Determinants and Effects of Vertical Integration on the Performance of Moroccan Manufacturing

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In this paper we study the vertical integration of the Moroccan industrial sector, its determinants and its effects on the economic performance of the sector and on the economy in general. A key aspect of our analysis is to present the link between the theories of the firm and vertical integration, and the incentives to vertical integration according to two approaches: monopoly theory and efficiency. Next, we also present the choice of integration measure, their determinants and their effects on economical performance. Our findings show that the Moroccan industry is characterized by the weakness and dispersion of the degree of vertical integration. They also show the existence of a correlation between the degree of vertical integration and market factors. Thus, the degree of integration of industries is explained, essentially, by the basic conditions and the structures of the industrial sector, particularly, the degree of concentration, the capital intensity, the level of the barriers to entry, the importance of economies of scale and the rate of sales growth. These factors also reflect the hypotheses of the main explanatory theories of vertical integration, particularly those of monopoly and efficiency. The latter finding reveals, however, a negative correlation between the degree of vertical integration and the profitability of industrial firms. This confirms the idea that integration is usually accompanied by significant costs (bureaucratic costs, costs resulting from changes in incentives) that offset its savings (savings in transaction costs, savings related to monopoly power).

Introduction

It is difficult to treat the theories of the firm (as a production process) without mentioning a certain degree of vertical integration[1]. This complexity poses many theoretical and empirical difficulties for the treatment of both approaches. The use of vertical integration is usually justified by some to increase market power of firms, and for others, by the will to increase the efficiency of firms.

Note that the question of the firm's vertical dimension relates to several disciplines. In the first place, the theory of vertical integration occupies an important place in economics and particularly the theory of the firm. This

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[1]"The transfer from one department to another of a good or a service which could be sold on a market without major adaptation" (Adelman, 1949, p. 29).

importance is justified by the need to determine the optimal vertical size of the firm. Secondly, lawyers are increasingly interested in the theory of vertical integration due to the contributions and insights it has brought to the contract theory and its fundamental contribution to antitrust laws. This interest translates, thus, the deep conviction of the researchers that the resolution of the problems of the firm goes first by the understanding of the functioning of this one and the different relations it maintains with the other economic agents. Finally, the strategy of vertical integration is a controversial topic for strategic management and business leaders, due notably to mixed results of vertical mergers operations that have marked the last decades. Nevertheless, it still constitutes the frame of reference in all decisions relating to the choice between "make or buy" and continues to occupy an important place in the vertical development strategies of firms.

Generally, the vertical integration theory studies the different incentives for firms to produce the goods and services they need for their production processes instead of using the market, and to examine the effects of this choice on firm performance and vertical structures. Thus, theorists were led to define precisely the different dimensions of vertical integration and to mark the boundaries it has with other forms of vertical relations. They were thus faced with many methodological, theoretical and practical difficulties.

The first problem encountered by economists was to give a convincing definition of the notions of "firm" and "vertical integration". Indeed, economic theory proposes multiple approaches of the firm. Some of them emphasize the technological dimension by considering the firm as a production function, while others place more emphasis on its contractual forms.

The second problem concerns the delimitation of the various forms of vertical relations. Usually, companies often choose between making or buying a product or a service. But, in practice, these two choices are only the extreme solutions of a continuum of possible vertical relations. These relationships include, indeed, all forms of quasi-integration, partnerships and long term contracts. Faced with this multitude of alternatives, it is often difficult to draw a hermetic line between integration in the strict sense and all other forms of non-integration.

The third problem is a direct consequence of the previous ones and is particularly relevant to the question of measuring vertical integration. Indeed, the choice of a measure must faithfully represent the definition of vertical integration and must clearly differentiate it from other forms of relationship. So, the measurement index should be able to quantify internal transfers to the company, which seems to be difficult for both methodological and practical reasons.

The last problem relates, in turn, to the specification of the main determinants of vertical integration and the assessment of its effects on economical performance. In this context, the economic theory creates a great debate, opposing the opponents of the monopoly theory on one side, and those of the efficiency on the other. The opposition of the reasoning of the two

theories thus reflects the attitudes of their followers towards vertical integration and its effects on social welfare.

In an effort to give answers to these problems, we will present in the first section the main approaches of the firm and vertical integration. In the second section, we will highlight the link between incentives for vertical integration and efficiency issues. The characteristics of the Moroccan manufacturing industries which constitute the scope of our study will be sketched in the third section. Section four will present the choice of measurement and the numerical results obtained. The last section will conclude.

Firm Approaches and Vertical Integration

Theories of the Firm

The concepts of firm and vertical integration pose many problems in their definition. These problems relate, firstly, to the difficulty of apprehending these concepts, and secondly, to the multiplicity of theoretical approaches in the field.

The theory of the firm is characterized by a great diversity of approaches that apprehend the firm under different angles of vision. The purpose of the paper will, however, focus on those that define the firm by reference to its vertical dimension. In this context, we distinguish the neoclassical approach which emphasizes the technological dimension and considers the firm as a production function, and the new contractual theories that focus more on incentive issues and on the different forms of contracting.

