, age, status and size of undertaking, seniority, specific occupation, cognitive scope.

These results may be explained in several ways:

- These industrial constraints do indeed worsen working conditions.
- Industrial constraints indicate an industrial type of working environment. In principle, this should be taken into account by the occupation. However, not only is the classification not free from internal variations but defects in the specification of the model also make it impossible completely to eliminate structural effects. The fact is that surveys of working conditions, both by virtue of their history (Molinié and Volkoff, 1978; Kramarz, 1991; Gollac and Volkoff, 2000) and by virtue of the social processes of objectivising working conditions, focus particularly on measuring the working conditions associated with an industrial environment. It is therefore probable that the effect of industrial constraints is quite often overestimated. However, it is certainly not a spurious aspect, since it becomes apparent even in working conditions that are not typically industrial.

Ultimately, then, it may be considered that industrial constraints on pace of work are associated with a substantial, or even massive, deterioration in working conditions.

Commercial constraint: the effect of interruptions

By comparison, the effects of commercial constraints may seem limited. As far as the physical discomforts, nuisances and risks measured in the Third European Survey on Working Conditions are concerned, the dependence of pace of work on demand is not associated with a significant deterioration, to the point that most coefficients are not statistically different from 0 and some are even negative. Variations are possible, in so far as the occupations most exposed to commercial constraints tend to be more sheltered from physical discomforts, so that specification failings in the model undoubtedly result in the under-estimating of the effect of commercial constraints. It would be an overstatement, however, to attribute the trend of results to this phenomenon without proof.

So why is there this apparent asymmetry between the effects of industrial and commercial constraints? The fact is that the two types are not measured symmetrically. Industrial constraints are identified through their 'equipment', whether physical (machines, production lines) or non-physical (targets). Commercial constraints, however, are measured through 'external demand (customers, public)'. We do not know how this 'external demand' is reflected if, indeed, it is not satisfied, whereas failing to satisfy the industrial constraints identified in the survey inevitably triggers various objectivising devices: machine breakdowns or stoppages, production line wastage, dockets reporting failure to meet targets, reprimands from bosses and colleagues.

The survey nevertheless allows us to identify an obvious example of commercial constraints: the presence of the customer. This tends to lead to an increase in certain discomforts (painful positions, heavy loads) or certain risks. The effect of the customer's presence appears greater if we get rid of the factor 'type of work carried out' and introduce economic activity, as well as occupation, as an explanatory variable or, better still, combine the two; the results obtained in this case remain, however, tentative because of mathematical difficulties in estimation. Although it is probably true that the sense that one's pace of work is constrained by demand has an influence on that pace (Gollac, 1995), the influence is more marked when someone is present to provide a reminder of the constraint. It should also be noted that in the new spirit of capitalism (Boltanski and Chiapello, 1999), 'purely' commercial relations are not very prominent – in other words, they do not make themselves felt in an exclusively commercial form but are transmuted into personal relationships in the form of the 'network' that 'links' suppliers and customers, bosses and subordinates.

In the same way, pace constraints associated with colleagues' work or with supervision by a boss increase the effects of the industrial constraints in the strict sense.

However, the principal way in which the commercial constraint affects working conditions is through interruptions. The occurence of work interruptions several times a day is significantly associated with all the physical discomforts, risk factors and nuisances measured in this survey.

Interruptions may highlight forms of improvisation, where employees fail to take all the necessary safety precautions or may be in no position to implement all the established precautions necessary to safeguard their health. Another likely hypothesis is that interruptions are in some cases symptomatic of poor organisation (especially the forms of organisation that do not allow for the commercial constraint) and that, in more general terms, this poor organisation has an adverse effect on the working conditions experienced by the employees.[34]

[34] It may be wondered whether the impact of interruptions is an artefact. It might be the case, for example, that being interrupted generates a feeling of discontent that is reflected in the reports on working conditions. However, there is no reason to believe that reports of good or bad working conditions are sensitive to a feeling of satisfaction or dissatisfaction.

Overall, the results are compatible with the assumption that industrial and commercial pace constraints both contribute to a deterioration of the working conditions analysed in the survey, although the effect of the industrial constraints is much more clearly apparent. The effect of those constraints on working conditions (and, very probably, on work intensity) is more pronounced when they are brought to mind by physical (machines, production lines) or non-physical (targets) 'equipment' or persons. The efficacy of human resources, of 'domestic' logic, is still a significant factor nowadays (Eymard-Duvernay, 1987).

The effects of combined constraints

Previous studies have stressed the fact that the reorganisation of undertakings has increasingly resulted in the combination of industrial and commercial constraints. Although that trend is not in any doubt (for the periods 1984–91 and 1991–8, see Gollac and Volkoff, 1996; Cartron, 2000), its consequences require clarification.

The specific effect of combination is neither very pronounced nor generalised. The idea that the effects of each type of constraint have a saturation point can be discarded. Out of the nine estimated coefficients, only two are significant at the 5% level, and they are both positive. The hypothesis that coefficients are generally negative (saturation effect) is therefore improbable.

As a minimum, the effects of the commercial and industrial constraints are cumulative (in the context of logistic specification) and it is likely that in some cases combination does have a specific effect.[35]

Autonomy

If we are to trust in the criticisms of lack of autonomy in Taylorist working, extensively expounded by conventional work sociologists, or in epidemiological studies (Karasek and Theorell, 1990) (see Figure 10), independence at work may be expected to have a positive effect on working conditions. The results of the logistic regressions correspond to the hypothesis that autonomy, particularly temporal autonomy, reduces the probability of reporting discomforts, risks or nuisances at work.

Employees who are able to arrange their own working procedures are less conscious of fatigue or repetitive movements. The effects of temporal autonomy are even greater than those of procedural autonomy. The mere possibility of being able to choose when to take breaks leads to a reduction in discomforts and risks.

[35] The model used to interpret the combination of constraints is presented in detail in (Cartron 2001).

Work intensity and health problems 6

The study of the relationship between work intensity and health poses a number of methodological problems; there are several biases that tend to conceal any direct link between them.

Despite these problems, the Third European Survey on Working Conditions clearly shows that time pressures at work affect workers' state of health; all the mental problems and most of the physical disorders recorded seem to be closely linked to work intensity. The industrial constraints prove to be particularly burdensome, both mentally and physically. Commercial constraints, especially in the form of the physical presence of the customer or user, have an obvious impact on mental problems and on most of those physical disorders that are considered to be psychosomatic in origin. Finally, frequent interruptions at work, which are characteristic of badly controlled forms of flexible organisation, prove particularly harmful. Conversely, autonomy and social support at work are susceptible of reducing risks, at least on the psychological level.

The employees themselves perceive work intensity as a threat; in the short term, exposure to severe time pressures reinforces workers' sense that work can endanger their health and safety. Furthermore, intensity of work increases the fear that one will be unable to do at the age of 60 what one does today, and thus seems liable to compromise the employability of employees in the long term.

Methodological difficulties

We carried out, for experimental purposes, an econometric analysis of the link between pace of work and workers' state of health. That study encountered numerous methodological obstacles.

The correlations between work and health are neither clear cut nor immediately apparent. Thus, a single feature of work often has more than one consequence: for example, noise has an effect not only on hearing but also on the cardiovascular system. But above all – and this made our analysis particularly difficult – a deterioration in health may have several occupational causes, and to those in turn may be added other, non-occupational factors. Psychological problems, for example, may be caused simultaneously by working hours, time pressure at work, commuting conditions and the employee's domestic situation. In addition, a worker's state of health has a corresponding effect on the way he works. Some of the mechanisms associating work and health are, moreover, either in an early stage of development or appear later. Some forms of occupational exposure (asbestos being a well-known example) cause diseases that only become apparent twenty or thirty years later.

Epidemiologists use the term 'healthy worker effect' to describe the bias resulting from the fact that individuals who are capable of regular work are, *a priori*, in better health than the general population, which includes people who are incapable of working. The more difficult working conditions are, the more pronounced that effect is (Goldberg, 1995). Throughout working life, selection mechanisms play a part: an employee's presence in a particular job at a particular time is to some extent the result of his previous working conditions and his health history. One result, very well known to epidemiologists through paradoxical *a priori*, is the relative rarity of disorders among night-shift workers. This finding is explained by a progressive selection procedure: employees in poor health stay away, or are kept away, from work situations that they cannot (or can no longer) handle. This is why a high frequency of health problems is found among former shift

workers who have returned to daytime working (Bourget-Devouassoux and Volkoff, 1991). Similarly, the hypothesis that workers subjected to high-intensity working are selected, in particular, because of their state of health cannot be discarded. The fact that ageing workers are partly sheltered from very high intensity tends to confirm this hypothesis.

The 'healthy worker effect' may conceal relationships between work and health. Its extent can only be established by using longitudinal data relating to changing states of health and occupational careers; it is clear that the data from the Third European Survey on Working Conditions provide no basis for evaluating the extent of the 'healthy worker effect' or understanding the delayed effects of work. Nor do they supply any satisfactory indicators regarding the impact of non-occupational factors.

