ORGANIZATIONAL EFFICIENCY AND MONOPOLY POWER : THE CASE OF FRENCH INDUSTRIAL GROUPS (*)

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INTRODUCTION

The phenomenon of corporate group is a familiar characteristic of European, Canadian and Japanese industrial organization[1]. It is a situation where a number of industrial companies, though legally autonomous, act under common control. The controlling corporation, usually known as the parent or head company and the controlled corporations - its subsidiaries or affiliates - constitute together the industrial group.

From an economic point of view, these industrial groups are not fundamentally different from the large U.S. corporations organized on a multidivisional basis. Like them, they are institutions which - following the definition given by A.D. Chandler Jr. (1977) - own and operate a multi-unit system administered by a multi-level managerial hierarchy.

However, unlike the U.S. case, the industrial groups in France have no legal existence and are not identified in official censuses. Each subsidiary maintains its legal autonomy and keeps separate accounts. It is therefore not surprising that there have been very few quantitative studies of this phenomenon. It is clear, though, that for the purpose of analyzing industrial structures the relevant decision making unit is the group as such, and not the separate legal entities - i.e. the various companies - within the group.

The purpose of this paper is to analyze the respective roles of efficiency and of market power considerations in explaining why industrial groups are the predominant form of organization in some French industries.

A first explanation for the presence of these groups in specific industries rests in the following proposition : by combining the pro-

[1]For a discussion of the role of various forms of industrial groups in Europe, see A. Jacquemin and H. de Jong (1977, pp. 68-77). The Canadian situation is described in a governmental publication, Statistics Canada (1979), on inter-corporate ownership. See also S. Berkowitz, P. Carrington, Y. Kotowitz and L. Waverman (1978-79). For Japan, see R. Caves and M. Uekusa (1976).

perties of decentralization decision making at the operating level with centralized strategic planning and capital allocation, the French industrial group efficiently coordinates and monitors a multi-unit system. If so, it is only in industries where administrative coordination is superior to market mechanisms and to contractual agreements that this structure will predominate. Inversely, in industries whose characteristics do not lead to a superiority of internal coordination, these groups will be absent or weakly present.

Theoretical arguments to justify this hypothesis and empirical tests to support it will be presented in the first section.

A second explanation lies in the significance of these groups for enhancing market power. Two views could be advanced. On the one hand, it may be argued that industrial groups enhance monopoly power in the economy by increasing market concentration. On the other hand, oligopolistic interdependence may be weaker in industries where competition occurs between highly and differently diversified groups than in industries where the main participants are single unit firms. The second section provides the theoretical framework and the empirical tests for these views. A third section makes more precise the respective role of efficiency and monopoly power by contrasting two types of industries according to the share of groups' activities.

SECTION 1. INDUSTRIAL GROUPS, HIERARCHIES AND EFFICIENCY

This section begins by presenting theoretical framework which explains why internal organization may offer advantages that outweigh the rival benefits of market mechanisms (*1.1*). The distinct question of which form internal organization takes is then tackled by analyzing the characteristics of the industrial group. These characteristics may explain why it is such a widespread mode of internal coordination in France (*1.2*). An econometric model is then used to test some of the hypotheses advanced above (*1.3*).

1.1. Internal coordination

In all virtually industrialized countries, some industries (i.e. chemicals, electrical machinery, oil, ...) are dominated by vertically integrated and diversified firms, while in other industries (i.e. wood, printing and publishing, apparel, ...), small non-integrated single product firms are the most common form of industrial organization.

A theoretical framework explaining this dual industrial structure has been provided in works by A. Chandler (1977) and O. Williamson (1975).

Chandler, through his research on the history of large-scale modern business enterprise and managerial capitalism, has analyzed the circumstances under which managerial hierarchies arose in various sectors of the American industry. A main proposition is that "the modern multi-unit business enterprise replaced small traditional enterprises where administrative coordination permitted greater productivity, lower costs and higher profits than coordination by market mechanisms" (p. 6). Similarly, Williamson, extending seminal work by R. Coase (1937) on the nature of the firm, has analyzed the underlying factors that explain how and why transactions within the firm can yield economies relative to market transactions. Doing so, he suggests that "measures of internal organizational structure will eventually be joined with measures of market structure in attempting to explain conduct and performance in industrial markets" (p. 8).

There is a growing body of research on which M. Spence (1975) has termed "economics of internal organization". The general idea is that "the firm in large part consists of non-market institutions whose function is to deal with resource allocation in the presence of informational constraints that markets handle poorly or do not handle at all" (p. 144). A methodology common to this research is to compare the performance of the market and of internal organization in efficiently allocating human and non-human resources. Interesting results have been derived for a range of situations (increasing returns associated

with the acquisition and use of information, structure of managerial incentives, role of internal capital markets, transactional arguments favourable to vertical integration or to diversification ...).

However, this research does not identify the difference among industries which explain why managerial hierarchies are used to coordinate, monitor and allocate resources better than do market mechanisms. Without pretending to give an exhaustive answer to this difficult question, we shall discuss some industrial characteristics which may be relevant. The influence of these characteristics will be empirically tested for the case of French industries.

1. A first and frequently recognized factor are economies of scale. According to Chandler (1980), the ability to closely coordinate the flow of raw materials and finished goods and to standardize the processes involved makes it possible for firms to use the human and non-human resources of the individual units more intensively : this reduces the cost of production and distribution. "Scheduling and standardization make possible what can be termed economies of speed, a basic element in what economists normally call the economies of size or scale" (p. 12). Hence, although *plant scale economies* are traditionally linked with the phenomenon of technical concentration, there is also a direct link with the ability to achieve internal coordination. For example, a reduction in production costs can arise from a merger if the production of a plant with sub-optimal capacity is transferred to another plant, allowing that plant to reach minimal efficient scale. However, the benefits of this merger will be achieved only if the previously separated units can be suitably coordinated.

This is even truer for *economies at the level of the firm.* In industries where these economies are potentially important[1], their exploitation requires a high degree of internal organization : for example, so is to pool management services, coordinate multi-regional investments (taking into account transportation costs and regional characteristics),

[1] See F.M. Scherer (1975).

relocate output within multi-plant operations or control a broad range of products. Each of these factors requires a managerial hierarchy capable of providing a high level of administrative coordination.

