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Following the High Road or Not: What Does It Imply for Firms As to WTR Implementation

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Following the High Road or not: what does it imply for firms as to WTR implementation?

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Abstract

This paper aims at studying in what extend the fact a firm competes on quality of goods or on cost reduction could help or not in implementing the French 35 hour work week. To that purpose, we use both the COI ("Changements Organisationnels et l'Informatisation", 1997) survey and Robien, Aubry I and II administrative surveys on Working Time Reduction (WTR) agreements. We consider a three level strategy indicator for the firm (namely : High Road, Medium or Low Road companies) and we implement local polynomial matching estimators. As a first attempt, considering the results provided by the local linear estimator, we show that Low Road firms, which employ workers with smaller wages, would have implemented later a WTR. High Road companies would have committed more often on job creations, but less often on 10 percent WTR.

Keywords: firm strategy, mandatory working time reduction, selection bias, mutiple average treatment effects.
***JEL* Classification:** C14, C52, J38, L10.

1 Introduction

Since the implementation of the Robien, Aubry I and II laws to reduce the mandatory weekly hours of work, a lot of studies, either theoretical (Fitzgerald [1998], Fitzroy et al. [2002], Marimon and Zilibotti [1999], Rocheteau [2000],...) or empirical ones (Bunel [2002], Bunel and Jugnot [2003], Crépon et al. [2004], Fiole et al. [2000], Fiole and Roger [2002],...) were led to quantify the impact of a working time reduction (WTR) on job creations and / or on unemployment reduction through work sharing. Fewer aimed at studying the link between the labour organization within the firm and the implementation of a WTR.

However, and on the one hand, according to Aubry I and II laws in particular, firms were allowed to bargain WTR together with possible labour reorganizations

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(like for example the annualization of the hours of work; modulations) in order to facilitate the WTR implementation, since firms could accept reducing working time with full wage compensation in exchange of more flexibility, from an organizational point of view. Moreover, they could benefit from incentives (reduction in employer social contributions) as they implement earlier a WTR. On the other hand, the organization of the work in the firm before turning to WTR could influence the way the firm implements this last one: through a general equilibrium model including a negociation on both the intensity of the work and weekly hours of work, Askenazy [2001] concludes that i) firms who implement the first a WTR are those for which the cost of reducing the working time is the lowest; ii) those firms would appear to be companies that make use of the so-called "*innovative work practices*" (or "high performance" devices such as Just In Time (JIT), Total Quality Management (TQM) and People Involvment (PI) around the classification proposed by Hall [1987]) before implementing a WTR; iii) consequently, firms benefiting from incentives would be those using such practices. In an empirical analysis, looking for determinants of implementing a WTR together with "modulation-annualization" device, Bunel [2001] found that firms who went into that direction were those who already made use of such devices before turning to reducing working time. Some times later, Askenazy [2002] tries to put evidence on his previous theoretical results: working with the REPONSE98 database, and considering single "innovative practices", he finds some effects of having adopted some practices on the fact the firm decided to implement 35-hour work week: a positive one for Just In Time and a negative one for Total Quality Management, confirming thus the results and predictions obtained by earlier studies, such as that of Aucouturier et al. [1999], who share and try to check the same idea. Nevertheless, in the two papers, results are often found to be non significant, either because they rely on preliminary data bases, or because of there exists a high correlation between these practices. To overcome such troubles, using the fact that employees find their firms reorganized as soon as they make use of more organizational devices (see Greenan and Mairesse [1999, 2001, 2002]), following in this way Janod and Saint-Martin [2003], Osterman [1994], Gilles [2004] considered as an indicator of innovating the number of organizational devices in use within the firm. His study leads to the result that innovating firms before the implementation of WTR, which could also be seen as the more constrained firms, tend to implement earlier a WTR and to commit more often on job creations. However, such an approach does not allow to distinguish reorganization changes and to classify them.

An alternative approach is to look at the organization type of the firm before implementing WTR. Indeed, we consider the strategy followed by the firm, either competing on the quality of good or on cost reduction, the so-called "High Road" or "Low Road" strategies (see Piore and Sabel [1984]). In this paper, we try to evaluate the impact of firm strategies before implementing a WTR device on the way the company will implement it, that is: when does the firm adopt a WTR? Does it commit more often on job creations? Following the definition given in Jones et al. [2002], we consider a firm strategy may be of three types, either being a high, a medium or a low road one, depending on the combination of organizational practices the company

makes use of. We merge both COI ("Changements Organisationnels et l'Informatisation", 1997) survey dealing with the Organizational and Computerization Changes within the firm and the Robien and Aubry WTR administrative survey's agreements. Using our strategy indicator, we estimate a mutinomial logistic model to characterize, thanks to organizational features and other characteristics, the probability for a firm to follow of one of the three strategies before adopting a WTR. Then, implementing two of the local polynomial matching estimators (Nadaraya-Watson and the Local Linear ones – Heckman, Ichimura and Todd [1998a, b]) in the particular framework of multiple treatment evaluation, we evaluate pairwise and aggregate average treatment effects. On the basis of the local linear results (which may be more reliable than those of the local constant one through its statistical properties), our main result is the following: high road firms – which employs workers with higher wages – tend to i) implement earlier a WTR device, ii) wait fewer time between signing the agreement and implementing the WTR, iii) commit more often on job creations (and on more if we look at the number of jobs to be created), but iv) commit less often on a 10 percent WTR. If we also take care of the Nadaraya Watson estimates, we still have that such firms commit more often on job creations rather than on job preservations.

2 Firm strategy and WTR

2.1 A synthetic indicator

In fact, as to *strategy*, some companies compete more on the quality of goods, variety and services: those firms are said to follow the "high road"; other go rather competing on the basis of cost reduction and follow the "low road" (see for example Piore and Sabel [1984]). The assumption that is made concerning these strategy aspects is that the former favours the labour factor allowing workers to have more responsibilities within the firm (via encouraging team initiatives (self-directed teams, problem solving groups)) and to be more involved into the establishment management (weekly or monthly employee meetings where Chef Executive Officer and Human Resource Manager meet their employees) for instance. This implies in general more generous employment conditions (higher wages, profit sharing schemes, individual incentives bonus on the firm profitability), at least to promote job retention or reduce turnover. Moreover, employees of those firms gravitating to a "high road" tend to be more concerned with skill than those of other establishments.

Considering those aspects, Jones et al. [2002] aim at describing such firms strategy. Indeed, the authors distinguish such firms in several ways. One of those is considering organizational devices, namely those around the classification proposed by Hall [1987] :

- Quality Devices, whose purpose is to improve production process and the quality of goods ;
- People Involvment devices, whose purpose is to increase the autonomy of the work within the firm ;

- Just In Time Devices, whose purpose is to better adjust production to demand variability, to minimize stocks.

Jones et al. [2002] define a high road firm as one company that makes use of at least one of the two first quoted types of considered devices, a medium road firm as a unit that use one of the two first devices and low road firms as those remaining elements[1]. By now, we begin exploring that definition using the COI ("Changements Organisationnels et l'Informatisation") survey. This database is a coupled employer / employee survey containing information on organizational structure and computerization of the firm (see Greenan and Hamon-Cholet [2001], and appendix 2). It also provides us information on the three different types of devices. We classify them as follows : i) Quality devices: the firm makes use of ISO norms, TPM (total productive maintenance) or functional analysis / "analyse fonctionnelle" (AMDEC); ii) People Involvment: in the firm, at least 10 percent of the employes take part to Autonomous Work Teams, Problem Solving Group or to Project Teams[2]; iii) Just in Time Devices: just in time delivery or production devices. As a field of study, we distinguish all manufacturing industries, including the agricultural and food ones. We merge at a firm level this survey to administrative WTR Robien, Aubry I and II (2003 version) agreements files.

2.2 Reducing working time within those firms

Our first remark concerns the different types of WTR firms we consider here. Indeed, we distinguish 5 types of firms, following that they have already or not implemented a WTR. Among the first quoted, four different WTR types are considered: Robien and Aubry I firms benefit from incentives and also from structural help; Aubry II firms benefit only from structural help[3]. The last type includes all firms who anticipate the mandatory working time reduction (i.e. implementing WTR before January, 1^{st} 2000 for firms with more than 20 workers, and 2002 for others) but who do not benefit from incentives because they didn't commit on a sufficiently large WTR or on enough job creations / preservations, or simply because they didn't have asked for. These are what is named Aubry II precursors.

Table 1 shows us that High Road firms tend to be the most numerous to have already implemented a WTR and Low Road companies seem to be fewer than Medium Road ones to have already adopted a WTR. Looking further at WTR devices, difference are not so clear-cut: there are more Aubry I firms among Low Road firms than among other, more Aubry II precursors among High Road firms and more Robien

[1] At the moment, we'll cope with that simple combination of organizational devices. Further research will be aiming at better defining such firms, through the information given by firms or by employees.

[2] In this organizational category, note that we could also include the reduction in the number of hierarchical levels and the increase in the number of tasks of the production worker between 1994 and 1997.

[3] From January 1^{st} 2000 for companies employing more than 20 workers and from January 1^{st} 2002 for others. This help is given under the form of a decrease in the employer' social contributions. See Appendix 1 and Bunel [2003], Pham [2002, 2003] and Passeron [2000].

Table 1: **WTR device choosen by companies, following the strategy she implements before turning to a shorter work week.**

Strategy/Device	No WTR yet	Robien	AubryI	AubryII prec.[e]	AubryII
High Road	31.53[a]	6.03[d]	21.23	17.52	55.22
Medium Road	40.39[b]	6.32[d]	26.29	10.57	56.82
Low Road	46.92[c]	4.07[d]	32.92	8.14	54.87

Note : [a,b,c]In percentage of High (respectively of Medium ; respectively of Low) Road firms coming from full COI survey. [d]In percentage of firms that have already implemented a WTR. [e]Aubry II precursor companies. The three rows sum to one only for the four last columns.