On the other hand, the state of health is described not on the basis of a medical examination but from statements made by the workers themselves.[36] The identification of the impact of work on health is thus conditioned, firstly, by a worker's perception of a health problem and, secondly, by his association of that problem with his work. This second aspect is highly dependent on how widespread scientific knowledge is, on whether the symptoms are individual or collective (we should recall that working conditions experienced by a group of workers may have different impacts on different individuals), and the way in which the link between work and health is, or is not, expounded by trade unions or other formal or informal collective bodies. The first point is, again, dependent on these factors; recognition of a causal link makes it easier to be aware of the fact that certain physical or mental sensations constitute a symptom or syndrome. In addition, whether those sensations are perceived as a problem or illness depends on social standards that vary between social groups, countries, etc. In general terms, the higher the level of economic development or position in the social hierarchy (especially the educational hierarchy) and the younger the individual, the less likely physical and, especially, mental problems are to be regarded as normal. The availability of medical care and information also plays a part. Finally, due account has to be taken of defence mechanisms against work-related illness and 'occupational defensive ideologies'. When confronted with discomforts and risks, workers experience illness and fear, which they deal with by employing (unconscious) individual and collective defence strategies (Cru, 1987; Dejours, 1993). The groups in question may be critical of disclosure of such problems and make a virtue of displaying endurance and insensitivity to physical or mental suffering, to the point where they adopt paradoxical attitudes towards dealing with it. As a result, suffering and the associated health problems are less likely to be reported in a statistical survey. The result is a bias similar to that caused by the 'healthy worker effect', albeit for quite different reasons.

What effect may all these methodological problems and sources of bias have? Clearly, the 'healthy worker effect' is such as to minimise any positive link between work intensity and health problems, or even to create the illusion of a negative link. Biases associated with cultures of defence against suffering at work will have the same statistical effects. The existence of any delayed and non-immediate effects of work intensity will also result in the minimisation or even elimination of its effects. The consequences of the multifactorial nature of certain disorders are more ambiguous: the strength of the link revealed by statistics will certainly be diminished by this, but it is not clear whether there will be a bias.

[36] The question asked was: 'Does your work affect your health? (IF YES) How does it affect your health? Hearing problems? Problems with my vision?' etc.

A positive bias (overestimate of the effect of intensity) will become apparent if very intensive working is associated with other poor working conditions (at least in so far as the latter are not the result of work intensity), though this can be partly avoided by taking account of occupation and sector of activity as additional determinants of health. A positive bias may also arise if work intensity is associated with unsatisfactory living conditions; taking account of occupation tends to eliminate the impact of living conditions associated with social position. As for the effects of the domestic situation, there is no reason to think that a high level of work intensity is especially associated *ex ante* with family or affective problems. A high level of work intensity may, of course, give rise to such problems, which in their turn will have a negative impact on the state of health, but that impact is indeed an effect of work intensity, so that it cannot be referred to as a bias (unless it is the negative bias created by the fact that the consequences of work intensity will probably be delayed). The same reasoning applies, for example, if work intensity drives the worker to the consumption of alcohol, tobacco or other toxic substances used as tranquillisers, stimulants, etc.

Furthermore, the intensification of work, especially if it is abrupt, may make workers aware that their jobs are the cause of their current health problems. However, as this effect cannot possibly arise unless a genuine link exists between work intensity and health problems, it cannot really be called a bias. A bias will appear only if the intensification, being difficult to endure, has caused health problems to be incorrectly attributed to the effects of work when in fact they are caused by something else. This source of bias probably exists, though its extent seems likely to be limited.

Overall, it would seem that, although work intensity is a source of health problems, there are numerous biases that weaken or even reverse the statistical link that can be observed on the basis of the data from the Third European Survey on Working Conditions, while the sources of bias in the opposite direction are less. It may thus be expected, *a priori*, that it will be impossible to demonstrate a link between work intensity and the health problems that individuals associate with their work.

Study of the links between work intensity and health problems

We have carried out logistic regressions where the explained variables are the health problems that the employees report and associate with their work, and where the explanatory variables are:

- constraints on pace of work; automatic type of constraint; numerical production targets (without automatic constraint); dependence on colleagues' work; direct supervision by the boss; direct requests from customers;
- the presence of customers;
- the obligation to comply with specific quality standards;
- frequent job interruptions (several or a few times a day);
- the combination of industrial and commercial constraints in the broadest sense;
- working hours;
- the degree of procedural autonomy and temporal autonomy;
- the repetitive nature of the job;
- the intensity of the cognitive load;

- the degree of social support;
- gender and age;
- occupation, which defines certain elements of conditions of working at a given intensity and also provides an indication of a worker's position in the social structure (apart from occupation, no indications are available on educational level – whether a third-level degree is held, age at which education ended, for example)

Member State, because national public health systems and national cultures have an impact both on the state of health and on awareness of it and its association with work.[37]

Table 12 Effect of work intensity on health: result of a logistic regression

	Automatic constraint	Numerical targets without automatic constraint	Dependence on colleagues	Supervision by the boss	Quality standards	Requests from customers	*Customers present at least 3/4 of the time*	*Customers present 1/4 or 1/2 of the time	Multiple daily work interruptions	Industrial + commercial constraint in broadest sense
Hearing problem	+	+	(+)	–	+	(–)	(–)	(–)	+	(–)
Eye problem	+	+	(+)	(+)	(–)	(–)	–	(+)	+	(+)
Skin problem	(+)	(–)	(+)	(–)	+	(–)	(–)	–	+	(+)
Back problem	+	(–)	+	+	+	(–)	+	(+)	+	(+)
Headaches	+	(+)	+	+	(–)	(+)	+	+	+	(–)
Stomach pain	(+)	(–)	+	(+)	+	(+)	+	(+)	+	(+)
Shoulder and neck pain	+	–	+	+	+	(–)	+	+	+	(+)
Pain in upper limbs	+	(+)	+	+	+	(–)	+	(–)	+	(+)
Pain in lower limbs	(+)	(–)	+	+	(–)	–	+	(+)	+	+
Respiratory problems	+	(+)	+	(+)	+	–	+	(–)	+	+
Allergies	+	(+)	(–)	(–)	+	–	+	(–)	+	+
Injury	(+)	(–)	+	(+)	+	–	(+)	(–)	+	+
Stress	+	+	+	+	+	(–)	+	+	+	+
General fatigue	(+)	(+)	+	+	(+)	(+)	+	(–)	+	(–)
Insomnia	+	(+)	+	(+)	(+)	(+)	+	+	+	(–)
Anxiety	(+)	(+)	(–)	+	(+)	(+)	+	(+)	+	(–)
Irritability	+	(+)	(+)	(–)	+	+	+	(+)	+	–
Trauma	(–)	(–)	+	(–)	+	(+)	+	(–)	+	(–)

For example: employees exposed to an automatic constraint are more likely to experience hearing problems which they associate with their work than those who are not exposed to such a constraint.

A + or a – indicates a coefficient which is significant at the 5% level, a (+) or a (–) indicates the sign of coefficients not significantly different from 0.

We have omitted certain health problems (cardiac disease) which have proven difficult to estimate. In so far as there are numerous sources of bias, we have not shown the value of the coefficient, only their sign and significance.

[37] In a variation, we also introduce economic activity as an explanatory variable, because it too determines some of the specific working conditions. In this case, there are a few technical problems with the practical estimation of logistic regressions. In the case of some of the explained variables, the convergence of the algorithm has not been achieved, despite a large number of iterations, and the estimate is thus lacking in accuracy. In other cases, the information matrix is singular and the quality of the estimate is again problematical. This is why we have not reproduced here the table showing the detailed results of these regressions. In general terms, they confirm those given here.

A comprehensive study of Table 12 gives an idea of the impact of work intensity on health; despite the biases referred to above, work intensity factors are very frequently associated with an increase in the frequency of illnesses or health problems associated with work, and never or virtually never with a reduction of risk.[38] Nevertheless, not all health problems are equally sensitive to work intensity and not all intensity factors have the same impact on health.

Psychological problems are particularly associated with work intensity. The clearest case is that of stress, the risk of which is significantly increased by all the work intensity factors except dependence on customer demand. The overall impact is considerable. Consider the case of an employee who is not exposed to any intensity factor and, taking into account the other characteristics of his job and his personal sociodemographic characteristics, has a 30% risk of reporting that he suffers from job-related stress. Another employee, in a similar situation but who is exposed to the cumulative effect of the various intensity factors studied, will by contrast have a risk level in the vicinity of 70%. The other psychological problems recorded – general fatigue, insomnia, anxiety and irritability – are also positively associated with virtually all the intensity factors, half of the coefficients being significantly different from 0. There are virtually no significantly negative coefficients; only irritability seems negatively linked to the combination of industrial and commercial constraints.

Some physical problems such as skin disorders show only a tenuous link to work intensity. In the majority of cases, however, there is a positive link between the physical problems recorded and the work intensity factors. This is especially the case with back problems, headaches, pain in the shoulders, neck and upper limbs, stomach disorders and injuries.

Industrial constraints have a considerable impact on the risk of mental problems: each of the mental problems recorded, except perhaps irritability, is sensitive to the majority of the industrial constraints. Automatic constraints also increase the physical risks. Dependence on colleagues' work and direct supervision by superiors particularly increase those physical risks that are often deemed to be wholly or partially psychosomatic in origin: stomach, head, back, neck, shoulder and upper limb disorders. These relationships can be interpreted on several levels. Being under severe time pressure is an attack on the system. But its reactions to that attack also play a part: ergonomic studies have shown that the powerful focusing of alertness under severe time pressure triggers hypercontraction of the muscles (Laville, 1968; Laville et al., 1973; Teiger et al., 1973), resulting in an increased risk of osteoarticular pain – and, in this case, cervical pain.[39] Risks of the psychosomatic type are also increased by being compelled to work to specific quality standards (which strongly focuses alertness and constrains movement). But quality standards are also associated with an increase in other risks: specific mechanisms, such as those associated with the constraints of ultra-cleanliness for skin problems, should perhaps be mentioned here. Finally, and surprisingly, numerical production targets do not themselves appear to be associated with a substantial increase in physical health problems; because of the many biases already noted, however, this finding must be treated with caution.

[38] Approximately three quarters of the estimated coefficients are positive. Better still, nearly half of these coefficients are positive and significantly different from 0 at the 5% limit. On the other hand, only 9 coefficients out of 180 are negative and significantly different from 0.