2. It is well known that there exist interindustry differences in *technological opportunities* : some industries - such as chemicals and electrical equipment - are more deeply related to scientific activites than others (food, apparel, metal industries, ...). However, research and development activities related to technological opportunities have organizational implications. First, production and marketing activities are closely interdependent with research and development since successful R & D must build on production and marketing experience so as to improve processes and products. This interdependence favours the integration of these activities. Further, technological knowledge displays some of these characteristics of a public good : transfer of this knowledge involve highly uncertain transactions; compared with interfirm trading, intra-firm transfer avoid the need for repeated negotiations and insure better governance (see H. Daems (1980) and D. Teece (1980)). Consequently, firms in high technology industries are more likely to be organized around managerial hierarchies.

3. A third relevant industrial characteristic is the extent of an industry's *capital requirement*. First, high fixed costs may be a source of market failure. As Spence (1975, p. 161) pointed out : "A market may have trouble providing a good with high fixed costs and low variable costs, and it certainly has trouble providing it efficiently, for revenues must cover total costs, and this may be either impossible or possible only with inefficiently high prices". Second, the cost of capital also gains an important role, particularly in industries characterized by relatively large capital requirements. Internal capital markets lower the cost of capital as compared to the traditional capital market processes. Only on the unrealistic assumption of frictionless capital markets, can the opposite be true. The existence of fixed transaction costs in industries requiring large volumes of capital, therefore favours centralized financial management. This fact has been extensively developed by Chandler whose historical analysis shows that

capital intensive and energy consuming industries were the first to replace market mechanisms by internal coordination.

4. Industries where *international operations* are important face the problem of coordinating the mobilization or the transfer of resources on an international scale. One aspect of this problem is the high degree of uncertainty and the high (indivisible) cost of information on foreign markets. Given significant increasing returns in the acquisition and use of information, internal coordination will be more advantageous than market mechanisms or contractual relations. Related to this is the role of various forms of intangible capital with public good characteristics. The managerial know-how, patents and trademarks, acquired in the domestic market can also be used for international operations. This suggests a close interdependence between domestic and international activities that must be consolidated. More generally industries competing on international markets require organizational structures which allow efficient control of the relations between domestic and foreign activities, and which reduce the uncertainties of international market mechanisms[1]. It is, therefore, not surprising that a growing share of international trade is realized within and not between firms.

1.2. *A specific form : the industrial group*

Having examined some of the industrial characteristics which favour internal coordination, it is now useful to discuss the properties of alternative organizational forms in terms of their ability to capture the benefits of coordinated activites. The place of industrial groups among these forms will then be identified.

The general problem is to find a compromise between a centralized allocation of capital and a decentralization of decisions, consistent with the objective of maximizing the overall profit of the organization.

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[1]For a study of the effect of external competitive threat on the organizational structure of large European enterprises, see L. Franko (1976).

More precisely, five properties of the organizational structure of the large enterprise are required in order to realize the potential benefits of internal coordination :

- total control of the capital of each constituent unit by the organization;
- centralized allocation of global net revenue among the different units;
- clear separation between senior management concerned with strategic planning and middle management in charge of operating decisions;
- establishment of internal incentive rules such that fulfillment by each unit of its own objectives leads to the achievement of global objectives;
- control by the general office of the results obtained by the operational units.

In the United States, the passage from the U-form enterprise, where the principal units are functional divisions (sales, finance, manufacturing) to the multidivisional structure (M-form), where quasi-autonomous operating divisions (organized along product, brand or geographic lines) are the basis for dividing responsibilities, enabled these conditions to be satisfied. According to Williamson (1975), "the organization and operation of the large enterprise along the lines of the M-form favours goal pursuit and least cost behaviour more nearly associated with the neo-classical profit maximization hypothesis than does the U-form organizational alternative" (p. 150). It is precisely this organizational form that is labelled in the U.S. as a "hierarchy" and that is qualified as "managerial", to underline that the effective control is exercised by professional managers, not by the owners of capital.

In Europe, and more specially in France, it is the industrial group which has the organizational structure most directly associated with the properties of a multi-divisional hierarchy. It is an organization where the parent company carries out strategic planning, coordinates and monitors the efficiency performance of each subsidiary. This is precisely the view presented in the proposed seventh EEC Directive on Group Accounts : "The basic characteristic of such groups is that the management of the companies belonging to them is coordinated in such a

way that they are managed on a central and unified basis by the dominant company in the interest of the group as a whole". Since France's entry into the EEC, industrial groups have become increasingly vertically integrated and diversified. From the point of view of internal organization, the general office of the parent company assisted by a staff composed of functional directors, coordinates a number of operational divisions. Each divisional directorate is responsible for the subsidiaries acting in a given product line or territory. The French industrial group therefore combines the properties of decentralized decisions with centralized allocation of resources.

However, these groups have three characteristics which make them distinct from the large U.S. multi-unit enterprises.

1. The constituent units have separate legal identities, associated with specific rights and duties. They are liable for their own debts and obligations and publish separate accounts. The legislation does not require the publication of consolidated accounts although a growing number of industrial groups do so. In contrast, in the United States, the Sherman Act and the Courts' interpretations of the law have forced groups to consolidate their operation into a single centralized enterprise administered by a hierarchy of managers[1]. It is worthnoting that maintenance of a legal identity may favour the sense of responsibility, motivation and efficiency of managers of individual units within the group. This may be one of those elements which Chandler calls "national characteristics".

2. In the United States as in France, the ownership of capital is the main criterion in deciding whether a company is a subsidiary of another. In contrast to the most common U.S. situation however, French parent companies usually control much less than 100% of the voting stock of affiliates. The legal rule of affiliation requires control of half the voting stock. An implication is that the parent company is able to control a much larger volume of activity with a given capital base than its

[1] See A. Chandler (1977, pp. 418-426) for the analysis of the Standard Oil case.

fully integrated counterpart[1].

3. A third characteristic is that in many groups, an important share of the capital is still in the hands of families[2] and banks. Their representatives are often among the members of the administrative board of the parent company.

At this stage, is is necessary to distinguish financial groups from industrial groups. Financial groups mainly engaged in banking activities provide capital for the development of industrial groups; they usually do not participate directly in the management of firms in which they hold a limited number of shares. According to Levy-Leboyer (1980), financial constraints, particularly the inability of the banks and the capital market to cope with the expanding requirements of business, explain why large industrial groups become tied together by financial holding companies.

