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Introduction: A New View of Organizational Design

The last two decades have seen a set of innovations in the organization of the firm that is similarly fundamental and that may ultimately be as momentous [as the rise of the multidivisional form in the first two decades of the twentieth century] ... [Firms] have eliminated layers of management and associated staff positions, redefined the units into which they divide themselves internally, dispersed functional experts to the business units, and increased the authority and accountability of line managers. By these measures, coupled with improved information and measurement systems and redesigned performance management systems, they have sought to increase the speed of decision-making and to tap the knowledge and energy of their employees in ways that have not been tried before.

(Roberts 2004, p. 2)

Statements like this are rather common in works on the organization that mix real facts based on anecdotal business evidence and case studies with conceptual and theoretical insights. It is our opinion that this popular approach though fruitful, suffers from a serious methodological weakness in that it fails to provide a generalizable framework for the study of organizational design. In fact, its conclusions are limited by some general caveats.

From a historical point of view, it is questionable that we are today experiencing a special phase leading to a discrete change that involves the emergence of a new organizational paradigm. In fact, one should acknowledge that in the twentieth century there has been an incessant transformation of organizational structures and practices, due to changes in both external (e.g. technology, market demand, labor relations) and internal (e.g. ownership structure, goals, unionization ratio) conditions. In order to qualify the above-mentioned organizational changes as “revolutionary” rather than “evolutionary,” a far more comprehensive and

generalizable empirical evidence is needed than the qualitative and rather fragmented picture on which most studies rely.

In addition, since the organization is a very difficult concept to define, analyze, and operationalize, scholars should carefully avoid overwhelming simplifications. On the one hand, organization studies should dissect the complexity of structures and procedures and try to provide comprehensive, robust, micro-level evidence on, at least, some key dimensions of the organization, instead of centering attention around theoretically derived archetypes. For instance, in the real world there is no matrix organization, there is instead a continuum of forms that differ one from another as to the specific “value” taken by several organizational dimensions. On the other hand, one should learn from well-known classifications instead of being trapped by them in scientific “culs de sac.” U-form, M-form, and lean organization (or J-form) are now standard concepts in the theory of business organizations. In our opinion, the huge work in business history and organization studies that has provided evidence on these forms should be used as a starting (and not an ending) point of empirical and theoretical research. The use of the concept of organizational form indeed is unsuitable to quantitative studies on the organization. In other words, the definition of organizational forms implies a holistic approach to the organization that is not compatible with the statistical analysis of its individual dimensions – e.g. allocation of power, management hierarchy, incentive structure, routines, procedures, and practices. We need complexity in order to study complexity.

In particular, we claim that what we need is a framework in which organization can be quantitatively analyzed in a multi-dimensional space, an idea which is not new in the organization literature. For any organization, the value of a set of indicators measuring different dimensions of organizational design will jointly define an empirically derived profile. The individual dimensions and their variations both across different organizations and over time, can then be studied quantitatively through appropriate statistical and econometric techniques. The emergence of this (static and dynamic) quantitative evidence on organizational design is a necessary condition for the rigorous empirical assessment of the explanatory power of arguments proposed by the theoretical literature.

In this volume we have adhered to this research design. First, we have tried to systematize, combine, and condense the existing quantitative

empirical evidence on (selected dimensions of) organizational design coming from disciplines as diverse as industrial economics, personnel economics, business history, organization and management studies, industrial relations, and sociology. In fact, the lack of a synthesis of quantitative work in different disciplines is a major drawback of the extant empirical literature on organizational design which we have attempted to remedy in this volume. Second, drawing on these studies, we have proposed a new empirical framework aimed at defining (a limited set of) standardized quantitative indicators of organizational design that are suitable for use in econometric work. Third, we have used the stylized facts that result from both existing quantitative empirical studies and our own framework to test theoretical predictions that are derived from the theoretical economic literature about the determinants of organizational design, its evolution, and its effects on firm performance. In so doing, we have also indicated promising directions for future research in this field.