[39] This could provide an explanation of the spread of 'musculoskeletal disorders' and 'repetitive strain injuries', occupational disorders that are now recognised in most industrialised countries. Repetitive working under time pressure is nothing new, but it is now combined with relative variety, requiring sustained attention and, consequently, a more rigid posture. There is no proof of this explanation, however, because although a more rigid posture causes pain there is no certainty that the effect can extend to the causing of permanent injury.

Commercial constraints have a very unfavourable impact on mental health, and a more uneven impact on physical health. This applies particularly to working in the almost continuous presence of customers, which appears to be psychologically hazardous: it is associated with a significant increase in all the psychological problems recorded and in almost all those physical problems that are most likely to have a psychosomatic origin. Working occasionally in the presence of customers has a more moderate and uneven impact. Finally, the mere dependence of pace of work on demand may possibly be associated with psychological problems, but the results are generally not statistically significant; the link between this and the physical disorders recorded in the survey tends to be negative.

The combination of industrial and commercial constraints always has a limited effect, except in the case of a small number of disorders, including stress. Conversely, this means that the potentially harmful effects of industrial and commercial constraints are almost completely cumulative in hybrid organisations. Above all, however, when the hybrid or makeshift nature of the organisation is reflected by frequent work interruptions, there is a clear and significant increase in all the hazards recorded, without exception. These interruptions, which are characteristic of insufficiently controlled 'flexible' organisations, could well constitute a particularly harmful form of work intensification.

The other organisational parameters studied also have an effect on health; the cognitive load, the repetitive nature of the job and long working hours are associated, other things being equal, with an increase in reported problems. Conversely, temporal autonomy (which may be seen as a form of disintensification) is associated with an almost generalised reduction in problems. Procedural autonomy reduces the mental problems associated with work, but its impact on physical problems is less generalised and even ambiguous. The same applies to social support.

Subjective evaluation of the effects of intensity on health

Using the same logistic regression model as before, we attempted to measure the effects of work intensity on workers' subjective evaluation of the link between their jobs and their overall state of health:

- The sense that work can endanger health or safety.[40]
- The subjective perception by the workers themselves of whether their jobs are sustainable, judged on the basis of being able to do at the age of 60 what they do today. We studied the probability of replying to this question in the negative, in other words either 'no, I don't think so' or 'no, I would not want to' (this latter reply not being suggested by the interviewer but recorded only if given spontaneously). In fact, the significance of the question varies with the age of the person questioned. For this reason, separate analyses were carried out by age groups. The sample in each age group being small, the statistical significance of the coefficients was tested at the 10% level (instead of 5%).

[40] Question Q34: 'Do you think your health or safety is at risk because of your work, or not?'

Work as a threat to health

The higher the pace constraints, other things being equal, the more probable the perception of a threat to health.[41] More specifically, constraints of the automatic type, dependence on colleagues' work, supervision by the hierarchical superior, the obligation to comply with specific quality standards, the almost continuous presence of customers and frequent work interruptions have a statistically significant impact. The combination of an industrial type of constraint and a commercial type of constraint (in the broadest sense) appears to produce a similar trend, but the coefficient is not significantly different from 0.

The subjective assessment of the threats posed by work intensity to health thus provides quite a good reflection of the links between that intensity and the various problems recorded in the survey; work intensity, then, is clearly perceived as a threat to health.

It will be noted, moreover, that a high level of procedural or temporal autonomy is an incentive to optimism, just as is a high level of social support. Repetitive working in short cycles, conversely, is an incentive to pessimism, as is a heavy cognitive load. The other factors that encourage pessimism are working hours in excess of or equal to 45 hours per week and following an unskilled or, especially, blue-collar occupation. Being older does not make people more pessimistic, but those under 25 are, other things being equal, more optimistic. Clerks are the most optimistic, followed by executives.

The sustainable nature of the job

By making working conditions more difficult and creating numerous health problems – particularly minor ones that are not necessarily incapacitating but make it more difficult to carry on occupational activities – work intensity can obstruct the pursuit of those activities. It is for this reason, when assessing the effects of work intensity, that it is necessary to 'reason on the lifetime scale' (Guérin and Rochefort, 1999). Work intensification poses the question of the 'sustainable' nature of the job. Social justice at the very least demands that work should not compromise the maintenance of skills, 'employability' and social integration. A lack of 'sustainability' in a job would also pose a problem of collective economic efficiency, in view of the demographic ageing of the European workforce. Finally, an unsustainable job represents an unfair transfer of employees themselves and social protection arrangements to enterprises offering poor working conditions and to the detriment of those offering good working conditions.

The perception by the employees themselves that they will be unable to do at the age of 60 the work they do today is, of course, only an opinion, and at present it is impossible to have any idea of the accuracy of such forecasts. Nevertheless, that opinion does clearly reflect an anxiety that is in itself unpleasant. On the other hand, it has proved possible to demonstrate, thanks to the INSEE's French study *Travail and modes de vie*, that the sense of having no future is associated with acute forms of suffering at work (Baudelot and Gollac, 1999).

The results by age group (Table 13) clearly show that work intensity increases, at every age, the feeling that a person will be unable to 'stand' his job until the age of 60. Contrary to what might

[41] Working hours, degree of procedural or temporal autonomy, cognitive load, degree of social support, sex, age, profession, economic activity and Member State of residence being equal.

have been thought, the actual effect of work intensity is not at its greatest among the oldest employees. However, the most inconvenient forms of intensity are not the same at every age. The need to interrupt the job frequently, hierarchical supervision and an obligation to meet numerical targets are perceived at all ages as work situations that will be difficult to bear over an entire career. Older workers are particularly bad at enduring constraints of the automatic type, and possibly another 'real-time' constraint as well, that caused by the continuous presence of customers. On the other hand, dependence on colleagues' work appears more and more tolerable as an employee grows older. This may be due to the fact that, in working collectives, a common form of redistribution of work is to make the youngest workers responsible for the most difficult tasks and make them take the risks.

Table 13 Effect of work intensity on the feeling that it will be impossible to do the same job as now at the age of 60: result of a logistic regression

	Automatic constraint	Numerical targets without automatic constraint	Dependence on colleagues	Supervision by the boss	Quality standards	Requests from customers	*Customers present at least 3/4 of the time*	*Customers present 1/4 or 1/2 of the time	Multiple daily work interruptions	Industrial + commercial constraint in broadest sense
15 to 24 years	+ 0.08	+ 0.24	+ 0.35	+ 0.14	+ 0.03	+0.27	- 0.20	+0.07	+ 0.13	- 0.39
	(0.13)	(0.14)	(0.10)	(0.11)	(0.12)	(0.17)	(0.14)	(0.16)	(0.10)	(0.17)
25 to 34 years	+ 0.02	+ 0.19	+ 0.31	+ 0.33	+ 0.16	+ 0.01	+ 0.09	+ 0.01	+ 0.20	- 0.06
	(0.09)	(0.09)	(0.07)	(0.07)	(0.08)	(0.11)	(0.09)	(0.10)	(0.07)	(0.11)
35 to 44 years	+ 0.23	+ 0.05	+ 0.16	+ 0.06	+ 0.11	+ 0.18	- 0.26	- 0.35	+0.09	+ 0.03
	(0.10)	(0.09)	(0.07)	(0.07)	(0.09)	(0.11)	(0.09)	(0.11)	(0.07)	(0.11)
45 to 54 years	+ 0.27	+ 0.31	- 0.06	+ 0.17	- 0.08	- 0.05	+0.15	- 0.01	+ 0.17	- 0.21
	(0.11)	(0.10)	(0.08)	(0.08)	(0.09)	(0.09)	(0.10)	(0.11)	(0.08)	(0.13)

For example: the coefficient +0.08 indicates that employees between 15 and 24 years of age subjected to automatic constraints are more likely than those who are not so subjected to say that they will be unable to do the same job as today at the age of 60.

The significant effects at the 10% level are in bold. Standard deviations are shown in brackets.

Declared illnesses and intensive working

Conversely, it may be wondered whether those who are ill for non-occupational reasons are spared work intensity to a greater extent than other employees (which would not necessarily be an advantage, 'soft' jobs often offering few career prospects and even being likely to be lost in the event of restructuring).

The survey provides an indication of the number of days' absence due to health problems not attributable to work.[42] For want of anything better, we have used this indicator, though it is a not ideal. First, the non-occupational nature of the illnesses requires caution, their aetiology possibly

[42] Question Q36c.

being complex and unknown to the person concerned and even to his physician, hence a problem with the nature of the causality. Secondly, the number of days lost depends on institutional factors (compensation, supervision, etc.). Thirdly, the absences may be due to chronic problems but alternatively to acute ones.

With these important reservations, Table 14 shows that people in poor health are by no means sheltered from pace constraints and that they also have a perception of the intensity of their work that is not very different from that of other employees.

Table 14 Exposure to pace constraints and work intensity as a function of the number of days' non-job-related sick leave over the past 12 months

	No absence	1 to 9 days	10 to 19 days	20 days or more
Pace constraints				
Automatic constraint	21%	21%	25%	18%
Numerical targets (without automatic constraint)	17%	18%	12%	16%
Dependence on colleagues	47%	49%	49%	48%
Supervision by the boss	39%	36%	33%	36%
Quality standards	69%	72%	70%	72%
Customer demand	66%	71%	63%	67%
Customers present at least 3/4 of the time	46%	45%	40%	45%
Customers present 1/4 or 1/2 of the time	15%	20%	20%	15%
Daily interruptions	46%	53%	47%	47%
Combination of industrial constraint + commercial constraint (s.l)	32%	65%	56%	63%
Perceived intensity				
Constant or almost constant high speeds	25%	24%	28%	22%
High speeds 1/2 or 3/4 of time	19%	20%	22%	22%
Constant or almost constant tight deadlines	29%	30%	32%	30%
Tight deadlines 1/2 or 3/4 of time	18%	22%	18%	18%
No time to complete the job	21%	23%	24%	24%

For example: among employees reporting no days' absence for non-occupational reasons over the past twelve months, 21% perceive their pace of work as being determined by an automatic constraint.