To conclude, although the organization of French industrial groups presents some pecularities due mainly to national characteristics inhe-

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[1] A simple expression shows this effect. Let us define A_r as the productive assets of the r-th company, β_r the degree of control exercised by company r - 1 on company r, $(r = 1,\ldots,n)$, where $\beta_r > 50\%$ $r > 0$, and β_0 the share held by the controlling shareholder in the parent company. Then, this controlling shareholder holds only

$$\sum_{r=0}^{n} A_r \left(\prod_{0}^{r} \beta_k\right),$$

but controls :

$$\sum_{r=0}^{n} A_r .$$

The multiplier effect is then defined as

$$m = \frac{\sum_{r=0}^{n} A_r}{\sum_{r=0}^{n} A_r \left(\prod_{0}^{r} \beta_k\right)} .$$

The higher the ratio between the total amount of group assets controlled by the controlling shareholder (the parent company for $\beta_0 = 1$) and what it holds, the larger is the multiplier effect.

[2] See F. Morin (1974) for a classification of the large French firms according to the weight of families and A. Jacquemin and E. de Ghellinck (1980) for testing the effects of familial control on the French firms' profitability.

rited from history, it appears to be the best approximation of the M-form enterprise; this form is particularly efficient in capturing the benefits of internal coordination. If the existence of industrial groups is seen as a search for an efficient organizational adaptation to industrial characteristics, then one would expect these groups to be active mainly in industries where internal coordination is clearly superior to alternative forms of coordination; conversely, in industries where market mechanisms offer greater advantages, there will be few industrial groups. The next section tests this hypothesis.

1.3. *Testing the efficiency hypothesis of industrial groups*

The statistical data is drawn from a large-scale study carried out by the Center for Mathematical Economics of the University of Paris I in collaboration with the French National Institute of Statistics (INSEE). This study focused on the year 1974[1]. The first objective of this study was to identify the structure and membership of industrial groups. The lack of a legal basis for the definition of a group of corporations and the scarcity of published data, compelled us to use a simple criterion of group membership. Though many dependency links between firms may exist (subcontracting, patents, interlocked directorates), stock ownership remains the most reliable indicator of hierarchical links. This indicator has therefore been used as the main source of information on group membership.

Let us start with a brief presentation of the methodology used to reconstruct industrial groups in the French economy.

A. INDUSTRIAL GROUPS : METHODOLOGICAL ASPECTS

According to the Law of July 1966, one company is considered a subsidiary of another when the latter directly or indirectly controls half the nominal value of the former's voting share capital. The head

[1] See Centre de Mathématiques Economiques de l'Université Paris I (1980).

(or parent company) of a group is defined as a company which holds subsidiaries but is not itself a subsidiary of another company. The group is then constituted by all the firms in which the head, directly or indirectly, owns a majority of the company stock. In order to retain only groups of substantial size, the identification procedure started from a list (published yearly by "Le Nouvel Economiste") of the 500 largest French companies classified by their consolidated equity. Each of these companies was examined to see if it was an independent firm, a parent company or the subsidiary of another company. After correcting to account for minority control, this process identified 319 parent companies for the base year 1974[1].

The global importance of these 319 groups is attested by the fact that their affiliated firms account for about 40% of total industrial employment, 50% of total value added and 60% of fixed assets. These groups weigh heavily in most of intermediary and equipment goods industries, but rather weak in consumer goods industries. Among the 319, 28 groups, which employed each one more than 20.000 persons, accounted for about 55% of total group employment, but in some industries small size groups had an appreciable share so it was necessary to keep the whole set of groups.

B. THE INDUSTRY SAMPLE AND THE VARIABLES

Our sample consists of 270 industries at the four digit level (level 600 in the "Nomenclature d'activités et de produits"). These industries cover intermediate, capital and consumption goods, but exclude regulated industries. For each industry, we have distinguished independent compa-

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[1]About 8000 companies depend on these parent companies. Numerical data concerning these firms was gathered from the INSEE data bank SUSE (Système Unifié des Statistiques d'Entreprises) which contains fiscal and census data. A subset of about 35000 firms listed in SUSE and defined by size criteria including employment (more than 50 workers) was used. This subset of firms constitutes the "reference set" from which sectoral data used for the econometric studies which follow was derived. 3931 firms within this "reference set" depend on groups, the remaining 4000 being too small to figure in the "reference set". Firms controlled at more than 50% by a single parent company from the previous list of 319, constitute 75% of the 3931 identified firms and more than 90% of their total value added and employment. Only these firms will be considered in the sample as affiliated to industrial groups.

nies from those affiliated to one of our 319 corporate groups. On this basis, we have computed the share of employment by industrial groups in each industry (G), that is the share of the industry employment accounted for by firms effectively controlled by groups. This will be used as a dependent variable expressing the extent to which hierarchies are used to carry out coordination, allocation and monitoring functions in particular industries. If we split the 270 industries into different subsets according to the share of groups in industry employment, the results, displayed in Table 1, show that the 77 industries where this share is above 50% represent about 54% of value added for the sample as a whole. Inversely, the 87 industries where G is below 10% represent less than 12% of total value added. These results confirm two facts :

- first, the importance of groups varies greatly over French industries;
- second, industries where groups predominate account for the bulk of value added in the industries examined.

As suggested by the previous theoretical arguments, the following economic variables may serve to explain interindustrial variation in the share of groups G :

- *Economies of scale* (ES) measured by the share of industry output produced by plants of minimum efficient scale. An estimate of economies of scale is derived from the methodology used by Comanor and Wilson (1967). It is defined by the average employment size of the largest establishments employing 50% of total employment in an industry, divided by the total employment of this industry.
- *Multiplant economies* (MULTIP) measured by the ratio of the number of plants in an industry to the number of firms in the industry. This ratio, which represents the mean number of plants per firm in an industry, is derived from the S.T.I.S.I. (Service du Traitement de l'Information et des Statistiques Economiques) which is a division of the Ministère de l'Industrie. Unfortunately, this variable is available only for 231 industries out of the 270 used above. For comparison, we have also calculated the mean number of plants per firm for firms affiliated to industrial groups (MULTIP G).
- *Research activity* (RES) is measured by the ratio of research and develop-

Industries where share of groups employment (G) is :	Number of industries (level 600)	Importance in the sample in terms of		
		Value added %	Sales %	Employment %
$G \leqslant 10\%$	87	11.9	15.4	21.2
$10\% < G \leqslant 30\%$	61	16.4	18.2	18.5
$30\% < G \leqslant 50\%$	45	17.9	18.0	17.2
$G > 50\%$	77	53.8	48.4	43.1
TOTAL	270	100	100	100

TABLE 1 : Value added, sales and employment by share of groups in industry employment

- ment outlays to total sales. These data come from a publication of the S.T.I.S.I. (1977). This variable is available only for three digit level industries ("level 100"). A proxy has been calculated by assuming that each "level 600" industry within a "level 100" aggregate has the same RES.
- *Capital requirements* (KR) are measured by the product of industry's total fixed capital and the Herfindhal concentration index calculated over the same variable (fixed capital). As well-known, the inverse of the Herfindhal measure of concentration is the "equivalent number of equal sized" firms yielding the same level of concentration.