Nonetheless, in order to render this research design manageable, we have been forced to impose some constraints on ourselves.

First, attention has been limited to organizations which induce or coerce participation, and not to organizations of a voluntary nature, such as religious or ideological associations. Hopefully some of the propositions advanced here can fruitfully be applied to these organizations as well.

Second, we have exercised considerable discretion, selecting only a limited number of dimensions of organizational design which have both been analyzed by previous empirical studies and appear key for the purpose of creating a more solid bridge between economic theory and empirical findings. This means that we have omitted some other aspects, no matter how widely they are used or how powerful they have proved to be for other purposes. We claim that failure to adopt this selective strategy has been a major drawback of the quantitative empirical literature in this field. In fact, as will be indicated below in greater detail, some seminal research programs on organizational design in the 1960s have attempted to delineate empirically all the possible interesting variables in organizations. In so doing, they have not given sufficient consideration to the potential operational problems of acquiring reliable data on them and relating them to each other and to the characteristics of the environment.

Before addressing the core aspects of our framework and relating them to theoretical models, some preliminary remarks are in order.

I.1 Preliminary issues in the study of the organization

I.1.1 The concept of organization

Organization is a complex multi-dimensional concept that has been subject to numerous definitions. In this volume, we do not embrace any particular view of the organization. We adopt a very general approach in which an organization can be defined as a collectivity with a relatively identifiable boundary, a normative order, authority ranks, communications systems, and membership coordinating systems; this collectivity exists on a relatively continuous basis in an environment and engages in activities that are usually related to a goal or a set of goals (Hall 1972, p. 9).

In this sense, we use not only an agnostic definition of organization but also a very general conceptual framework through which different theoretical approaches (in both industrial economics and organization science) can be validated empirically. Strangely enough, industrial economics and organization science have developed parallel but unrelated theories of organization (see below for a review of theoretical models).

First of all, organizations are systems for *collective action*. They develop a structure and pattern of functioning which equip them, more or less well, for coping with externally given constraints and uncertainties in order to achieve their objectives. In this view, control is essentially apolitical and defined as independent of interest factors (see the so-called contingency theory in organization science, Burns and Stalker 1961; Woodward 1965; Lawrence and Lorsch 1967; Galbraith 1973, and below for works in the information processing stream of the theoretical economic literature).

In other views, the analysis instead focuses on questions related to the existence in organizations of agents with different interests and the way in which the *distribution of power and influence* affects the pursuit of a common goal. In this case, the mechanisms by which these groups are held together and through which they pursue their own interests to the detriment of the organization's goal become critically important to the understanding of organizational processes and outcomes (see, among many others, Emerson 1962 and Pettigrew 1973 in organization science, and below for works in the decentralization of incentives stream of the theoretical economic literature).

Some other scholars have developed theories that are based on the assumption that the structure of organizations is the outcome of a process of negotiation between *different organizational participants* (see Elger 1975 in organization science, and below for works in the transaction cost economics stream of the theoretical economic literature).

As was mentioned above, we acknowledge the existence of these different conceptual approaches but we do not take any of their considerations for granted, since our goal is to test empirically their predictions.

At this preliminary stage, we want only to clarify that, purely for empirical reasons, our notion of organization excludes:

- informal arrangements (or so-called “informal organizations”)
- organizations of a voluntary nature.

I.1.2 Unit of analysis

Overall complex structures consist of many differentiated but interdependent subsystems. For instance, there may be a number of functional divisions within the same corporation, and also a number of branches, plants, or factories at various distances from the headquarters.

These subunits can be analyzed separately so as to simplify the empirical analysis of organization. However, one has to acknowledge the fact that these subsystems are linked together as an overall organizational system through information and resource flows. Indeed, as systems become large they differentiate into parts, and the functioning of these separate parts has to be integrated if the entire system is to be viable.

In this vein, the present volume will illustrate results on both the whole organization of complex structures and that of single subunits. In the latter case, subunits are, however, considered as parts of a greater system of relations.