The evolution of work intensity 7

Despite the problems involved in comparing the two European survey on working conditions, a comparison of the results for 2000 and those for 1995 highlights a number of patterns. For example, the trend towards an increase in perceived work intensity is confirmed, especially among junior executives, technicians and the blue-collar groups.

In addition, following a period of generalised increase in the frequency of all pace constraints, there is evidence of a spread of the constraints most typical of flexible organisations; this phenomenon, then, is more one of qualitative transformation of organisations and the constraints to which they give rise.

The 1980s and the first half of the 1990s was a time of work intensification in the Member States of the European Union (Dhondt, 1998), although how pronounced it was, and how early it began, varied from country to country. Between 1995 and 2000, according to the results of the surveys, the overall trend has been for this intensification to continue (Merllié and Paoli, 2001).

Increase in perceived intensity

A comparison between the 1995 and 2000 surveys is difficult, because the survey underwent quite radical changes. A number of improvements were made:

- The questionnaire was made more thorough, changing the nature of the interview, which became geared more towards a general examination of work organisation than exclusively towards the mere measurement of nuisances at the work place.
- Improved translations into the various languages of the Union from the English and French versions.
- Improved procedure for adjusting the sample.
- Improved monitoring of those who asked the questions, which restricted a number of biases, particularly those associated with absence and refusal to reply.

There was a further increase in employees' subjective perception of intensity (Table 15). The average percentage of hours during which employees reported high-speed working increased from 38% to 40%. Similarly, the percentage of hours in which employees felt they were subjected to very tight and short deadlines increased from 42% in 1995 to 44% in 2000. As for the percentage of employees who believed they never had enough time to complete their work, this remained steady.

The spread of high-speed working is apparent in half of the occupational categories, and that of tight deadlines in the majority. The two indicators have advanced simultaneously in four categories out of ten: junior executives, technicians (among whom intensification has been particularly pronounced, the indicators increasing from 32% to 39% in the case of speeds and 38% to 45% in the case of deadlines), craft workers, and industrial workers. The only simultaneous falls have occurred in the cases of clerks and the armed forces. In the other four categories, the patterns diverge.

Table 15 Changes in perceived work intensity

	Average temporal frequency of exposure to			
	High speeds		Tight deadlines	
	in 1995	in 2000	in 1995	in 2000
Senior executives	39%	36%	55%	58%
Junior executives	31%	33%	40%	42%
Technicians	32%	39%	38%	45%
Clerks	39%	37%	41%	40%
Sales staff	35%	38%	35%	34%
Agricultural workers	42%	41%	30%	35%
Craft workers	42%	46%	46%	52%
Industrial workers	47%	48%	49%	51%
Unskilled workers	43%	40%	38%	40%
Armed forces	39%	35%	45%	39%
Total	**38%**	**40%**	**42%**	**44%**

For example: whereas in 1995 senior executives reported exposure to high speeds for 39% of their working hours, that percentage was no more than 36% by 2000.
The indicator of average time frequency is defined at the beginning of Chapter 2.

Changes in pace constraints

The changing pattern of pace constraints has been made difficult to follow at European level by the improvements made to the questionnaire. Instead of 'production targets', with no further clarification, the reference is now to 'numerical production targets', which is more precise but, of course, more restrictive. It is impossible to be sure of the impact of this change. In addition, the very important question about interruptions was not asked in 1995. The results appearing below are thus subject to reservations.

The decline in target constraints, from 20% to 16%, must be treated with caution because of the change in the questionnaire. Constraints of the automatic type, by contrast, have declined slightly, from 23% to 21%, though increasing for skilled industrial workers and unskilled workers. As far as industrial constraints in the broad sense are concerned, the patterns have diverged. Control by the boss has declined slightly, from 40% to 38%. The level of quality standards has remained constant. As for dependence on colleagues' work, this increased very rapidly between 1995 and 2000, from 40% to 48%. This increase was found in all professional occupations apart from unskilled workers. Overall, the 'broad industrial constraint' still affects 71% of employees.

As far as market constraints are concerned, dependence on demand has increased (from 64% to 67%), but the almost constant presence of customers is a little less widespread (45% versus 49%). Overall, the 'broad market constraint' now affects 72% of employees as compared with 71% in 1995.

The 'broad industrial constraint'[43] has increased in seven occupational categories out of ten, and the broad market constraint in six (Table 16). Rather than an increase in pace constraints (subject

[43] The broad industrial and market constraints are defined in Chapter 1.

to the difficulty of measuring the trend of numerical targets), it is better to refer to a transformation; after a period of generalised increase in constraints, the situation now is that it is more the constraints typical of flexible organisations (though not necessarily propitious to good working conditions) that are increasing.

Table 16 Changes in pace constraints

	Percentage of employees subjected to					
	An industrial constraint (broad sense)		A market constraint (broad sense)		Both at once	
	in 1995	in 2000	in 1995	in 2000	in 1995	in 2000
Senior executives	66%	76%	84%	87%	58%	67%
Junior executives	63%	57%	87%	84%	53%	49%
Technicians	64%	66%	78%	81%	50%	54%
Clerks	70%	71%	76%	79%	54%	57%
Sales staff	61%	63%	90%	91%	55%	59%
Agricultural workers	78%	74%	46%	50%	36%	38%
Craft workers	84%	85%	51%	55%	42%	47%
Industrial workers	84%	85%	54%	51%	42%	42%
Unskilled workers	73%	70%	55%	51%	39%	36%
Armed forces	75%	79%	64%	54%	48%	45%
Total	**71%**	**71%**	**71%**	**72%**	**49%**	**51%**

For example: whereas in 1995, 66% of senior executives reported being subject to an industrial constraint in the broad sense, the corresponding figure in 2000 was 76%.

This qualitative transformation of organisations and of the constraints to which they give rise is also reflected by a less clear separation between industrial and market constraints. Despite the change in the question on targets (focusing on the most typically industrial forms), market and industrial constraints are less and less incompatible (as demonstrated by the change in J[44] in the cross tabulation). The combination of a (broad) industrial constraint and a (broad) market constraint has become more frequent, affecting 51% of employees in 2000 as compared with 49% in 1995, an increase which is underestimated because of the change in the questionnaire. This change was recorded in most categories, particularly among senior executives, technicians, employees and craft workers.

At the end of the day, pace constraints have undergone more change than increase in frequency. At the same time, perceived intensity has increased. On the one hand, this may specifically be an effect of the qualitative change in the constraints. However, an autonomous change has occurred: econometric analysis suggests that, objective constraints being equal, subjective intensity (high speeds, very tight and short deadlines) is greater in 2000 than in 1995. There are at least three reasons (not mutually exclusive) that may explain this:

- First, the change in the questionnaire singled out the targets and standards that had the most influence on work intensity. The effect is no doubt limited, but virtually certain. In other words, the objective change would be underestimated.

[44] See note 8 for a definition of this coefficient j.

- Secondly, the force of the constraints would be increased - stricter targets and standards, faster machinery, more fluctuation in demand, etc.
- Thirdly, factors other than pace constraints play a part - increase in the complexity of work, workers less tolerant of their workload.

Wages as a regulator of intensity?

The wage benefits associated with work intensity are extremely minimal: it would thus appear that the cost of work intensification to undertakings is very limited, and it may therefore be doubted whether the mere interplay of market forces is such as to regulate work intensity. That was the result of the French surveys of working conditions (the questionnaire for which was very similar to the European survey).

Are the mechanisms of the employment market susceptible of regulating work intensity? There is no doubting the fact that working under severe intensity exposes employees, directly or indirectly, to nuisances, discomforts and risks. The theory of pay differentials holds that the resulting disadvantage to employees is compensated by additional pay: undertakings and employees reach an understanding on the basis of arbitration between the monetary and non-monetary aspects of jobs. For example, undertakings will abandon plans to intensify working if the expected gains in productivity and profit are lower than the compensatory addition to the wage bill. It follows from this not that the work intensity is necessarily low, but that its scope will be restricted by the market within the context of these adjustments.

This theory of compensatory differences is disputed, however, particularly by adherents of the theory of segmentation of the employment market. They assert that employees in the 'primary' segments combine appropriate remuneration with satisfactory working conditions (unlike those in the 'secondary' segments, who are in the opposite situation).

Numerous researchers have tried to test these contradictory theories empirically, resorting to econometric methods to try to isolate the effect of working conditions on wages. It is important to look beyond a generalised finding to the effect that, overall, employees exposed to poor working conditions are less well paid. The theory of compensatory differences merely holds that an employee who accepts poor working conditions will be better paid than another employee, with the same characteristics, who rejects them; it certainly does not maintain that employees who accept poor working conditions will necessarily earn more than others. In the same vein, segmentation theorists certainly do not predict that unskilled workers in the primary sector will be better paid than executives belonging to undertakings with unstable work forces in the secondary sector, merely that membership of a particular segment will, other things being equal, involve a plus or minus on the wage side, and will also and simultaneously have a positive or negative impact on their working conditions. It is therefore necessary to argue on a basis of 'other things being equal' (which econometric methods permit).

Overall, these studies have not permitted satisfactory proof of the validity of the theory of compensatory differences. Although some results tend to confirm it, levels of pay are frequently found to be lower, other things being equal, among employees exposed to poor working conditions. Here, we have tried to test the idea of market regulation specifically as regards work intensity.