Sources : Author's results based on the merge of the COI survey (manufacturing industries) and administrative surveys of Robien, Aubry I and II agreements.

firms among Medium Road companies. To get a more precise information, we build some continuous variables (expressed in years) to measure the WTR date of implementation of all firms: i) the date at which the WTR agreement was signed and ii) the WTR has been implemented within the company, both relatively to Robien law enforcement date (i.e., June $11^{th}1996$). Looking at those variables, distinguishing between strategies, we see that High Road firms tend to have implemented a WTR before all other firms, and before Low Road ones in particular (two months before - $(3.92 - 3.76) \times 12 = 2$, against fewer than one month $(3.83 - 3.76) \times 12 = 1$ as to Medium Road firms. As we consider the date the agreements were signed, differences are much more smaller. The delay between the two dates goes from two months (0.18 year) for High Road firms to three months and a half for Low Road ones, indicating perhaps for the first quoted a smaller delay to reorganize after implementing working time reduction[4]. Concerning job creation commitments, High Road firms commit more often on job creations than other firms (63.57 percent against 61.52 (Medium Road) and 56.84 (Low Road)), whereas Low Road firms tend to commit more often on anything or to commit on job preservations only (25.89 percent of the concerned companies). Finally, Low Road units tend to commit more frequently on a 10 or a 15 percent WTR[5].

Finally, it seems that firms which use more complicated organization forms would have more benefited from the WTR implementation, this even if they benefit less often from incentives. Nevertheless, a lot of organizational constraints and other individual caracteristics of firms may influence both the fact they are of a High, a Medium or of a Low Road type and the fact they implement earlier a WTR, commit

[4]Note that this delay could also represent an administrative delay, i.e. could be implied by the due to time delay for the Government to agree after the agreement was signed.

[5]Note that firms could commit on both WTR widths, following the workers are concerned or not with one of the two work week length.

Table 2: **Information about working time following the company has ex-ante choosen to follow a High, Medium or Low Road strategy.**

WTR Variable / Strategy	High Road	Medium Road	Low Road
Recalling:			
WTR adoption before May 2003	68.47[a]	59.41	53.08
Date of implementation[b]:			
Between 0 and 3 years	13.92[a]	13.46	11.22
Between 3 and 4 years	50.00	47.88	49.32
More than 4 years	36.08	38.66	39.46
Mean delay	3.76[d]	3.83	3.92
Agreement's date[c]:			
Between 0 and 3 years	21.00[a]	21.95	22.44
Between 3 and 4 years	47.33	46.07	47.97
More than 4 years	31.67	31.98	29.59
Mean delay	3.58[d]	3.60	3.62
Delay between both:	0.18[d]	0.24	0.30
Commitment on WTR Size:			
10%	27.73[a]	33.51	37.11
15%	0.70	0.72	1.11
Kind of agreement:			
Job creations	63.57[a]	61.52	56.84
Job preservations	19.37	21.50	25.89
Job creations and preservations	8.24	5.06	5.18
No commitment	8.82	11.92	12.08
Summary and correction :			
Offensive[e]	71.81[a]	66.58	62.02
Other (preservation only or no promise))	28.19	33.42	37.98
Mean forecasted job creations:	13.56[e]	7.17	3.73

Note : [a]Percentage of high (respectively of medium, of low) road companies.[b],[c]Day of WTR implementation (respectively of agreement) relative to the day law Robien was enforced (june 11^{th} 1996).[d]In years after the agreements were signed (resp. after WTR was implemented).[e]Number of forecasted job creations.

Sources : Author's results based on Manufacturing part of COI survey and on administrative surveys of Robien and Aubry agreements.

more often and on more job creations.

2.3 Characterizing firm strategy choice

Therefore, our goal is to attempt at studying to what the extent determinants for the firm strategy also explain differences in WTR features as we distinguish between the three types of companies. In Tables 3 and 4, we present potential determinants for both types of variables.

The first group of variables we study are those dealing with the *competitive strategy and the market environment* of the firm. Through the question "what are the factors which are rather to very important in the firm strategy?", the COI survey may allow us to justify our definition of the firm strategy: cost reduction appears to be a major goal for almost all of both of the company types, even at most for High Road ones; so does quality improvment of goods. The factors that allow to differentiate at most High Road from Medium or Low Road strategies are "New products" and "New production processes". Concerning *markets constraints*, we see that High Road firms seem to face more often Client constraints, which may not be a surprise, because they compete on the quality of goods, and hence put a lot of attention on the relations to the client (even sometimes using just in time and not only quality and people involllvment devices). To answer to the expectations of clients, High Road firms have to look at demand variability, as well as at market competition. That's certainly why a higher market competition is more quoted by such firms, as well as the fact they seem to adjust more frequently production to the demand in a random manner (86.55 percent against 81.93 percent (respectively 73.74%) for Medium Road ones (respectively for Low Road ones). On the contrary, Low Road firms seem to suffer relatively more often from market uncertainty, provider constraints and adjust more often their production to an expected demand of goods (57.95 percent against 51.04 for High Road and 56.19 for Medium Road companies). Turning to the ways used to adjust production, High Road firms differ from other units particularly relatively to the fact they use much more often temporary labour force and part time work. Finally, as to time constraints, Low Road units work more often on sunday and less on saturday or by night than other types of firms.

Refering to *more individual characteristics* (Table 4), we see that companies employing a smaller number of people are more often classified among High Road or Medium Road firms and the employment level within a High Road unit is twice as large as that of a Medium Road firm. Highly related to the firm size, the fact the company is part of a wider organization should provide to it a greater information and financial ressources to implement such a high road strategy (only 19.31 percent of the High Road firms are independant units). Otherwise, as to the economic sector to which the firm belongs to, Table 4 suggests that relatively to other firm types, Medium Road companies are more often found among food industries, Low Road industries among consumption good industries and High Road ones among car industries or intermediary good sectors.

The last variable deals with caracteristics that should more accompany the adoption by a firm of a single strategy than simply cause it, particularly in the case of

Table 3: **Organizational features of companies following she decide to follow a High, a Medium or a Low Road strategy before having implemented a working time reduction (before May 2003). Part 1.**

Features /Strategy	High Road	Medium Road	Low Road
Number of employed people in 1997[a]*:*	794,04	303.27	151.65
Determinant factors of firm strategy:			
New products	85.38[b]	79.49	72.50
Product differenciation	74.94	69.38	64.49
Quality improvement	98.14	96.75	91.99
New production processes	86.19	81.57	68.43
Cost reduction	97.80[a]	96.84	94.70
Organizational constraints:			
Higher market competition	81.55[b]	78.23	74.11
Market uncertainty	59.28	60.79	62.15
Client constraints	79.23	80.13	73.86
Provider constraints	18.79	21.23	22.56
Administrative constraints	37.59	42.64	42.54
Shareholding	29.35	20.33	16.77
Other (merge...)	34.45	23.13	16.52
WTR in 1997:	12.76[b]	12.29	8.88
Equipment Use also :			
By night	72.39[b]	57.90	36.51
On Saturday	72.16	60.25	40.69
On Sunday	75.06	74.53	84.71
Production adjustment to demand:	96.17	94.58	92.36
Random adjustment	86.43[b]	81.93	73.74
Expected adjustment	51.04	56.19	57.95
Ways used to adjust production:			
Overtime	71.58[b]	69.65	62.89
Temporary labour force	81.79	73.17	57.95
Finite term contracts	70.30	69.38	64.61
Part time work	32.48	22.58	15.41
Part time unemployment	17.63	13.91	16.28
Annualization	16.94	13.46	11.71
Modulation	36.66	33.97	30.70
Subcontracting	55.10	48.96	48.34
Production storage	51.04	48.15	41.80

Note: [a]Number of workers.[b]Percentage of the (high, medium of low) road firm group.

Sources: Descriptive statistics based on common part of the COI survey (manufacturing industries) and of administrative surveys of WTR.

Table 4: **Organizational features of companies following she decide to follow a High, a Medium or a Low Road strategy before having implemented a working time reduction (before May 2003). Part 2.**

Features / Strategy	High Road	Medium Road	Low Road
Sectors:			
Food industries	16.94[a]	21.05	16.15
Consumption goods	9.28	15.36	31.94
Car industries	6.61	2.89	1.73
Equipment goods	19.61	19.24	12.58
Intermediary goods	44.20	38.57	35.14
Energy	2.09	1.72	1.36
Other (including services, trade)	0.12[d]	0.09	0.00
Employed people by class in 1997:			
Less than 28 people	7.89[a]	16.98	28.61
Between 29 and 49 people	3.36	8.85	13.93
Between 50 and 99 people	12.53	21.14	26.88
Between 100 and 249 people	19.84	19.87	16.40
Between 250 and 499 people	16.71	15.00	8.26
More than 500 people	39.68	18.16	5.92
Firm ownership[b]:			
French group	41.35[a]	36.35	24.85
Foreign group	39.34	25.41	12.13
Independant firm	19.31	38.24	63.02
Wages[b]:			
High wages	14.55[a]	14.47	8.67
Medium wages	53.46	49.38	40.31
Low wages	31.99	35.65	50.52

Notes : [a]Percentage of High (resp. Medium; resp. Low) Road firms. [b]Not available for food industries firms.

Sources : Descriptive statistics based on common part of COI survey (manufacturing industries) and of administrative surveys of Robien, Aubry agreements.

Human Resource Management practices (such as cross training, compensation, pay for skill) which should presumably be jointly determined with the strategy. Even if our purpose is to look for variables that cause (rather than are correlated with) the firm strategy, we present some figures dealing with the wage level within the firm. In fact, one Low Road firm in two pays its workers low wages versus only 30 to 35 percent of High Road and Medium road firms. It confirms the fact that High (and in a lesser extent Medium) Road firms tend to pay their employees a wage premium to compensate for more commitment / people involvment, effort and to avoid turnover (see the efficient wage theory).

The question is now to evaluate in what extent those factors are able to reduce / to control for differences that exists in the manner the WTR has been implemented by the firm, following the strategy it chooses before turning to WTR. To try to answer this question, we use non experimental methods, in the multiple treatment evaluation framework, matching on the balancing score.