As an economic agent, the firm ensures the production of goods and services with the concern for a better allocation of economic resources. It must first solve a technical problem by choosing the optimal combination of factors of production that maximizes its output. Then, it must choose the level of output that maximizes the profits. In other words, the necessary condition for profit maximization is, generally, expressed by the equalization of the marginal cost of production and the marginal revenue (price).

The marginalist view of the firm is open to criticism in more than one aspects, especially for its optimizing behavior and its uniqueness of purpose. In fact, members of an organization often use rough rules instead of complex calculations, even more if we take into account the uncertainty of the forecasts concerning contingent situations. In this case, the firm no longer controls all the variables on which the achievement of its objective depends (Knight, 1933). Similarly, organizations can have many objectives that may conflict with profit maximization, including survival, security, sales growth, leisure, or the power of leaders (Monsen & Downs, 1965; Baumol, 1959; Cyert & March, 1963). The critics of neoclassical theory insist, therefore, on the lack of realism of the objectives of this approach and its inability to apprehend the firm in terms of its functioning, its behavior and its objective. It must be emphasized, however, that the firm's model in the marginalist theory was not intended to

explain and predict the behavior of firms in the real world, but rather to explain and predict changes in observed prices. We must not, therefore, blame this theory for an objective for which it was not conceived (Machlup, 1967).

The limitations of the neoclassical approach have, thus, contributed to the appearance of many theories that attempt to provide a better description of the functioning of the firm in the real world by insisting on the problems of incentives and the different forms of contracting. This is notably the case of the principal-agent theory, which defines the firm through the agency relationships linking the different members of an organization, and which is essentially based on the idea of separation between ownership and control, and divergence or conflict of interests between shareholders and managers.

This approach consequently makes it possible to overcome certain shortcomings of the neoclassical vision, by adopting an approach much closer to the reality of modern firms and the relative demystification of the black box, through the description of a significant aspect of the functioning of the firm. However, the principal-agent approach remains unable to provide explanations for certain points that seem essential to any objective theory of the firm, e.g., the approach does not describe the decision-making mechanisms and the role of authority within a hierarchy. Thus, this theory is not able to describe the relationship of the firm with other economic agents, as well as its relationship with the market, and the restriction of these different relationships to agency problems would be a too excessive reduction of reality.

Contrary to the agency's approach, the transaction costs theory is particularly important because of the originality of its method and the relevance of the questions it tries to answer. Indeed, the theory adopts a contractual approach characterized by:

1. Adopting a microanalytical approach that retains the transaction as a basic unit of analysis.
2. Retaining more realistic behavioral assumptions that are better adapted to the functioning of the economic system.
3. Adopting an institutional analysis that considers the firm and the market as two economic institutions with the same role in economic activity.
4. Considering the firm as a governance structure.

The transaction costs theory, thus, considers the firm and the market as two alternative modes whose objective is the coordination of production. Outside the firm, price movements guide production, which is coordinated through a series of market exchanges. On the other hand, these market transactions are eliminated within the firm where the coordinating entrepreneur substitutes the complicated structure of exchanges. The choice is made, therefore, between the coordination by the management and the coordination by the prices. As a result, the form of organization that will be required for each transaction will be the one that results in the lowest transaction costs. This principle acts, according to Coase (1937), by describing the growth and the optimal size of a firm. However, the transaction costs theory has prompted

many critics that relate mainly to its low operational nature. In this context, Clarke (1985) considers that the transactional theory of the firm was essentially descriptive and it lacks operational content as it can not provide empirically verifiable hypotheses. Similarly, Alchian and Demsetz (1972) criticize the theory on two aspects. The first concerns the difficulty of formalizing its assertions, in that it is often impossible to specify the nature of the transaction costs. The second concerns the weakness of the dichotomy of the role of authority in the firm and that of the price mechanism on the market.

The set of criticisms addressed to the transaction costs theory has given rise to an important literature referring to the notion of incomplete contract. This emphasizes the fact that the firm and the contract are different modes of governance and considers the company as a particular way of specifying the contingencies not provided for by a contract. This approach is based on the idea that contracts are necessarily incomplete because some events are unpredictable, or because there are too many to specify all in writing. In a world characterized by incomplete contracts and high transaction costs, the firm is defined by referring to the residual control rights conferred by the ownership of the physical assets used in its production process. The property rights approach, therefore, bases its reasoning on the idea that possession of an asset provides the right to use it in all situations not specified by an incomplete contract. However, these rights only concern physical assets, since they can be sold and transferred in contrast to human assets. Thus, the reasoning of the property rights theory does not make an explicit distinction between ownership and control. However, this conception can be applied to small firms where control is concentrated in the hands of the owners, but cannot be valid in capital companies which are characterized by an increasingly marked divorce between ownership and control. This deficiency, therefore, constitutes a restriction of the approach to individual companies only.

The Concept of Vertical Integration

The concept of vertical integration has taken several meanings in the literature with a common idea that the company sometimes chooses to internalize certain operations instead of resorting to an external stakeholder. This integration occurs if the structure includes two stages of production so that all of the upstream stage production is used as input to the downstream stage and all of the downstream stage requirements are provided by the upstream stage (Perry, 1989).

