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How rules operate in practice: the team productivity bonus, productivity and work quality at AME, 1992-2000

Bénédicte Reynaud

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Ecole normale supérieure
CNRS – Cepremap
48, bd. Jourdan
75014, Paris
benedicte.reynaud@cepremap.ens.fr

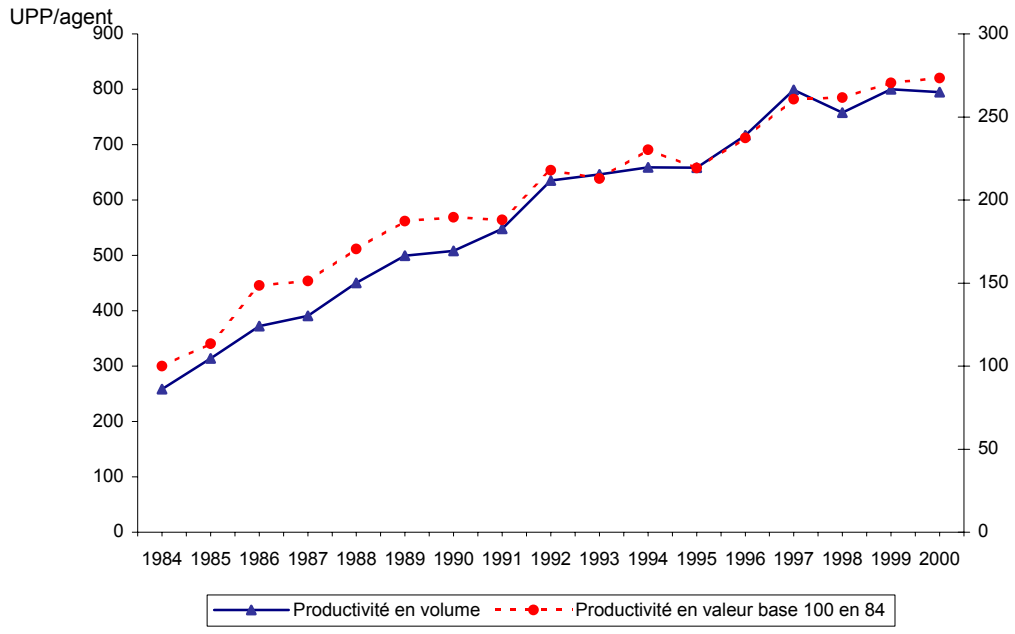
According to incentive theorists, rules produce the same results wherever they are applied. This reason for this, it is said, is that they are implemented mechanically by actors who are assumed to be identical and within groups that exist only through the temporary interaction of individuals. When this is not the case, the only possible explanation must lie in the fact that the groups being compared (work teams) are not comparable, primarily because their technical and individual characteristics are too heterogeneous.

The Electronic Equipment Maintenance Workshop (AME) of the Paris Metro offers particularly fertile ground for investigating the effects of identical rules on work groups. Such opportunities are rare indeed, since organizations seldom keep data such as those kept by AME over such a long period. Eight years have now elapsed since the introduction of the team productivity bonus scheme, or DEC to use its French acronym; this is sufficient time for us to be able to take stock and bring our investigation to a successful conclusion, provided we can first demonstrate that the teams are comparable and that the exogenous shocks, if there were any, have been neutralized by certain rules governing the management of the DEC.[1] This is the subject of the second section of this chapter. Subsequent statistical analysis of the evolution of labour productivity and of work quality indicators (debt levels and fault recurrence rates) among the AME production teams and examination of the amendments to the team contracts produce two main findings. The first is that teams adopt different strategies in order to obtain maximum bonus payments. This is reflected in their dissimilar records in terms of productivity gains, improvements in work quality and group dynamics. The second is that labour productivity emerges as a negotiated variable that is a collective construction (sections 3 to 5). Finally, before immersing ourselves in the intricacies of team strategies, we need briefly to trace the evolution of productivity before and after the introduction of the productivity bonus. In order to do this, we will draw on data provided by the AME. The bonus scheme, which was initially conceived as a rule to encourage increases in labour productivity, has probably not produced all the effects, at an aggregated level, that its advocates were hoping for (section 1). We will attempt to ascertain the significance of this finding in the light of the various teams' performance.

1. The slowdown in labour productivity following the introduction of the team productivity bonus

Labour productivity, measured in volume terms as the number of WOUs produced per operative over a 12-month period,[2] does not increase at the same rate before and after the introduction of the DEC. Between 1984 and 2000, the annual rate of growth in labour productivity was + 7.3 per cent; however, the rate was much higher in the period preceding the introduction of the bonus than afterwards. From 1984 to 1992, it was + 11.9 per cent per annum, while from 1992 to 2000, it fell to +2.8 per cent per annum (Figure 1).

Figure 1. Evolution of labour productivity in volume and value terms in AME: 1984-2000

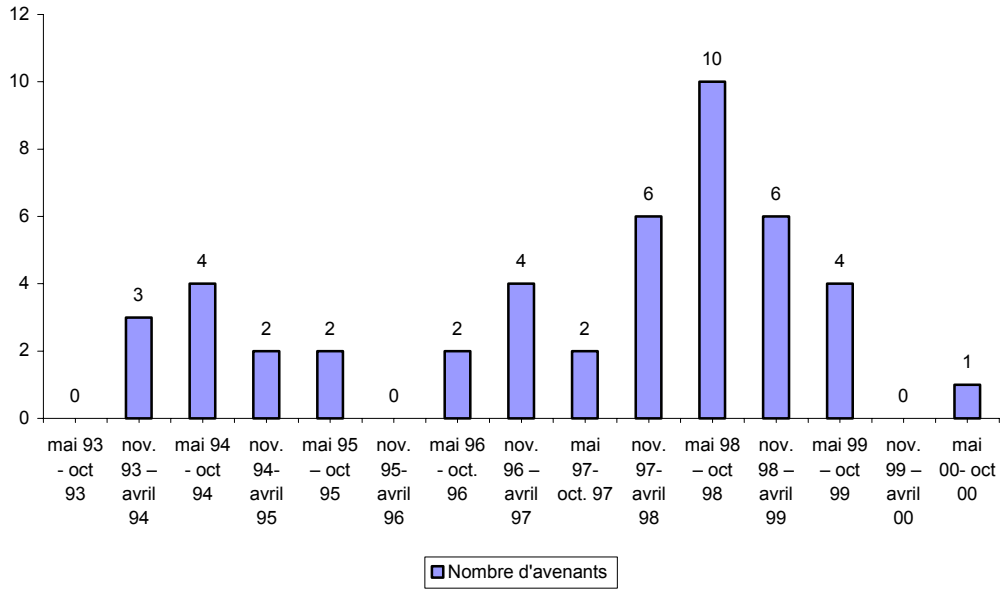


In particular, in the three years following the introduction of the DEC (1992-95), labour productivity stagnated (+ 1.2 per cent per annum). The period 1995-2000 saw an improvement (+3.8 per cent per annum), despite the mediocre results for the year 2000 (- 0.65 per cent).

These results raise two questions. Why did the rate of productivity growth slow down for the first three years? Is the improvement from 1995 onwards real or does it reflect a different mode of managing the DEC? This question is particularly pertinent in the light of the fact that, of the 46 amendments to the team contracts negotiated since the introduction of the DEC, no fewer

than 24 were added during a short period of time between November 1997 and April 1999 (Figure 2). Analysis of the situations in the individual teams will help us answer this question. In any event, we will hypothesize that the year 1995 marked a turning point, either towards a real recovery in labour productivity or towards other, more realistic ways of managing the DEC that took greater account of the economic constraints and which we would be tempted to label 'the social management of the DEC'.

Figure 2: The number of amendments signed at AME between November 1992 and October 2000



2. The comparability of the teams

The production teams can be said to be comparable, both over time and among themselves.

The teams can be compared over time because they remained more or less unchanged in number during the period under consideration. Of the five teams at work in AME in 1984, four are still in existence in 2001. The survivors are EK1, EK2, EK3 and the micromechanics team. A new team, EK4, was established in October 1996. It is made up of units previously attached to other teams: two BPUs from EK1 and one from EKS; they were joined in March 1999 by the 'Relays in Critical Failure Mode' unit from the Relays team, whose other activities were transferred at the same time to another workshop.

2.1. Specialization and homogeneity of the teams

The notion that the teams can be compared with each other is based on several arguments and one fundamental idea, namely that their undeniable specialization is not a source of heterogeneity. After all, they work on different applications of electronics technology: control electronics in the case of EK1, automatic electronic devices and installations, such as Météor[3] and self-steering systems on the Metro, in the case of EK2 and power electronics in the case of EK3. Even the micromechanics team deals with electronics to some extent, since it is responsible for repairing the trains' electronic clocks. However, with the exception of the relays and micromechanics teams, they are dealing with the same 'technological family', in this case the 'electronics family', rather than the 'pneumatics family' or the other technological 'families' used in the Rolling Stock Department. Now one of the particular characteristics of electronic equipment is that, unlike micromechanical equipment, it is not subject to wear and tear. Consequently, reconditioning is the only preventive procedure carried out, generally once every ten years. This is important because preventive procedures cause difficulties within the teams: they require more working time, they are dirty, and so on. Thus the operatives in all the electronics teams[4] have the same types of procedures to carry out.

Firstly, specialization by sphere of application means that each team works on several different generations of technology[5], spanning some 40 years. For example, the electronic circuit boards maintained by EK1 may belong to the first generation (discrete components), to the second generation (analogic control systems) or to the third generation (microcontroller controled units). The maintenance procedures undertaken by EK2, which specializes in automatic train safety systems, involve four generations of technology, the design of which varies from line to line: low frequency (first and second generations), high frequency (first and second generations), automatic operation and maintenance system (third generation) and the automatic train control system used on line 14 (Météor) (fourth generation). This has one basic consequence, which is that all the teams experience the same difficulty in finding components for the older generations of equipment.

Secondly, specialization can go hand in hand with a high degree of homogeneity between some of the teams. This is the case with EK4, which came into existence partly as a result of the splitting of EK1.

Thirdly, specialization does not partition the teams off from each other. One reason for this is that the AME recruits at workshop rather than team level. The same qualifications (or equivalents) are required for all the teams: the CAP (vocational training certificate), BEP

(technical school certificate) or a technical *baccalauréat* in electronic engineering. Another is that operatives can change teams, with those who do working alongside a colleague for a period of six months to a year.

2.2. Consequences for the employment structure

The form of specialization described above means that the employment structure is fairly comparable between teams and that this structure has been distorted in the same way in all the teams. The decline in skill levels between 1992 and 1999, which is linked to recruitment difficulties, affected all the teams, as Figures 3 and 4 show.