3 The causal evaluation framework with mutiple treatments[6]

3.1 Econometric model and estimands

We consider N *companies* ($i = 1, 2, ...n$) being assigned to one of the $M = 3$ states of nature (so-called *treatments*) T: $T_i = 0$ if the firm decides to follow a High Road or $T_i = 1$ (respectively $T_i = 2$) if it decides to follow a Medium (respectively a Low) Road before having implemented a WTR. Moreover, we denote by (Y_{0i}, Y_{1i}, Y_{2i}) the *potential outcomes* (like the WTR date of implementation, job creations commitment, WTR commitment) associated with participation of i to treatment $0, 1$ or 2. Y_{Ti} represents what would be realized if i were assigned to treatment T_i. Ex-post, only one of these three potential outcomes is observed:

$$Y_i = \sum_{j=0}^{2} \mathbb{I}(T_i = j) Y_{j,i}$$

with $\mathbb{I}(T_i = j) = 1$ if $T_i = j$ (and 0 else), considering N_0 High (respectively N_1 Medium; respectively N_2 Low) road firms for whom $T_i = 0$ (respectively $T_i = 1$; respectively $T_i = 2$) and whose observed outcome is $Y_i = Y_{0i}$ (respectively $Y_i = Y_{1i}$; respectively $Y_i = Y_{2i}$). For the $M = 3$ types of companies, the remaining potential outcomes can be seen as *counterfactuals*[7].

[6] This framework was recently developped in Imbens [1999], Lechner [1999, 2000, 2002] or Frölich [2002] for instance.

[7] Note that the notion of potential outcome implicitly suppose 'no interference between different units'. Indeed, it assumes that the pair of potential (Y_{0i}, Y_{1i}, Y_{2i}) for the company i is not affected by the outcome of other one, that is:

$$Y_i(T) = Y_i\left(T^{'}\right) \text{ if } T = T^{'}, T = 0, 1, 2$$

This refers to the Stable Unit Treatment Value Assumption (SUTVA – Rubin [1980]).

As to the binary causal evaluation $T_i \in [0;1]$ ($M = 2$ case) the interest is put on the whole average treatment effect:

$$ATE \equiv E(Y_1 - Y_0) \tag{1}$$

or the average treatment on the treated or on the non treated:

$$ATET \equiv E(Y_1 - Y_0|T = 1) \text{ and } ATENT \equiv E(Y_1 - Y_0|T = 0) \tag{2}$$

In the multiple treatment case (i.e. $M > 2$), (1) and (2) refer to pair-wise comparisons (Lechner [1999]) and do not lead to the "whole treatment effect". Hence, they do not necessarily represent an optimal way to summarize the causal effects in presence of multiple treatments. Consequently, we will distinguish two types of ATE: the *pair-wise* ones:

$$\gamma_0^{m,l} \equiv E(Y_m - Y_l) \tag{3}$$
$$\alpha_0^{m,l} \equiv E(Y_m - Y_l|T \in [m,l]) \tag{4}$$
$$\theta_0^{m,l} \equiv E(Y_m - Y_l|T = m) \tag{5}$$

if we want to lead comparison *between only* 2 of the $M = 3$ firm types[8]; the *composite/ aggregate* ones:

$$\gamma_0^m \equiv \sum_{l=0}^{2} v_{m,l}\gamma_0^{m,l} \tag{6}$$

$$\alpha_0^m \equiv \sum_{l=0}^{2} v_{m,l}\alpha_0^{m,l} \tag{7}$$

$$\theta_0^m \equiv \sum_{l=0}^{2} v_{m,l}\theta_0^{m,l} \tag{8}$$

if we want to compare *one type of firms to all other types*. In fact, assuming the weights $(v_{m,0}, v_{m,1}, v_{m,2})$ fulfill $v_{m,m} = 0$ and $\sum_{l=0}^{2} v_{m,l} = 1$, (6) and (8) can be rewritten as such:

$$\gamma_0^m = E(Y_m - Y_{-m}) \text{ and } \theta_0^m = E(Y_m - Y_{-m}|T = m)$$

and consequently be interpreted as causal effects[9].

3.2 Identification

For the remaining of the study, we will only focus on (3), (6) and (8).

[8] The properties of these estimands are the same as in the binary treatment case, i.e. $\gamma_0^{m,l} = -\gamma_0^{l,m}$, $\alpha_0^{m,l} = -\alpha_0^{l,m}$ but $\theta_0^{m,l} \neq -\theta_0^{l,m}$ and $\alpha_0^{m,l} = \theta_0^{m,l} P(T = m|T \in [m;l]) - \theta_0^{l,m}(1 - P(T = m|T \in [m;l]))$(seeLechner [1999]).

[9] Note that it is not possible to do the same thing as to α_0^m (see Lechner [2000] and appendix 3). $(-m)$ refers to values other than m.

3.2.1 As to *pair-wise* effects :

Concerning (3), we have:

$$\begin{aligned}\alpha_0^{m,l} &\equiv E\left(Y_m - Y_l | T \in [m,l]\right) \\ &= \theta_0^{m,l} P\left(T = m | T \in [m;l]\right) - \theta_0^{l,m}\left(1 - P\left(T = m | T \in [m;l]\right)\right)\end{aligned}$$

where $\theta_0^{m,l} = E\left(Y_m - Y_l | T = m, T \in [m,l]\right)$ and $\theta_0^{l,m} = E\left(Y_l - Y_m | T = l, T \in [m,l]\right)$, with $m, l \in [0;1;2]$ and $l \neq m$. Hence, $\alpha_0^{m,l}$ is identified as soon as $\theta_0^{m,l}$ and $\theta_0^{l,m}$ are identifed. Since we do not fall in the case of a randomized experiment (firms are not randomly assigned to a particular strategy), we do not know $E\left(Y_l | T = m, T \in [m,l]\right)$ (respectively $E\left(Y_m | T = l, T \in [m,l]\right)$) which we can not take as been equal to

$E\left(Y_l | T = l, T \in [m,l]\right)$ (respectively to $E\left(Y_m | T = m, T \in [m,l]\right)$). However, if we consider we have information on individual characteristics that includes *all* variables (X_i) affecting both the treatment (i.e. being a High, a Medium or a Low Road firm) and the outcome variable (i.e. a WTR variable: date of implementation, job creations commitment,...), we can suppose as verified the *ignorable treatment assumption* of Rosenbaum and Rubin [1983] in the case of multiple treatments (Imbens [1999]):

$$(Y_0, Y_1, Y_2) \amalg T | X \tag{9}$$

and identify $E\left(Y_l | T = m, T \in [m,l]\right)$ and $E\left(Y_m | X, T = l, T \in [m,l]\right)$ since it implies:

$$\begin{aligned}E\left(Y_l | X, T = m, T \in [m,l]\right) &= E\left(Y_l | X, T = l, T \in [m,l]\right), \forall m, l \in [0;1;2] \\ \text{and } E\left(Y_m | X, T = l, T \in [m,l]\right) &= E\left(Y_m | X, T = m, T \in [m,l]\right), \forall m, l \in [0;1;2]\end{aligned}$$

To overcome the dimensionality problem (as the dimension of X is great, it becomes tedious constructing comparable firms), Lechner [1999] generalize the Rosenbaum and Rubin [1983] results to the multiple treatment case:

$$(Y_0, Y_1, Y_2) \amalg T | X \Rightarrow (Y_0, Y_1, Y_2) \amalg T | b\left(X\right) = b\left(x\right) \tag{10}$$

where $b\left(x\right)$ represents the following *balancing score*:

$$b\left(x\right) \equiv P^{m|m,l}\left(x\right) = P\left(T = m | T \in [m,l], X = x\right) = \frac{P\left(T = m | X = x\right)}{P\left(T = m | X = x\right) + P\left(T = l | X = x\right)}$$

However, estimators of $E\left(Y_l | P^{|m,l}\left(X\right), T = m\right) = E\left(Y_m | P^{m|m,l}\left(X\right), T = l\right)$ and of $E\left(Y_m | P^{m|m,l}\left(X\right), T = l\right) = E\left(Y_l | P^{m|m,l}\left(X\right), T = l\right)$ can be computed only if there is sufficient overlapping between the balancing score density in both sub-populations, i.e. if $X \in S$, where S represents common support, the values of X for which we have firms with $T = l$ and $T = m$, $S = Supp(X|T = l) \cap Supp(X|T = m)$. So we may also have to verify in particular that:

$$0 < P^{m|m,l}\left(x\right) < 1, \forall m, l \in [0;1;2] \tag{11}$$

because if, for some $X = x$, $P^{m|m,l}(x) = 1$ or $P^{m|m,l}(x) = 0$, it is not possible to build counterfactuals (Heckman, Ichimura and Todd [1998*a*]). Under these two conditions, (4) is identified[10].

Considering now (3), we use similar assumptions to check that:

$$\begin{aligned}
\gamma_0^{m,l} &\equiv E(Y_m - Y_l) \\
&= E(Y_m) - E(Y_l) \\
&= E(Y_m|T=m)P(T=m) \\
&\quad + E_{P^m(X)}\left[E\left(Y_m|P^m(X), T=m\right)|T \neq m\right](1 - P(T=m)) \\
&\quad - E(Y_l|T=l)P(T=l) \\
&\quad - E_{P^l(X)}\left[E\left(Y_l|P^l(X), T=l\right)|T \neq l\right](1 - P(T=l))
\end{aligned}$$

where $E\left(Y_m|P^m(X), T \neq m\right)$ and $E\left(Y_l|P^l(X), T \neq l\right)$ are the counterfactuals to be estimated and conditioning is this time on balancing scores equal to marginal probabilities (like in the binary treatment case) $b^j(x) \equiv P^j(x) = P(T_i = j|X = x), j = m, l$. In this case, similar assumption like (11) has to hold:

$$0 < P^j(x) < 1, j = l, m; \forall m, l \in [0; 1; 2]$$

3.2.2 As to *aggregate* effects:

We consider two types of weights: in the first case, we take $v_{m,l}$ such that (Lechner [2000]):

$$\begin{aligned}
\tilde{v}_{m,l} &\equiv 0 \text{ si } m = l \\
&= P(T=l|T \neq m) = \frac{P(T=l)}{1 - P(T=m)} \text{ si } m \neq l
\end{aligned}$$

Let $(\gamma_0^m(\tilde{v}_{m,l}))$ denote the composite effect using such a weighting scheme. Another point of view would consist in looking only at one type of firms (m) on the one hand, and other types of firms on the other $(-m)$, this without taking into account the fact that this latter group is composed of different subgroups, that is:

$$\begin{aligned}
\gamma_0^m(\breve{v}_{m,l}) &\equiv E(Y_m - Y_{-m}) \\
&= E(Y_m) - E(Y_{-m}) \\
&= E(Y_m|T=m)P(T=m) + E(Y_m|T=-m)(1 - P(T=m)) \\
&\quad - [E(Y_{-m}|T=-m)(1 - P(T=m)) + E(Y_{-m}|T=m)P(T=m)] \\
&= E(Y_m|T=m)P(T=m) \\
&\quad + E_{P^m(X)}\left[E\left(Y_m|P^m(X), T=m\right)|T=-m\right](1 - P(T=m)) \\
&\quad - E(Y_{-m}|T=-m)(1 - P(T=m)) \\
&\quad - E_{P^m(X)}\left[E\left(Y_{-m}|P^m(X), T=-m\right)|T=m\right]P(T=m)
\end{aligned}$$

However, it is difficult to derive analytically the weights $(\breve{v}_{m,l})$, since they depend on the distribution of $P^m(x) = P(T = m|X = x)$ in comparison groups.