In particular, our empirical exercise will concentrate on manufacturing plants (see the Appendix at the end of the volume). On the one hand, the focus on subunits will allow us to investigate the organization in greater detail. On the other hand, we will conduct the analysis taking into consideration the relation between subunits and the whole organization through the use of firm-level variables (e.g. ownership status, characteristics of the group).

I.2 An overview of a new approach to the study of organization

I.2.1 The roots of the new approach

Of course, we hope that this volume will be regarded as an original contribution, but the claim of originality is a difficult one to establish. In the building of a science, each of us starts from the contributions of others. In this volume, we have tried to build as much as possible on the contributions of diverse disciplines.

1.2.1.1 Organization science

First, those familiar with organization theory, particularly studies conducted in the mid-1960s, will recognize that our debts fan out from a bunch of seminal studies. Indeed, in those years several important contributions started to shed light on the functioning of the organization. We share the same general approach to the study of organization: a comprehensive investigation of structures based on empirical facts provided by a quantitative account of some dimensions of organizational design.

We build on the pioneer work on organization developed in the 1960s by Derek Pugh and his colleagues at the University of Aston (see Pugh *et al.* 1963, 1968, 1969a, 1969b), and we design a stylized but thorough description of the organization using a vector of quantitative variables similar to that proposed by the Aston group, but of smaller size.

Likewise, Joan Woodward (1965) analyzed deeply the organization of firms, providing comprehensive evidence on some important dimensions. For instance, she established a (linear) relationship between a firm's technical complexity and aspects of its organization chart and personnel ratios, such as the length of the line of command and the span of control of the Chief Executive Officer (CEO) and of other managers. She also explained why firms involved in unit production were more successful if they had short lines of command and wider spans of supervisory control.

A similar analysis was conducted by Burns and Stalker (1961), who found that organizations in more stable industry contexts tended to rely more on formal rules and procedures; decisions were reached at higher levels of the organization and the span of supervisory control was narrower. On the contrary, effective organizations in more dynamic industries were characterized by wider spans of control, less formal procedures, and decentralization of decision-making to middle levels of the organization. In this vein see also Blau and Schoenherr (1971) and Starbuck (1971), among others.

1.2.1.2 Business history

Second, our contribution builds on the huge amount of empirical evidence on organization provided by the business history literature. In particular, we have tried to operationalize and to measure through quantitative indicators aspects that qualitative studies developed by business history scholars generally consider as key dimensions of organizational forms.

In particular, Boxes I.1–I.4 show that this work has extensively documented that organizational forms may be expressed by a bunch of key dimensions. Among them we have selected three:

- the corporate hierarchy and its structure (i.e. the span of control and the depth of the hierarchy)
- the allocation of power (i.e. formal and real decision authority)
- organizational routines, procedures, and practices.

Box I.1 The passage from the pre-modern to the modern form of organization

Business history studies have extensively documented that the passage from the pre-modern to the modern form of organization was characterized by both the rise of a managerial hierarchy and the specialization of workers in fixed, planned and repetitive tasks (see Marglin 1974). In the pre-factory organization workers were directly linked to the owner/entrepreneur and they frequently changed their tasks and positions along the layout of production. The modern corporation is based upon two opposing features: “it contains many distinct operating units and it is managed by a hierarchy of salaried executives” (Chandler 1977).

The evolution of the factory system followed the opposite pattern of that of agriculture (the so-called “Dahlman Paradox,” see Leijonhufvud 1986). The modern factory arose from a process of coordination and consolidation of disperse units of production within the same centralized production system. This was mainly due to the technological advances of the second industrial revolution and to an expanding market. Modern firms developed a structure that gathers and processes information and takes decisions faster and better than the pre-modern factory did (O’Donnell 1952).