Figure 3. Skill structure by team in 1992

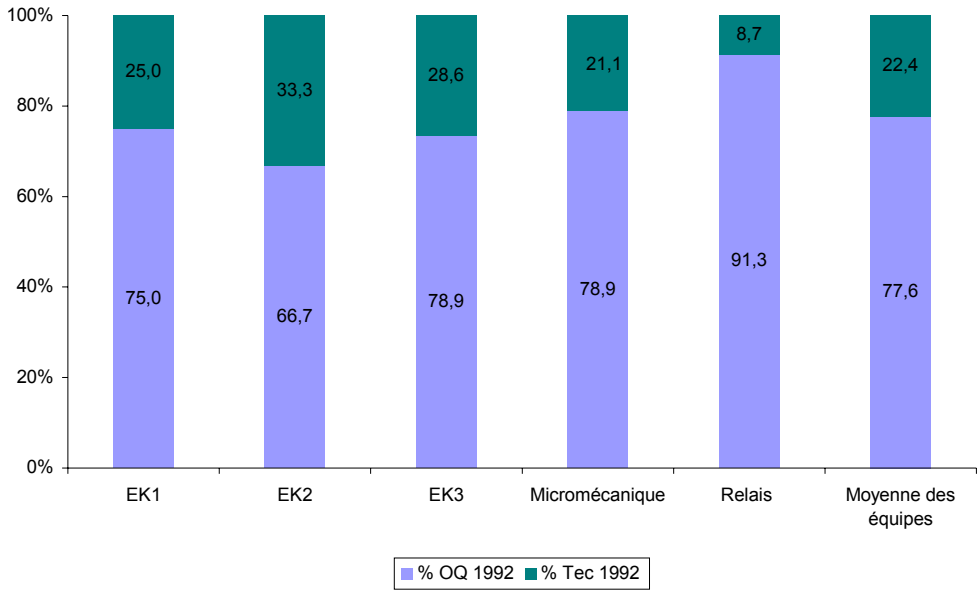
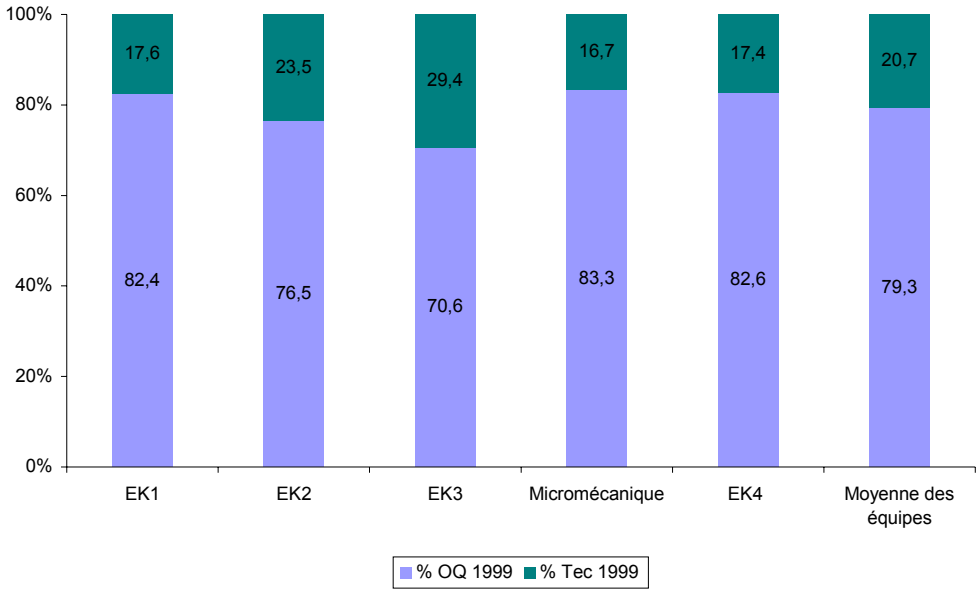


Figure 4. Skill structure by team in 1999



2.3. Making procedures equivalent: the 'weighting coefficients'

The notion that the teams are comparable is based on two other arguments of a different kind. Firstly, the introduction of the productivity bonus gave rise to a need to create some sort of equivalence between the procedures carried out by the various teams. This is why the 'weighting coefficient' was devised; it is defined, for each BOU and for each type of corrective and preventive procedure, as the average number of hours required per procedure. This ratio has been recorded in the AME database since 1991. Thus each procedure, modified by its coefficient, is equivalent to n 'weighted output units' (WOUs), in which n is the weighting coefficient. This coefficient changes on the basis of an assessment of exogenous changes affecting the working time required for a given type of procedure. We will see later how this rule, designed to create equivalence between different procedures, has been exploited in the strategies adopted by team seeking to maximize bonus payments. Secondly, in addition to a three-yearly review, the original team contracts provided for the negotiation of amendments in situations in which teams were likely to be penalized by an external event. As it turns out, a considerable number of amendments has been negotiated (Figure 2), mostly with the aim of preventing a team being penalized for events for which it is not responsible. Thus in the event of

exogenous shocks, usually caused by problems with component supplies or the breakdown of industrial equipment, such as lifts (thereby paralysing the flow of equipment) or the machine used to polish and clean electronic circuit boards and test benches, an amendment to the team contract is negotiated. Consequently, exogenous shocks cannot be adduced as an explanation for differences in the various teams' results.

2.4. Reconstituting a monthly database for each team (November 1992-October 2000)

In order to analyze the effects of adding a new rule to an existing rule system, it was necessary to reconstitute a monthly database depicting the evolution over time of the various teams. This had to be done by using the current AME database, in which data is recorded in accordance with the current structure. Starting from the most recent period, production figures since the time the database was first set up (1994-95) were reconstituted as if the structure of the current teams had never changed, using the most recent weighting coefficients. The idea underlying this approach is to process the data as if the technical structure had remained unchanged in such a way that one WOU is always equal to one hour's work. The AME database uses current weighting coefficients to reconstitute the output and productivity series for each team broken down into its various current basic production units (BPUs). With this approach, the notion of team loses its meaning, since any sense of evolution over time, reflecting changes in each team's remit as activities are transferred between teams, is jettisoned.

In order to reconstitute the evolution of the teams over time, it was necessarily, firstly, to reconstitute their remits and, using the non-weighted output figures contained in the current AME file, to calculate the monthly WOUs by seeking out each BPU'S weighting coefficients and the changes to them, as detailed in the amendments to the team contracts. I carried out this work for all the teams, with the exception of the relays teams, whose computer files disappeared when the team transferred to the Sucy site in March 1999. Secondly, it was necessary to reconstitute debt levels and fault recurrence rates, potentially with a few possible errors.

For the period prior to 1995, I drew on a file containing data on all the teams for the year 1993 and on graphical data on the productivity bonus results, which I had kept since my first two visits to the AME. Nevertheless, there is a six-month period for which I was unable to find data (November 1994-April 1995).

Taking these monthly figures (November 1992-October 2000) as a starting point, I calculated the quarterly figures corresponding to the bonus payment periods. The two databases

contain virtually the same indicators: output as measured by the number of WOUs, labour productivity in volume terms, debt levels and fault recurrence rates; the quarterly database also contains the percentage of the maximum bonus obtained by each team at the end of each bonus period. The other important source of information on which I was able to draw relates to the legal aspects of the bonus scheme: the original team contracts, the revisions negotiated at three-yearly intervals and all the amendments negotiated between the production manager and each team supervisor. Since the results obtained before the amendments were negotiated had not been recorded by AME, it proved impossible to measure the effect of an amendment on the level of bonus obtained. Nevertheless, there are a few examples drawn from direct observations between the months of October and November 1994 or taken from annexes to the amendments.

It was obviously necessary to reconstitute these data for all the teams in order to assess the degree of diversity within the results as a whole, in terms of both productivity and work quality. However, it also enabled us to define the parameters for the three teams whose strategies I examined in detail (EK1, EK3 and the micromechanics team).

However, statistical analysis taken in isolation reveals nothing about the strategies adopted by operatives in order to obtain the maximum bonus. Those strategies can be reconstituted by eliminating those that are incompatible with certain results and by comparing them with different data. Thus the statistical analysis has to be supplemented with data on changes to the rules governing the team productivity bonus scheme, and particularly to the weighting coefficients and to the upper limits on debts and fault recurrence rates as detailed in amendments to the team contracts, as well as with information on the management style adopted by the supervisors who took over as heads of the various teams.

3. EK1: maximising the bonus through amendments to the team contract

3.1. Declining productivity but virtually maximum bonus payments

In the period in question, EK1 operatives almost always obtained maximum bonus payments,[6] 97.26 per cent on average. There are three exceptions to this. In October 1994, despite the fact that the team received 90 per cent of the bonus, it actually went through a real crisis, to which we will return later. In October 1996, the team was paid 92 per cent of the possible maximum bonus, while in April 1998 it received 94 per cent (Figure 5).

Figure 5: Percentage of the maximum bonus obtained by team EK1 (1993 – 2000)

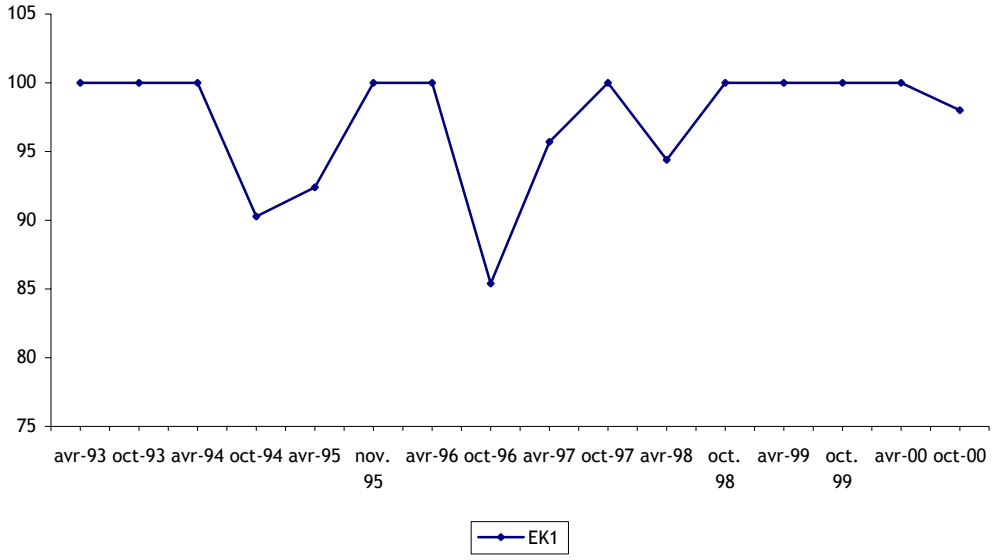
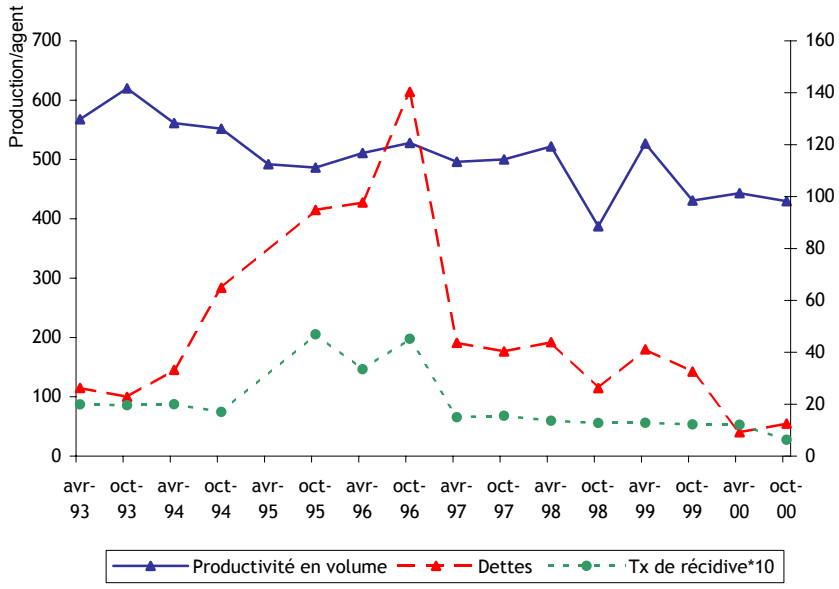