Thus defined, the capital requirements variable is the average level of fixed capital corresponding to a given level of concentration in the industry.

- *Level of export* (EXP) measured in each industry by the ratio of exports to total sales.

With the exception of MULTIP and RES, these data are drawn from the statistical data bank "SUSE".

Before turning to the results of the econometric model, it is interesting to compare the mean value and standard deviation of each of the above mentioned variables in subsets of industries corresponding to different levels of G (Table 2). The most noticeable result is the following : the mean values of all the variables are much higher in the last subset of industries ($G > 54\%$)[1] than in the other subsets. This can be seen by comparing the mean values in this subset with corresponding values in the sample as a whole (the two last columns of Table 2) : economies of scale, multi-plant economies, research expenditures are approximately twice as great in industries where the share of groups employment is high; the capital requirements ratio is about three times higher; the level of exports is also higher though not to the same extent. It is also interesting to compare the mean number of plants by firms (MULTIP) to the same ratio for firms affiliated to industrial groups (MULTIP G). In the entire sample, the mean value of MULTIP is 2.27 with a standard deviation of 1.82, while the mean value of MULTIP G is 4.86 with a standard deviation of 3.26. The discrepancy is even more striking in the subset of industries where the share of groups in industry employment is high ($G > 54\%$) : the mean value and the standard deviation of MULTIP are respectively 4.00 and 3.00, while the corresponding values for MULTIP G are 8.25 and 6.53.

These results suggest that industrial activities of groups in the French economy occur mainly in industries meeting the prerequisites for internal coordination, as long as these prerequisites are correctly

[1]The justification of this threshold will appear in Section 3 where the switching technique is used.

Variables	"Level 600" industries where share of groups employment G is :				Whole Sample
	G = 0	0 < G ⩽ 30%	30% < G ⩽ 54%	G ⩾ 54%	
G %	0 (0)	12.3 (8.4)	40.1 (6.6)	78.8 (12.4)	34.2 (31.4)
ES %	13.8 (12.9)	10.3 (15.6)	10.4 (9.8)	33.2 (20.8)	17.1 (18.9)
MULTIP	1.32 (0.24)	1.62 (0.86)	1.76 (0.58	4.00 (3.00)	2.27 (1.82)
RES %	0.31 (0.29)	0.60 (0.76)	1.64 (3.48)	2.65 (3.94)	1.32 (2.74)
KR 10^6 Francs	168 (170)	831 (2695)	1135 (1092)	7474 (11390)	2641 (6913)
EXP %	20.9 (14.5)	18.5 (11.9)	20.6 (12.8)	25.9 (12.2)	21.3 (12.8)
Number of industries	30	95	42	64	231

TABLE 2 : Mean values (and standard deviations) of structural variables in subsets of industries defined by the share of groups in industrial employment

represented by variables such as scale and multi-plant economies, research outlays, financial requirements and intensity of international activity.

We now formulate an econometric model allowing us to test more precisely our efficiency hypothesis.

C. AN ECONOMETRIC MODEL AND ITS RESULTS

The general structure of the model tested is the following :

$$(1) \qquad G = a_0 + a_1 ES + a_2 MULTIP + a_3 RES + a_4 KR + a_5 EXP + \varepsilon.$$

Given the previous discussion, if the efficiency hypothesis is correct, the coefficient of each variable is expected to be significantly positive. Several variants of the general model have been used. They differ essentially in the measures adopted for the multi-plant economies (MULTIP) and research activity (RES) variables. We note that the variables MULTIP as previously defined (i.e. the number of plants divided by the number of firms in an industry) has a rather narrow range of variation. Virtually, by nature of its construction, it is a relatively stable variable which does not capture very well the effect of multi-plant economies of scale. Therefore, we used proxies to capture this effect. In equation (1) the variable MULTIP has been defined as the ratio :

$$\frac{\text{mean number of plants of groups affiliated firms in an industry}}{\text{mean number of plants of all firms in the same industry}}.$$

In equation (2) and (3), the continuous variable MULTIP has been replaced by a dummy whose value is 1 if the mean number of plants of all firms in an industry is above 2 and 0 otherwise. In equation (4) and (5), the variable MULTIP has been replaced by another dummy whose value is 1 if the mean number of plants of all firms in an industry is above 3 and 0 otherwise.

We recall that data on the variable RES (i.e. the ratio of research and development outlays to total sales in an industry) was available only at the "level 100". The convention ascribing an equal value for

this variable to all industries belonging to the same "level 100" is unlikely to be accurate. One way to reduce this inaccuracy is to transform again the continuous variable RES into a dummy variable. In equation (1), the continuous measure of RES defined above, has been used. In the other equations, RES has been replaced by a dummy whose value is 1 if the ratio $\frac{\text{research outlays}}{\text{total sales}}$ is above 1% in equation (4), 1,5% in equation (2), and 3% in equations (3) and (5).

Finally, note that in equation (1), we have introduced two dummies X and Y to account for the nature of the product : X = 1 for industries producing intermediate products, zero otherwise, and Y = 1 for industries producing capital goods and zero otherwise. These two dummies have not been used in the other equations.

The results are presented in Table 3. All the variables, in all the equations, are significant at 1% level with the exception of EXP which is significant at only 10% level. The simple correlation coefficients between independent variables are not very high, since the highest value (between economies of scale ES and the capital requirements ratio KR) is only 0.34.

We conclude that for our sample of French industries, the importance of corporate groups is clearly related to technological characteristics such as plant specific economies and multi-plant economies, to the need for research activity as revealed by R & D outlays, to financial requirements as captured by the average fixed capital in an industry, and to the degree of openness of an industry to international markets as measured by the level of exports.

If these variables signal the existence of potential benefits from internal coordination, and if the internal organization of French industrial groups permits them to capture these benefits, we conclude that the distribution of these groups among industries responds to efficiency considerations.

In Section 3, this result will be made more precise by distinguishing two types of industries according to the importance of industrial groups.