To carry out a test of this kind, it is necessary to know the principal determinants of wages. Level of education is one of these major determinants, even making allowances for occupation. Unfortunately, the Third European Survey on Working Conditions provides no information on the level of education of the individuals questioned (for example, the age at which they completed their education or obtained degrees).

This was why we had to use the 1998 French survey on working conditions. In the absence of panel data, we undertook a simple variance analysis (ordinary least-squared method) where the wage logarithm was regressed over a set of determinants:[45]

- degree level (13 jobs);
- age (10 jobs);
- sex cross-tabulated against family situation (single or couple);
- nationality (9 jobs);
- full- or part-time status;
- working hours (14 jobs);
- seniority in the undertaking (4 jobs);
- public or private status combined with size of undertaking (8 jobs);
- region (21 jobs);
- economic activity (36 jobs);
- hierarchical responsibilities and control over subordinates' wages;
- Saturday working (all/some/none);
- Sunday working (all/some/none);
- night working (all/some/none);
- variability of working hours and reasons (5 jobs);
- period of notice of working hours (4 jobs);
- type of control over working hours (3 jobs);
- overtime;
- shift working (2 x 8, 3 x 8);
- multitasking and reasons;
- repetitive nature of the job;
- one indicator of temporal autonomy;
- three indicators of procedural autonomy;
- five indicators of cooperation;
- three indicators of responsibility in the event of error;
- seven indicators of use of new technologies;
- occupational situation in 5 jobs;
- pace constraints.

The results relating to the pace constraints are shown in Table 17.

Wage supplements associated with pace constraints are minimal. A single coefficient, that relating to the imposition of precise numerical quality standards (an even more restrictive wording than in the European survey), differs significantly from 0 but is still very low: 1.5%. It is even likely that

[45] We did not undertake a Heckman-style correction of the supposed selection bias associated with unemployment because we did not want to make the strong and unnecessary assumption of a neoclassical employment market rather than one governed by agreements.

some forms of intensity, not very objective in the view of management,[46] such as dependence on colleagues or interruptions (though these cause so many problems for employees) are associated, other things being equal, with a lower wage. An employee subjected to all the intensity factors studied would receive a wage only 1.6% higher. The cost of work intensity to undertakings is therefore minimal. There is thus no prospect that market forces alone are capable of regulating it.

Table 17 Effects of pace constraints on wages

Constraint	Effect on wages
Automatic constraint	0.60% (-1.3% to +2.5%)
Numerical targets or deadlines on one day or fewer	0.50% (-0.5% to +1.6%)
Dependence on colleagues	-0.60% (-1.7% to +0.6%)
At least daily supervision by boss	0.40% (-0.7% to +1.5%)
Precisely quantified quality standards	1.50% (+0.2% to + 2.9%)
Customer demand	0.40% (-0.8% to +1.6%)
Presence of customers	0.40% (-0.8% to +1.6%)
Interruptions	-0.50% (-1.5% to + 0.5%)

For example: the effect on wages of subjection to automatic constraints is estimated by coefficients interpreted in terms of deviation from the reference population: employees not subject to automatic constraints. The standard deviation for the estimating of coefficients is given in brackets. The significant effects at the 5% limit are in bold.
The confidence intervals at 95% appear in brackets (these intervals, centred on the estimated value, have an *a priori* 95% chance of including the exact value).

Sources: French survey of working conditions, 1998.

[46] According to some authors, working conditions must be objectivised in order to be compensated for (Baudelot and Gollac, 1999).

Conclusion

Industrial constraints and market constraints are becoming cumulative

Employees' pace of work is subject to various constraints that can be grouped in two categories. Industrial constraints are associated with the desire to regularise production activity: production standards, automatic speed of machinery, automatic movement of products. Market constraints arise from the concern to adapt to customer demand.

In a given sector of activity or occupation, one or other of these organisational models is generally dominant. Industrial workers and, to a lesser extent, craft workers are subject to high industrial constraints, while senior executives are subject to high demand constraints resulting, particularly, in frequent and unexpected interruptions. As far as economic sectors are concerned, the manufacture of transport equipment and paper/cardboard/wood are characterised by high industrial constraints, while financial institutions and health and social work, conversely, are characterised by high levels of demand.

Between 1995 and 2000, automatic industrial constraints declined. On the other hand, dependence on colleagues' pace of working increased: this constraint is more widespread in industrial organisations, though without being an absolutely distinctive sign of such an organisation. As for commercial constraints, they are on the increase (Merllié and Paoli, 2001). Today, two thirds of employees are finding their pace of work dependent, in one way or another, on variations in demand.

Over recent years, industrial organisations have tried to become more flexible and to 'adhere' to the market, while many other commercial or service activities have adopted certain industrial principles of organisation. Hence, the combination of an industrial constraint and a market constraint is on the increase.

Intensity as perceived by employees reflects working situations

The work intensity that employees report experiencing (high frequency of speeds and tight deadlines, shortage of time) varies greatly between working situations. The sense that working speeds are nearly always high is principally created by rigid industrial organisations: production targets, automatic constraints. Almost constant tight deadlines are characteristic both of more flexible industrial organisations, where the constraint may arise from colleagues or quality requirements, and of hybrid industrial-commercial organisations.

The sense of shortage of time is particularly frequent in situations where industrial and market constraints are combined. It is even more widespread among employees exposed interruptions on at least a daily basis. Such interruptions are a frequent occurence in commercial organisations, but they are also often a symptom of makeshift organisation (Cartron, 2000). Either the employees are indifferent to interruptions or they experience them more negatively. Those interruptions which employees regard as disruptive are caused at least as much by industrial constraints as by commercial constraints, and the dual industrial and commercial constraint is seen as an aggravating circumstance. Commercial organisations foster the occurrence of interruptions, and industrial organisations do not allow them to be integrated into the normal pattern of work. The hybridisation of the two forms of organisation is thus particularly burdensome.

Autonomy and social support seem to make it possible, all things being equal, to avoid intensification of the entire period spent at work, but not entirely to compensate for the intensity created by work organisation. A heavy cognitive load is an aggravating factor, as is repetitive working.

Female workers, especially young workers in the mass-producing industries, are particularly exposed to working at high speeds or to tight deadlines. Senior executives are also frequently forced to observe tight deadlines. Furthermore, they are often faced with a shortage of time to complete their work.

Intensity as perceived by employees increased between 1995 and 2000. This trend cannot be fully explained by the spread of objective pace constraints. The strength of those constraints may have increased: stricter targets, faster machinery, more fluctuating demand, etc. Work, too, may have become more complex and workers less tolerant of their workloads.

Intensity, a source of discomforts and risks

Employees who are exposed to heavy industrial constraints report experiencing more discomforts at work and being exposed to more risks. The commercial constraint does not have such a clear effect, possibly because the discomforts and risks measured in the questionnaire relate essentially to industrial contexts. In fact, the results of the econometric analyses are compatible with the hypothesis that industrial pace constraints and commercial pace constraints both contribute to a deterioration in working conditions. But the effect of these constraints on working conditions is more marked when they give rise to interruptions of work. It is also clearer when the constraints are objectivised by tangible or intangible equipment (targets, for example) or personified by individuals (boss, colleagues). The efficacy of individuals, of 'domestic' logic, has certainly not disappeared (Cartron and Gollac, 2001). When commercial and industrial constraints are present simultaneously, their effects are generally cumulative.

From this standpoint, the present trend of organisations is such as to worsen the working conditions as perceived by the employees (Gollac and Volkoff, 1996). Admittedly, the increase in employees' autonomy is another very pronounced trend in the evolution of organisations. But procedural autonomy (choice of methods of working, choice of order of tasks) has only a limited impact on working conditions, compared with that of intensity. The effect of temporal autonomy (choice of working hours and breaks) is greater.

'Seriously injurious to health?'

According to employees' statements, industrial constraints have a considerable impact on the risks of both physical and mental problems associated with work. Commercial constraints have a powerful adverse impact on mental health and a more uneven impact on physical health. The impact of the customer's presence is greater than that of mere dependence on demand.

Daily interruptions are associated with a clear and significant increase in all the risks of illness recorded (reported by employees and attributed by them to their work). These interruptions, which are characteristic of inadequately controlled 'flexible' organisations, might be a particularly harmful form of work intensification.

It is the case for all age groups that work intensity increases the feeling that it will be impossible to 'stand' one's present job until the age of 60. The most burdensome forms of intensity are not the same at every age. But 'intensive' working is the opposite of 'sustainable' working.