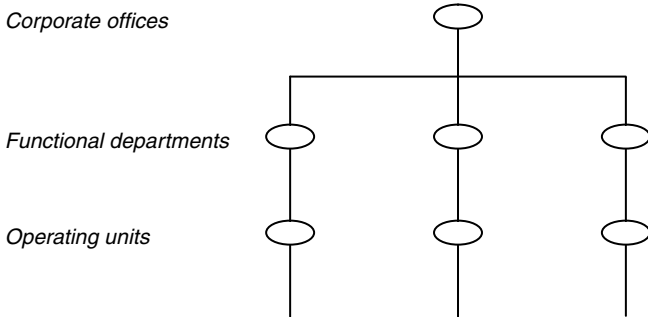
Economies of scale and scope of managerial work depend crucially on technology. As a consequence, the advances of the second industrial revolution allowed an increase in the optimal depth of the organization of firms, by sharply decreasing costs of communication and transportation (see Chandler 1977).

In addition the passage from a craft to a hierarchical system of organization induced both a drastic change in the allocation of decision-making and the adoption of new organizational practices (see Montgomery 1987). Using Taylor’s (1967) own words “it is only through enforced standardization of methods, enforced adoption of the best implements and working conditions, and enforced cooperation that this faster work can be assured. And the duty of enforcing the adoption of standards and enforcing this cooperation rests with the management alone.”

In sum, the modern form of organization is characterized by the rise of a managerial hierarchy, the re-allocation of decision-making power within this hierarchy, and the use of new organizational practices.

Box I.2 The U-form

This structure is characterized by both the presence of a deep managerial hierarchy and the key role of vertical coordination and control; decision-making is highly centralized at the pinnacle of the hierarchy, where corporate offices (e.g. the board of directors, the executive committee) operate. Managers that hold each functional department (e.g. sales, production, finance, R&D) are also members of the top management, so that real and formal authority is mainly centralized at upper levels.



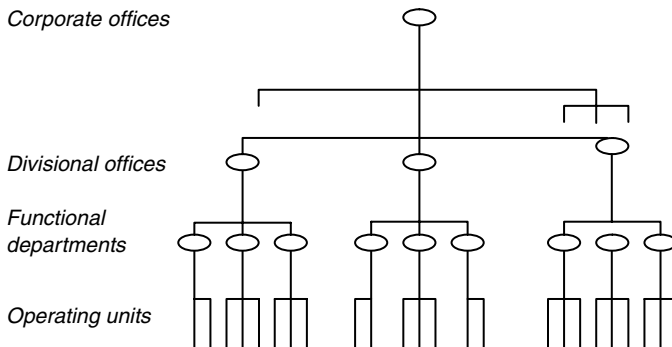
The central management defines long-run and short-run strategies, drawing upon the information coming from lower levels. The vertical and upward structure of the information flow is a key element of this organization. At the bottom of the hierarchy, lower-level managers supervise the implementation of strategies operated by line workers.

The organization depends heavily on the availability of computable data upon which the firm's strategies are based. In this respect, the development of new accounting methodologies for planning and monitoring operations (Johnson 1975) and the use of new organizational practices (Montgomery 1987) are essential elements of the functional organization.

In sum, the U-form is a complex structure composed of a deep hierarchy of managerial executives who are ranked vertically. Strategic decision-making is highly centralized and is based on a bottom-up information network.

Box I.3 The M-form

The multi-divisional form is an evolution of the functional structure (U-form) in which organizational complexity increases and authority is partially allocated downwards. Middle management is now composed of heads of divisional offices as well as functional departments. So the organization is first subdivided by divisions (product and market divisions) and then is functionally structured. Given the introduction of new hierarchical levels, the depth of the management hierarchy expands.



Besides changes in the number and structure of hierarchic relations, the multi-divisional form implies a step towards decentralization of decision-making. The corporate office still remains in charge of long-run strategies. However, divisions are partially autonomous, especially for short-run decisions, and they are managed functionally by a general manager. This partial transfer of authority aims at exploiting local knowledge and increasing the initiative and participation of middle managers (see Chandler 1962).