[10] Or almost, see sub-section 3.3.3.

3.3 Considered propensity score estimators

3.3.1 K^{th} versus local polynomial regression estimators

For $E\left(Y_j|P^{j|-j,j}\left(X\right),T=-j\right)$ or for $E\left(Y_j|P^{j}\left(X\right),T=-j\right),j=m,l$ several estimators have already been taken under consideration in the evaluation litterature. By now, we will discuss matching on the balancing score (which we'll estimate through a multinomial logistic model - see Tables 9 and 10 for the estimation results), either considering k^{th} nearest match or local polynomial estimators (the Nadaraya Watson or the local linear one in particular)[11].

The simple nearest neighbour or "pair-matching" estimator is based on Rubin [1974] idea to compare two comparable individuals: one want to find, for each i from the $T=l$ sample, one individual from the $T=m$ sample such that $|P(X_i)-P(X_j)|$ is the smallest. An extension of this method is to consider K nearest neighbours:

$$\hat{E}\left(Y_{li}|P^{m|ml}\left(X_i\right),T_i=m\right)=\frac{1}{K}\sum_{\substack{k=1\\ \{T_k\in A_x\}}}^{K}Y_{lk} \tag{12}$$

where A_x index the set of x observations with the k lowest value of $|P(X_i)-P(X_k)|$, this in the case of the estimation of $E\left(Y_l|P^{m|ml}\left(X\right),T=m,T\in[m,l]\right)$. Such estimators may be highly biased, particularly if they are implemented without replacement. Considering matching with replacement allows partly to solve this problem, but it may lead to variance inflation (see Dehejia and Wahba [1998]). Recently, Abadie and Imbens [2003] have been studying large sample properties of these estimators and show these estimators include a conditional bias that may not vanish and so may be not $\sqrt{N}$ consistent as more that one continuous variable is included in the covariates. Moreover, when correcting for conditional bias and considering a fixed number k of nearest neighbours, the estimator still does not reach the efficiency bounds derived by Hahn [1998] for average treatment effect. Another limit of such an estimator is that it gives the same weight to all observations that are used to build the counterfactual, whatever the distance $|P(X_i)-P(X_k)|$ is.

Local polynomial estimators help solving these problems. Considering the local polynomial regression of order p, we have:

$\hat{E}\left(Y_{li}|P^{m|ml}\left(X\right),T_i=m\right)=\hat{\beta}_0$ where:

$$\left(\hat{\beta}_0,\hat{\beta}_1,...,\hat{\beta}_p\right)$$

[11] We won't look further at other regression estimators that use all observations, like the least squares one. In fact, consistent estimation of each counterfactual requires that the local neighbourhood – around the unit that has to be matched – shrinks with increasing sample size. Consequently, those estimators are in general not consistent (Frölich [2002]). Moreover, we won't consider the re-weighting estimator. Indeed, Hirano, Imbens and Ridder [2002] show that the last one (with weights normalized to one) is consistent and asymptotically normally distributed, but is in general not efficient, if the propensity score is known or parametrically estimated.

$$= \arg\min \left[\sum_{j:T_j=l} \left(Y_{lj} - \sum_{r=0}^{p} \beta_r \left(P^{m|ml}(X_j) - P^{m|ml}(X_i) \right)^r \right)^2 \times K\left(\frac{P^{m|ml}(X_j) - P^{m|ml}(X_i)}{h_{n_l}} \right) \right] \quad (13)$$

where the weighting is achieved through a kernel function $K(.)$ that is chosen such to sum to one and to be an odd function.

The Nadaraya-Watson (or local constant; "kernel") estimator is obtained setting p to 0:

$$\hat{E}\left(Y_{li} | P^{m|ml}(X_i), T_i = m \right) = \sum_{j:T_j=l} \frac{K\left(\frac{P^{m|ml}(X_i) - P^{m|ml}(X_j)}{h_{n_l}} \right)}{\sum_{j:T_j=l} K\left(\frac{P^{m|ml}(X_i) - P^{m|ml}(X_j)}{h_{n_l}} \right)} Y_{lj} = \frac{Q_0\left(P^{m|ml}(X_i) \right)}{S_0\left(P^{m|ml}(X_i) \right)} \quad (14)$$

given that: $Q_r\left(P^{m|ml}(X_i) \right) \equiv \sum_{j:T_j=l} K\left(\frac{P^{m|ml}(X_i) - P^{m|ml}(X_j)}{h_{n_l}} \right) \left(P^{m|ml}(X_i) - P^{m|ml}(X_j) \right)^r Y_{lj}$ and $S_r\left(P^{m|ml}(X_i) \right) \equiv \sum_{j:T_j=l} K\left(\frac{P^{m|ml}(X_i) - P^{m|ml}(X_j)}{h_{n_l}} \right) \left(P^{m|ml}(X_i) - P^{m|ml}(X_j) \right)^r$. Moreover, this estimator has been proved to be $\sqrt{N}$ consistent and asymptotically normally distributed (even with estimated propensity score and like other local polynomial estimators – see Heckman, Ichimura and Todd [1998a, 1998b]). Besides, it suggests a trade-off – that is not proposed by the K^{th} nearest neighbour estimator – between the bias and the variance of the estimator and is related to the choice of a bandwidth parameter h_j (see the next sub-section as to a discussion dealing with this point).

Another local polynomial estimator is the local linear estimator ($p = 1$):

$$\hat{E}\left(Y_{li} | P^{m|ml}(X_i), T_i = m \right) = \frac{S_2\left(P^{m|ml}(X_i) \right) Q_0\left(P^{m|ml}(X_i) \right) - S_1\left(P^{m|ml}(X_i) \right) Q_1\left(P^{m|ml}(X_i) \right)}{S_2\left(P^{m|ml}(X_i) \right) Q_0\left(P^{m|ml}(X_i) \right) - S_1\left(P^{m|ml}(X_i) \right) Q_1\left(P^{m|ml}(X_i) \right)} \quad (15)$$

Contrary to the local constant estimator, it has two major properties (see Härdle et al. [1999]): i) its local bias is of the same order in the boundary region as in the interior (which is usefull particularly in the case of the two treatment evaluation problem where a large part of the density mass of the balancing score $f\left(P^{m|ml}(X_i) \right)$ often lies in the boundary region of the support of the source population); ii) the bias does not depend on the design of the density function. Nevertheless, it may lead to rugged regression because of very small values of the denominator of (15) in region of sparse data particularly in small samples[12].

Frölich [2000, 2003] attempted to analyse relative performances (in terms of mean squared error reduction) of local constant, local linear and local linear regression with a Seifert and Gasser correction, re-weighting estimator relative to simple nearest neighbour, when estimating the Average Treatment Effect on The Treated (binary

[12] One solution was proposed by Seifert and Gasser [2000], considering adaptative ridge regression jointly with local linear estimator.

treatment evaluation problem): he found that in almost all cases, kernel regression outperforms (in terms of reducing the mean squared error) the simple nearest neighbour (except in some cases, when there are fewer control units than treated), the re-weighting estimator and often but not always the local linear estimator (it is less clear in this case)[13].

3.3.2 Choosing the bandwidth parameter

Considering either the local constant or the local linear (either standard one or the one including the Seifert and Gasser [2000] correction), we have to choose the bandwidth parameter h_{n_l}. Indeed, there are no precise ways to choose h_{n_l}. Todd [1999] advises to set it equal to the distance to the k^{th} nearest neighbour as a good way to take account for heterogeneity, allowing it thus to vary from point to point with smaller h_{n_l} for points evaluation where there are more observations in the local neighbourhood of the unit to be matched. Another method suggested for instance by Brodaty, Crépon and Fougère [1999], in the case of using a duration model, was to consider a Silverman rule of thumb. Ichimura and Linton [1999] also explore this problem without infering any precise rule.

More recently, Frölich [2000, 2003] has been studying finite sample properties of different matching estimators and by now recommends the traditional leave-one-out cross-validation criterion (which works quite well but does not offer an asymptotically optimal way to set h_{n_l}):

$$h_{n_l} = \arg\min CV(h) = \sum_{j|T_j=l} \left(Y_{lj} - \hat{m}_{-j}\left(P^{m|ml}(X_i), h \right) \right)^2 \tag{16}$$

where $\hat{m}_{-j}\left(P^{m|ml}(X_i), h\right)$ represents the leave-one-out estimator, i.e. a non parametric regression of Y_{lj} on all $P^{m|ml}(X_j)$ – except that one for which $j = i$ – coming from the $T = l$ sample[14]. This criterion appears also to perform better than that of the Akaike (or of other penalizations – see Härdle et al. [1999]) penalized criterion.

3.3.3 Restricting to common support

Following the common support assumption, we have to determine $S = Supp(P^{m|ml}(X)|T = l) \cap Supp(P^{m|ml}(X)|T = m)$ (in the case of $\hat{E}\left(Y_{li}|P^{m|ml}(X_i), T_i = m\right)$). Since we do matching on the balancing score, one simple way to proceed is to exclude extreme values of the estimated balancing score, i.e. those which are smaller than the maximum of the minima or greater than the minimum of the maxima of the balancing score values in the two selected samples $T = m$ and $T = l$. However, interior regions

[13] His results depend on the relative size of the treated sample relatively to that of the non treated sample, on the form of covariates density. Since the Seifert and Gasser [2000] estimator appears to reduce MSE more, relatively to all other estimators, either matching on the covariates or on the (known or estimated) propensity (or balancing) score, we also implement this estimator. However, no result are by now available.