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Annexes

Annex I
Perceived intensity of work among different categories of employee

Table 18 Perceived intensity of work by occupational groups

	High speeds				Tight deadlines				Shortage of time
	Always	Always or almost	Peak periods	Temporal frequency	Always	Always or almost	Peak periods	Temporal frequency	
Senior executives	12%	23%	18%	36%	24%	44%	20%	58%	31%
Junior executives	7%	19%	16%	33%	13%	27%	18%	42%	26%
Technicians	8%	23%	21%	40%	13%	28%	22%	45%	27%
Clerks	8%	20%	21%	37%	10%	23%	22%	41%	21%
Sales and service staff	9%	23%	19%	38%	11%	23%	13%	35%	16%
Agricultural workers	5%	26%	21%	42%	8%	23%	17%	36%	15%
Craft workers	14%	29%	23%	46%	17%	36%	24%	53%	21%
Industrial workers	19%	36%	18%	49%	22%	38%	19%	52%	21%
Unskilled workers	14%	28%	16%	41%	16%	29%	13%	41%	20%
Armed forces	5%	18%	25%	39%	10%	29%	9%	40%	9%
Total	**11%**	**25%**	**20%**	**40%**	**15%**	**30%**	**19%**	**45%**	**22%**

Table 19 Perceived work intensity by employee status

	High speeds				Tight deadlines				Shortage of time
	Always	Always or almost	Peak periods	Temporal frequency	Always	Always or almost	Peak periods	Temporal frequency	
Open-ended contract	11%	25%	20%	40%	15%	30%	20%	45%	22%
Fixed-term contract	12%	25%	18%	39%	15%	28%	16%	41%	20%
Temporary	12%	30%	19%	43%	14%	27%	13%	38%	26%
Apprenticeship	11%	23%	32%	46%	11%	22%	22%	41%	19%
Others	12%	27%	18%	41%	15%	29%	15%	41%	23%
Total	**11%**	**25%**	**20%**	**40%**	**15%**	**30%**	**19%**	**45%**	**22%**

Table 20 Perceived intensity of work by gender

	High speeds				Tight deadlines				Shortage of time
	Always	Always or almost	Peak periods	Temporal frequency	Always	Always or almost	Peak periods	Temporal frequency	
Men	11%	25%	20%	41%	16%	32%	20%	48%	22%
Women	11%	25%	19%	39%	13%	26%	17%	41%	22%
Total	**11%**	**25%**	**20%**	**40%**	**15%**	**30%**	**19%**	**45%**	**22%**

Table 21 Perceived intensity of work by age group

	High speeds				Tight deadlines				Shortage of time
	Always	Always or almost	Peak periods	Temporal frequency	Always	Always or almost	Peak periods	Temporal frequency	
15–24 years	12%	29%	21%	44%	16%	32%	16%	45%	18%
25–34 years	12%	27%	21%	43%	14%	31%	20%	46%	22%
35–44 years	11%	25%	19%	40%	16%	30%	21%	46%	24%
45–54 years	9%	22%	19%	37%	13%	29%	17%	43%	23%
55–64 years	10%	20%	15%	33%	12%	21%	20%	38%	21%
> 64 years	7%	11%	3%	21%	9%	12%	20%	30%	17%
Total	**11%**	**25%**	**20%**	**40%**	**15%**	**30%**	**19%**	**45%**	**22%**

Table 22 Perceived intensity of work by sectors of economic activity

	High speeds				Tight deadlines				Shortage of time
	Always	Always or almost	Peak periods	Temporal frequency	Always	Always or almost	Peak periods	Temporal frequency	
Agriculture, fishing	8%	27%	20%	43%	11%	25%	19%	41%	17%
Mining and quarrying	4%	16%	30%	39%	10%	26%	16%	41%	17%
Manufacture of food products, beverages and tobacco	19%	37%	15%	49%	16%	34%	20%	49%	18%
Textiles, clothes	14%	28%	14%	40%	14%	31%	18%	45%	24%
Wood, paper, cardboard	28%	42%	25%	58%	17%	29%	25%	47%	29%
Publishing, printing	6%	27%	23%	44%	26%	43%	21%	59%	24%
Chemicals, plastics	12%	23%	20%	39%	17%	31%	19%	46%	18%
Metallurgy, mechanical engineering	15%	30%	19%	45%	19%	33%	25%	52%	21%
Electrical, electronic engineering	11%	33%	15%	43%	22%	50%	17%	60%	26%
Manufacture of transport equipment	22%	37%	20%	51%	27%	50%	18%	63%	23%
Miscellaneous industries	6%	21%	21%	38%	11%	25%	26%	42%	23%
Electricity, gas, water	2%	14%	21%	33%	13%	26%	15%	44%	23%
Construction	13%	29%	26%	48%	17%	35%	25%	53%	25%
Trade	9%	21%	21%	37%	10%	22%	18%	37%	19%
Hotels and restaurants	16%	37%	26%	53%	18%	35%	21%	51%	15%
Land transport	14%	28%	17%	41%	26%	43%	17%	55%	21%
Other transport	10%	24%	15%	38%	18%	36%	21%	52%	21%
Post and telecommunications	18%	29%	19%	46%	23%	42%	19%	56%	22%
Financial activities	9%	19%	21%	37%	13%	33%	22%	48%	23%
Business services	9%	26%	22%	42%	18%	35%	22%	52%	25%
Public administration	6%	16%	19%	32%	9%	21%	17%	37%	20%
Education	9%	16%	13%	28%	9%	17%	15%	31%	23%
Health and social work	12%	27%	19%	42%	13%	28%	17%	41%	29%
Private service	6%	21%	19%	35%	11%	26%	13%	37%	17%
Domestic service	3%	17%	14%	27%	11%	16%	9%	25%	19%
Total	**11%**	**25%**	**20%**	**40%**	**15%**	**30%**	**19%**	**45%**	**22%**

Table 23 Perceived intensity of work by status of establishment

	High speeds				Tight deadlines				Shortage of time
	Always	Always or almost	Peak periods	Temporal frequency	Always	Always or almost	Peak periods	Temporal frequency	
Government service	8%	19%	18%	34%	11%	23%	16%	38%	24%
Publicly owed company	10%	23%	19%	38%	12%	25%	18%	40%	20%
Private company	12%	27%	20%	42%	16%	32%	20%	48%	21%
Other	10%	22%	18%	36%	13%	26%	16%	39%	24%
Total	**11%**	**25%**	**20%**	**40%**	**15%**	**30%**	**19%**	**45%**	**22%**

Table 24 Perceived intensity of work by size of undertaking

	High speeds				Tight deadlines				Shortage of time
	Always	Always or almost	Peak periods	Temporal frequency	Always	Always or almost	Peak periods	Temporal frequency	
1 person	6%	16%	16%	29%	7%	14%	14%	27%	14%
2–4 persons	8%	18%	18%	34%	10%	20%	17%	35%	15%
5–9 persons	10%	23%	21%	40%	11%	25%	21%	42%	19%
10–49 persons	11%	25%	20%	40%	15%	30%	20%	45%	23%
50–99 persons	11%	25%	19%	41%	17%	31%	19%	47%	23%
100–249 persons	14%	29%	21%	44%	19%	35%	18%	49%	25%
250–499 persons	11%	27%	21%	42%	14%	32%	21%	48%	29%
> 499 persons	13%	28%	18%	42%	17%	36%	19%	50%	24%
Total	**11%**	**25%**	**20%**	**40%**	**15%**	**30%**	**19%**	**45%**	**22%**

Table 25 Effects of structural variables on perceived intensity of work (logit econometric models)

Explained variables / Explanatory variables	Working at almost continuously high speeds		Working to almost continuously tight deadlines		Shortage of time to complete the job	
	Estimator of parameter	Standard deviation	Estimator of parameter	Standard deviation	Estimator of parameter	Standard deviation
Occupational group						
Senior executives	+ 0.13	*(0.09)*	+ 0.77	*(0.08)*	+ 0.32	*(0.09)*
Junior executives	– 0.09	*(0.08)*	+ 0.17	*(0.07)*	– 0.03	*(0.07)*
Technicians	reference		reference		reference	
Clerks	– 0.09	(0.07)	– 0.28	*(0.07)*	– 0.21	*(0.07)*
Sales and service staff	+ 0.02	*(0.07)*	– 0.14	*(0.07)*	– 0.42	*(0.08)*
Agricultural workers	+ 0.29	*(0.19)*	– 0.04	*(0.19)*	– 0.38	*(0.22)*
Craft workers	+ 0.37	*(0.07)*	+ 0.31	*(0.07)*	– 0.20	*(0.07)*
Industrial workers	+ 0.65	*(0.08)*	+ 0.29	*(0.08)*	– 0.29	*(0.09)*
Unskilled workers	+ 0.38	*(0.08)*	+ 0.16	*(0.07)*	– 0.26	*(0.08)*
Armed forces	+ 0.18	*(0.24)*	+ 0.44	*(0.21)*	– 1.25	*(0.33)*
Employment status						
Fixed-term contracts	– 0.02	*(0.06)*	– 0.05	*(0.06)*	+ 0.07	*(0.07)*
Temporary	+ 0.04	*(0.12)*	– 0.22	*(0.12)*	+ 0.49	*(0.12)*
Other	+ 0.03	*(0.08)*	– 0.03	*(0.07)*	+ 0.22	*(0.08)*
Indefinite contracts	reference		reference		reference	

(continued overleaf)