It has been also pointed out (Johnson 1978) that this new type of organization has needed new accounting procedures as well as a new information and communication network. Of course, information flows and authority links remain vertically structured.

To sum up, the M-form is a complex organization in which functional structures (divisions) are subsystems of a more complex and integrated system of authority relations and information flows. Decision-making is partially delegated down the management hierarchy in order to exploit capabilities of division managers, stimulate their participation to firm's objectives, and speed up implementation of strategic decision-making.

Box I.4 The lean organization (J-form)

The so-called “lean” type of organization (or J-form, see Aoki 1986) represents a step towards a decrease of bureaucratization (Womack *et al.* 1990); in this structure tasks are loosely defined in order to achieve flexibility and exploit local learning and dispersed capabilities. In addition “increased use of technologies, such as email, voice mail and shared databases, has, over time, reduced the need for traditional middle management, whose role was to supervise others and to collect, analyze, evaluate, and transmit information up, down, and across the organizational hierarchy” (Bahrami 1992). The new applications of the information and communication technology (ICT) paradigm have flattened managerial hierarchies just as the second industrial revolution increased their depth; thus the depth of the corporate hierarchy decreases.

It has also been noted (Krafcik 1988) that this type of organization is characterized by a higher span of control, possibly due to the fact that ICTs allow managers to monitor more employees.

Decision-making is further decentralized (Jaikumar 1986; Drucker 1988); flexibility and agents’ initiative are achieved through partial delegation of authority, i.e. by the so-called “white collarization of blue collars” (Koike 1990). Hence this structure needs a skilled workforce also at the bottom of the hierarchy.

Finally, the new organization is closely intertwined with the adoption of new organizational practices: innovative work practices (IWPs) and human resource management practices (HRMPs).

To sum up, the lean type of organization is characterized by a drastic reduction of the number of corporate tiers, an increase in the span of control of managers, a further delegation of decision-making power and the use of new work and incentive practices.

I.2.1.3 Management studies

Third, we acknowledge management studies that have documented the rise of a new form of organization: the so-called “lean” type of organization (see Box I.4). In so doing, they have by and large stressed the role played by the same key dimensions of organizational design that have been mentioned above: (re-)allocation of decision authority, (shrinking of the) corporate hierarchy, and (use of innovative) organizational procedures and practices. We are thus indebted to these studies that have been used here as focusing devices. Moreover, the book provides a condensed, comprehensive illustration of stylized facts on these aspects of organizational design, thus providing an original contribution to this debate.

1.2.1.4 *Economic theory*

In the past three decades there has been growing interest in organizational design from economic theoreticians. We share Roberts' (2004) view that "economics has much to say about the problem of organizational design" (p. 12). He defines his own work as mixing "case studies and shorter examples with fundamental conceptual and theoretical material" (p. ix). As was mentioned earlier, this approach indeed is rather popular in the extant literature on organizational design. In this volume we have the ambition to go a step further.

In fact, in spite of the claim that economic theory provides useful predictions on the determinants of firms' organizational design and its evolution over time, there is a surprising shortage of robust quantitative tests of the explanatory power of different theories. In turn, this represents an insurmountable obstacle to the further development of theoretical models, and more generally of our knowledge about the "how" and "why" of firms' organizational design. The main objective of this volume is to contribute to closing this gap. For this purpose, we provide a critical review and a synthesis of the multi-disciplinary quantitative empirical evidence on selected aspects of firms' organizational design and we propose and use a new empirical methodology that is suitable to econometric tests (see below).

In Chapters 1–4, for each organizational dimension under scrutiny, a conceptual model that leads to precise theoretical predictions is first illustrated. In order to allow the interested reader to better relate these models to the theoretical debate in the economics of organizational design, in a later section of this Introduction we briefly highlight relevant aspects of the different streams of the theoretical literature.