This definition remains restrictive because it stipulates that the volume of production at the upstream stage corresponds exactly to the input requirements of the downstream stage. In other words, the upstream unit and the downstream unit are respectively exclusive supplier and customer.

As a result, the vertical integration is characterized by substituting the internal exchange to trade or contract exchange, so that the goods in question do not transit through the market and therefore do not refer to the market price. Nevertheless, this substitution alone is not enough to define vertical

integration, but it requires that one must have full flexibility in making production and distribution decisions in all the stages it controls (Coase, 1937). To be able to ensure this coordination, the entrepreneur has a specific instrument to the hierarchy, namely the authority. The latter is precisely what defines a firm, since within it, the transactions result from the instructions and orders of the leader. Vertical integration allows the firm to move from the purchase of inputs to that of their production (Williamson, 1985).

Using a different logic, Grossman and Hart (1986) define vertical integration as the ownership and absolute control of physical assets. Riordan (1990), meanwhile, defines vertical integration as "the organization of two successive stages of production by a single firm". He regards the firm as a legal entity that holds assets and enters into commercial and financial contracts. Therefore, the organization of a production process by a firm requires the appropriation or purchase of inputs required for production. Riordan's definition distinguishes the organization of a process and its control, which is essentially a managerial function. The authority of the manager remains, however, defined by a contract with the firm, which remains responsible for the contractual obligations taken by the manager on its behalf.

Incentives for Vertical Integration and Efficiency Issues

The theory of vertical integration offers, of course, a large number of determinants that we can group under two main currents: the theory of monopoly is placed in the extension of the neoclassical tradition and that of efficiency, represented, essentially, by the contractual theories of the firm.

Approach to Monopoly Theory

In this design, vertical integration is incompatible with perfect competition[2], because the different forms of imperfection create numerous incentives for the integration of enterprises. Thus, a firm can integrate vertically to reinforce its monopoly power and limit effective and potential competition[3]. Similarly, vertical integration may be justified by the desire to eliminate the various distortions created by monopolistic structures. Finally, problems of uncertainty, agency problems and asymmetric information can be determinants of integration, even in competitive structures.

It should be noted that, in many cases, vertical integration is not justified by the desire to improve the economic efficiency in a vertical structure, but rather by the weakening, even the elimination, of actual and potential

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[2]The perfection of the markets makes it possible to eliminate most of the incentives for integration.

[3]This is particularly the case when integration is equated with strategic behavior by introducing new barriers to entry, foreclosure of the market or price squeeze.

competitors of integrated firms[4]. Similarly, integration may be motivated by the desire to weaken or crowd out the actual competitors of a firm[5]. Finally, vertical integration may result in the outright foreclosure of actual competitors through the refusal of supply by the integrated firms[6].

In these cases, it seems clear that vertical integration is not motivated by the desire to improve the economic efficiency of the vertical structure, but rather by the increase of the monopoly power of the integrated firm at the expense of its actual and/or potential rivals. Similarly, vertical integration solves the negotiation problems posed by a bilateral monopoly structure characterized by a divergence of the individual interests of the upstream monopoly and the downstream monopsony[7]. However, the solution of integration allows the realization of joint profit maximization and may solve the problems of restriction of production and those related to the negotiations on the intermediate product price (Scherer, 1990).

These results can be generalized, but to a lesser extent, in cases where at least one of the vertical stages is competitive. This is the case where integration is used by a monopoly for price discrimination between its different customers. In fact, the problems of arbitrage, imperfect information on customer preferences or the legal prohibition of discrimination often encourage firms to use integration to discriminate between these customers. In this context, integration can be a perfect substitute for the company to avoid arbitrage and realize the benefits of discrimination (Wallace, 1937; Stigler, 1951; Perry, 1978).

Vertical integration can solve the problems caused by rationing prices when the market is characterized by a significant difference between the actual price and the equilibrium price (Stigler, 1951; Green, 1974). The same applies when the market is characterized by price fluctuations resulting from possible exogenous changes in supply and/or intermediate demand. Indeed, these fluctuations often affect the upstream and downstream stages in the opposite direction: an increase in the price of the intermediate good positively affects the firm located upstream and negatively the one located at the downstream stage. In such situations, vertical integration can be used to mitigate the negative effects of fluctuations, through the synchronization of the production in both stages and the abstention of the integrated firm from participating in the intermediate good market (Perry, 1982). It can also be used to take advantage

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[4]Many authors defend the idea that vertical integration can be used by some companies to erect new barriers to entry through increased capital costs of potential entrants (Bain, 1955; Stigler, 1968).

[5]This is particularly the case where it is used to facilitate the practice of price squeeze by reducing the profit margins of customers or suppliers of the integrated producer below the allowable threshold.

[6]Vertical foreclosure is based on the leverage hypothesis that the integrated firm can use the market power of non integrated upstream firms to reinforce its own market power in the downstream stage (Krattenmaker & Salop, 1986; Salinger, 1988).