Table 25 (continued) Effects of structural variables on work intensity

Explained variables / Explanatory variables	Working at almost continuously high speeds		Working to almost continuously tight deadlines		Shortage of time to complete the job	
	Estimator of parameter	Standard deviation	Estimator of parameter	Standard deviation	Estimator of parameter	Standard deviation
Sex						
Female	+ 0.26	*(0.04)*	+ 0.08	*(0.04)*	+ 0.04	*(0.04)*
Male	reference		reference		reference	
Age						
15–24 years	+ 0.28	*(0.07)*	+ 0.22	*(0.07)*	– 0.02	*(0.08)*
25–34 years	+ 0.23	*(0.06)*	+ 0.12	*(0.05)*	+ 0.08	*(0.06)*
35–44 years	+ 0.14	*(0.05)*	+ 0.08	*(0.05)*	+ 0.10	*(0.05)*
45–54 years	reference		reference		reference	
55 years and over	– 0.15	*(0.08)*	– 0.41	*(0.07)*	– 0.06	*(0.07)*
Seniority						
less than 1 year	+ 0.04	*(0.07)*	– 0.17	*(0.07)*	– 0.35	*(0.08)*
1 year	– 0.08	*(0.08)*	– 0.02	*(0.08)*	– 0.36	*(0.09)*
2–3 years	– 0.04	*(0.07)*	– 0.10	*(0.06)*	– 0.23	*(0.07)*
4–5 years	+ 0.00	*(0.07)*	+ 0.14	*(0.07)*	– 0.12	*(0.08)*
6–9 years	reference		reference		reference	
10–14 years	– 0.07	*(0.07)*	– 0.22	*(0.07)*	– 0.16	*(0.07)*
15–19 years	+ 0.13	*(0.08)*	– 0.15	*(0.08)*	– 0.02	*(0.08)*
20–24 years	– 0.26	*(0.09)*	– 0.13	*(0.08)*	+ 0.09	*(0.09)*
25–29 years	+ 0.17	*(0.10)*	+ 0.07	*(0.09)*	– 0.01	*(0.10)*
30–34 years	– 0.14	*(0.12)*	– 0.01	*(0.11)*	– 0.06	*(0.12)*
35 years and over	– 0.07	*(0.18)*	– 0.05	*(0.17)*	– 0.08	*(0.17)*
Economic activity						
Agriculture, fishing	+ 0.36	*(0.20)*	+ 0.21	*(0.20)*	– 0.05	*(0.19)*
Mining and quarrying	– 0.49	*(0.36)*	– 0.14	*(0.30)*	– 0.34	*(0.34)*
Manufacture of food products, beverages and tobacco	+ 0.54	*(0.16)*	+ 0.20	*(0.15)*	– 0.16	*(0.13)*
Textiles, clothes	reference		reference		+ 0.11	*(0.14)*
Wood, paper, cardboard	+ 0.65	*(0.19)*	– 0.06	*(0.20)*	+ 0.42	*(0.18)*
Publishing, printing	+ 0.13	*(0.20)*	+ 0.58	*(0.18)*	+ 0.11	*(0.17)*
Chemicals, plastics	– 0.20	*(0.16)*	– 0.09	*(0.15)*	– 0.29	*(0.12)*
Metallurgy, mechanical engineering	+ 0.19	*(0.14)*	+ 0.06	*(0.14)*	– 0.13	*(0.10)*
Electrical, electronic engineering	+ 0.33	*(0.16)*	+ 0.74	*(0.16)*	+ 0.13	*(0.13)*
Manufacture of transport equipment	+ 0.52	*(0.16)*	+ 0.74	*(0.16)*	+ 0.05	*(0.14)*
Miscellaneous industries	– 0.26	*(0.22)*	– 0.23	*(0.21)*	– 0.14	*(0.18)*
Electricity, gas, water	– 0.46	*(0.26)*	– 0.02	*(0.22)*	– 0.17	*(0.20)*
Construction	+ 0.33	*(0.14)*	+ 0.32	*(0.13)*	+ 0.26	*(0.09)*
Trade	– 0.03	*(0.14)*	– 0.17	*(0.13)*	reference	
Hotels and restaurants	+ 0.77	*(0.15)*	+ 0.56	*(0.15)*	– 0.12	*(0.12)*
Land transport	+ 0.13	(0.17)	+ 0.69	*(0.16)*	+ 0.11	*(0.14)*
Other transport	+ 0.12	*(0.18)*	+ 0.44	*(0.17)*	– 0.03	*(0.15)*
Post and telecommunications	+ 0.45	*(0.18)*	+ 0.78	*(0.17)*	+ 0.04	*(0.15)*
Financial activities	– 0.11	*(0.17)*	+ 0.36	*(0.15)*	– 0.02	*(0.12)*
Business services	+ 0.32	*(0.14)*	+ 0.44	*(0.14)*	+ 0.24	*(0.09)*
Public administration	– 0.10	*(0.15)*	– 0.11	*(0.15)*	– 0.06	*(0.10)*
Education	– 0.12	*(0.16)*	– 0.46	*(0.15)*	+ 0.03	*(0.11)*
Health and social work	+ 0.42	*(0.14)*	+ 0.16	*(0.14)*	+ 0.36	*(0.09)*
Private service	– 0.04	*(0.16)*	+ 0.05	*(0.15)*	– 0.15	*(0.11)*
Domestic service	– 0.25	*(0.25)*	– 0.22	*(0.26)*	+ 0.15	(0.23)

Table 25 (continued) Effects of structural variables on work intensity

Explained variables / Explanatory variables	Working at almost continuously high speeds		Working to almost continuously tight deadlines		Shortage of time to complete the job	
	Estimator of parameter	Standard deviation	Estimator of parameter	Standard deviation	Estimator of parameter	Standard deviation
Status of the body						
Government service	– 0.26	*(0.07)*	– 0.21	*(0.06)*	– 0.01	*(0.07)*
Publicly owned company	– 0.19	*(0.08)*	– 0.39	*(0.07)*	– 0.34	*(0.08)*
Private company	reference		reference		reference	
Other	+ 0.03	*(0.10)*	+ 0.07	*(0.10)*	+ 0.34	*(0.10)*
Size of establishment						
1 person	– 0.57	*(0.14)*	– 0.84	*(0.15)*	– 0.63	*(0.15)*
2–4 persons	– 0.54	*(0.07)*	– 0.54	*(0.07)*	– 0.48	*(0.08)*
5–9 persons	– 0.25	*(0.06)*	– 0.37	*(0.06)*	– 0.19	*(0.06)*
10–49 persons	reference		reference		reference	
50–99 persons	+ 0.03	*(0.06)*	+ 0.03	*(0.06)*	+ 0.01	*(0.06)*
100–249 persons	+ 0.20	*(0.06)*	+ 0.23	*(0.06)*	+ 0.11	*(0.06)*
250–499 persons	+ 0.10	*(0.08)*	+ 0.01	*(0.07)*	+ 0.33	*(0.07)*
> 499 persons	+ 0.16	*(0.06)*	+ 0.15	*(0.06)*	+ 0.06	*(0.06)*

Annex II
Categories of the workforce most exposed to work intensity

Exposure to high-speed working

Simultaneous membership of highly exposed occupations and activities very significantly increases the frequency of being compelled to work at almost continuously high speeds. Thus, whereas 36% of industrial workers, the most highly exposed occupational group, experience this type of intensive working, and 42% of those working in the wood, paper and cardboard industry, the most affected area of economic activity, are subjected to it, the figure for industrial workers in the wood, paper and cardboard industry is 56%.

If we combine occupations and sexes, we find that 55% of female industrial workers are subject to almost continuously high working speeds. If, in addition, we distinguish between sectors of economic activity, the exposure of female industrial workers may reach extremely high levels, of the order of 70% to 80%, for example in electrical and electronic manufacturing (81±13%) or in the food products (78±12%) or wood, paper and cardboard industry (78±19%).[47] Similarly, comparable exposure frequencies are found among unskilled female workers (most of them unskilled blue-collar workers) in the manufacture of transport equipment (82±17%).

Young people (under 35), who as a whole are more subject to working at high speeds, are clearly more exposed when they are industrial workers (38%) or unskilled workers (36%), or when they belong to sectors of activity such as the wood, paper and cardboard (49±11%), food products (48±7%) or transport equipment manufacturing (40±10%) industry. This is even more the case with young women, with very high exposure rates if they are working in the wood, paper and cardboard (84±16%), electrical and electronic manufacturing (61±13%) or food products (58±10%) industries. The degree of exposure is even higher for young industrial female workers in certain industries such as food products (84±16%), electrical and electronic manufacturing (82±15%) or textiles and clothing (68±13%).[48] Ultimately, young female workers in the mass-producing industries appear among the categories of the workforce most exposed to high working speeds.

Exposure to tight deadlines

An analysis by occupational groups shows that 44% of senior executives and 38% of industrial workers are exposed to working to almost continuously tight deadlines. Similarly, in an analysis by sectors of economic activity, it appears that 50% of those working in electrical and electronic manufacturing or the manufacture of transport equipment are affected. If occupations and

[47] When the numbers contained within workforce categories obtained from the cross-tabulation of several variables are small within the survey sample, of the order of from 20 to 100 employees, frequencies of working at almost continuously high speeds are given by way of indication, their confidence interval at 95% being specified (the interval having 95 chances out of 100 of containing the true frequency, which could be accurately assessed if it were possible to question all European employees but can only be estimated here on the basis of the survey sample; the proposed confidence intervals are centred on estimated values). When the numbers are below approximately 20, the intensive working frequencies are not recorded, the confidence intervals being too wide. The approach is also valid for frequencies of working to tight deadlines or subject to shortage of time.

[48] The three sectors of economic activity mentioned are the only ones including at least 20 young female industrial workers. This kind of sectoral analysis cannot be undertaken for another very highly exposed category, young unskilled female workers, because there are too few of them in industrial activities.

economic activities are combined, the levels of exposure become even more substantial. They rise to the range of 60% to 70%, or even higher, for senior executives in hotels and restaurants (80±15%), electrical and electronic manufacturing (79±17%) or financial institutions (72±12%) and for junior executives in electrical and electronic manufacturing (79±17%) or financial institutions (72±12%) and for junior executives in electrical and electronic manufacturing (80±19%) or publishing and printing (65±18%). At the opposite end of the socio-occupational scale, unskilled workers, although their level of exposure is more moderate (29%) and close to that of employees as a whole (30%), are also very exposed to working to tight deadlines in certain sectors of activity such as the manufacture of transport equipment (84±16%) or post and telecommunications (66±11%).

Distinctions between the sexes also reveal higher exposures for all female industrial workers (48%), more especially those in highly exposed sectors of economic activity such as electrical and electronic manufacturing (71±15%).

The youth of the workers is another factor that increases their exposure. Thus, nearly 50% of young employees (under 35) are exposed to almost constant tight deadlines in sectors such as the manufacture of transport equipment (49±11%), electrical and electronic manufacturing (47±9%) or post and telecommunications (49±8%). Exposure is even greater in the case of women, often in excess of 50% in industries such as wood, paper and cardboard (59±22%), the chemical industry (52±13%) and electrical and electronic manufacturing (51±14%). For young female industrial workers, exposure is again very high (47±8%) and reaches substantial levels in some industries, one example being electrical and electronic manufacturing (81±15%). As is true in the case of working at high speeds, young female workers in the mass producing industries thus seem to be very widely obliged to work to tight deadlines.