	Intercept	ES	MULTIP[1]	RES[1]	KR	EXP	X	Y	$\bar{R}^2$	F
eq.1	-0.0546 (-1.40)	0.5508 [a] (6.50)	0.0383 [a] (4.74)	0.1488 [a] (2.44)	0.1157 [a] (4.93)	0.2186 [c] (1.8)	0.1649 [a] (4.67)	0.1752 [a] (4.26)	0.5171	F(7,223) = 36
eq.2	0.0937 [a] (3.00)	0.4577 [a] (4.94)	0.1270 [a] (3.12)	0.1748 [a] (4.90)	0.1049 [a] (4.23)	0.2737 [a] (2.24)			0.4726	F(5,225) = 42
eq.3	0.1084 [a] (3.47)	0.5534 [a] (6.18)	0.1521 [a] (2.60)	0.2234 [a] (5.44)	0.1021 [a] (3.97)	0.2821 [a] (2.30)			0.4650	F(5,225) = 41
eq.4	0.1109 [a] (3.51)	0.5235 [a] (5.68)	0.1410 [a] (2.38)	0.1688 [a] (4.89)	0.1100 [a] (4.25)	0.2110 [c] (1.70)			0.4529	F(5,225) = 39
eq.5	0.1306 [a] (4.07)	0.5749 [a] (6.17)	0.1585 [a] (2.60)	0.1846 [a] (3.05)	0.1113 [a] (4.15)	0.2493 [b] (1.95)			0.4188	F(5,225) = 34

TABLE 3 : Regression equations relating groups share employment to structural variables (231 French industries); t ratios are given in parenthesis. Significance levels of the coefficients are [a] 1% level, [b] 5% level, [c] 10% level

[1]The measures of the variables MULTIP and RES in each equation are defined in the text.

SECTION 2. INDUSTRIAL GROUPS AND MARKET POWER

Parallel to the argument that the large multi-unit enterprise is a suitable organizational answer to efficiency requirements it has also been argued that the size of such an economic agent and the corresponding concentration of human and non-human resources can yield substantial economic power.

In this section, we limit our analysis to one aspect of this possible effect, i.e. horizontal market power, leaving open the more difficult (and probably more important) question of the overall effect.

It is known that for a given price elasticity of demand, two variables determine the degree of market power in an industry : the level of concentration and the degree of collusion (see Dansby and Willig, 1979; Encaoua and Jacquemin, 1980; Cowling, 1981).

If L is the Lerner index of monopoly power, ε the absolute value of the industry price elasticity of demand, H the Herfindhal index of concentration and β the degree of collusion ($\beta \in \{0,1\}$), the following relation is obtained in equilibrium for oligopoly markets :

$$L = \beta \frac{1}{\varepsilon} + (1 - \beta) \frac{H}{\varepsilon}.$$

The Cournot Nash equilibrium is derived for $\beta = 0$ and the monopoly solution for $\beta = 1$.

We shall examine briefly the potential effect of industrial groups on these variables.

a) The group is an organization which controls through its subsidiaries various industrial activities. In each industry, the subsidiaries of the same group must be aggregated to take into account the coordination of decision-making in spite of the legal autonomy of each of these subsidiaries. To avoid errors in the measurement of the *seller concentration ratio*, each seller should be defined as a collection of companies under common control. Taking into account the role of industrial groups will therefore increase the measure of market concen-

tration in all industries where more than one firm is dependent upon the same group. This question is examined in Paragraph 2.1.

b) The degree of *collusion* may also be influenced by groups' activities. In a given industry, a group can have strategies and overall objectives which differ from those of other groups, according to the nature and the extent of its activities outside the borders of the considered industry. An industry made of numerous groups, each of which has diversified its activities outside the borders of the industry may be characterized by a weaker degree of adherence to tacit agreements : differently integrated and diversified groups, with distinct sets of market goals and corporate strategies, will find it more difficult to collude[1]. This second aspect is dealt with in Paragraph 2.2.

2.1. *Concentration and industrial groups*

In France, most studies of the evolution of horizontal concentration have underlined the role of industrial groups. This role can be highlighted in our sample by calculating the correlation coefficient between the degree of concentration and the share of groups (G) used in Section 1. Defining concentration by the Herfindhal index applied to the market shares of legally distinct companies in an industry, we obtain a correlation of 0.55 (sample of 270 industries) and of 0.60 (sample of 231 industries) between this index and G. To clarify the relation between market structure and the share of groups, we classified industries according to the distribution of market shares of the largest firms. Again, a neat relation is obtained with the variable G. Seven types of market structure can be distinguished :

Monopoly : the largest firm has more than 80% of the market;

Dominant firm : the market share of the largest firm is between 50% and 80% and other firms in the industry are comparatively small;

Duopoly : two firms of approximately equal size share 80% or more of the market;

[1] This is in line with arguments developed by M. Hunt (1972); M. Porter (1976), R. Caves and M. Porter (1977), H. Newman (1978) and M. Porter (1979).

Asymmetrical oligopoly : three or four firms share 80% or more of the market, the market share of the largest being about 40%;

Symmetrical oligopoly : three or four firms share equally 80% of the market;

Asymmetrical competition : the largest firm has between 20% and 50% of the market, the remainder being divided between numerous other firms;

Symmetrical competition : the largest firm has less than 20% of the market.

After classifying each of the 270 industries into one of these categories, we calculated for each category the unweighted mean of groups' share of employment ($\overline{G}$) in all the industries in that category. The relation between the ordered classification and the mean share of groups ($\overline{G}$) displayed in Figure 1, shows that the importance of group activity decreases regularly over this ordering.

These results show that there is a strong relation between the importance of corporate group activity and market concentration, when market concentration is calculated over the legally distinct companies treated as if they were independent firms.

A distinct question, however, is the effect of consolidating the collection of companies in an industry which are under the common control of a group. Table 4 gives means and standard deviations for two measures of concentration, the first consolidating the activity of subsidiary companies in the same industry belonging to the same group, the second not consolidating these companies. Although, for some industries, the differences in concentration are important[1], the average divergence between

[1] With respect to the ratio $K = \frac{\text{consolidated concentration}}{\text{not consolidated concentration}}$, when the concentration is measured by Herfindhal index with the value added variable, the sample of 270 industries is splitted as follows :
for 161 industries $K = 1$,
for 40 industries $1 < K \leq 1.1$,
for 34 industries $1.1 < K \leq 1.43$,
for 30 industries $1.43 < K \leq 2$,
for 5 industries $K > 2$.