[7]In this context, the maximization of the individual profits of the two firms entails a restriction of the exchanged quantity of the intermediate good and a consequent increase in the price of the final good.

of the positive effects that can result from it through the diversification of the incomes of the integrated firm enabled by the possibility of speculation in the intermediate market (Perry, 1984) In addition to the problems caused by the uncertainties of supply and/or demand, vertical integration makes it possible to solve the difficulties posed by the asymmetrical distribution of information; in particular, the problems of agency and the use of the information for strategic purposes. Indeed, customers are often encouraged to conceal information relating to the demand and the selling price of their product. This is also the case for suppliers who conceal the cost of production and the level of supply. In such situations, the principal has a strong incentive to vertical integration to solve the agency problem. But at this level, the question is whether vertical integration allows the elimination of the agency relationship, or if it only internalizes it. In this context, the work of Arrow (1975) shows that integration is generally capable of solving the agency problem and changing the structure of information by preventing its use for strategic purposes. However, Crocker (1983) shows that integration does not eliminate the agency relationship but it requires knowledge of private information by internal audit. Nevertheless, the conclusions of both authors clearly confirm the proposals of Williamson (1985) and Riordan (1990) for the effects of vertical integration on the structure of information.

The Efficiency Approach

Contrary to the arguments of the theory of monopoly, the proponents of efficiency justify vertical integration by the will to choose the most effective organization form[8]. Thus, the internalization of an activity is much more than an arbitrage between the costs and the savings occasioned by the different possible forms of organization. In the framework of the transaction costs theory, vertical integration causes, both costs and savings to be taken into account in each internalization decision[9].

It also allows the achieving of significant savings related essentially to the transaction costs, that are more important in markets with small number and where the prevalence of uncertainty/complexity limits the rationality of agents and increases their opportunistic propensity. These environmental and human factors are much more important in relationships with frequent exchange since they further complicate the exchange process. In such context, vertical integration or internal organization is an effective solution for coordinating the

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[8]This arbitrage generally allows the choice of the most economically efficient solution.

[9]Indeed, the internalization of an activity implies, on one hand, the increase of the size of a firm and the consequent increase of bureaucratic costs, and on the other hand, the change of the incentives of the members of the firm because of the transition from the market mode to that of the internal organization. The first effect is explained by the hypothesis of decreasing returns on management function defended by Knight (1933) and Coase (1937), and the loss of control phenomenon advanced by Williamson (1967). The second effect, on the other hand, refers to the difficulty of making a selective intervention and of reproducing the strong market incentives when moving from the market mode to that of the internal organization (Williamson, 1985) .

exchange activity through the governance and coordination instruments that differentiate it from the organization by the market. More specifically, transaction cost theory advocates vertical integration in all exchange relationships requiring significant investments in specific assets[10]. The reason why the specific investment involves a bilateral dependence is due to the fact that the cease of the exchange relationship would be detrimental to the different parties. In this context, anonymous contracting is supplanted by a contractualization where the identity of the parties is decisive. As a result, contractors find themselves locked into a relationship with bilateral dependence, often giving rise to opportunistic tensions and propensities.

Linked in a bilateral monopoly relationship, the contracting parties find themselves in a strategic bargaining position for an incremental gain resulting from any adaptation of one of the parties. Although both have interest in making long-term adjustments permitting the maximization of joint profits, each one will seek to capture the maximum gains at the expense of the other. These opportunistic propensities, thus, result in costly haggling that can dissipate all gains from the relationship. This bargaining deals, essentially, with the additional surplus allowed by the specific investment and it is often characterized by the attempt of a "quasi-rents expropriation" by the contractor who has not invested in the relation (Klein, Crawford & Alchian, 1978), or a "hold up" (Goldberg, 1976; Allain, Chambolle & Rey, 2014). Thus, the situation of bilateral monopoly implies two fundamental effects on contracting, namely, the difficulty of *ex post* sharing of gains resulted from investing in specific assets and the *ex ante* incentive for the various parties to underinvest in the exchange relationship.

As a result, the contractual form governing the bilateral monopoly structures must maintain the optimal incentive for specific investment by solving the problem of *ex post* bargaining between the different parties. In this context, economic theory presents two different approaches:

> The first considers that the cause of the problem is purely transactional, because of the limited rationality represented by the inability of the parties to draft full contingency contracts, and the opportunism of the party who does not invest in the exchange relationship. Analysis in works representing this current (Williamson, 1985; Klein, Crawford & Alchian, 1978) refers to the institutional comparison between vertical integration and the market as solutions to the problem, and emphasizes the faculty of integration to mitigate opportunistic behavior and to maintain investment incentives at the optimal level.
> The second refers to the incomplete contracts literature affirming that between the two extremes, there is a series of incomplete contracts likely to give the same results of vertical integration and avoiding its

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[10]Indeed, the specificity of assets implies a "fundamental transformation" of the exchange relationship, in that it locks the contracting parties into a situation of bilateral monopoly.

disadvantages (Grossman & Hart, 1986; Holmström & Tirole, 1989; Hart & Moore, 1990)[11].

Vertical Integration in the Moroccan Manufacturing Industry: Empirical Test

In order to check the validity of the assumptions made by the different theories of vertical integration, we attempt to do a specific empirical study to the Moroccan industrial sector, so as to measure the degree of integration of the various industrial sectors and to identify the factors and effects of integration on the performance of the Moroccan industry.