[14] Because it is $E(Y_l|T = m)$ is to be estimated using non parametric regression and because the smoothness for the $E(Y_l)$ and $E(Y_m)$ curves may not be the same.

where the common support assumption fails to be checked also have to be taken into account. We so determine the overlapping region, as proposed in Todd [1999] in the two treatment case, estimating first the density $f\left(P^{m|ml}\left(X_i\right)|T=l\right)$ for each i coming from the $T=m$ sample in the $T=l$ sample:

$$f\left(P^{m|ml}\left(X_i\right)|T=l\right)=\frac{1}{n_l h}\sum_{j|T=l,j=1}^{n_l} K\left(\frac{P^{m|ml}(X_i)-P^{m|ml}(X_j)}{h}\right)$$

where h is set through a Silverman rule of thumb[15]. Secondly, we rank estimated values and remove from both comparison samples one or two percent of the f smallest values (including those for which $f\left(P^{m|ml}\left(X_i\right)|T=l\right)=0$[16]). Still, it may be unsatisfactory because excluding these individuals from estimation may change the definition of the parameter being estimated. Consequently, we have to compare our results restricting to common support with those coming from estimation without restricting to the common support[17].

3.4 Results[18]

Before we compute average treatment effects, we estimate two multinomial logistic models the first one on the whole COI sample, so to be able to compute average treament effects of the strategy on the fact the firm has or not implemented a WTR before may 2003[19]); the second on the common part of the COI (manufacturing industries) and WTR administrative survey's agreements, in order to compute treatment effects on WTR variables only present in that sample. The results presented in appendix (see Tables 9 and 10) deals only with the last one[20]. Estimations were led through the *catmod* procedure under the 8^{th} version of SAS, whose results confirm our descriptive statistics. On that occasion, we had a look to see which of the variables were finally found to be significant on a 10% level. However, to avoid any mispecification due

[15] A rule consisting in the minimization of a cross validation criterion, following standard non parametric analysis, but without excluding the i^{th} firm as to computing the leave-one-out estimator, was also considered. Results were not reported here but are available on request.

[16] For that purpose, we prefer using a kernel other than the gaussian one, since this last one gives positive estimates at all points of evaluation. In practice, we also consider here a two percent trimming rule. Nevertheless, in further estimation, we will only exclude those 0 values.

[17] Some solutions were recently proposed, like building confidence intervals for the average treatment effect (see Lechner [2001]). We will later explore it.

[18] All our computations were led using both the SAS IML module and the CATMOD procedure (as to the estimation of the probability model). As to boostrapped standard error, we generate at random (and with replacement) 200 samples, each time: i) re-estimating the multinomial logistic model, ii) restricting on the common support through a two percent trimming rule (choosing the bandwith value through a Silverman rule of thumb). Note that by now choosing a bandwith value through a leave-one-out cross validation minimization as to the counterfactuals estimations was not reproduced within the bootstrap process.

[19] Note that a more recent version (december 2004) of the WTR administrative survey's agreements is available by now. However, the difference between this one (which contains 495000 establisments) and the one in use (which contains 468000 establisments) here is small.

[20] Nevertheless, other results concerning the estimation of the multinomial logistic model on the whole COI sample are available on request.

to colinearity between variables and without any true way to select the significant variables (other than those provided by the catmod procedure - Chi-square values in the maximum likelihood analysis of the variance; likelihood ratio), we use the specification including all variables, taking account or not for the 1997 employment level[21].

Turning to Table 7 and 8, and to the Nadaraya Watson estimates of pairwise or aggregate effects of the firm strategy on WTR implementation variables, few of them are significant. One result emerge clearly: High Road firms tend to commit more often on job creations than low road firms (between 6.5% and 8.8% more - case of the unconditional pairwise estimates, Table 7), or than any other firms (Medium or Low Road) type (5.4% more - Table 8). Other significant effects are only obtained in some case, where matching is performing on a balancing score that does not include the 1997 employment level: high road firms tend to implement faster a WTR, commit on more jobs creations and less often on a ten percent WTR than low road one. For the remaining, even if going in the same direction than that indicated by the naïve estimator, results are far from being significant.

Nevertheless, considering the properties or the local linear estimator comparatively to the Nadaraya-Watson one, either in terms of bias or in terms of its sensitivity to the design of the density of the estimated balancing score, we also implement such an estimator[22]. Firstly, looking at pairwise effects (Table 5), High Road firms, relatively to Low Road ones, tend: i) to implement a WTR earlier, either considering the fact firms already implement or not a WTR (they are more numerous having done it, at least 14 percent) or the date of implementation itself (about 0.18 year, i.e. 2 months earlier for High Road firms); ii) to exhibit a smaller delay (between 0.098 and 0.194 year, i.e. between 1 and 2.3 months (unconditional pairwise case)) between the day the agreement was signed and the day WTR has been implemented; iii) to commit more often on job creations and on more job creations[23] and iv) less often on a 10 percent WTR. Such results may also be put in evidence between High and Medium road firms, but to a lesser extent (on a 12% (respectively at most a 15%) level as to the date of implementation (15% level at most in the case of committing or not on job creations). Moreover, High relatively to Medium and to Low Road firms on the one hand, and Medium relatively to Low Road firms on the other hand, implemented more often a WTR before may 2003. Secondly, considering aggregate effects, one can say that High Road companies: i) are still the most numerous to commit on job creations[24] when implementing a WTR; ii) they implement earlier a

[21] To face these problems, we will look further at other procedures, like the Qlim or Mdc one can find on the 9^{th} version as recommended in Afsa [2003], who presents and discusses multinomial logistic models. We will also check whether or not our results are sensitive or not to restricting to only 10% significant factors.

[22] Besides, from a statistical point of view, estimated variances for this estimator do not differ from that of the Nadaraya Watson one, except in some cases.

[23] Note that it would be interesting in the special framework of Robien and Aubry laws to study the impact of the firm strategy on the job creations commitment relatively to the within the firm employment level.

[24] And on more jobs creations. However, the result may change if we consider as an employment outcome the ratio "potential creations / before the WTR within the firm employment level".

Table 5: **Results for pairwise effects (conditional and unconditional pair) of the firm strategy on the way companies have implemented a WTR, following the balancing score does or not take account for the 1997 employment level. Local Linear estimates, restricting on the common support, using a two percent trimming rule.**

Var./Estimate	Pair	Naive	$\hat{\alpha}_N^{m,l_a}$	$\hat{\alpha}_N^{m,l_i}$	$\hat{\gamma}_N^{m,l_b}$	$\hat{\gamma}_N^{m,l_i}$
Already a WTR[c]*:*	HR[f]-MR	0.088***	0.079**	0.089***	0.160***	0.087***
		(0.017)	(0.032)	(0.030)	(0.049)	(0.031)
	HR-LR[h]	0.154***	0.354***	0.250***	0.182***	0.139***
		(0.018)	(0.102)	(0.046)	(0.050)	(0.035)
	MR[g]-LR	0.065***	0.077***	0.117***	0.022	0.053*
		(0.017)	(0.029)	(0.028)	(0.030)	(0.028)
Implementation[d]*:*	HR-MR	−0.078*	−0.110	−0.079	−0.096	−0.074
		(0.042)	(0.077)	(0.075)	(0.075)	(0.073)
	HR-LR	−0.166***	−0.251***	−0.176**	−0.181*	−0.182**
		(0.045)	(0.108)	(0.079)	(0.098)	(0.078)
	MR-LR	−0.088**	−0.103	−0.126*	−0.086	−0.108
		(0.044)	(0.078)	(0.076)	(0.091)	(0.075)
Delay[d]*:*	HR-MR	−0.058**	−0.071	−0.070	−0.175***	−0.068
		(0.026)	(0.055)	(0.046)	(0.063)	(0.047)
	HR-LR	−0.123***	0.138	−0.168***	−0.194***	−0.098**
		(0.031)	(0.136)	(0.051)	(0.058)	(0.047)
	MR-LR	−0.065**	−0.049	−0.056	−0.019	−0.030
		(0.032)	(0.052)	(0.050)	(0.050)	(0.050)
Job creations:						
Commitment[c]	HR-MR	0.052**	0.057*	0.050	0.053	0.065*
		(0.021)	(0.035)	(0.034)	(0.033)	(0.036)
	HR-LR	0.098***	−0.343***	−0.046	0.052	0.072*
		(0.023)	(0.124)	(0.094)	(0.039)	(0.040)
	MR-LR	0.046**	0.025	0.014	−0.001	0.008
		(0.022)	(0.035)	(0.038)	(0.038)	(0.036)
Jobs created[e]	HR-MR	6.386***	7.580***	6.576**	4.079	6.347**
		(1.233)	(2.699)	(2.644)	(2.912)	(2.625)
	HR-LR	9.828***	3.370	10.709***	6.807**	9.157***
		(1.194)	(167.49)	(3.095)	(3.023)	(2.638)
	MR-LR	3.442***	1.769	2.766	2.728	2.810
		(0.578)	(2.864)	(3.433)	(2.566)	(2.521)
10% *WTR* [c]*:*	HR-MR	−0.058**	−0.068*	−0.062*	−0.074*	−0.059*
		(0.021)	(0.036)	(0.036)	(0.040)	(0.035)
	HR-LR	−0.094***	−0.056	−0.135***	−0.087**	−0.064*
		(0.023)	(0.093)	(0.038)	(0.044)	(0.038)
	MR-LR	−0.036	−0.023	−0.007	−0.013	−0.004
		(0.022)	(0.039)	(0.042)	(0.039)	(0.040)

Notes : Bootstrapped standard errors in brackets. Significancy levels : * (10%), **(5%), ***(1%). [a,b]Conditional (respectively unconditional) pairwise treatment effect. [c]Percentage difference. [d]Difference in years. [e]Difference in the number of jobs to be created. [f,g,h] High (respectively Medium, respectively Low) Road strategy. [i]The balancing score specification does not include the 1997 employment level.

Source : Author's calculations based on the common part of the COI survey (manufacturing industries) and of administrative surveys of Robien, Aubry I and II agreements.

WTR (0.12 year, i.e. 1 month and a half on average; iii) expect fewer time to implement the WTR after signing the agreement (0.13 year on average) and iv) commit less often on a 10 percent WTR. Nevertheless, it does not imply neither that such high road firms will benefit more often from incentives, nor that they will benefit from more incentives since, according to a previous section, a lot of them may be classified as "Aubry II precursors"[25]. On the contrary, those firms following a Low Road strategy tend to have implemented a WTR later, and to have expected more time before having implemented it once the agreement was signed (only on a 12% level).