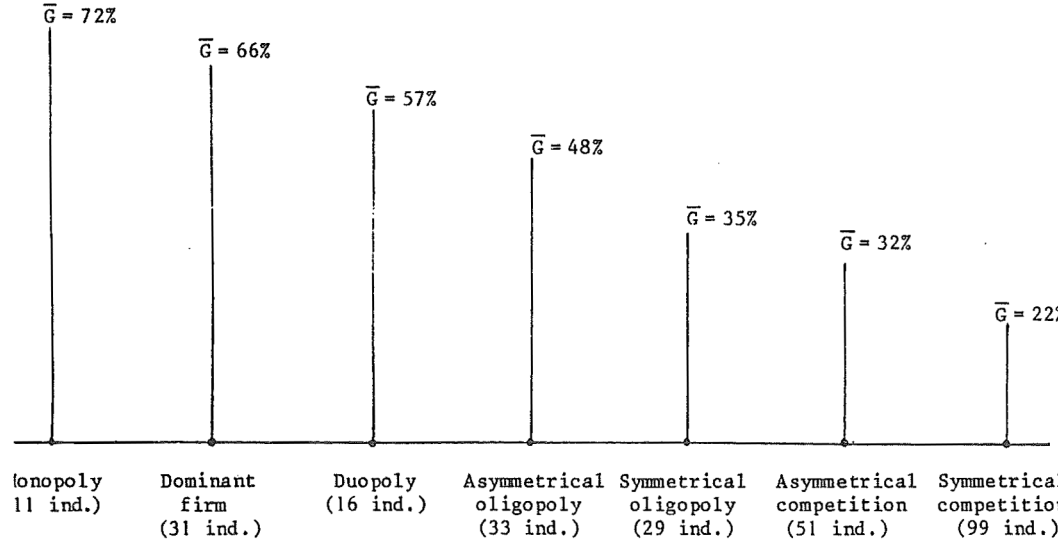

FIGURE 1 : The mean share of groups in ordered categories of industries

	Consolidated	Not consolidated
CR_4 (sales)	61% (26%)	57% (26%)
Herfindhal (sales)	0.203 (0.19)	0.179 (0.17)
Herfindhal (value added)	0.205 (0.20)	0.186 (0.18)

TABLE 4 : Mean values (and standard deviations) of consolidated and not consolidated indexes of concentration in the sample of 270 industries

the two measures is small. This is confirmed by the high degree of correlation between the consolidated and the unconsolidated Herfindhal indexes ($R^2 = 0.92$). The main explanation is that at our relatively fine level of disaggregation, few groups have distinct subsidiaries in the same industry. To increase their (horizontal) market share, industrial groups have usually preferred to utilize legal mergers of their subsidiaries in the same industry, this fact being reflected in the conventional measure of concentration.

2.2. *Collusion and industrial groups*

One implication of the preceding results is that firms affiliated to the same corporate group are spread over a large number of industries. Indeed, the number of industries where most of the groups are simultaneously operating varies between 5 and 70.

Keeping this result in mind, we can then question whether these diversified groups are able to exploit oligopolistic interdependence within a given industry.

To further examine this crucial question, we performed two types of econometric tests. First, we tested the extent to which changes in the concentration indexes obtained by consolidation positively influences industrial price-cost margins.

Second, in the next section, a distinction is made between two subsamples of industries according to the share of corporate groups in industrial employment (variable G). The object is to determine whether the probability of collusion is lower in industries where the groups are dominant.

The first test is based on the following model :

$$(2) \qquad PCM = b_0 + b_1 CONC + b_2 IMP + b_3 GS + b_4 K/O + \varepsilon,$$

where the variables are :

Dependent variable : price-cost margin PCM = $\frac{\text{value added - wages and salaries}}{\text{sales}}$.

Independent variables : concentration (CONC). Two values of concentration index are used :

CONC 1 : consolidated Herfindhal index based on the value added shares of the relevant decision units in the industry.

CONC 2 : unconsolidated Herfindhal index based on the value added shares of the legally distinct companies in the industry.

Import penetration (IMP) : ratio of imports to domestic output : $\frac{\text{imports}}{\text{sales - exports + imports}}$.

Growth of sales (GS) : 1 + the rate of growth of sales between 1970 and 1973 (expressed in 1973 prices).

Capital output ratio (K/O) : ratio of fixed capital to total sales.

Most of the variables are fairly standard in the industrial organization literature; no further justification is required as to their inclusion in the model. As previously mentioned, the decision unit used for calculating CONC 1 is either a single corporation which is not affiliated to a corporate group in our list of 319 industrial groups, or the aggregated corporations acting in the same industry under common control of a group. The results are presented in Table 5. The two first equations with either CONC 1 or CONC 2 are tested for the same subsample of industries (231) used in the preceding section. The two last equations are tested for the total sample of industries (270).

Almost all the variables have a significant effect on the gross profit margin. The industry growth rate positively affects the profitability, reflecting either the growth of demand or decreases in cost or both. The capital/output ratio has the expected positive sign. More surprisingly, however, import penetration also has a positive effect on the dependent variable. This suggests that some fraction of French industrial imports are goods with lower production costs abroad resold by local firms with a margin sometimes superior to that obtained on their

own products[1].

The most important result is that the measure of concentration, which is the main variable for our purpose, displays a positive and significant sign in all equations. This result is obtained with CONC 1 as with CONC 2. However, two important distinctions appear. First, the coefficient values of the concentration variable are lower when using CONC 1 (equations 1 and 3) than CONC 2 (equations 2 and 4). Second, the t-values of the concentration variables are also lower with CONC 1.

These results lead us to the following conclusion. When industrial groups are associated with a higher degree of "visible" concentration (CONC 2) they contribute to the reinforcement of horizontal monopoly power, through internal growth of their subsidiaries in a given industry or through legal mergers. However, the increase in concentration by control linkages (CONC 1) among legally independent firms does not lead to a higher impact on price-cost margins.

SECTION 3. EFFICIENCY AND/OR MONOPOLY POWER

The results of the preceding section indicate that the industrial characteristics favourable to the efficiency of internal coordination mechanisms perform well in explaining the share of activity realized in the various industries by corporations depending upon groups. Further, the increase in horizontal concentration obtained by consolidation has no positive effect on the price-cost margin. On the contrary, the effect of the concentration index is greater when the linkages used in the consolidated measure are ignored, suggesting a difference in the degree of collusion.

More precise results may be obtained by distinguishing two types of

[1]The influence of import rate is however greatly reduced when the rate of exports (variable EXP as previously defined) is introduced. In this case, the coefficient of IMP, though keeping a positive sign, is less significant (the t-value becomes 1.83). The reason is partly due to correlation between IMP and EXP (the coefficient of correlation between EXP and IMP in 270 industries is 0.37).