Figure 6. EK1 : Evolution of labour productivity, debts and fault recurrence rates (1993-2000)



Note : debts and fault recurrence rates are plotted against the second Y axis (on the right)

Over the period as a whole, EK1's labour productivity figures, as measured by the output volume in WOUs divided by the number of operatives, declined at a rate of – 3.6 per cent per annum, while work quality indicators over the same period show an upward trend. Debts and

fault recurrence rates declined at annual rates of – 9.4 per cent and 14.2 per cent respectively, as shown in Figure 6. The fundamental question is whether the decline in labour productivity can be imputed to a reduced volume of work. If this were the case, we should expect the level of debts to stagnate or decrease; in reality, however, debt levels exploded from April 1994 until October 1996 and collapsed six months later. The reasons for these sudden variations will be explained below. However, the reason for the decline in labour productivity cannot be said to lie in a reduced volume of work.

This description is still too general to reveal the bonus maximization strategies ; in particular, it does not take account of two extremely contrasting periods. In reality, for all three indicators analyzed, there was a sudden break in October 1995.

During the first period (April 1993-October 1995), the team seemed unable to meet demand. Labour productivity declined sharply (- 6 per cent per annum), while debt levels and fault recurrence rates increased at record speeds (+ 66.1 per cent and 40.9 per cent per annum respectively). The main reason for this was the ageing of the MF 77 stock. The quicker repaired units are returned to the workshop, the more the volume of work increases and the more the debts accumulate, even though operative effort remains constant. The correlation coefficient between debt levels and fault recurrence rates for the monthly data between 1992 and 1995 is high (R^2 = 0.55) and significant (cf. Annex C- 1a).

During the second phase (October 1995-October 2000), the team's situation improved. Labour productivity decreased less rapidly, at an annual rate of -2.5 per cent per annum, while debt levels and fault recurrence rates decreased very significantly (by -33.3 per cent and -33.1 per cent per annum respectively). However, what is the explanation for this sharp decline in debt levels, given that a decline in the number of procedures per operative meant that the context was equally unfavourable? The reason is to be found in the arrival of a new supervisor, who made the reduction of debt levels his top priority. He noted an imbalance between the existing stock and actual requirements and embarked on a destocking exercise between October 1996 and April 1998. Fault recurrence rates also fell automatically as a consequence; the R^2 between these two variables was 0.84 (cf. Annex C-1b). These developments are summarized in Table 6 below.

Table 6. Evolution of labour productivity in volume terms, debt levels and fault recurrence rates[7]: EK1 (1993-2000)

	Annual rate of increase in labour productivity in volume terms	Annual rate of increase in debt levels	Annual rate of increase in fault recurrence rates
April 1993 – October 2000	- 3.6	- 9.4	- 14.2
April 1993 – October 1995	- 6.0	+ 66.1	+ 40.9
October 1995 – October 2000	- 2.5	- 33.3	- 33.1

At this stage of the analysis, however, we do not yet have any economic or organizational explanation for the phenomena observed statistically.

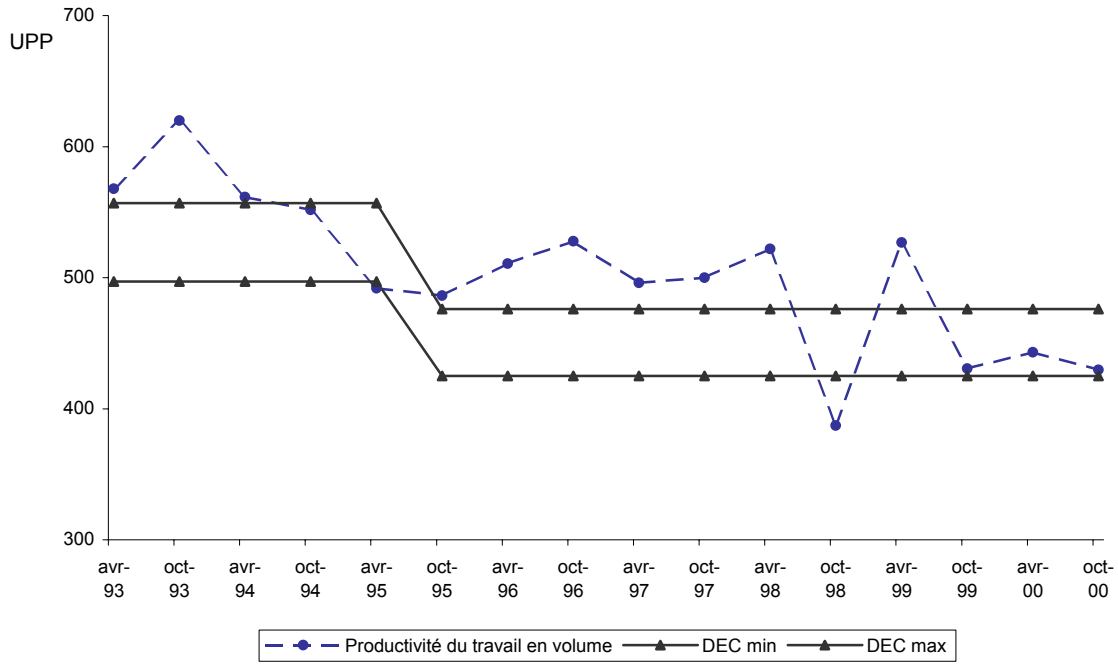
3.2. Maximizing the 'weighted output units' and its limitations as a strategy

We advance the following explanatory hypothesis: the operatives, as rational beings, seek to maximize the WOUs by selecting those procedures that minimize the time spent. Why? Firstly, the bonus is attractive: 7000 francs is about seven per cent of the operatives' average annual net wage. Secondly, output is the variable that offers operatives the most room for manoeuvre. Finally, output is the parameter on which half of the bonus is based, with the two quality indicators accounting for the rest.

In the phase immediately following the introduction of the productivity bonus scheme, the operatives came close to the output level that entitled them to the maximum bonus: according to the estimates made on the basis of the snapshot observations[8], the gap was + 6.1 per cent. The operatives gave priority to the easiest procedures, those that generated the most 'weighted output units'. Among the corrective procedures, this meant giving priority to single circuit boards rather than whole units, etc. In the case of procedures involving parts with intermittent faults, there is a high risk that operatives will simply label them NTR (nothing to report) after a cursory examination, without carrying out the necessary tests, and that this will have obvious repercussions on the fault recurrence rate (any part labelled NTR is entered in the operating account as one WOU).[9]

This strategy, which was adopted during the first two six-month periods that the productivity bonus scheme was in place (November 1992-October 1993), immediately proved to be 'profitable'. Labour productivity reached a level above that required to produce the volume of output triggering the maximum bonus, as Figure 7 below shows, and the operatives received the full bonus, since debt levels and fault recurrence rates were also good. Having achieved an output figure 11.3 per cent above that triggering the maximum bonus payment, it was rational for operatives to reduce their effort during the third six-month period while at the same time remaining at the maximum bonus level, particularly since a change to the rule had just been introduced. It was now possible to carry over output in excess of the maximum bonus level produced during the winter period (November – April) to the summer period, when there is less work. The idea was to avoid penalizing operatives who had been able to satisfy demand in the winter period but who would not be able to obtain the full bonus[10] if they had less work in summer. This is what happened at the end of April 1994.

Figure 7. EK1 : Evolution of labour productivity and of the minimum and maximum productivity bonus levels



Obviously, the preference for procedures that generated WOUs in a minimal time is not always compatible with quality standards, whether external (fault recurrence rates) or internal

(debt levels). Firstly, a productivist strategy can reduce the reliability of repairs[11], particularly when the equipment is ageing. The fault recurrence rate rises very sharply, which leads to massive indebtedness. Indeed, debt levels and the fault recurrence rate are very closely correlated (the R^2 is 0.55 and the test is significant: Annex C-1b). Secondly, maximization of the WOUs is not necessarily compatible with adherence to the priorities detailed on the *debt sheets*. This may be the second factor that contributed to the massive indebtedness from May 1994 onwards; debts reached an initial peak in October 1995 (Figure 6) and the team found itself in a critical situation. After six months' work in October 1995, it was only 2.6 per cent above the minimum DEC threshold. It was evident that this policy could not be pursued indefinitely: ultimately, it would be the trains that ground to a halt. This is why, from the end of October 1995 onwards, there was a change of direction.

The following section describes the way in which the drive to maximize WOUs came into conflict with output quality, thereby undermining the credibility of the DEC in the eyes of the operatives. It so happened that, during this period (October and November 1995), I was observing operations in several teams, including this one.