4 Conclusion

In line with several several studies whose goal was to analyse the consequences of the reorganizations on the Working Time Reduction date of implementation or to model the last one (Askenazy [2001, 2002], Aucouturier et al. [1999], Bunel [2001]), we wanted to analyse the impact of the firm strategy chosen before WTR implementation on its WTR modality (job creation commitment, date of implementation). Contrary to Askenazy [2002] or Aucouturier et al. [1999] who focus on the effect of single "innovative practices" (Quality Devices, Just In time, People Involvment), on the fact the firm has already implemented a WTR, or to Gilles [2004] who focus on the effect of the "reorganization" of the firm – aggregating the number of devices in use within the firm –, we're going to consider the firm strategy, namely on the fact the firm has choosen to follow a High or a Low road strategy before implementing a WTR.

Hence, as a first approach, following Jones et al. [2002], we characterize firms according three different strategies: High, Medium or Low road one, following the firm employs particular combinations of organizational devices, a High Road firm being for instance a company that makes use of at least one quality and one people involvment devices, together with or without at least one just-in-time device. Those High Road (and Medium Road to a lesser extent) tend to favour people involvment in the firm organization and so propose higher wages than Low Road ones. We proceed merging both COI and the administrative survey's of Robien and Aubry agreements and, on the basis of our descriptive statistics, we see that High relatively to Medium (respectively Medium to Low; respectively High to Low) Road firms tend to implement earlier a WTR, commit more often on job creations and to be fewer to have committed on a 10 percent WTR. However, those three types of strategy may reflect some individual / organizational constraints that will potentially influence the way the WTR has been implemented by firms. After having modeled the firm strategy through the estimation of a multinomial logistic model, we use matching estimators in the particular multiple evaluation framework to control for these factors.

Our findings are twofold. On the one hand, on the basis of the Nadaraya Watson estimator, the only significant result concern the fact that High road firms commit more often on job creations. On the other hand, on the basis of the Local Linear

[25] On the basis of preliminary results, High Road firms may even get more scarcely incentives.

Table 6: **Results for composite (or aggregate) effects of the firm strategy on the way companies have implemented a WTR, following the balancing score does or not take account for the 1997 employment level. Local Linear estimates, restricting on the common support through a two percent trimming rule.**

Var./Estimate	Firm	Naive	$\hat{\gamma}_N^m(\tilde{v}_{m,l})^a$	$\hat{\gamma}_N^m(\tilde{v}_{m,l})^i$	$\hat{\gamma}_N^m(\breve{v}_{m,l})^b$	$\hat{\gamma}_N^m(\breve{v}_{m,l})^i$
Already a WTR[c]*:*	HR[f]	0.118***	0.170***	0.110***	0.124***	0.151***
		(0.016)	(0.047)	(0.029)	(0.030)	(0.031)
	MR[g]	−0.004	−0.060**	−0.010	−0.014	−0.010
		(0.015)	(0.031)	(0.023)	(0.029)	(0.024)
	LR[h]	−0.101***	−0.087***	−0.088***	−0.084***	−0.091***
		(0.015)	(0.031)	(0.027)	(0.028)	(0.027)
Implementation[d]*:*	HR	−0.115***	−0.132*	−0.120*	−0.143**	−0.101
		(0.038)	(0.073)	(0.065)	(0.069)	(0.069)
	MR	−0.002	0.008	−0.014	−0.008	−0.007
		(0.037)	(0.067)	(0.063)	(0.064)	(0.063)
	LR	0.122***	0.127	0.140**	0.134*	0.153**
		(0.039)	(0.087)	(0.068)	(0.071)	(0.068)
Delay[d]*:*	HR	−0.085***	−0.183***	−0.080**	−0.146***	−0.101**
		(0.024)	(0.049)	(0.040)	(0.054)	(0.041)
	MR	0.002	0.081*	0.020	0.006	−0.001
		(0.025)	(0.043)	(0.042)	(0.042)	(0.043)
	LR	0.090***	0.095**	0.059	0.065	0.067
		(0.028)	(0.047)	(0.043)	(0.046)	(0.043)
Job creations:						
Commitment[c]	HR	0.072***	0.052*	0.068**	0.061*	0.063*
		(0.019)	(0.030)	(0.033)	(0.032)	(0.035)
	MR	−0.005	−0.027	−0.029	−0.014	0.014
		(0.018)	(0.030)	(0.030)	(0.029)	(0.030)
	LR	−0.068***	−0.022	−0.035	0.125	−0.037
		(0.020)	(0.035)	(0.033)	(0.081)	(0.033)
Jobs created[e]	HR	7.842***	5.233**	7.594***	7.167	8.483***
		(1.183)	(2.675)	(2.317)	(2.418)	(2.418)
	MR	−1.622**	−0.780	−1.908	−0.683	−1.732
		(0.777)	(2.298)	(2.212)	(2.187)	(2.195)
	LR	−6.237***	−4.514*	−5.588**	−3.837	−5.346***
		(0.665)	(2.369)	(2.219)	(2.846)	(2.473)
10% *WTR* [c]*:*	HR	−0.073***	−0.080**	−0.061**	−0.074**	−0.086**
		(0.019)	(0.037)	(0.031)	(0.031)	(0.032)
	MR	0.012	0.032	0.028	0.013	0.017
		(0.018)	(0.033)	(0.032)	(0.032)	(0.032)
	LR	0.061***	0.058	0.030	0.047	0.035
		(0.020)	(0.035)	(0.034)	(0.034)	(0.035)

Notes : Bootstrapped standard errors in brackets. Significancy levels : * (10%), **(5%), ***(1%). [a,b]Composite / aggregate average treatment effects specified in the text. [c]Percentage difference. [d]Difference in years. [e]Difference in the number of jobs to be created. [f,g,h] High (respectively Medium, respectively Low) Road strategy. [i]The balancing score specification does not include the 1997 employment level.

Source : Author's calculations based on the common part of the COI survey (manufacturing industries) and of administrative surveys of Robien, Aubry I and II agreements.

estimator, which seems to exhibit more favourable properties than the local constant one, we obtain the following main result: high road firms, which propose their workers higher wages than in other firm type, tend to implement earlier a WTR, commit more often on (and on more – when considering the absolute number of) jobs creations and less often on a 10 percent WTR, but they are not necessarily those firms who benefit more often from incentives. However, we have to note that it will be interesting to develop an analytic framework that will allow us to better select factors that will characterize firm strategy choice and then variables that will potentially affect both the firm strategy and WTR features. Otherwise, further research will include better defining the "strategy indicator" (thanks to data analysis for instance) using the information emerging from the COI part where the information is provided not by firms, but by workers.

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Appendix 1 : About mandatory WTR in France since 1996[26]

Since 1982 and the decrease of the mandatory weekly duration of work from 40 hours down to 39 hours by French governement Mauroy (January, 13^{th} 1982), three other laws were implemented in France to promote job creations and reduce unemployment on the basis of the work sharing idea. These laws are the following: "de Robien" (June, 11^{th} 1996), Aubry I (June, 13^{th} 1998) and Aubry II (January, 19^{th} 2000) laws[27].

The **'de Robien' law** (law nu. 1996 - 502) states that the firm or the establishment can benefit from cuts in employer social contributions if it reduces the effective weekly hours of work of a part or of all its employees. If it reduces its effective working time by 10 percent, firms had also either i) to increase by 10 percent ("offensive agreement") the number of the people it employs, at least for 2 years, or ii) to preserve ("defensive agreements") jobs forecasted to be suppressed (in the same proportions). In this case, the firm benefited from a 40 percent decrease in employer social contribution the first year (i.e. during the year the agreement was signed), 30 percent during the 6 following years and this whenever the agreement was signed between June, 11^{th} 1996 and the adoption of the day Aubry I law was adopted (June, 13^{th} 1998). Higher tax reductions were given to the firm if it commits on a 15 percent (or higher) decrease of its effective working time reduction, together with a 15 percent increase (or preservation) of its employment level.

The **'Aubry I' law** (law nu. 1998 - 461) foresees to reduce the mandatory weekly hours of work from 39 hours down to 35 hours after January, 1^{st} 2000 for firms employing more than 20 workers, after January, 1^{st} 2002 for other units. Firms anticipating the mandatory working time reduction could benefit from incentives, as soon as they commit on a 10 percent decrease of their effective weekly duration of the work, together with a 6 percent increase of their employment level ("offensive agreement") or a preservation of their employment level (in the same proportions - "defensive agreement") if they planned to fire people before turning to WTR. Incentives are given under the form of employer's social contributions reductions and correspond to a fixed amount given to the firm every year for each of the concerned workers, an amount that depend on the date the firm signs the agreement. If it signs an agreement between June, 13^{th} 1998 and June 1999, it gets 9000 French francs per salary the first year, the amount diminushing by 1000 French francs every year ; if it signs between June and December 1999, it gets 7000 French francs the first year, 6000 the following year and so on. Tax reductions are higher if the company reduces its effective weekly duration of the work by 15 percent or more and if it commits on creating / preserving jobs by 9 percent (of its initial employment level).

[26] This note remind an information that was largely discussed in Passeron [2000], Pham [2002] as well as in IRIS [2000 – 2002].

[27] Recently, the Fillon law (law nu. 2003 - 47) implemented on January, 17^{th} 2003, foresees to increase the potential overtime and replace the former Aubry II tax redution system by another one which concern all firms, either still working 39 hours, or already working 35 hours. For this reason, this law won't be of a very high importance in the framework of our study. See Pham [2003] for a small discussion dealing with that law.

The **'Aubry II' law** (law nu. 2000 - 37) confirms the reduction of the mandatory weekly duration of the work from 39 down to 35 hours after January, 1^{st} 2000 for those firms employing more than 20 workers. As to incentives, firms implementing the 35 hours work week after January, 1^{st} 2000 benefit from incentives only if they employ 20 or fewer than 20 people and commit on WTR and on job creations (or job preservations) in the same conditions[28] than those previously quoted for bigger than 20 workers firms before January, 1^{st} 2000. Firms employing more than 20 workers but who do still not have implemented a WTR will benefit from a unique tax reduction decreasing with the wage rate; no incentives are given to those firms. This new employer's tax reduction system (on the small and medium wages) - we will name Aubry II structural help - decreases with the wage down to 1.8 times the SMIC (French minimum wage); it replaces the old employer social contribution reduction system (1996) on the small wages, which used to be decreasing with the wage, down to 1.3 times the SMIC. For a company employing more than 20 workers, having implemented a WTR before January, 1^{st} 2000 and having benefited from incentives before that date, the tax reduction is the sum of Aubry II structural help and of a part of the incentives the firm used to get before the year 2000.