Since its independence, Morocco has adopted a development strategy aimed at laying the foundations for an independent and dynamic national economy. This strategy ended, however, with an economic and social crisis, whose most significant indicators were the internal and external financial imbalances and the worsening social disparities that marked the beginning of the 1980s. At the industrial level, the failure of the development strategy has resulted in the accentuation of the dualities of the public and private, on one hand, and the formal and informal sectors on the other. In this context, the Moroccan authorities began, as early as the second half of the 1980s, a series of reforms including the structural adjustment program aiming at cleaning up the national economy and improve the competitiveness of the different sectors of production. These reforms have affected, in the first place, the fundamental financial balances and the questioning of the role of the State in the economic activity, at the institutional, legal, fiscal and financial level. In the industrial field, the reforms aimed at improving the competitiveness of the sector through the withdrawal of the State from the production activity, the deregulation of the markets and the liberalization of domestic prices. At the external level, reforms have focused on the progressive liberalization of foreign trade through the substitution of tariff protection for the quota system and the promotion of exports.

Despite these efforts, the output of the Moroccan manufacturing industry remains quite low. Between 1980 and 1989, the average annual growth rate of industrial production was barely above 4% and the manufacturing sector's share of GDP hardly exceeded 18% (World Bank, 1993). This weakness was further accentuated during the 1990s as a result of the relative liberalization of manufacturing imports. Thus, the share of manufacturing output in GDP was barely 16% in 1997 (Ministère du Commerce, de l'Industrie et de l'Artisanat, 1998, p.11). This observation clearly reflects the weakness of the industrial tissue and the anomalies related to industrial structure and performance.

In terms of industrial structure, the Moroccan manufacturing sector is marked by a relatively high degree of industrial concentration and a low

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[11]For Grossman and Hart (1986) the two parts of the exchange relationship may rely on a third party who can make the effective decisions. For Holmström and Tirole (1989) the comparison of the different forms of organization depends essentially on the nature of the specific assets.

mobility of capital. In fact, despite the positive evolution of the level of concentration, industrial production remains assured by a minority of large companies in most industrial branches. The large weight of big companies is also reflected in the low mobility of industrial capital, due to the high level of barriers to entry particularly in the "drinks and tobacco", "chemicals and parachemicals" sectors. And "the products of the basic metal industry" characterized by a relatively high rate of public participation of capital and a high protection against import competition. These characteristics allow, therefore, to make a useful assessment of the dynamics of the manufacturing industry in Morocco. So, the main idea that emerges is that the process of corporate concentration is the dominant feature of growth. The new businesses are relatively numerous, but the emergence of new entrepreneurs is not likely to bring competition to the existing businesses. The observable active competition is mainly the result of the companies established and even more of the effect of the liberalization of foreign trade. Likewise, the weakness of inter-branch capital mobility arises from the fact that entrants are generally small and remain handicapped by their economies of scale.

The structural characteristics of the Moroccan manufacturing industry have a direct influence on the level and dispersion of its performance. Indeed, the study carried out by Belghazi (1997) shows the low profitability and the wide dispersion of margin rates and price-cost ratios in most industrial sectors. This finding can be explained by the relative importance of small firms in the industrial tissue. In fact, the proportion of firms producing at a loss appears to be negatively correlated with firm size.

In parallel, the Moroccan industrial tissue is characterized by a dualism that opposes, on one hand, high productivity companies, and on the other hand, the low productivity ones. This allows us to identify two different behaviors: that of companies relying on the low cost of labor and preferring intensive processes in unskilled labor and inefficient management of the labor force, and that of companies choosing technical solutions and grant incentive salaries in order to maximize the productive potential of the human and material resources mobilized.

Thus, companies of the first type spend much more human energy and mobilize little supervision and qualified work. Refusing to substitute a work force devalued by machines, they are content with the manufacture of a product of poor quality. However, they can be competitively sustainable in the local market because of low wages and tax evasion. On the other hand, they are gradually losing their strengths on the international market because their competitors are modernizing more and more and are introducing new productive innovations. Companies of the second type are sometimes at the forefront of international techniques and prefer to equip themselves with mechanized or automated equipment to avoid the management problems posed by a labor force that is not suited to the tasks of a modern industry.

Overall, the flexibility of the productive apparatus seems limited. The analysis of the dispersion of profitability reveals that the dominant trend is that of the disparity of profit rates. Thus, despite the noticeable decrease in the level

of disparities during the period of structural adjustment, the flexibility of the structures remains insufficient: the potential investments still face significant barriers to entry, the size of the internal market, the difficulty to conquer new export niches and burdensome initial investment.

Measuring the Degree of Vertical Integration in the Moroccan Manufacturing Industry

The measurement of vertical integration poses many theoretical and practical problems that make it difficult to study the degree of integration at the firm level as well as at the industry level. To these various problems, it is added the lack of adequate information on the Moroccan industrial sector, which complicates more the task of the empirical studies in the matter.

Choice of Measure

The problem of measurement remains major in any empirical work to study the degree of integration at the level of firms and industries. Generally, a company is said to be vertically integrated if it meets its needs for a good by producing it itself. In other words, the degree of integration can be expressed by the importance of internal transfers compared to the use of the market. However, it is often difficult to assess the importance of internal transfers. On one hand, the accounting documents kept by the companies are unable to provide an idea about this type of transfer, and on the other hand, this type of information is often confidential and, therefore, it can not be made available to people outside the firm.