3.3. Quality debates and the credibility of the bonus scheme

The context in which the team's results declined in this way was an unfavourable one. The equipment they were dealing with had certain particular weaknesses. Firstly, it belonged to the earliest generation of electronic equipment used on the Metro, which was introduced in 1977. Secondly, the positioning of the racks of printed circuit boards did not allow for the type of maintenance desired by the RATP. When the MF 77 stock was designed, the plan had been to make it possible to withdraw individual circuit boards rather than complete racks for maintenance. The regular withdrawal and follow-up monitoring of all racks were not made any easier by their awkward positioning on the trains. This technical complication explains why little maintenance was carried out in the early years and, as might be expected after 15 years' service, the age of the equipment was beginning to tell against it. Furthermore, it was not unusual for the supply of components to dry up when the manufacturers stopped making certain items because the MF 77 stock was getting old, and the equivalent parts were not always made available in good time by the RATP'S design office. Since they were dealing with rolling stock, the workshops were prohibited from modifying the equipment's frame of reference. The team had been waiting for one type of circuit board for two years, for this reason.

These factors cannot be said to be the primary cause of the decline in the team's results. None of them was new, not even the ageing of the rolling stock, which was an endogenous factor for all the teams. These factors were an integral part of the technological context in which the unit had been operating since its establishment and it had never before encountered serious problems. Thus the hypothesis of an exogenous shock should be discarded. All these factors served rather to aggravate the existing situation.

So what happened? When the bonus scheme was first introduced, the operatives worked to maximize output. While output figures are seldom a matter of dispute,[12] the definition of quality can give rise to disputes on both sides. External quality, for example, is measured on the basis of the fault recurrence rate. Now this rate, which is defined by the ratio of the number of units withdrawn again within six months of repair to the number of units received for repair, contains a bias, since a piece of equipment may be re-installed on a train well after the fateful six months, sometimes as much as two years later. However, this does not prevent the fault recurrence rate being monitored over a given period. The other rule relates to internal quality, measured on the basis of the level of *debts* to the logistics department. In other words, the rule penalizes a team's failure to meet the deadlines laid down in the *debt sheets*. It is not easy to use these criteria in order to define the level of quality to be achieved. For example, operatives knew that some capacitors were reckoned to have reached the end of their useful life after 15 years. Since all the equipment had been in use for more than 15 years, operatives might well have considered it reasonable to take advantage of the repairs being carried out to change the capacitors, albeit at the cost of extending repair times, which would be reflected in *debts* and a lower internal quality grade. It is not a simple matter to decide how far to go in making these changes and where the dividing line between preventive and corrective maintenance lies.

It was around the quality issue that the dispute crystallized. The breakdown of an efficient polishing machine did not encourage operatives to bother about the surface quality of the circuit boards, which consequently remained dirty and oily after being repaired, which gave the impression of slapdash work. In February 1994, when none of the quality indicators had deteriorated, the line operators voiced their dissatisfaction with the quality of the repair work being carried out, which in their view was poor. This led ultimately to the AME management ordering in July 1994 that *one third of all corrective procedures should be supplemented by significant reconditioning work*. This was to involve polishing and cleaning, putting in rivets, changing the transistors on certain boards and the systematic replacement of capacitors. Operatives were to take one circuit board in three withdrawn for corrective maintenance, irrespective of its condition. This very arbitrary rule was intended to prevent work from piling

up, which would inevitably have led to an increase in debt levels. Faced with this criticism, which they considered harsh but justified, the operatives decided not to obey management's instructions to recondition one third of all boards sent for repair but to apply the notion of *total* quality to what they judged to be necessary work. This reaction can be interpreted in two ways. Either the operatives were seeking to highlight the contradictions between quantity and quality inherent in the bonus scheme, or they were trying to maximize the WOUs. If they chose to repair all the units in a magazine rather than just one third, they would be able to record their work not as a single procedure but as a number of separate procedures equal to the number of units in the magazine. Since not all the units in a magazine undergoing *general reconditioning* are faulty, such a strategy is obviously profitable. Although both reactions are compatible, the subsequent unfolding of the episode gives good grounds for believing that it was the desire to highlight the possible conflict between quantity and quality that prevailed.

The total quality approach soon revealed itself incompatible with the quantitative targets laid down in the DEC agreement, since procedure times were doubled.[13] This is why *debt levels* exploded and also explains the poor results recorded by the EK1 team as a whole (2 to 3 per cent of the productivity bonus in September 1994). Faced with this situation, management issued an order in October 1994 that the repair procedures should be scaled down, since it was impossible to allocate the necessary (human) resources to maintain quality levels without increasing debt levels. This order was difficult to interpret and to implement. The supervisor responded by drawing up a list of procedures to be carried out and those to be excluded. On his own initiative, and without consulting the operatives, he drafted a document based on the AME reference manual that also proved difficult to interpret, since it left plenty of scope for the inevitable ambiguities and individual judgement on the part of operatives. This conveyed the impression that there was a contradiction between the requirements of the line operators and those of the AME management and a degree of inconsistency between the pursuit of short-term objectives (elimination of *debts*, reduction in manning levels) and long-term interests (obtaining the resources to carry out technical modifications likely to lessen the impact of recurrent faults, extending the quality and cleanliness standards that had been trialled during the previous period to all circuit boards and to all procedures). Furthermore, in order to deal with the problem of indebtedness (I saw equipment awaiting repair piled up as high as the workshop ceiling, which made the place look as though a bomb had hit it), the supervisor asked the operatives in the unit to work overtime; this request, which was presented as exceptional, seemed to be both absurd, since it was out of proportion to the volume of work to be done, and illegitimate, since the objective was more to meet certain quality requirements than to satisfy any real need from the

line operators. These measures had probably been wrongly interpreted by the operatives, since they involved maintenance procedures whose consequences would mainly be felt in the long term. For these reasons, the operatives refused to cooperate and the work was transferred to another team.

3.4. Towards a strategy of permanent renegotiation of results

During this period, the six-month bonus calculation period was drawing to a close, and management should logically have paid 2.6 per cent of the bonus to operatives who, everyone was agreed, had worked harder than before, despite the poor results. It was the supervisor, again acting alone and against the operatives' advice, who took it upon himself to negotiate the level of the bonus payment with management. The latter embarked upon a process of *debt discharge or neutralization*,[14] which led to the production manager and the supervisor reaching agreement on an amendment to the team contract that made it possible to pay 92 per cent of the bonus. The following commentary can be read on the output chart displayed at the entrance to the team's work area: *'Debts written off for this period because of the MF 77 circuit reconditioning campaign'*. This marked the beginning of the team's policy of systematically negotiating amendments to their DEC contract.

In making such a firm stand and refusing to cooperate with management in restoring the situation to normal (rejection of overtime), the operatives were disputing the overall coherence of a system of incentivizing rules that failed to make the constraints of short-term profitability compatible with the aim of maintaining the rolling stock in good condition over the long term. They were adapting the *exit* strategy as analysed by Hirschman.[15] In making no demands of management, despite the obvious injustice of the situation, the operatives were showing themselves to be wholly disinterested, thereby lending credibility to their decision to adopt a total quality approach. By 'releasing' virtually the whole of the bonus, management, on the other hand, was admitting that there might be a dissocation between output volumes and payment of the bonus. In doing so, it was rejecting an excessively productivist approach to managing the productivity bonus scheme in favour of a more 'social' approach. This decision risked undermining the credibility of the DEC. It was not unusual during this period to hear the operatives saying: *'we'll get the bonus whatever happens'*.

The episode of October and November 1995 seems to have opened the way for a different strategy, which involved bargaining over the results for the six months that had just finished (period t-1) and then using the negotiating results as the basis for calculating the

productivity bonus to be paid in period t. And indeed, EK1 is the team that has concluded that most amendments since the introduction of the productivity bonus scheme, a total of 16 between 1993 and the year 2000, an average of one every six months (cf. Annex C-2). At this stage, there is some value in outlining the various strategies adopted by the teams as reflected in the provisions of the amendments they negotiated. Some of these agreements constitute decisions to revise the rules laid down in the DEC agreement, while others invoke decisions, in the legal sense of the term, that are concrete, categorical and non-permanent. Some of these decisions adjust a team's past results, while others, anticipating poor results in the future, adjust them in t+1, t+2, and so on. Decisions to revise the rules do not have the same implications as decisions to modify the past or the future, particularly when it comes to the degree of credibility attached to the bonus scheme.

These differences, which serve to locate the strategy adopted by EK1, are summarized in Table 7 below. The table is based on an examination of all the amendments concluded in the OF AME, the aim of which was to classify them on the basis of various criteria. What was modified? For what reasons? Who was the team supervisor and the production manager when the amendment was signed? Does the amendment constitute a decision to revise the rule or does it invoke a decision? Does this decision relate to the past or the future? All of this is listed in greater detail in Annexes C-3 and C-4.

Table 7 : Decisions and revisions of rules in amendments to the DEC agreement (1992 – 2000)[16]

	Past	Future	No. of amendments 1992-2000
Teams	No. of decisions adjusting the result of the DEC in t-1, t-2	No. of decisions to revise the rule	
EK1	16	0	16
EK2	4	2	6
EK3	2	5	7
EK4 (from late 1996 to 2000)	2 ½	5 ½	8
Micromechanics	2	5	7
Relays (1992-March 1999)	0	2	2
Total	26 ½	19 ½	46

All the amendments negotiated by EK1 are decisions that modify the results of the previous period, particularly the level of debts, with phrases such as: 'debts must be adjusted as

follows…'. The method involves allowing exceptions to the results that count towards the calculation of the productivity bonus. EK1 is the only team that has more or less systematically modified its actual results; finally, the amendments concluded since 1998 have led to the team being paid the maximum bonus.

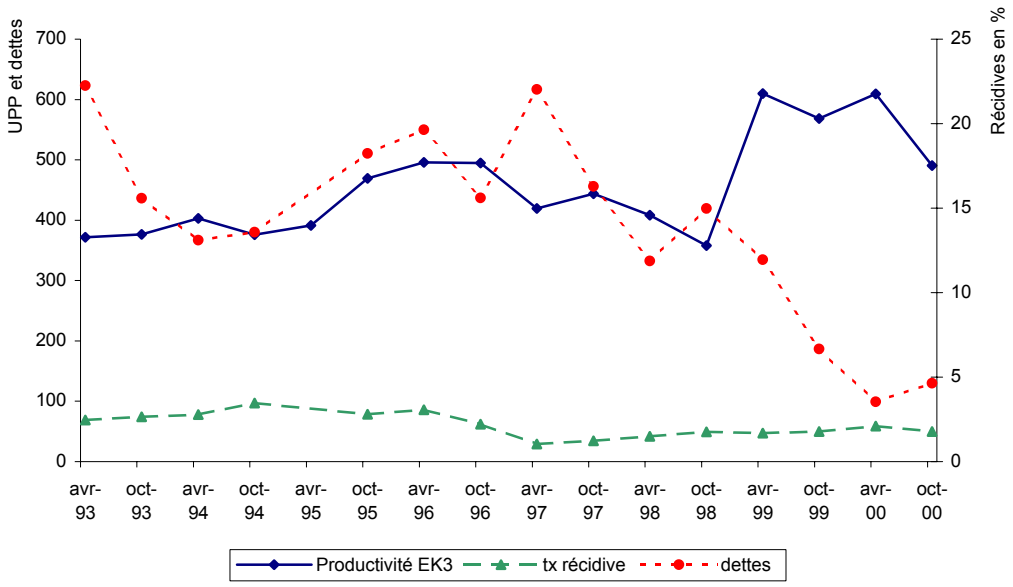
One fundamental and probably unusual conclusion emerges from this analysis: the bonus paid always equates to an actual daily working time of 6 hours 50 minutes but not necessarily to an increase in labour productivity. On the one hand, the negotiation of amendments has the effect of decoupling actual results from the awarding of the bonus, as Figure 8 below shows. Bonus payments have remained fairly stable, always close to the maximum, when compared with the evolution of the various indicators determining them. On the other hand, the DEC, which was initially supposed to be a rule to be applied on the basis of team results, gradually became a negotiable rule. It is the product of a battle of wills between the production manager and the team supervisor. This aspect of the diagnosis will be verified in the other teams.