[28] Except if increasing jobs by 6 percent of the before WTR within the firm employment level means hiring fewer than 8 people: in this case, the firm is not forced to hire.

Appendix 2 : Surveys in use, basic and final data sources

Our study has been led on the basis of the merge of two data sources, one of which deals with recent collective Working Time Reduction agreements – Robien and Aubry I or II devices – , the other - the French "Changements organisationnels et l'Informatisation" COI survey - includes information on organizational devices and changes.

The COI survey

This survey is a matched employer-employee survey for French manufacturing and was led in 1997 (see Greenan and Hamon-Cholet [2001] for a detailed presentation). It contains information on organization contraints, organizational devices and strategies at the firm level in 1997 and the evolution between 1994 and 1997 for some of these variables. It is composed by seven firm questionnaires ("industrial enterprises", "agricultural and food industries" for industries ; "chartered accountants" and three for "do-it-yourself trade" in the services sectors) and by a salaried employee questionnaire, for which employees were randomly selected by group of 1 to 3 people per firm (following its size[29]). For our purpose, we consider "industrial firms" (IF) and "food industries" (FI) surveys, whose questionnaires are quite similar – they only differ through question 23[30].

They both contain information for initially 4675 (respectively 970) enterprises in the IF survey case (respectively FI case) and give information on the use of 11 organizational devices in 1997 through questions Q4 (ISO 9001, ISO9002 and EAQF certification ; other certification system or total quality; value analysis, functional analysis or AMDEC; 5S Method or Total Productive Management; Profit center organization; Formal in-house customer/ suppliers contracts; Just in time delivery and Just in time production) and Q5 (Autonomous work groups or self managed groups; Problem solving groups; Project groups). For question Q5, we constructed three dichotomous variables that take the value 1 if more than 10% of production workers are involved in the group and 0 else. Moreover, on the basis of question Q7, we built up a variable RNIV that indicates when the number of hierarchical layers increases and, on the basis of question Q6, a variable which takes the value 1 if the number of tasks done by the production worker increases between 1994 and 1997 and 0 else.

To merge theses two files and to distinguish between industries, we had to build up the NAF16 and NAF36 variables which take as a value the second letter of NF16 and NF36 when the company is part of "industrial firms" database and B and B0 otherwise, in correspondance with INSEE customs nomenclature. Else, each firm is being attributed a coefficient (POND variable) that measures the importance of the firm, following its size (number of salaried employees) and the business sector it is member of in the whole population (see Greenan and Hamon-Cholet [2001] for more

[29] Contrarily to the firm questionnaire, salaried employees that have been questioned about their working conditions come from companies employing only 50 people or more.

[30] Note that at the moment, we let aside the questionnaire about "chartered accountants", because it is quite different from the two first cited. We'll look at such a case later.

details). We exclude all firms for which POND and NAF16 have no value or more generally for which we have no available information or those for which there were at least one missing value (case of more than 540 companies). After those operations, there are still 5104 companies remaining in our sample (24269.4 when taking into account the POND coefficient).

Robien, Aubry I and II Administrative surveys' agreements

This file refers to Robien (June, 11^{th} 1996), Aubry I (June, 13^{th} 1998) and Aubry II (January, 19^{th} 2000) laws and contains data on collective Working Time Reduction (WTR) agreements: the WTR date of implementation, the date at which agreements were signed between Employers and Unions; the type of WTR agreement (i.e. if the production unit commits on job creations only, on job creations and preservations, on job preservation only or on none of these possibilities) and the number of workers the firm commits on to hire or note to fire[31]; the WTR size (commitment on 10% or on 15% of before WTR weekly hours of work); whether the firm benefits from incentives, structural help, both or none of them. Otherwise, some more individual characteristics are given (firm size before WTR, sector of activity)[32], all of this at the establishment level.

For the purpose of our analysis, we need to build up three variables to compare firms in terms of their WTR date of implementation. Given that days, months and years were available for agreement signing and effective WTR date of implementation, we create four variables: the two first measure the number of days that separate the agreement signing date (respectively effective WTR date of implementation) from the date the Robien law was enforced (June, 11^{th} 1996). Since the two considered dates do not in general coincide, we take the difference between them as a proxy for the time to be required by the establishment to implement WTR (for example to proceed to reorganizations...) after signing an agreement. For convenience, we convert these figures in years. Else, for all three laws, three other variables were created each one taking the 1 value when the firm signs an agreement corresponding to that device.

Concerning the type of signed agreement (commitment on job creations, job preservations, both or none of them), we build only one variable saying whether or not the establishment commits on job creations. To check whether or not this variable was relevant, we build another variable which is equal to one if job creations were different from zero and 0 else. We find identical descriptive statistics through this new variable.

As to the size of the Working Time Reduction, we use weekly or annually hours of work declared within the firm before and after the WTR to get a continuous variable which deals with the percentage reduction in the weekly hours of work. Nevertheless, establishments often declare 39 weekly hours of work before and 35 weekly hours of work once the WTR has been implemented; hence no more information is provided

[31] We can not use this last variable since it appears to be affected by measurement errors (see Pham [2001]).

[32] Note that contrary to the former one, this file – whose version dates from May 30^{th} 2003 – does not provide us any further information on wage compensation, or WTR reorganization (and the way firms used to achieve it).

in comparison to what is already brought through the two dichotomous variables – previously quoted – dealing with a commitment either on a 10% or on a 15% reduction in the working time. Consequently, we let this variable aside and consider only the two dichotomous ones.

Finally, we remove from sample all observations for which : i) there are at least one missing value; ii) an agreement (respectively a WTR) is declared to be signed (respectively to have been implemented) before Robien law enforcement or after 2004; iii) weekly hours of work (respectively annually hours of work) are declared to be greater after than before the WTR is implemented. This database contains 463938 establishments before and about 360000 once our database was cleaned.

Merging the two surveys

Before merging WTR administrative survey's agreements and the manufacturing part of the COI survey, we proceed to some modifications. Firstly and contrary to COI database, administrative WTR surveys are constructed at the establishment level. Given that we have the mean number of workers[33] both at the firm level and at the establishment level, we may consider only those companies with one single establishment as soon as these two numbers are equal. However, we suffer from massive data loss: about one third of companies which are both in the WTR survey and in the COI survey disappear from our sample. Moreover, since we want to describe 1997 reorganization within the firm before it implements a WTR only through the COI survey, we do not need to exclude all "non single establishment" companies. Indeed, in the WTR files, one variable (REF) points to the reference establishment and is used to count the number of firms at the national level. Hence, we merge COI and WTR agreements by SIREN and exclude from our sample all establishments for which the reference variable takes the 0 value and we consider for the firm the information available for the reference estalishment. Note that before proceeding to the merge, we create one variable which allows us to point to WTR firms. Finally, after merging, there were 4644 firms or 2780 firms remaining in our sample, as we take account or not for companies that still do not have implemented a WTR.

[33] Computed on the last twelve months preceeding the WTR date of implementation (see Pham [2001] for a complete dictionnary describing all variables appearing in the administrative WTR surveys'agreements).

Table 7: **Results for pairwise effects (conditional and unconditional pair) of the firm strategy on the way companies have implemented a WTR, following the balancing score does or not take account for the 1997 employment level. Nadaraya Watson estimates, restricting on the common support using a two percent trimming rule.**

Var./Estimate	Pair	Naive	$\hat{\alpha}_N^{m,l_a}$	$\hat{\alpha}_N^{m,l_i}$	$\hat{\gamma}_N^{m,l_b}$	$\hat{\gamma}_N^{m,l_i}$
Already a WTR[c]*:*	HR[f]-MR	0.088***	0.016	0.049	0.014	0.051
		(0.017)	(0.031)	(0.030)	(0.032)	(0.032)
	HR-LR[h]	0.154***	−0.006	0.050	0.011	0.074**
		(0.018)	(0.034)	(0.034)	(0.036)	(0.035)
	MR[g]-LR	0.065***	−0.025	0.006	−0.003	0.023
		(0.017)	(0.027)	(0.027)	(0.028)	(0.028)
Implementation[d]*:*	HR-MR	−0.078*	−0.037	−0.071	−0.053	−0.077
		(0.042)	(0.074)	(0.074)	(0.076)	(0.073)
	HR-LR	−0.166***	−0.085	−0.164**	−0.099	−0.169**
		(0.045)	(0.082)	(0.081)	(0.082)	(0.077)
	MR-LR	−0.088**	−0.044	−0.082	−0.046	−0.091
		(0.044)	(0.074)	(0.074)	(0.077)	(0.074)
Delay[d]*:*	HR-MR	−0.058**	−0.023	−0.038	−0.027	−0.039
		(0.026)	(0.045)	(0.045)	(0.046)	(0.045)
	HR-LR	−0.123***	−0.078*	−0.072	−0.042	−0.082*
		(0.031)	(0.047)	(0.046)	(0.048)	(0.046)
	MR-LR	−0.065**	−0.001	−0.033	−0.015	−0.042
		(0.032)	(0.049)	(0.050)	(0.050)	(0.050)
Job creations:						
Commitment[c]	HR-MR	0.052**	0.044	0.048	0.046	0.046
		(0.021)	(0.035)	(0.034)	(0.034)	(0.034)
	HR-LR	0.098***	0.092**	0.070*	0.088**	0.065*
		(0.023)	(0.039)	(0.038)	(0.040)	(0.037)
	MR-LR	0.046	0.017	0.018	0.041	0.019
		(0.022)	(0.035)	(0.035)	(0.038)	(0.035)
Jobs created[e]	HR-MR	6.386***	2.005	4.407*	1.869	4.301
		(1.233)	(2.663)	(2.654)	(2.785)	(2.737)
	HR-LR	9.828***	2.819	6.862**	3.157	7.247***
		(1.194)	(2.782)	(2.725)	(3.047)	(2.702)
	MR-LR	3.442***	0.281	2.158	1.287	2.941
		(0.578)	(2.483)	(2.468)	(2.765)	(2.498)
10% *WTR* [c]*:*	HR-MR	−0.058**	−0.036	−0.049	−0.031	−0.052
		(0.021)	(0.036)	(0.036)	(0.037)	(0.036)
	HR-LR	−0.094***	−0.037	−0.059	−0.048	−0.070*
		(0.023)	(0.040)	(0.039)	(0.039)	(0.038)
	MR-LR	−0.036	−0.020	−0.020	0.017	0.018
		(0.022)	(0.039)	(0.039)	(0.039)	(0.039)

Notes : Bootstrapped standard errors in brackets. Significancy levels : * (10%), **(5%), ***(1%). [a,b]Conditional (respectively unconditional) pairwise treatment effect. [c]Percentage difference. [d]Difference in years. [e]Difference in the number of jobs to be created. [f,g,h] High (respectively Medium, respectively Low) Road strategy. [i]The balancing score specification does not include the 1997 employment level.