In this logic, economic theory proposes many measures based on relatively available information. This is the case of the index proposed by Chapman and Ashton (1914) to measure the degree of integration of firms in the British textile industry. This index was constructed on the basis of equipment used by textile companies in the following two vertical stages: spinning and weaving. However, this index does not reflect internal transfers since the data used correspond to equipment inventories and not to production transferred from the spinning stage to the weaving stage. Using a different route, Gort (1962) proposed a measure of integration on the basis of the assignment of employment in a firm, by distinguishing the main activity from other auxiliary activities of the firm. However, the measure by the assignment of the job raises the same criticisms as the previous one. The fact remains that the ratio of Adelman (1955) is most widely used to measure the degree of integration and that, because of its theoretical foundations and especially its construction that is based on two economic variables relatively available (value added and turnover). This ratio, however, has two essential limits: the first is that it can be influenced by other forces than vertical integration, especially the profitability of the company; the second is sensitivity to the position of a firm in the vertical chain.

We note, finally, the emergence of numerous measures based on the interactions and connections of the different industries by using the intermediate consumptions given by the input-output tables. This is the case, on one hand, of the index proposed by Maddigan (1981), which makes it possible to measure the degree of integration at the level of the companies, and on the second hand, that of Caves and Bradburd (1988), which retains a more aggregate level by taking the industry as the base unit.

Due to the limitations of the vertical integration measures proposed by economic theory, we opted for an index more suitable for a comparative analysis. This index is inspired essentially by the Bradburd and Caves (1988) study and measures the degree of integration of different Moroccan manufacturing industries, using data based on classification three-digits and two-digits of national nomenclature. Formally, the measure used can be written as follows:

$$VI_i = \sum_{j=1}^{N}(b_{ij} \frac{N_i}{N})$$

Where:

VI_i: vertical integration index of industry i .
b_{ij}: Share of industry output i used by industry j .
N_i: Number of industries vertically related to the industry i .
N: Total number of industries.

The value of VI_i is between 0 and 1. The more VI_i tends to the unit, the more the industry is integrated.

Results

To determine the integration index, we used data from the input-output matrix of the 1990 Moroccan economy constructed by Bussolo and Roland-Host (1993), in addition to data from the annual surveys of the Industry and Commerce Ministry. Our choice for 1990 is motivated first by the availability of the input-output table for 1990, then by the fact that the year 1990 corresponds to the beginning of the implementation of the liberalization reforms and the restructuring of the Moroccan economy (the second wave of the structural adjustment program). By this choice, we want to determine the impact of these reforms on the behavior of firms that are trying to protect themselves from the competition (the impact of the reforms on the performance of firms and industries).

Table 1. *Breakdown of the Number of Industrial Segments by Degree of Vertical Integration*

Classes	Number of Segments	%	Cumulative	%
[0 - 0.1]	49	50.00	49	50.00
[0.1 - 0.2]	9	9.18	58	59.18
[0.2 - 0.3]	12	12.24	70	71.42
[0.3 - 0.4]	15	15.31	85	86.73
> 0.4	13	13.27	98	100.00
Total	98	100.00	-	-

 Note: 3-digit classification

Based on the empirical results (Table 1), we find that the Moroccan manufacturing industries present a low average and a wide dispersion of their degree of integration, with an average index of integration equal to 0.18. This average is all the more nuanced by the wide dispersion of the index, which oscillates between zero, for some branches, and 0.7 for others. However, the distribution of the different industries, according to the degree of integration, shows a high concentration of the latter in the slice grouping industries, with an index less than 0.1.

The classification by the degree of integration ranks the "textile and leather industry", followed by the "chemical and para-chemical industries" and the "metal and mechanical industries". We find, however, that the "food industry" remains the least integrated, followed, to a lesser extent, by the "electrical and electronic industries". We note a more or less dispersion of the integration's degree within the branches of a same sector, as is the case with the "core metal products", which is characterized by high capital intensity and relatively large economies of scale, with almost complete absence of private capital, and the "textile and knitting products" marked by a less intensive capital and a strong presence of private capital. The two branches are also differentiated by the orientation of the markets since the production of the former is exclusively destined to the local market, while the second is, for the most part, for export.

Table 2. *Distribution of the Number of Industrial Branches According to the Degree of Vertical Integration*

classes	Number of branches	%	cumulative	%
[0 - 0.1]	8	44.44	8	44.44
[0.1 - 0.2]	3	16.67	11	61.11
[0.2 - 0.3]	2	11.11	13	72.22
[0.3 - 0.4]	3	16.67	16	88.89
> 0.4	2	11.11	18	100.00
Total	**18**	**100.00**	**-**	**-**

Note: Two-digit classification.

The least integrated branches belong essentially to the "agri-food industry", that is characterized by private equity participation and low capital intensity[12]. The food chain includes a very small number of vertical stages and most of the production is destined directly for final consumption. This is not, however, the case of the "electrical and electronic industries", where the degree of integration remains rather low due to the newness of this sector and the importance of technological knowledge and the high qualification of the labor force it requires.