1.2.2 **A new approach to the study of organizational design**

Above and beyond the contribution of existing empirical quantitative studies, in this volume we present new facts based on a new empirical approach to the study of organizational design. While a detailed description of this approach is postponed to Chapter 1, it is important to delineate here the main principles by which it is inspired.

We have designed a framework in which organization is quantitatively analyzed in a multi-dimensional space. For any structure or subsystem, the value of a vector including a *selected* set of organizational dimensions will jointly define empirically a profile of organizational design. We are thus able to investigate quantitatively individual dimensions of organizational

design, correlating them to each other and to other aspects of the firm (e.g. ownership status, technology) and of its environment (location, demand, labor market, social context). Dynamically, changes over time in these dimensions provide evidence on the evolutionary path of organizational design.

The key advantage of this approach is that it is suitable for use in statistical and econometric analyses based on large-scale data sets. In addition, while providing a set of standardized quantitative indicators, it can be replicated in different empirical settings. In so doing, it extends our capacity to measure (and thereby investigate) some key characteristics of firms' organizational design. In our view, this is a substantial departure from case studies that attempt little in the way of measurement of variables and quantification of relationships; hence they do not offer the opportunity to systematically confirm findings from one study with those of another one or to assess the reliability of the relationships detected between variables.

It is important to emphasize that in order to render this approach manageable, we have had to concentrate on some key dimensions of organizational design, basically due to operational constraints, and we have developed appropriate indicators only for these dimensions. It is fair to acknowledge that there are other aspects of organizational design that have been omitted here. In principle, our empirical framework could be easily extended to other dimensions. However, the aspects that we do consider are central to the debate in economics, management, and business history. In fact, we take as our major concern the issues of hierarchical relations and of power and its distribution in organized structures. After all, this is what social organization is all about.

Indeed, the fundamental conception of formal complex organizations entails two dimensions: the subdivision of the total responsibilities among employees so as to simplify individual tasks and permit the application of expert knowledge in the performance of specialized duties, on the one hand, and a hierarchy of official authority to effect the coordination needed as the result of this subdivision, on the other (see Roberts 2004, pp. 17–18).

In so doing, we have first of all developed standardized scales and measures of the structural dimensions of organizational design. For instance, the detailed examination of control systems resulted in the development of a typology based on two parameters: the degree to which control is exercised personally or indirectly; and the degree to which control systems are integrated or dispersed (Woodward 1965). Accordingly,

we have derived measures of the amount and forms of control exercised by managers at the different levels of the corporate hierarchy.

Furthermore, we have added to the variables measuring the architectural features of organizational design indicators relating to organizational procedures and practices. These latter present complementary relations with the structure *a la Weber*, because they define the ways in which workers should perform their tasks (*systems of formal and informal routines*) and they try to align employees' interests to the goals of the firm (*incentive structure*).

But organizations do not operate in a vacuum. They affect their internal and external environment and are affected by them. We will go into the relation between design, structure and performance of organizations, and technology, asserting that the previous ones vary systematically in different technological contexts. In addition, organizations are in constant interaction with other organizations, clients and customers, and general societal conditions (the external environment). In a variety of ways we will also assert that the design, structure, and performance of organizations reflect variations in external environmental conditions, so that industry, location, and cultural contexts play a key role in shaping organizational design.

We stop this brief presentation of our new approach at this stage. In Chapter 1 we will further specify our empirical methodology and provide preliminary descriptive evidence on firms' organizational design and its evolution in the past two decades. Then, in Chapters 2 and 3, we will study the relation between architectural features of organizational design and the internal and external environment (the allocation of decision-making authority in Chapter 2, and the corporate hierarchy in Chapter 3). In Chapter 4 we will investigate the determinants of the dynamics of organizational design. Chapter 5 will shed new lights on the impact of organizational design on firm performance. Finally, the main contributions of this volume are synthesized in the conclusion.