	Intercept	CONC 1	CONC 2	IMP	GS	K/O	Number of industries	$\bar{R}^2$	F
Eq.1	$0.186\ 10^{-1a}$ (1.33)	$0.333\ 10^{-1a}$ (2.67)		$0.398\ 10^{-1a}$ (4.43)	$0.311\ 10^{-1a}$ (2.99)	0.107^{a} (8.45)	231	0.430	F(4226) = 44
Eq.2	$0.127\ 10^{-1}$ (0.86)	$0.447\ 10^{-1a}$ (3.79)		$0.203\ 10^{-2a}$ (2.69)	$0.426\ 10^{-1a}$ (3.93)	$0.839\ 10^{-1a}$ (7.24)	270	0.364	F(4.265) = 40
Eq.3	$0.204\ 10^{-1}$ (1.47)		$0.414\ 10^{-1a}$ (2.92)	$0.282\ 10^{-1a}$ (4.21)	$0.304\ 10^{-1a}$ (2.93)	0.103^{a} (8.07)	231	0.442	F(4.226) = 45
Eq.4	$0.188\ 10^{-1}$ (1.35)		$0.617\ 10^{-1a}$ (4.65)	$0.188\ 10^{-1}$ (2.53)	$0.385\ 10^{-1}$ (3.62)	$0.777\ 10^{-1a}$ (6.77)	270	0.380	F(4.265) = 41

TABLE 5 : Regression equation relating price-cost margins to structural variables (231 and 270 French industries; t ratios are given in parenthesis. Significance levels of the coefficients are expressed as in Table 3.

industries, depending on whether industrial groups constitute the predominant organizational form, or whether independent single unit firms account for the bulk of the industry's activity.

In industries where single unit firms are predominant (a "firm regime") one would not expect the existence of industrial groups to be explained by technical or financial characteristics underlying superiority of internal coordination. Market power aspects are probably at work and shall be apparent in the concentration-profitability relation.

Conversely, in industries where industrial groups account for a large share of activity (a "group regime") the presence of this hierarchical form may be explained by the search for an efficient organizational adaptation to industrial characteristics; contrary to the preceding case, it is likely that oligopolistic interdependence within these industries will be weaker due to the more intense competition between highly and differently diversified corporate groups.

Given that structural relations may differ according to the share of groups in various industries, it is necessary to take this non-linearity into account, by searching for a critical share above which there could be a switch of regime. Since this share is unknown a priori, it must be viewed as a parameter to be estimated.

Two equations are used to explain interindustrial price margin variations, one for a "firm regime" and the other for a "group regime". The value of the critical threshold is obtained by using the share of groups in total sectoral employment as a switching variable to determine in which regime an industry should be placed. We experiment with successive partitions of the data in order to obtain the critical value which maximizes the value of F statistics[1]. The F values are the ratios between the residual variance in the previous one equation model (Section 3) and the residual variance obtained in the two equation model for each partition of the data (variances being divided by the corresponding degrees of freedom). The group share partition which gives the highest

[1]See L. White (1976) and D. Encaoua and B. Franck (1980).

ratio is unique and equals 54%. The corresponding F statistic has a value of 5.79[1]. The 1% confidence level for the F-distribution is $F(q, I-2q) = 2.51$ where I is the total number of industries (270) and q is the number of independent variables (4). The null hypothesis that the two regimes come from the same underlying population can therefore be rejected[2].

In the entire sample of 270 industries, there are 197 industries where the share of groups is below the critical threshold of 54% and 73 industries where it is above, the corresponding values for the sample of 231 industries being 167 and 64.

The results of the switching model appear in Table 6. In the "firm regime" equation, each variable is significant at the 1% level and the degree of concentration plays an important role. The adjusted $\bar{R}^2$ value is also higher than in the one equation model.

In contrast, in the "group regime" equation, the explanatory power of the model is much lower. The F value is very small compared to its value in the "firm regime" equation. Concerning the concentration variable, the contrast between the two regimes is striking. While the concentration coefficient is positive and significant at 1% level in the firm regime it is not significantly different from zero in the group regime[3]. This last result, viz. industries where group participation

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[1] It cannot be postulated that the statistic $\hat{F} = \max F$ follows itself the F distribution. However, the ratio of maximum likelihoods may be used. This ratio has asymptotically a χ^2 distribution so that the test is to reject the null hypothesis when the ratio is greater that the confidence value of the χ^2 distribution. But such a ratio is itself approximated by F. We acknowledge A. Monfort (E.N.S.A.E., Paris) for underlining this point.

[2] The existence of a "switch of regimes" has also been tested successfully using other functional specifications of the PCM equation (2) (namely log linear and semi-log specifications).

[3] The same result is obtained for non-linear specifications of the price-cost margin equation : the variable lg CONC has a very significant positive effect either on PCM or on log PCM in industries where $G < 54\%$ and no significant effect in industries where $G > 54\%$.

	Intercept	CONC 1	IMP	GS	K/O	Number of Industries	$\bar{R}^2$	F
Eq.1 $G \leqslant 54$ %	$0.581\ 10^{-2}$ (0.40)	$0.478\ 10^{-1a}$ (2.64)	$0.448\ 10^{-1a}$ (4.50)	$0.353\ 10^{-1a}$ (3.14)	0.109^{a} (7.71)	197	0.462	F(4,192) = 44
Eq.1 $G > 54$ %	$0.643\ 10^{-1}$ (1.64)	$0.619\ 10^{-2}$ (0.24)	$0.170\ 10^{-2}$ (0.14)	$0.242\ 10^{-1}$ (0.88)	$0.650\ 10^{-1a}$ (3.09)	73	0.149	F(4,68) = 4.1
Eq.2 $G \leqslant 54$ %	$0.225\ 10^{-1}$ (1.57)	0.101^{a} (4.56)	$0.255\ 10^{-1a}$ (2.62)	$0.278\ 10^{-1a}$ (2.58)	$0.984\ 10^{-1a}$ (6.26)	167	0.519	F(4,162) = 46
Eq.2 $G > 54$ %	$0.251\ 10^{-1}$ (0.60)	$-0.109\ 10^{-1}$ (-0.41)	$0.572\ 10^{-1a}$ (2.46)	$0.392\ 10^{-1}$ (1.42)	$0.915\ 10^{-1a}$ (4.00)	64	0.230	F(4,59) = 5.7

TABLE 6 : Regression equations relating price cost margins to structural variables in two subsamples of industries obtained with the switching regimes technique. Notations are as in Tables 3 and 5.

is important show no profitability-concentration relationship[1], supports the view that collusion in these industries is ineffective, while as has been seen, in the "firm regime", horizontal collusion can operate effectively[2].