Source : Author's calculations based on the common part of the COI survey (manufacturing industries) and of administrative survey of Robien, Aubry I and II agreements.

Table 8: **Results for composite (or aggregate) effects of the firm strategy on the way companies have implemented a WTR, following the balancing score does or not take account for the 1997 employment level. Nadaraya Watson estimates, restricting on the common support through a two percent trimming rule.**

Var./Estimate	Firm	Naive	$\hat{\gamma}_N^m(\tilde{v}_{m,l})^a$	$\hat{\gamma}_N^m(\tilde{v}_{m,l})^i$	$\hat{\gamma}_N^m(\breve{v}_{m,l})^b$	$\hat{\gamma}_N^m(\breve{v}_{m,l})^i$
Already a WTR[c]*:*	HR[f]	0.118***	0.013	0.061**	0.007	0.053*
		(0.016)	(0.031)	(0.030)	(0.030)	(0.030)
	MR[g]	−0.004	−0.008	−0.011	−0.014	−0.018
		(0.015)	(0.024)	(0.024)	(0.023)	(0.024)
	LR[h]	−0.101***	−0.002	−0.043	−0.003	−0.030
		(0.015)	(0.027)	(0.027)	(0.027)	(0.026)
Implementation[d]*:*	HR	−0.115***	−0.072	−0.116*	−0.060	−0.101
		(0.038)	(0.069)	(0.065)	(0.069)	(0.066)
	MR	−0.002	0.005	−0.004	−0.002	−0.004
		(0.037)	(0.064)	(0.062)	(0.063)	(0.063)
	LR	0.122***	0.070	0.125*	0.055	0.118*
		(0.039)	(0.070)	(0.066)	(0.069)	(0.067)
Delay[d]*:*	HR	−0.085***	−0.034	−0.058	−0.028	−0.052
		(0.024)	(0.040)	(0.038)	(0.040)	(0.039)
	MR	0.002	0.007	−0.001	−0.003	0.008
		(0.025)	(0.042)	(0.042)	(0.025)	(0.042)
	LR	0.090***	0.027	0.060	0.015	0.048
		(0.028)	(0.043)	(0.043)	(0.043)	(0.043)
Job creations:						
Commitment[c]	HR	0.072***	0.064**	0.054*	0.054*	0.053*
		(0.019)	(0.031)	(0.031)	(0.032)	(0.031)
	MR	−0.005	−0.004	−0.014	−0.010	0.018
		(0.018)	(0.030)	(0.029)	(0.029)	(0.029)
	LR	−0.068***	−0.062*	−0.040	−0.047	−0.034
		(0.020)	(0.035)	(0.032)	(0.035)	(0.033)
Jobs created[e]	HR	7.842***	2.557	5.545**	1.709	4.856**
		(1.183)	(2.414)	(2.426)	(2.540)	(2.477)
	MR	−1.622**	−0.339	−0.790	−0.893	−1.741
		(0.777)	(2.320)	(2.249)	(2.184)	(2.540)
	LR	−6.237***	−2.106	−4.824**	−1.339	−4.502**
		(0.665)	(2.540)	(2.204)	(2.553)	(2.243)
10% *WTR* [c]*:*	HR	−0.073***	−0.038	−0.060*	−0.036	−0.057*
		(0.019)	(0.032)	(0.031)	(0.033)	(0.032)
	MR	0.012	0.007	0.018	0.011	0.015
		(0.018)	(0.032)	(0.032)	(0.032)	(0.032)
	LR	0.061***	0.031	0.041	0.031	0.034
		(0.020)	(0.035)	(0.034)	(0.035)	(0.035)

Notes : Bootstrapped standard errors in brackets. Significancy levels : * (10%), **(5%), ***(1%). [a,b]Composite / aggregate average treatment effects specified in the text. [c]Percentage difference. [d]Difference in years. [e]Difference in the number of jobs to be created. [f,g,h] High (respectively Medium, respectively Low) Road strategy. [i]The balancing score specification does not include the 1997 employment level.

Source : Author's calculations based on the common part of the COI survey (manufacturing industries) and of administrative surveys of Robien, Aubry I and II agreements.

Table 9: **Modeling the probability for a company to have followed a High, a Medium or a Low Road strategy. Maximum likelihood estimates of a multinomial logistic model. Sample: intersection of COI and WTR.**

Variables / Strategy	HR	HR	MR	MR
Specification	All	Only 10%	All	Only 10%
Intercept:	−4.86***	−5.09***	−2.01***	−2.21***
Sectors:				
Food industries	−0.16	–	−0.07	–
Consumption goods	−1.20***	−1.19***	−0.65***	−0.66***
Car industries	0.96***	1.04***	0.45	0.49
Equipment goods	0.42**	0.43***	0.52***	0.48***
Intermediary goods	ref	ref	ref	ref
Energy	–	–	–	–
Log of number of workers :	0.72***	0.75***	0.35***	0.35***
Strategy factors:				
New products	0.38**	0.35**	0.24*	0.17
Product differenciation	−0.06	–	−0.15	–
Quality improvement	0.93***	0.89**	0.61**	0.57**
New production processes	0.71***	0.70***	0.52***	0.51***
Cost reduction	−0.76**	−0.74**	−0.43	−0.41
Organizational constraints:				
Higher market competition	0.08	–	0.04	–
Market uncertainty	−0.06	–	−0.06	–
Client constraints	0.22	0.11	0.31**	0.30***
Provider constraints	–	–	–	–
Administrative constraints	−0.13	–	−0.06	–
Shareholding	0.24*	0.29**	0.01	−0.01
Other (merge...)	0.13	–	−0.07	–
Equipment Use also :				
By night	0.46***	0.47***	0.34***	0.35***
On Saturday	0.31**	0.35**	0.21*	0.31**
On Sunday	−0.22	−0.15	−0.39***	−0.35***
Production adjustment to demand:	−0.46	–	−0.45	–
Random adjustment	0.43**	–	0.33**	–
Expected adjustment	−0.37***	−0.48***	−0.09	−0.19*
Ways used to adjust production:				
Overtime	−0.29**	−0.31**	−0.07	−0.09
Temporary labour force	0.65***	0.64***	0.35***	0.33***
Finite term contracts	−0.17	–	−0.04	–
Part time work	0.64***	0.63***	0.35***	0.33***
Part time unemployment	−0.33**	−0.28*	−0.33**	−0.31**
Modulation	0.14	–	0.12	–
Annualization	−0.02	–	−0.09	–
Subcontracting	−0.02	–	−0.10	–
Production storage	0.16	–	0.18*	–

Notes : Maximum likelihood analysis of variance. Likelihood ratio: Chi-square: 5203.32; P-value >Chi-square: 0.9978.

Sources : Author's computations on the common part to the COI survey, and to administrative survey of Robien and Aubry I and II agreements.

Table 10: **Modeling the probability for a company to have followed a High, a Medium or a Low Road strategy. Maximum likelihood estimates of a multinomial logistic model. Sample: intersection of COI and WTR. The 1997 within the firm employment level is not taken into account.**

Variables / Strategy	HR	HR	MR	MR
Specification	All	Only 10%	All	Only 10%
Intercept:	−2.16***	−2.68***	−0.69***	−0.99***
Sectors:				
Food industries	−0.37**	–	0.14	–
Consumption goods	−0.99***	−0.86***	−0.54***	−0.50***
Car industries	1.22***	1.29***	0.54	0.54
Equipment goods	0.60***	0.69***	0.59***	0.59***
Intermediary goods	ref	ref	ref	ref
Energy	1.00**	0.99**	0.48	0.48
Log of number of workers :	–	–	–	–
Strategy factors:				
New products	0.53***	0.57***	0.30**	0.25**
Product differenciation	0.04	–	−0.11	–
Quality improvement	0.88**	0.66**	0.57**	0.43
New production processes	0.68***	0.67***	0.51***	0.49***
Cost reduction	−0.56	–	−0.35	–
Organizational constraints:				
Higher market competition	0.18	–	0.07	–
Market uncertainty	−0.17	–	−0.10	–
Client constraints	0.14	0.13	0.27**	0.25**
Provider constraints	–	–	–	–
Administrative constraints	−0.25**	−0.32***	−0.13	−0.13
Shareholding	0.40***	0.43***	0.10	0.10
Other (merge...)	0.30**	0.31**	−0.01	0.01
Equipment Use also :				
By night	0.95***	0.96***	0.56***	0.56***
On Saturday	0.55***	0.51***	0.30**	0.29**
On Sunday	−0.29*	−0.18	−0.44***	−0.39***
Production adjustment to demand:	−0.66**	−0.78**	−0.54*	−0.63**
Random adjustment	0.44**	0.46***	0.35**	0.34**
Expected adjustment	−0.32**	−0.35***	−0.08	−0.08
Ways used to adjust production:				
Overtime	−0.22*	–	−0.08	–
Temporary labour force	0.76***	0.72***	0.41***	0.40***
Finite term contracts	−0.11	–	−0.01	–
Part time work	0.84***	0.85***	0.42***	0.39***
Part time unemployment	−0.16	–	−0.26*	–
Modulation	0.23*	–	0.17	–
Annualisation	0.05	–	−0.06	–
Subcontracting	0.01	–	−0.10	–
Production storage	0.28**	0.30**	0.24**	0.24**

Notes : Maximum likelihood analysis of variance. Likelihood ratio: Chi-square: 5386.60; P-value >Chi-square: 0.8562.

Sources : Author's computations on the common part of the COI survey, and administrative surveys of Robien and Aubry I and II agreements.

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