Determinants and Effects of Vertical Integration on the Performance of the Moroccan Manufacturing Industry

In order to answer the questions relating to the determinants of vertical integration and its effects on the economic performance of firms and industries, we present two simple econometric models to test the hypotheses formulated by the theory of vertical integration and to verify the predictions of the theory. The cross-sectional data used relate to the year 1990 and are mainly the annual surveys of the Ministry of Industry and Trade.

The main determinants of vertical integration correspond, essentially, to the assumptions of monopoly theory and transaction costs. These variables reflect the effects of small numbers, asset specificity, barriers to entry, and uncertainty. The results of the model (Table 3) show a strong correlation between vertical integration and explanatory variables translated by values of R^2 and R^2 adjusted.

From a statistical point of view, the relationship does not seem to be random, because the value of the Fisher statistic is significant at a probability threshold of less than 1%. The signs of estimated coefficients correspond to those provided and, therefore, they cannot reject the predictions of the vertical integration theory. This result is further supported by the values of Student's t-statistics[13]. In addition, several empirical studies on the determinants of vertical integration give results similar to ours in the measurement of risk and uncertainty (e.g., Caves & Bradburd, 1988).

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[12] With the exception of the "beverage and tobacco" branch, whose capital structure is, essentially, of a public nature.

[13] The estimated coefficients were all significantly different from zero at thresholds below 5%, with the exception of the uncertainty of demand variable, for which we do not find a fundamental explanation for its non-significance.

Table 3. *Results of the Model Estimation of the Determinants of Vertical Integration (Variable Explained: IV)*

Variable	Coefficient	Standard Error	Standardized Coefficient	t	P (t)	Collinear	
						Tolerance	VIF
Constant	-16.699	2.843	-	-5.873	0.000	-	-
IK	3.084	0.406	0.997	7.597	0.000	0.674	1.484
H	4.709	1.080	0.634	4.359	0.001	0.549	1.823
TMOR	-1.452	0.457	-0.603	-3.179	0.009	0.322	3.103
TEPCA	0.709	0.295	0.420	2.407	0.035	0.381	2.622
TCMCA	-18.239	8.307	-0.256	-2.196	0.050	0.854	1.171
INCD	11.588	8.799	0.162	1.317	0.215	0.770	1.298
R^2	0.872						
R^2 Adjusted	0.803						
F	12.535						
Meaning of F	0.000						

Note: IV is the vertical integration index; IK, capital intensity; H, the Herfindahl Concentration Index ; TMOR, the minimum optimal relative size ; TEPCA, entry rate weighted by turnover; TCMCA, the average growth rate of turnover and INCD, the demand certainty.

Thus, the results of the model estimation confirm the assumptions of the theories of vertical integration, and show that the degree of integration of the Moroccan manufacturing industries is explained, for the most part, by the determinants specified by the monopoly theory and that of efficiency. The correlation between the actual signs and those predicted by the estimators clearly confirms the link between vertical integration, on one hand, and the degree of concentration of the industrial branches, their capital intensity, the level of barriers to entry, the importance of the economies of scale, the degree of growth of the industries and the level of risk of the demand, on the other hand.

Thus, the most integrated industrial branches are, in general, the most concentrated, the most capitalistic and having greater mobility of capital, less importance of economies of scale, and weak growth in demand coupled with high sales uncertainty. Our findings suggest that the manufacturing sector is largely influenced by market forces. This seems to be true because the study is carried out on data relating to the year 1990, which is a period of restructuring of the Moroccan economy marked, essentially, by the progressive liberalization and the disengagement of the State of the productive activity. The importance of the link between the market forces and the industrial structures in Morocco can thus be interpreted as a signal of a progressive trend of industrial enterprises towards the conditions of economic efficiency[14].

The chosen performance criterion focuses directly on the profitability of an industrial branch through the size of the gross operating surplus in relation to

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[14]*A priori*, it seems difficult to predict the nature of the relationship between vertical integration and the performance criteria of industrial branches. On one hand, vertical integration involves both savings and costs, making it difficult to predict the net effect that results. On the other hand, the choice of the criterion representing the performance implies a restriction of the global vision on the effects of the integration, to the extent that a quantitative criterion can bring only a partial judgment there.

turnover. It is important for us to see the nature of the relationship between vertical integration and the profitability of a branch, as well as the correlation between profitability and the degree of integration.

Unlike the first model, the specification of the link between the margin rate and the explanatory variables did not require any transformation except for vertical integration.

Table 4. *Results of the Industrial Performance Model Estimate (Variable explained: TM)*

Variable	Coefficient	Standard Error	Standardized Coefficient	t Student	P (t)	Collinear	
						Tolerance	VIF
Constant	-4.73 E-02	0.021	-	-2.202	0.048	-	-
LnIV	-5.72 E-03	0.001	-0.824	-4.213	0.001	0.528	1.895
IK	3.070 E-05	0.000	1.519	4.562	0.001	0.182	5.502
H	0.188	0.034	1.343	5.565	0.000	0.346	2.890
TEPCA	4.666 E-03	0.002	0.383	2.081	0.060	0.596	1.678
TMOR	-2.42 E-03	0.000	-1.905	-5.492	0.000	0.168	5.968
R^2	0.758						
R^2 Adjusted	0.657						
F	7.519						
Meaning of F	0.002						

Note: *TM* is the margin rate; *IV*, the vertical integration index ; *IK*, capital intensity; *H*, the concentration index of Herfindahl; *TEPCA*, the entry rate weighted by the turnover and *TMOR*, the minimum optimal relative size.