Exposure to shortage of time to complete the job

When the very high-exposure occupations and economic activities are combined, the likelihood of being short of time at work is increased. Thus, while 31% of senior executives, on average, are short of time at work, making them the most affected occupational group, they are much more exposed to the same problem in some sectors of economic activity such as post and telecommunications (60±18%), electrical and electronic manufacturing (40±20%) and services to business (38±12%). They are not the only occupational group severely affected in some activities: the same also applies to junior executives in the manufacture of metal products and machinery (55±19%), technicians in electrical and electronic manufacturing (47±15%) and unskilled workers in the wood, paper and cardboard industry (63±22%). On the other hand, as noted above, blue-collar workers, women and young people are less affected by this kind of exposure. Thus, for young female industrial workers, exposure rates are below 50%, even in sectors of economic activity such as the textile and clothing industry, where they are relatively high (49±14%). Confronted by a shortage of time at work, young female workers in the mass-producing industries are therefore not the most characteristic category of the workforce in terms of high exposure to intensive working, as was the case with work situations involving high speeds or tight deadlines. The most exposed category here are, in fact, executives in some sectors of industrial activity or in post and telecommunications services.

Annex III

Constraints, autonomy and social support among various categories of employees

Table 26 Constraints, autonomy and social support by professional groups[49]

	Pace constraints	Procedural autonomy	Temporal autonomy	Social support	Autonomy and support
Senior executives	0.44	0.88	0.75	0.92	0.85
Junior executives	0.33	0.82	0.47	0.93	0.74
Technicians	0.38	0.74	0.53	0.90	0.72
Clerks	0.40	0.68	0.55	0.87	0.70
Sales and service staff	0.38	0.58	0.42	0.83	0.61
Agricultural and fishery workers	0.39	0.60	0.47	0.79	0.62
Craft workers	0.49	0.57	0.42	0.85	0.61
Industrial workers	0.51	0.40	0.36	0.81	0.52
Unskilled workers	0.37	0.53	0.40	0.73	0.55
Armed forces	0.40	0.74	0.49	0.96	0.73
Total	**0.41**	**0.64**	**0.47**	**0.85**	**0.66**

Table 27 Constraints, autonomy and social support by sectors of activity

	Pace constraints	Procedural autonomy	Temporal autonomy	Social support	Autonomy and support
Agriculture, fishing	0.39	0.60	0.48	0.77	0.62
Mining and quarrying	0.49	0.63	0.44	0.90	0.66
Manufacture of food products, beverages and tobacco	0.50	0.46	0.41	0.81	0.56
Textiles, clothes	0.56	0.47	0.38	0.78	0.54
Wood, paper, cardboard	0.49	0.44	0.36	0.85	0.55
Publishing, printing	0.50	0.60	0.52	0.83	0.65
Chemicals, plastics	0.50	0.56	0.45	0.86	0.62
Metallurgy, mechanical engineering	0.50	0.57	0.48	0.87	0.64
Electrical, electronic engineering	0.52	0.71	0.53	0.92	0.72
Manufacture of transport equipment	0.54	0.50	0.43	0.88	0.60
Miscellaneous industries	0.43	0.67	0.46	0.88	0.67
Electricity, gas, water	0.39	0.70	0.51	0.95	0.72
Construction	0.46	0.62	0.44	0.83	0.63
Trade	0.40	0.64	0.49	0.82	0.65
Hotels and restaurants	0.45	0.56	0.38	0.82	0.59
Land transport	0.43	0.41	0.40	0.76	0.52
Other transport	0.43	0.60	0.50	0.94	0.68
Post and telecommunications	0.42	0.59	0.51	0.84	0.65
Financial activities	0.42	0.72	0.63	0.90	0.75
Business services	0.39	0.72	0.63	0.87	0.74
Public administration	0.34	0.71	0.55	0.90	0.72
Education	0.30	0.79	0.28	0.88	0.65
Health and social work	0.37	0.68	0.45	0.91	0.68
Private service	0.32	0.66	0.52	0.81	0.66
Domestic service	0.19	0.73	0.52	0.45	0.57
Total	**0.41**	**0.64**	**0.47**	**0.85**	**0.66**

[49] These indicators are defined in the glossary.

Annex IV
Glossary of specific terms

Procedural autonomy
Employees' freedom to select or modify their working procedures and conditions. Procedural autonomy is defined on the basis of three indicators: control over order of tasks (q25_1: Are you able, or not, to choose or change your order of tasks?), control over work methods (q25_2: Are you able to select or modify your work methods?) and control over pace of work (q25_2: Are you able to select or modify your speed or rate of work?).

Temporal autonomy
Autonomy available to employees with regard to breaks (q26_2: You can take your break when you wish), holidays (q26_3: You are free to decide when to take holidays or days off) or working hours (q26_4: You can influence your working hours).

Working at high speeds
q21b_1: And, does your work involve working at very high speed? ('all the time', 'almost all of the time', 'around 3/4 of the time', 'around half of the time', 'around 1/4 of the time', 'almost never', 'never', 'don't know'). On this basis, three indicators are defined: almost continuously high speeds (all the time or almost all the time); high speeds at peak periods (half or three-quarters of the time); synthetic indicator of average temporal frequency of high speeds, which estimates the average proportion of working hours spent working at high speeds.

Repetitive nature of the job
Please tell me, does your job involve short repetitive tasks of less than ... 5 seconds/30 seconds/1 minute/5 minutes/10 minutes (q21a)? All employees involved in repetitive tasks taking less than 10 minutes are regarded as exposed to repetitive working.

Cognitive load or extent of the job
Generally, does your main paid job involve, or not, solving unforeseen problems (q24_3), complex tasks (q24_5) and learning new things (q24_6)?

Direct contact with customers or users
Does your main paid job involve ('all the time', 'almost all of the time', 'around 3/4 of the time', 'around half of the time', 'around 1/4 of the time', 'almost never', 'never', 'don't know') dealing directly with people who are not employees at your workplace such as customers, passengers, pupils, patients, etc. (q12_7)?

Industrial constraint in the broad sense
Employees whose job involves complying with precise quality standards are regarded as being exposed to industrial constraints in the broadest sense.

Commercial constraint in the strict sense
Employees exposed to a constraint associated with direct demand from customers or the equivalent are regarded as exposed to a commercial constraint in the strict sense.

Commercial constraint in the broad sense
Employees whose jobs involve direct contact with customers or users for at least three-quarters of their working time are regarded as exposed to a commercial constraint in the strict sense.

Automatic constraints
The pace of work depends on the automatic speed of a machine or movement of a product (q22_4).

Demand constraints
The pace of work depends on direct requests from people such as customers, passengers, pupils, etc. (q22_2).

Target constraints
The pace of work depends on numerical production targets (q22_3).

Quality constraints
Work involves compliance with specific quality standards (q24_1).

Industrial constraints in the broad sense
Employees exposed to relational constraints associated with colleagues' work and supervision by bosses are regarded as exposed to industrial constraints in the broad sense.

Industrial constraints in the strict sense
Employees exposed to automatic constraints or numerical targets without automatic constraints are regarded as exposed to industrial constraints in the strict sense.

Event constraints
Constraints that become apparent in situations where risks, malfunctions or critical problems have to be addressed as a matter of urgency.

Hierarchical constraints
The pace of work depends on direct control by the boss (q22_5).

Horizontal constraints
The pace of work depends on the work done by colleagues (q22_1).

Constraints associated with interruptions of work
Frequency (several times a day/a few times a day/several times a week/a few times a week/never) with which the employee has to interrupt a task he is doing in order to take on an unforeseen task (q23a).

Very tight deadlines
q21b_2: And, does your job involve working to tight deadlines? (same scale and same indicators)

Dual industrial and commercial constraint in the strict sense
Employees exposed to an industrial constraint in the strict sense and a commercial constraint in the strict sense are regarded as exposed to a dual industrial and commercial constraint in the strict sense.

Dual industrial and commercial constraint in the broad sense
Industrial constraint in the broad sense and commercial constraint in the broad sense.

Dual industrial and market constraint in the broadest sense
Industrial constraint in the broadest sense and commercial constraint in the broad sense.

Scope for decisions
This aspect derives from the epidemiological studies of Karasek and Theorell (1990) and incorporates autonomy at work (possibility of choosing working methods and hours and ability to influence decisions) and the cognitive scope of the job (possibility of learning and developing skills, high level of skill, variety and creativity of the job, etc.).

Shortage of time to complete the job
You have enough time to get the job done (yes/no), q26_5.

Social support at work
Technical or emotional support received by the employee at work: assistance from colleagues (q26_1: You can get assistance from colleagues if you ask for it) and discussion of working conditions or the organisation of your work when changes take place (q30a).

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In recent years it has become increasingly evident that work is growing more and more intensive. The survey of working conditions undertaken in 2000 by the European Foundation for the Improvement of Living and Working Conditions finds no reversal of this trend. The survey findings provide a basis for a better understanding of the detailed mechanisms of work intensity. Work intensification is associated with radical changes in company organisation and economic life. The constraints affecting employees' pace of work have an impact on the discomforts, risks and nuisances to which they are exposed. That impact depends on the precise nature of the constraints and, more generally, on the quality of work organisation.

The European Foundation for the Improvement of Living and Working Conditions is a tripartite EU body, whose role is to provide key actors in social policy making with findings, knowledge and advice drawn from comparative research. The Foundation was established in 1975 by Council Regulation EEC No 1365/75 of 26 May 1975.

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