Using the same critical threshold ($\overline{G} = 54\%$), two equations have been estimated to explain the variations in G among industries[3]. The results are presented in Table 8. In the "group regime" equation, all the coefficients are significant with the exception of the coefficient of research activity (RES)[4]. The adjusted coefficient of correlation is high.

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[1]As shown by the formula of page 19, there could be no direct relation between CONC and PCM if the degree of collusion β equals 1 in industries where the share of groups is above the critical threshold. This would imply higher values of the price-cost margin in these industries. This fact is indeed verified by comparing mean values and standard deviation in the two subsamples.

	$G < 54\%$	$G > 54\%$
PCM	0.113 (0.044)	0.130 (0.045)
Π/K	0.333 (0.123)	0.336 (0.162)
K/O	0.373 (0.177)	0.450 (0.218)

TABLE 7 : Mean values (and standard deviations) of PCM, rate of return and capital output ratio in the two equation samples

It is, however, unlikely that this higher mean of PCM is explained by a collusive effect. Indeed, the following decomposition of PCM shows that differences in PCM are only due to differences in capital output ratio (see Table 7) : $PCM = \Pi/O = \Pi/K \times K/O$ where K is fixed capital Π is gross profit and O is output.

[2]Note also in Table 6 that the coefficient of the rate of imports (IMP) is no more significant in the "group regime" when the switching is done on the sample of 270 industries.

[3]As previously mentioned, our sample must then be reduced to 231 industries for which data are available.

[4]The perverse effect of the research activity variable may be due to the fact that as it is measured here, this variable does not reflect a structural trait of the industry as would do a measure of technological opportunity. It rather expresses a mode of conduct which in the case of industrial groups, could mean that these economic agents devote a large part of their research outlays in industries different from their prime one to expand in new markets.

On the contrary, in the "firm regime" equation, the model has little explanatory power, and neither variable (except RES) has a positive effect on the share of group activity.

These results may be summarized in the following table :

Type of industries / Dependent variable	Independent firms predominate "Firm equation" 167 industries	Corporate groups predominate "Group equation" 64 industries
Price-cost margin PCM	*High* explanatory power $\bar{R}^2 = 0.519$ $F(4,162) = 46$ CONC 1 has a significant positive effect.	*Low* explanatory power $\bar{R}^2 = 0.230$ $F(4,59) = 5.7$ CONC 1 has no significant effect.
Share of group G	*Low* explanatory power $\bar{R}^2 = 0.067$ $F(5,161) = 3.4$ neither variable, except RES has a significant effect	*High* explanatory power $\bar{R}^2 = 0.416$ $F(5,58) = 10$ All variables, except RES have a significant effect.

	Intercept	ES	MULTIP D[1]	RES D[1]	KR	EXP	Number of industries	$\bar{R}^2$	F
Eq.1 G < 54 %	0.1332 [a] (5.71)	-0.0958 (-1.05)	0.0621 (1.62)	0.0941 (2.33)	0.5921 (1.02)	0.0922 (0.97)	167	0.079	F(5,161) = 3.86
Eq.1 G > 54 %	0.6117 [a] (15.91)	0.1908 [a] (3.13)	0.0460 [c] (1.76)	0.096 (0.38)	0.3635 [a] (3.09)	0.2105 [b] (2.06)	64	0.393	F(5,58) = 9.15
Eq.2 G < 54 %	0.1369 [a] (5.81)	-0.0651 (-0.73)	0.1053 (1.43)	0.1476 [a] (3.31)	0.9196 (1.58)	0.0976 (1.02)	167	0.067	F(5,161 = 3.39
Eq.2 G > 54 %	0.6131 [a] (17.68)	0.2080 [a] (3.44)	0.0513 (1.79)	0.0371 (1.46)	0.3358 [a] (2.89)	0.2040 [b] (2.04)	64	0.416	F(5,58) = 9.97
Eq.3 G <54 %	0.1407 [a] (5.92)	-0.0572 (-0.63)	0.0650 (0.87)	0.0812 [a] (2.67)	0.7722 (1.30)	0.0600 (0.62)	167	0.046	F(5,161) = 2.59
Eq.3 G >54 %	0.6384 [a] (17.55)	0.1867 [a] (3.09)	0.0520 [c] (1.79)	-0.0094 (-0.37)	0.3650 [a] (3.11)	0.1982 [c] (1.95)	64	0.396	F(5,58) = 9.26
Eq.4 G <54 %	0.1445 [a] (6.16)	-0.0500 (-0.55)	0.0986 (1.33)	0.1657 [a] (2.78)	0.9205 ((1.56)	0.0741 (0.77)	167	0.049	F(5,161) = 2.72
Eq.4 G >54 %	0.6277 [a] (19.17)	0.1948 [a] (3.25)	0.0518 [c] (1.79)	0.0307 (0.95)	0.3396 [a] (2.88)	0.1938 [c] (1.92)	64	0.404	F(5,58) = 9.53

TABLE 8 : Regression equations relating group share employment (G) to structural variables in two subsamples of industries obtained with the switching of regimes technique. Notations are as in previous tables.

[1]In this table, the variables MULTIP D and RES D are defined as dummies whose values is 1 if MULTIP $> K_1$ and RES $> K_2$ with the corresponding values of K_1 and K_2 :

	K_1	K_2
eq.1	2	1,5%
eq.2	2	3%
eq.3	3	1%
eq.4	3	3%

CONCLUSION

Our paper has shown that French industrial groups make no systematic contribution to horizontal market power. These groups largely operate in industries whose characteristics call for internal coordination and require an organizational type which these groups can provide.

These findings lead us to three conclusions. First, corporate and antitrust laws control industrial groups not only so as to protect creditors of insolvent subsidiaries (mainly shareholders and employees of a subsidiary) but also so as to prevent a possible restriction of competition. In this respect, our results suggest that there is a danger of systematically penalizing what appears to be an efficient organizational form.

Second, in terms of industrial policy, if Europe is to play a larger role in energy, capital-intensive, mass-production and internationally open industries, this could enlarge the role of industrial groups which appear to be well equipped for this task.

Third, our inquiry cannot rule out the possibility that industrial groups are the source of more global monopoly power extending beyond the boundaries of specific industries, and even beyond the limits of economic scenery. For instance, it has been shown that the existence of industrial groups affects the functional distribution of income among the factors of production[1]. The importance of these potential effects suggests the usefulness of developing the analysis presented here.

[1] See D. Encaoua and B. Franck (1981).

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