The findings (Table 4) give relatively high values of R^2 and adjusted R^2; 0.758 and 0.657 respectively. At this level, we can emphasize that the unexplained part of the model may be due to the absence of the other determinants of business profitability in the model specification, especially the variables representing the strategies of the different firms. The value of Fisher's statistic is significant at a threshold less than 1%, which means that the link between the explained variable and the explanatory variables can not be due to the hazard.

Similarly, estimation of the coefficients associated to explanatory variables gives values significantly different from zero to thresholds less than 6%. Finally, the signs of the coefficients of the control variables are in line with our expectations. The profitability of the industrial branches seems indeed positively correlated to the degree of concentration, the capital intensity and the mobility of the capital, and negatively with the minimum dimension of the companies of these branches. This confirms the conclusions regarding the analysis of the characteristics of the Moroccan industry, according to which the degree of concentration and the level of the barriers to entry are relatively high and, thus, constitute an advantage for the existing enterprises and, particularly, for those operating in relatively concentrated markets.

However, profitability has been found to be negatively correlated with the degree of vertical integration. This shows that the average margin rate of the industrial branches is much higher as they have a low degree of vertical

integration. The most logical explanation of this result is undoubtedly linked to the importance of the costs generated by vertical integration, particularly those of bureaucracy and the big size. This does not mean, however, that the high degree of vertical integration of the industrial branches is synonymous with the economic and organizational inefficiency of these branches. In fact, the low profitability of the most integrated industries can be explained mainly by specific considerations to these industries. In this case, the high degree of the integration of firms implies their greater efficiency and the vertical structure at the expense of the high costs of vertical integration and the low profits that result. Thus, the results show that vertical integration is often a costly strategy that should be used only for economic reasons and organizational efficiency which can justify the costs it generates.

Conclusion

Vertical integration is often explained by one of the following considerations: (i) The desire of companies to maintain or enhance their market power at the expense of actual and/or potential competitors. In this case, the vertical integration does not fit into a logic of improving the economic efficiency. On the contrary, the integration decision is justified by anti-competitive considerations designed to weaken or oust the rival firms and to deter potential entrants from entering the market. In this case, integration can be used as a means of foreclosure of rival firms, price crushing or strengthening the barriers to entry.

Thus, improving the market power of integrated firms is generally at the expense of actual and potential competitors and it therefore implies a deterioration of social welfare and economic efficiency. (ii) The willingness of firms to choose the most efficient form of organization in the coordination of production. In this case, vertical integration is motivated, essentially, by the desire to improve the economic efficiency, in the sense that the internalization of activities provides substantial savings compared to the solution of the market relationship. It results, therefore, from an arbitrage between the advantages and the disadvantages of the different economical institutions for the sole purpose of improving efficiency. As such, we emphasize that the choice of integration prevails, generally, in case of market failure, in particular, in case of non-satisfaction of certain conditions of perfect competition (such as the atomicity of operators or market transparency). In these cases, vertical integration often implies an improvement in economic efficiency by addressing the problems of market failure.

On the empirical level, the Moroccan manufacturing industry is essentially characterized by the weakness and dispersion of the degree of vertical integration. This finding is explained, on one hand, by the relatively weak weight of the industrial sector in the Moroccan economy, and on the other hand, by the disparities which characterize the different industries. Indeed, the industrial sector was often relegated to second place in the priorities of the development strategies in Morocco, which insisted more on the import-substitution and export industries, whose main purpose was the economy of foreign exchange and the elimination of

external deficits. This explains also the wide dispersion of the degree of vertical integration of the Moroccan manufacturing industries. Indeed, we stress a high degree of integration of the export-oriented branches (textile products) and those whose production is intended to satisfy internal needs and the substitution of imports (basic metal products). In contrast, the least integrated industries generally correspond to basic food products and mechanical, electrical and electronic equipment.

However, the study of the degree of vertical integration in the Moroccan industry reveals an important correlation between the vertical integration and market factors. In fact, the adoption of the structural adjustment program in the mid-1980s and the policy of progressive liberalization of the Moroccan economy have significantly improved the functioning of the industrial enterprises and markets. Thus, the degree of integration of the industrial branches is explained, essentially, by the basic conditions and the structures of the industrial sector, such as, the degree of concentration, the capital intensity, the level of the barriers to the entry, the importance of economies of scale and the growth rate of sales. These factors also reflect the hypotheses of the main explanatory theories of vertical integration, in particular those of monopoly and efficiency.

Our paper reveals, however, a negative correlation between the degree of vertical integration and the profitability of the industrial firms. This confirms the idea that integration is usually accompanied by significant costs (bureaucratic costs, costs resulting from changes in incentives) that offset the savings that result (savings in transaction costs, savings related to monopoly power).

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