4. EK3: from maximization of WOUs to the forward-looking management of debt sheets

4.1 Favourable results and maximum bonus payments

EK3 operatives have always obtained the maximum bonus, which reflects the generally positive results they recorded between April 1993 and October 2000. The annual rate of growth in labour productivity is + 3.8 per cent, while debts and fault recurrence rates declined at a rate of – 18.9 per cent and – 4.3 per cent per annum respectively, as Figure 8 shows.

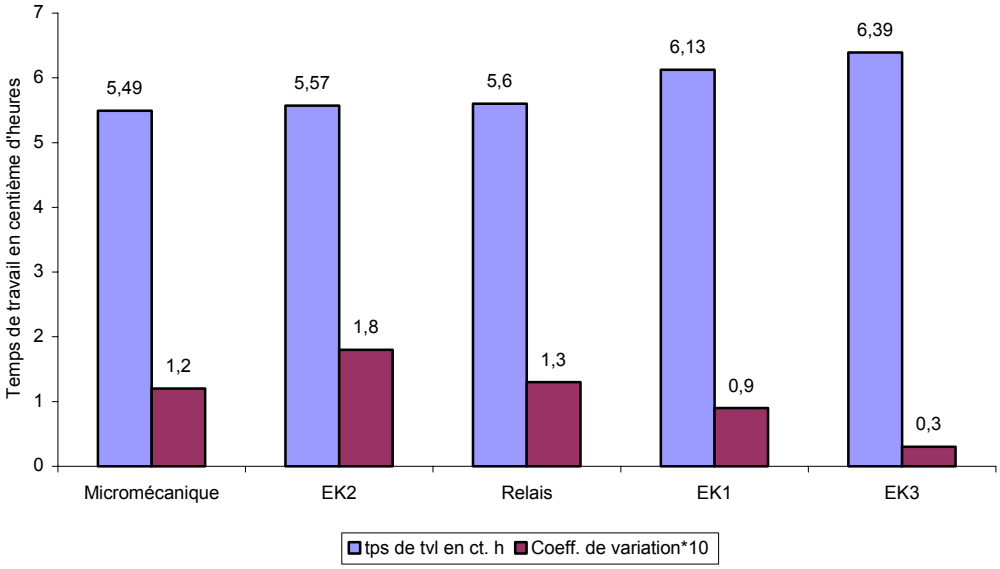
Figure 8. EK3 : Evolution of labour productivity, debt levels and fault recurrence rates (1993-2000)



Note : Debt levels and fault recurrence rates are plotted against the secondary Y axis.

Even before the introduction of the DEC, EK3's labour productivity was very high. In 1991, average working time was estimated at 6.39 hours, whereas the 'standard' working time equating to the output required for payment of the maximum bonus was 6.50 hours (Figure 9).[17] In concrete terms, the operatives had to improve their daily productive effort of 0.11 hours, or about six minutes, in order to obtain 7,000 francs, assuming that the other indicators used to calculate bonus payments were at the maximum level required. Moreover, disparities in working time within the team were low, as is shown by the coefficient of variation for individual working times (0.03 - see Figure 9). This is an indication of a high degree of cohesion within the team, a characteristic that encourages high labour productivity.

Figure 9. Estimation of daily working time per operative and coefficient of variation for individual working times in 1991



Note : in order to improve legibility, the coefficient of variation has been multiplied by 10.

However, these apparently favourable factors do not constitute a guarantee that the maximum bonus will be received over a period of eight years. In order to reconstitute the team's strategies, we need to compare various data, as we did in the case of EK1. Thus statistical analysis, changes to the rules governing the bonus scheme, and in particular changes to the standards for debt levels and fault recurrence rates through the negotiation of amendments to team contracts, together with the management style of the various supervisors who succeeded each other at the head of the team, all have to be taken into account.

Examination of these various elements over the period 1993-2000 reveals a discontinuity in April 1996. On the one hand, this month marked the first time maximum labour productivity was achieved and the last time the maximum fault recurrence rate was recorded. On the other hand, the whole set of rules governing the DEC was beginning to change; in particular, the first amendment to the team contract, the only legal mechanism for modifying the rules governing thresholds, scales and coefficients, was signed in May 1996.[18] Incidentally, EK3 was the only team not to have negotiated an amendment to its contract before 1996.

In reality, closer examination of the content of the amendments shows that the real break occurred in April 1997, since it was from this point onwards that the nature of the amendments began to change following the arrival of a new supervisor. This is why we

hypothesize that a shift in strategy occurred in the second quarter of 1997. Table 8 summarizes the differences in the evolution of the relevant indicators in the various sub-periods.

Table 3. EK3 : Rates of growth in labour productivity, debt levels and fault recurrence rates (1993 – 2000)

Annual rate of productivity growth (April 93 - Oct. 00)	+ 3.8	Annual rate of productivity growth (April 93- April 1997)	+ 3.1	Annual rate of productivity growth (April 97 – Oct.. 00)	+ 4.6
Annual rate of growth in debt levels (April 93 - Oct. 00)	- 18.9	Annual rate of growth in debt levels (April 93 – April 1997)	- 0.25	Annual rate of growth in debt levels (April 97 – Oct.. 00)	- 35.9
Annual rate of growth in the fault recurrence rate (April 93 - Oct. 00)	- 4,3	Annual rate of growth in the fault recurrence rate (April 93 – April 1997)	- 19.5	Annual rate of growth in the fault recurrence rate (April 1997 – Oct. 00)	+ 16.6

4.2. Maximizing the 'weighted output units' (1993-1997)

During this period, there was sustained growth in labour productivity (+ 3.1 per cent) and a very slight decrease in debt levels (- 0.25 per cent). The marked reduction in the fault recurrence rate (- 19.5 per cent) was concentrated into a period of a few months (September 1996-April 1997) and was not sustained beyond that period. However, this rate is very much higher than the level required to obtain the maximum grade (cf. Annex C-6). In reality, labour productivity and debt levels deteriorated over the last six months of this sub-period (October 1996-April 1997), falling below the minimum and maximum DEC thresholds respectively (Figures 10 and 11). This deterioration reveals the limits of a policy of maximizing the 'weighted output units'.

Figure 10. EK3 : Evolution of labour productivity and the minimum and maximum DEC thresholds

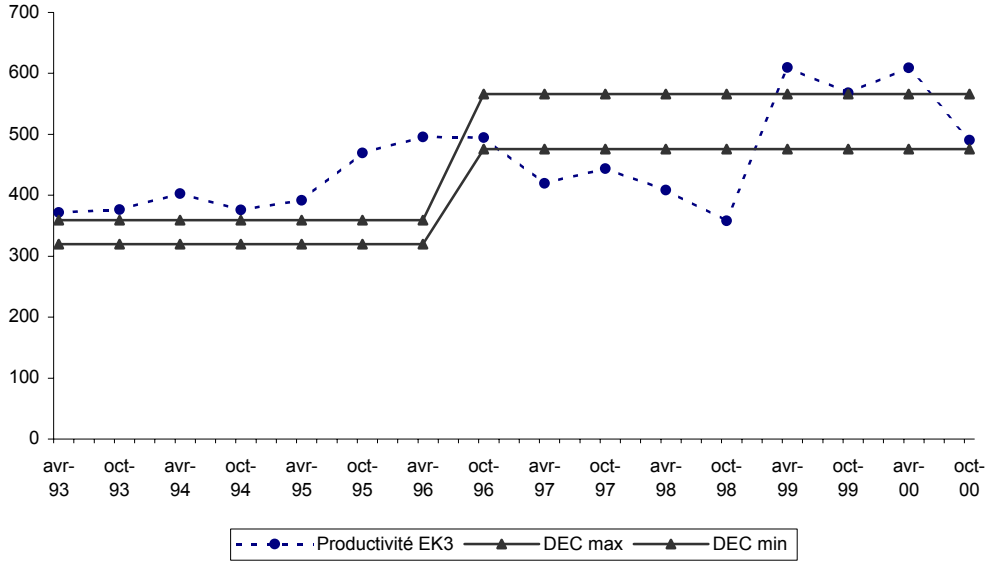
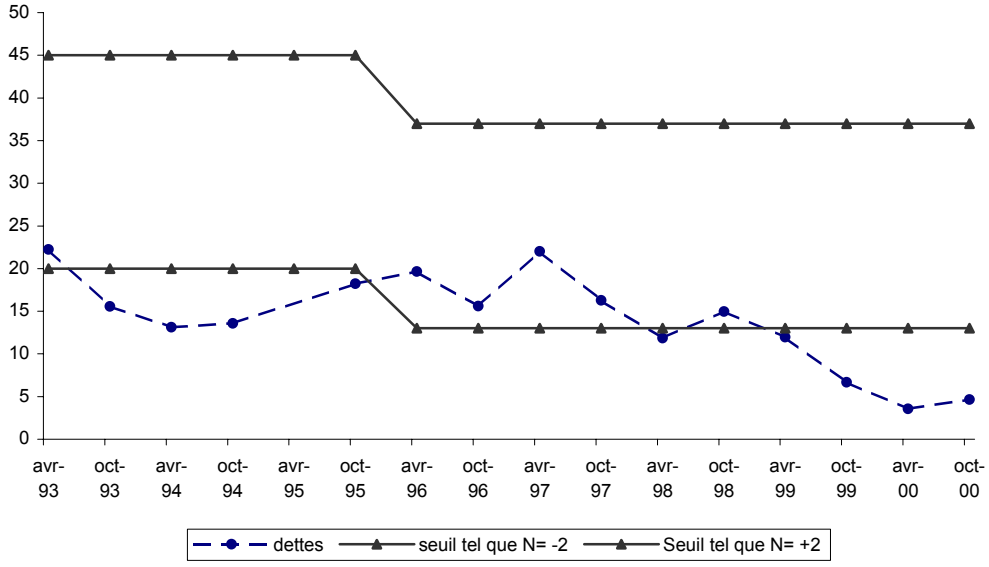


Figure 11. EK3 : Evolution of debt levels and of the minimum and maximum DEC thresholds



At the beginning of the period, when debt levels were declining, productivity was rising slowly; subsequently, the converse was the case. It would seem, therefore, that the operatives were not *continuously* adhering to the priorities imposed by the *debt sheets*, otherwise debt

levels would have declined significantly as labour productivity rose. The operatives selected those procedures that minimized the time spent on each repair, in such a way as to maximize output. They gave priority to the easiest procedures, those that generated the most 'weighted output units': individual circuit boards rather than whole units, and so on.[19] This strategy was a rational one. On the one hand, the productive effort required was minimal – the team was only 1.7 per cent short of the output figure required for payment of the maximum bonus. On the other hand, if the team's output figures exceeded the threshold that triggered the maximum payment, any excess could be carried over to the following period, which was not the case with debts and fault recurrence rates.[20]

It was probably in order to encourage operatives to take action to reduce debt levels that it was decided in February 1996, as management and team supervisors were engaged in the triennial review of the DEC contracts, to apply new, much higher weighting coefficients.[21] These coefficients were applied retrospectively, with effect from May 1995, which enabled the team to exceed the output level triggering the maximum bonus payment while at the same time working to reduce debt levels; some of the parts in question had to undergo *reconditioning* or *general overhaul*, which increased procedure times.

4.3. A shift in strategy: revisions of the rules and the introduction of conditional rules (1997-2000)

The second phase, which lasted from April 1997 until October 2000, saw the emergence of two new characteristics, namely a decline in debt levels (- 35.9 per cent per annum) and a new policy on amendments. Under the influence of a new supervisor, the purpose of the amendments underwent radical change. In contrast to the first two amendments concluded on 9 May 1996 and 17 April 1997, the next five amendments anticipated a future difficulty by introducing rules that were conditional on a particular event, usually relating to the availability of a missing component. The supply problems that began to make themselves felt from 1996 onwards stemmed from the fact that suppliers were working on a just-in-time basis, which extended delivery times from four to six months.[22] The change the supervisor introduced was a fundamental one. Unlike decisions, whose effects make themselves felt in a specific and different way each time and are exhausted once enacted, rules modify the context within which work is organized and the conditions under which the bonus is obtained, thereby opening up a space within which choices can be made.

The aim of the new policy on amendments was to prevent operatives being penalized for organizational shortcomings for which they were not responsible. However, it does not explain the extent to which debt levels declined. At the same time, the supervisor required the operatives to give priority to clients' needs, and in particular to the *debt sheet*, rather than to easy procedures. Finally, he put in place a *predictive maintenance system* based on a detailed analysis of the history of each unit sent for corrective maintenance. As a result, components were replaced before they failed. The data on the damage to each unit gathered in this way could also be used to predict, to some extent, future demand for components so that they could be ordered in advance.

Thus the supervisor's strategy created the conditions under which labour productivity could continue to rise and debt levels could be reduced. Incidentally, there was a negative correlation during this period between labour productivity and debt levels: the R^2 was 0.21, with a significant coefficient (Annex C-7a).

However, in the midst of all these efforts to strike a balance between the rules on quantity and those on quality, the operatives also perhaps managed to extricate themselves from the situation fairly well by concentrating on the debts that were easier to discharge, that is the *non-recurrent faults*, while at the same time fulfilling their responsibilities in respect of the *debt sheet*. Maximizing the productivity bonus was still compatible, if only in the short term, with satisfying client demand. This would be one possible explanation for the negative correlation between debt levels and fault recurrence rates during this period; the R^2 was 0.36, while the sign for the fault recurrence rates is negative (cf. Annex C-7b).

This team adopted a somewhat different strategy from that adopted by EK1. The maximum bonus can never be obtained by recourse to just a single strategy, since each one comes up against the limits imposed by the DEC rule system. The strategy of maximizing labour productivity by concentrating on procedures that take little time comes into conflict with the rule imposed by the debt sheet and telephone calls from the line operators. There was a shift of strategy in order to give priority to clients' needs while at the same time maximizing the productivity bonus, the solution being to concentrate on *debts caused by non-recurrent faults*. The most effective way of achieving the maximum bonus seems to be to find the correct balance between the constraints imposed by the various rules. The supervisor was also obliged to engage in these manoeuvres with the rules. Firstly, in return for the action on debt reduction, he managed to obtain changes to the rules governing the three possible levers: the output weighting coefficient and revisions of the debt schedules and of the fault recurrence rates. Secondly, he innovated by introducing conditional rules. However, the opportunity to make these changes

depended to a large extent on the balance of power between the production manager and the supervisor, and on the latter's credibility. It would seem, therefore, that the team's results reflect a balance between the various rules.

5. The micromechanics team: guaranteeing 50% of the maximum bonus

5.1. Recovery from a critical situation

Of all the teams, it was the micromechanics team that progressed most during the period in question; however, it was also the one that had been in the most difficult situation in the period 1991-92, just before the introduction of the DEC.

All three indicators used to calculate the productivity bonus evolved very positively, making the micromechanics team the best in terms of productivity gains (+ 7.3 per cent per annum) and improvements in work quality: debt levels and the fault recurrence rate declined by – 7.2 per cent and – 23 per cent per annum respectively, as Table 9 shows.

Table 9. Rate of increase in productivity, debt levels and the fault recurrence rate for the teams and AME as a whole (1993 – 2000)

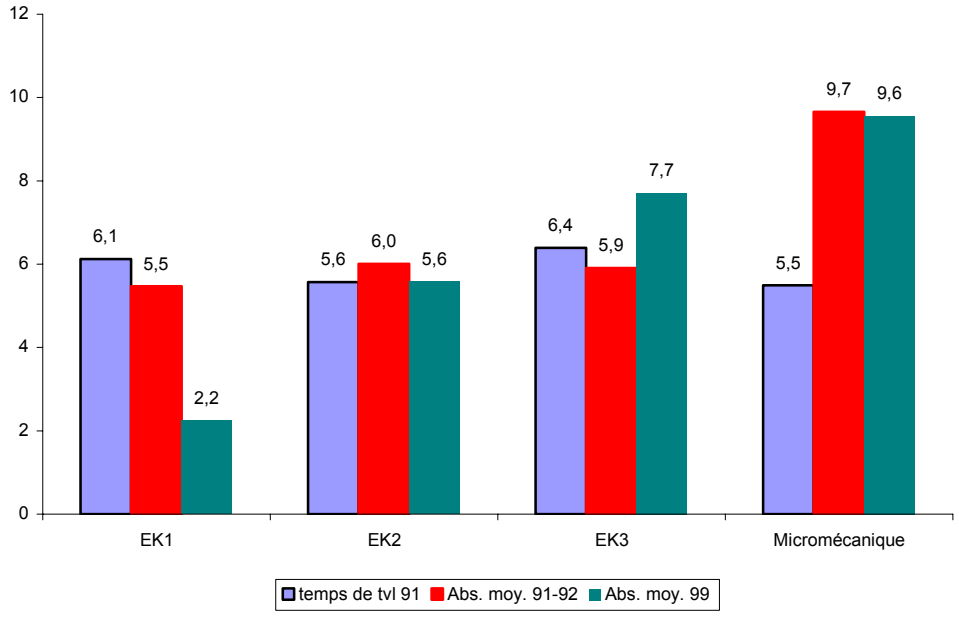
	EK1	EK2	EK3	EK4 (*)	Micromechanics	AME[23]
Annual rate of productivity growth	- 3.65	+ 0.31	+ 3.76	- 2.82	+ 7.79	+ 2.84
Annual rate of growth in debt levels	- 9.39	+ 14.55	- 19.36	+ 30.15	- 6.51	+ 0.40
Annual rate of growth in the fault recurrence rate	- 14.21	- 5.57	- 4.29	+ 14.03	- 21.68	- 12.01

* EK4 has been in existence only since October 1996.

However, the team's progress has to be assessed relative to its initial situation, which in terms of productivity, work quality and employee involvement was particularly critical. Firstly, the micromechanics teams was the one which, on average, had to make the most significant productive effort, since its output figures were no less than 18.5 per cent below the maximum DEC threshold, as Figure 9 shows.[24] Secondly, as far back as November 1992, the team's debt

levels were extremely high: 125 is a record for the period in question (November 1992 – October 2000). This is more than 12 times the debt level (10) that makes teams eligible for the maximum monthly internal quality mark used in calculating the bonus payment.[25] Finally, the level of employee involvement was low. According to the estimates based on the snapshot observations conducted in 1991, actual working time was 5.49 hours, the lowest of all the teams, compared with a standard working time of 6.50 hours. Moreover, absenteeism, measured in terms of the number of days' absence per year due to sickness, was the highest of all the teams, at 9.7 days (Figure 12). Incidentally, there was a negative relationship between actual working time and absenteeism in this team, although it is not possible to infer any correlation between these two variables. The industrial relations climate in this team was undoubtedly difficult, no doubt because of the prospect that most of the operatives, all of whom were clockmakers by trade, would have to retrain as electronics specialists. The micromechanics team was employed to repair the clockwork-driven devices used on the Metro (black boxes, tachographs, etc.), and as early as 1991 it was already known that this equipment was to be replaced by electronic devices.

Figure 12 : Estimated working time in 1991, average absenteeism in 91-92[26] and in 1999



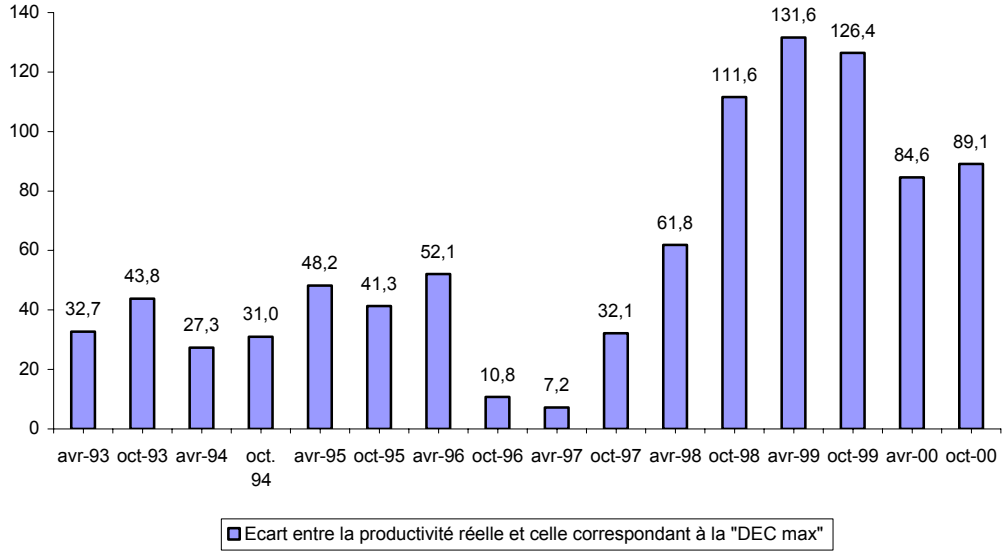
It should be made clear that the micromechanics team is actually engaged in two separate activities: micromechanics in the strict sense of the term and the electronic aspects of

clockwork-driven machinery. Micromechanics accounts for by far the larger share of the team's activities: 89.4 per cent of the WOUs produced on average over the period between November 1992 and October 2000, 91 per cent of debts in April 1995[27] and 95 per cent in October 2000. The average fault recurrence rate for the micromechanics section (4 per cent) is very comparable to that of the team as a whole (3.9 per cent). Calculation of the coefficients of correlation between the team variables and those of the micromechanics section on the basis of the monthly data for the period in question indicates that the structure of the team as a whole is determined by the weight of the micromechanics section. The regression between the team's fault recurrent rate and that of the micromechanics section is high (R^2=0.73). The same applies to debt levels (R^2=0.99) and productivity (R^2=0.92). The full figures are given in Annex C-8. This is why, in the rest of this section, we focus on the team's micromechanical activities.

5.2. Guaranteeing 50 per cent of the DEC through overestimated weighting coefficients

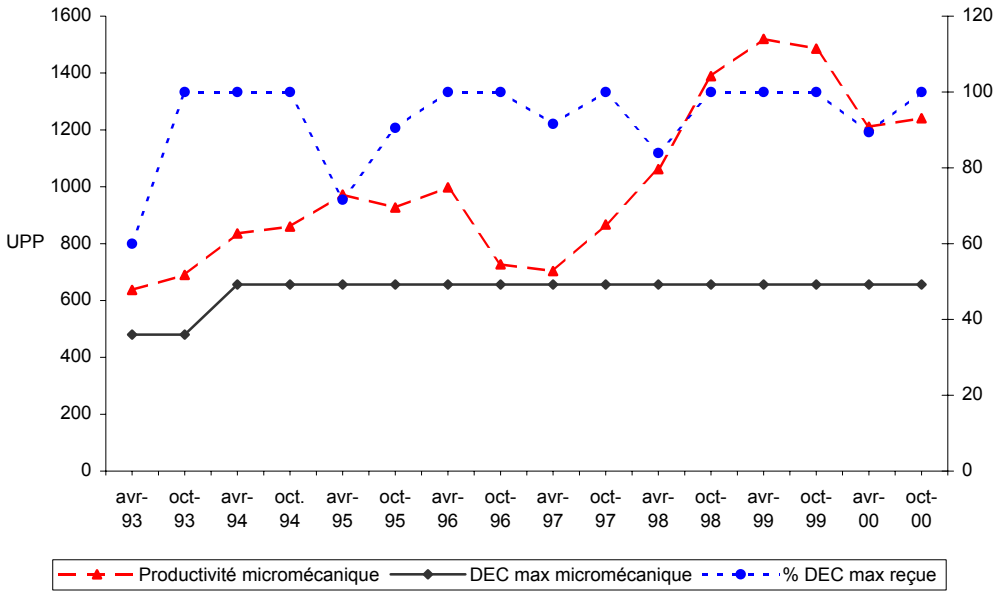
One of the specific characteristics of the micromechanics team, one that is not encountered anywhere else, is that its productivity is well in excess of that required to obtain the maximum bonus, as Figure 13 shows.

Figure 13. The micromechanics team and its productivity margin (in %)



When the DEC was introduced, in April 1993, this gap, known as the productivity margin, was 32.7 per cent. By April 1999, it had reached 132 per cent. The average productivity margin was 58.2 per cent, despite the decrease in the weighting coefficients, to which we will return. Thus the evolution of labour productivity (measured in volume terms – see Figure 14) was such that the team always obtained the 50 per cent of the productivity bonus paid in respect of output.

Figure 14 : The micromechanics team : evolution of productivity relative to the maximum DEC threshold



Note : The line drawn in small dots, which represents the share of the maximum productivity bonus obtained by the team, is plotted against the secondary vertical axis (on the right-hand side).

Undoubtedly, therefore, the micromechanics team made sure it was paid 50% of the maximum bonus by negotiating very high weighting coefficients, for both corrective and preventive maintenance work. When the productivity bonus scheme was introduced, they were 2.5 and 13 respectively; in concrete terms, this means that a preventive procedure generates 13 WOUs or 13 hours' work. As we have already noted, the purpose of the weighting coefficient is to make all procedures comparable and to make one WOU equivalent to one hour's work (cf. Annex C-10: Evolution of the weighting coefficients).

In reality, these coefficients, and those that were applied subsequently, are overestimated. This can be demonstrated by comparing the average number of hours per

corrective or preventive procedures, as declared each month by the supervisor, with the weighting coefficient. The results are shown in Table 10.

Table 10. Operatives' time savings per type of micromechanical procedure (1995 – 2000)

	Average actual time/procedure		Estimated times : coefficients applied		Difference between estimated time and actual time per procedure	
	Average hours per corrective procedure	Average hours per preventive procedure	Corrective coefficient	Preventive coefficient	Time saved per corrective procedure	Time saved per preventive procedure
1995[28]	2.09	6.96	2.5	13	+ 0.41	+ 6.04
1996[29]	2.11	6.59	2.5	13	+ 0.39	+ 6.41
1997	1.64	5.58	1.419	10.361	- 0.22	+ 4.78
1998	1.67	3.55	1.419	10.361	- 0.25	+ 6.81
1999[30]	1.55	3.18	1.419	10.361	- 0.13	+ 7.18
2000	1.45	2.88	1.118	6.482	- 0.33	+ 3.60

For the six years in question here, the average time per preventive procedure (column 3) is considerably less than the theoretical time produced by applying the coefficient, despite its reduction in two successive amendments. Thus the time saved per preventive procedure in 1995 was 6.04 hours or 6.04 WOUs. In the case of corrective procedures, the coefficient tends to be somewhat underestimated (column 6). This is of relatively little importance, since about 85 per cent of the team's work, in terms of the number of procedures, consists of preventive procedures. This overestimation of the coefficients explains why an increase in productivity does nothing to reduce debt levels; this is reflected in statistical terms by the lack of correlation between the two variables.

The micromechanics team is a good illustration of the notion that productivity is a social and collective construction. It is likely that, when the first DEC contract was signed in 1992, the balance of power lay in the team's favour.

5.3. The maximum bonus as a reward for relative rather than absolute results

The following two diagrams show the evolution of the fault recurrence rate and debt levels. The level of fault recurrence (and of debts) corresponding to the maximum score required for payment of the maximum bonus has been plotted for each variable. These diagrams show the

gap between the team's performance and the maximum target. The fault recurrence rate, which was indifferent in April 1993, fairly quickly reached the level equating to the maximum score; on two occasions (in April 1993 and April 1995), it was this rate that explained why the team failed to obtain the maximum bonus (Figure 15).

Figure 15 : The micromechancis team : Evolution of the fault recurrence rate relative to the maximum DEC threshold

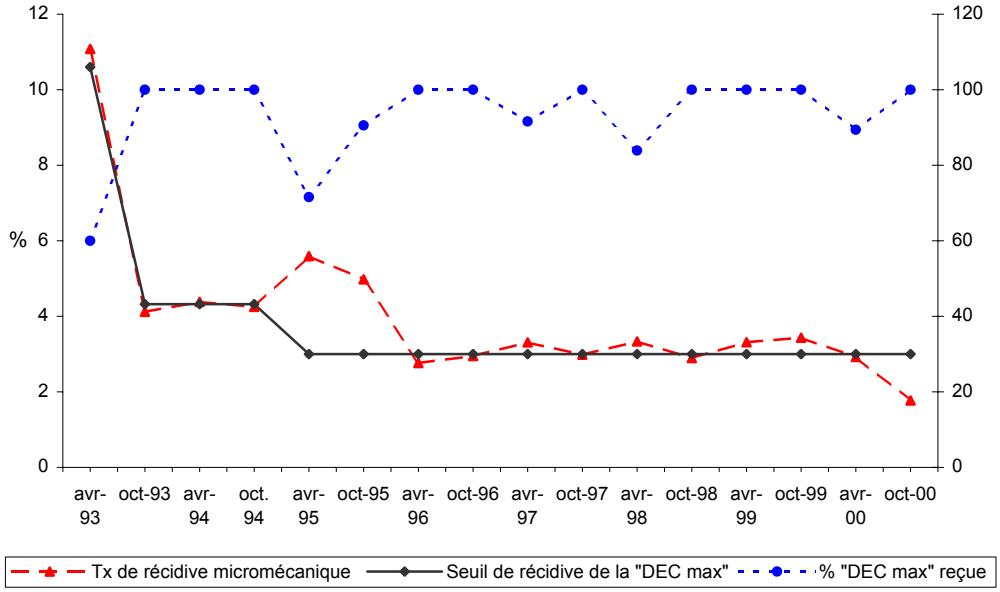
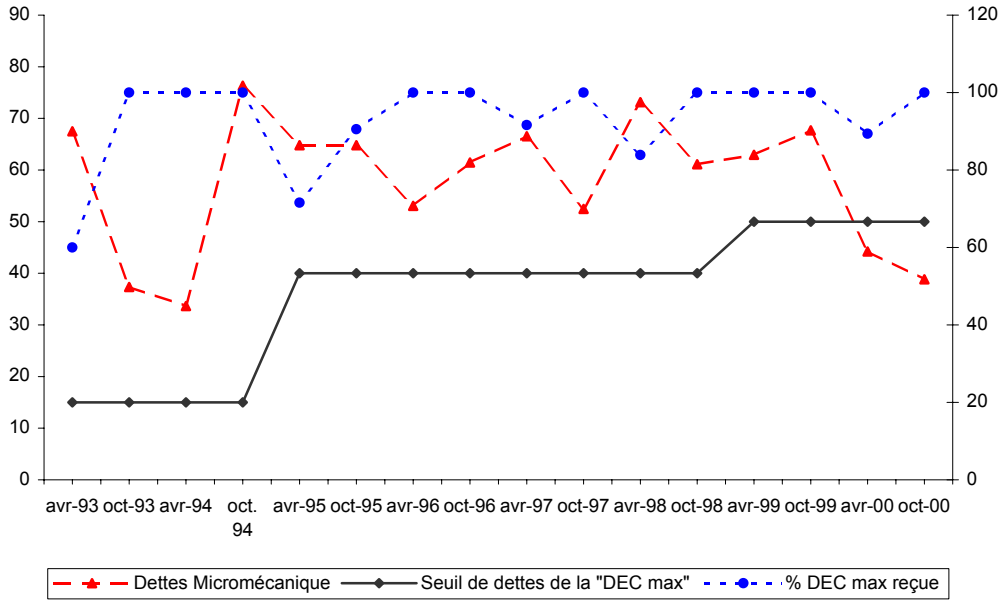


Figure 16. The micromechanics team : the evolution of debt levels relative to the maximum DEC threshold



Note : The line drawn in small dots, which represents the proportion of the maximum productivity bonus obtained by the team, is plotted against the secondary vertical axis (on the right-hand side).

The operatives obtained the maximum bonus when they showed they had made an effort, particularly to improve debt levels, and not when they reached the absolute level required. On virtually every occasion, that is with the exception of the April 1993 and April 1995 payments, the team received the full bonus when the level of debt declined; conversely, the team obtained less than the maximum bonus whenever the debt level worsened. However, on no occasion did the team reach the minimum debt level required. This clearly shows that interpretation of the DEC varies according to the relations established between the supervisor and the production manager and each team's economic history (its initial level and its specific difficulties). In the case of the micromechanics team, it would seem that account was taken in managing the bonus scheme of the need to retrain operatives in electronics and of the deterioration in the industrial relations climate arising out of the clockmakers' attachment to their trade. As far as the micromechanics team is concerned, the DEC can be said to be an instrument for improving the performance of a team in difficulty; it functions well as an incentive mechanism while at the same being sufficiently flexible for specific economic and industrial relations constraints to be taken into account.

Conclusion

At the heart of this chapter lies the notion that there is no sense in seeking to explain how rules operate without at the same time investigating how individuals or groups act upon them. Three conclusions can be drawn from a comparison of the teams' performance as measured in statistical terms with the amendments to the team contracts, the triennial reviews of the contracts and the percentage of the bonus obtained. Firstly, there is a dissociation between productivity gains and payment of the bonus, since operatives can obtain the maximum payment without their productivity figures being at the required level. Secondly, the DEC productivity bonus scheme has not fulfilled all the objectives its advocates were initially seeking, since there has been a marked slowdown in labour productivity growth since 1992, although it cannot be proved that the introduction of the DEC is one of the reasons for this. Thirdly, the teams adopted different strategies in order to maximise their bonus payments.

The first finding – that of a dissociation between the teams' actual performance and payment of the maximum bonus – means that *labour productivity is the result of a collectively formulated plan*. This policy started in November 1994 at the time of the dispute within team EK1. In retrospect, it would seem that it was the first step towards a *social approach to the management* of the DEC bonus scheme, an approach that that spread gradually and unevenly within the AME over the course of the following year. A proliferation of amendments to team contracts and changes to the weighting coefficients are the main instruments used in this social management of the DEC, even though the latter were conceived and deployed as a means of preventing teams from being penalized by exogenous shocks for which operatives are not themselves responsible (technical problems, difficulties in obtaining the components required for repairs, and so on). Thus the supervisors use the results produced by application of the rules as a basis for renegotiating their teams' contracts and putting forward amendments of their own. Among the variables that are the object of negotiation, the one that directly affects productivity levels (upwards or downwards) is the weighting coefficient. In effect, the level of the coefficient depends on the supervisor's ability to justify his request for change, and hence on the balance of power between management and supervisor. This brings us to the second finding.

To state, as we have done, that productivity is a construct does not mean that it might be arbitrary. We cannot embark here on an exhaustive analysis of the determinants of labour productivity, but it would appear that one factor in particular has played an important role in the slowdown in productivity since 1992. This is the contradiction, most evident in the performance of EK1, between the DEC's quantitative and qualitative targets. We have argued that this

contradiction explains the decline in this team's productivity (- 6 per cent per annum between 1992 and 1995). In the case of the relays team, the collapse of its labour productivity (- 9.8 per cent per annum) seems due to ideological reservations about the notion of productivity gains, which allegedly create unemployment. From a statistical point of view, these two poor results are sufficient to explain the stagnation of productivity in the AME during this period (+ 1.2 per cent per annum), given the disproportionate weight of these two teams within the workshop as a whole (cf. Annex C-11).

And now to the third finding. In their attempts to maximize bonus payments, the teams adopted different strategies. This is reflected in differences in their performance in respect of productivity gains, improvements in work quality and group dynamics. It is this finding that persuades us to contradict the majority of economists and argue that the same rule produces non-identical effects. This finding undermines the hypothesis that, by virtue of their homogenizing effect on behaviour, rules are one of the possible bridges between the micro and macroeconomic levels. We have shown that, on the contrary, the DEC and the rule system of which it is part produce heterogeneity. There is one fundamental reason for this, namely that the operatives make specific choices, taking into account factors such as their work organization habits, the strength of their involvement in their work, the degree of cohesion within the group, the amount of shared knowledge and their relations with the team supervisor. This latter also has a strategy to implement, based on his approach to managing the productivity bonus scheme. All this, and many other aspects as well, can be summarized in the term 'team style'. This 'style' exists only as a collective phenomenon and cannot be reduced to individual behaviours or characteristics. The rules have different effects depending on the characteristics of the groups to which they are applied. This shows clearly that the knowledge held by those at whom rules are directed is an essential factor that economists should take into account in evaluating the consequences of rules once they are applied.

The rules governing the bonus scheme produce heterogeneity in those situations in which incentive theory assumes homogeneity of behaviour and strategy. Moreover, the thresholds and coefficients changed in the course of the period under investigation. *Clearly, therefore, we can say that the DEC is in a state of constant evolution but not that the rule in question is no longer the same rule*. This characteristic of rules is not taken into account in models of incentive systems.

Taken as a whole, these findings show that, while individuals may follow a set of rules (Chapter 4), they also act according to the rules, to adopt a distinction drawn by Evelyne Serverin (2000).[31] In this case, '*acting according to the rules*' means that supervisors and

management engage in the task of interpreting past results as well as the conditions under which results can be obtained in future. This exercise in interpretation finds its concrete form in the bargaining process. The purpose of such an exercise varies from team to team. In his *Essay on the Theory of Science*, Max Weber[32] saw this as the reason for the diversity of outcomes produced by the same rule: *'Le sens d'un règlement établi, et par conséquent l'activité propre qu'un individu se propose d'accomplir ainsi que celle qu'il attend des autres, peuvent avoir été compris et avoir été interprétés par la suite différemment par chacun des individus socialisés, de sorte qu'une activité orientée en conformité subjective à un règlement (auquel les membres attribuent subjectivement une signification qu'ils croient identique) ne conduit pas nécessairement dans les mêmes situations, à une activité objectivement similaire.* ' (p. 324)

The following chapter draws together the lessons of the various empirical analyses with a view to developing a practical theory of rules based essentially on the links between rules, routines and habitus.

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[1] As we will see, the allusion here is to amendments to the team contracts and to changes in the weighting coefficients.

[2] Productivity in value terms is defined by the following ratio: WOU for the entire Saint-Ouen site/average annual size of workforce. As is clear from Figure 1, the evolution of productivity in value terms is much the same as that of productivity measured in volume terms.

[3] Météor is an entirely automatic Metro line.

[4] Except in the micromechanics team. However, we will examine later the role played by the weighting coefficients in making this team comparable with the others.

[5] There are four technological generations.

[6] In this chapter, the percentage of the bonus always refers to the maximum bonus.

[7] The calculations are based on half-yearly series.

[8] Cf. Figure 4, Chapter 4.

[9] The question of the NTRs was mentioned several times by the operatives during the interviews conducted in 1993.

[10] The carry-over rule does not apply from summer to winter.

[11] By regressing debt levels against the fault recurrence rate, we found an R^2 of 0.14 and a significant coefficient for the 1993-95 period only. This result has to be considered not as proof but rather as an indication of a link between the productivist strategy and the deterioration of the fault recurrence rate. In order to obtain proof, we would have to examine the time spent on the various procedures by category of equipment.

[12] Unless an error is made in entering the procedures carried out into the computer system (which did happen in the relays team).

[13] If the operatives had obeyed the 'one-third rule' while retaining 'normal' quality standards, procedure times would also have risen appreciably.

[14] These are the terms used by management.

[15] A. Hirschman (1970), *Exit, Voice, Loyalty*, Cambridge, Mass., Harvard University Press.

[16] The fractions in this table may seem surprising ; in reality, for those amendments that have two sections, one relating to the past and the other to the future, we have allocated a weighting equal to ½ to each configuration.

[17] See Chapter 3 for a summary of the equivalences between working time and labour productivity.

[18] See Annex 5 on the content of the amendments to the EK3 contract.

[19] The supervisor who was in charge of the team agrees with this diagnosis.

[20] The carry-over rule was introduced very soon after the DEC agreement in order to stop operatives being penalized by a decrease in workloads during the summer. Fewer trains run in summer than in winter, when the effects of bad weather also make themselves felt. This is why excess production can be carried over from winter to summer but not vice versa.

[21] The coefficients rose from 0.87 to 1.01 (BPU1), from 1.06 to 1.48 (BPU2) and from 0.57 to 0.77 (BPU3).

[22] Discussion with the supervisor in charge of this team.

[23] For AME as a whole, the fault recurrence rate is the average of the rates for the individual teams. The 2.84 per cent relates to all the productive teams in the AME.

[24] Cf. section 3 of the present chapter, which focuses on team EK3.

[25] Each of the monthly qualitative results (debt level and fault recurrence rate) is reflected in the award of a monthly mark ranging between – 2 and + 2. At the end of each six-month period, the marks awarded for debt levels and fault recurrence rates are summed to give the overall quality mark.

[26] We have used the average absenteeism rate in 1991 and 1992 because the figures for the micromechanics team differ too much from one year to the next.

[27] The debts for the micromechanics and electronics sections are counted separately from November 1994 onwards; for the period 1993-95, I have assumed that the debts incurred by the micromechanical activities were equivalent to the debts for the team as a whole.

[28] The coefficients 2.5 and 13 had been applied since the introduction of the DEC. Cf. Amendment no1 of 7/12/ 1993.

[29] The coefficient changed in May 1996 and was applied with effect from the May-October 1996 bonus calculation period. Decision of 3/7/96.

[30] The coefficient changed at the end of October 1999 and was applied with effect from the November 1999 - April 2000 bonus calculation period.

[31] Serverin (2000), in E. Serverin and A. Berthould (Eds.): 209-235.

[32] I am grateful to Evelyne Serverin for having reintroduced me to Max Weber.