1.3 The substance of the economics of organizational design

In this section we will synthesize the key approaches of the economic theoretical literature on organizational design. Note that the aim is not to provide another survey of this literature. Rather we will simply illustrate the key intuitions behind the most popular approaches, and the fundamental indications they provide to empirical studies. Accordingly, we will be selective rather than comprehensive, and in so doing we will

not do justice to the richness of the theoretical debate – for this purpose, the interested reader will find appropriate references. Inclusion of a particular contribution will be driven by our subjective appreciation of its relevance in terms of predictions regarding the determinants of firms' organizational design, its evolution over time, and the economic impact of its adoption.

We will start from the pioneer insights on authority and hierarchical design provided by transaction cost economics. Then we will consider the information processing and decentralization of incentives streams of literature, which offer different, but largely complementary, explanations of the determinants of firms' organizational design. Lastly, we will briefly analyze different bodies of literature that, starting from different premises and following different approaches, have addressed the question of why organizational design is sticky and tends not to be changed by firms over time.

1.3.1 Transaction cost economics

Since the seminal work of Simon (1962) economists have described the firm as a system that is composed of interrelated subsystems, each of the latter being, in turn, *hierarchical* in structure until we reach some lowest level of elementary subsystem. According to Williamson (1975) hierarchical organizational designs arise because of the efficiency advantages of authority relations based on decisions by fiat. These advantages stem from the ability of hierarchical designs (i) to economize on communication and information processing costs,¹ and (ii) to mitigate problems engendered by individuals' opportunism. In particular, in Chapter 3 of his book Williamson compares the efficiency properties of simple hierarchy and peer group organizations. The latter organizations involve collective production, information processing, and decision-making activities, and provide income-sharing arrangements between participants, but do not entail subordination. Conversely, in a simple hierarchy one individual (the "boss") is assigned the task of giving instructions to other individuals (the "employees") and monitoring their behavior: "The employee stands ready to accept authority regarding work assignments provided only that the behavior called for falls within the "zone of acceptance" of the [employment] contract" (Williamson, 1985, pp. 218–219). In joining a hierarchy he also accepts the authority of the boss to monitor his behavior *ex post*.

Therefore, a simple hierarchy enjoys both information processing and monitoring advantages. First of all, information flows and decision-making activity are centralized in the hands of the supervisor. In accordance with Arrow (1974, p. 68) this arrangement yields the benefits of

coordinated decision-making and saves on the costs of transmitting and processing information. In addition, if the requisite information processing and decision-making capabilities are not uniformly distributed among individuals, it also captures specialization economies as the supervisory function will be assigned to the most talented individual. Second, the tasks assigned to the supervisor also involve *ex post* auditing and experience-rating. As is discussed by Alchian and Demsetz (1972) this limits the free rider problem inherent in the peer group arrangement.

Williamson adds that more complex multi-stage hierarchies are composed of a sequence of simple hierarchies and enjoy similar advantages to those highlighted above: “there are striking parallels between the reason for workers to be joined in simple hierarchies and the decision to merge simple hierarchies into a multistage hierarchy rather than mediate transactions between them by market means” (Williamson 1975, p. 56).

1.3.2 The information processing stream

The information processing stream analyzes the issue of coordination of imperfectly informed agents.² The rationality of agents is bounded *à la* Simon, in the sense that the scarce resource is not information, but information processing capacity (Simon 1945). Accordingly, in this stream of literature emphasis is placed on the costs involved in information processing and communications. Conversely, the problems of conflicting objectives among individuals, and the need for suitable incentives to deal effectively with these problems, are ignored (see below).

In particular, the information processing stream highlights that there are different sources of organizational failures in hierarchical organizations that centralize the decision-making function. First, centralized hierarchies suffer from information transmission leaks (Keren and Levhari 1979, 1983, 1989) and delays (Radner 1993; Van Zandt 1999b) in transmitting information from the pinnacle to the bottom of the hierarchy. The larger the depth of the hierarchy, the larger the leaks and delays. Hence, even if one abstracts from incentive problems, general strategies defined by the superior (i.e. the top management of a firm) might differ from those implemented by subordinates simply because of distortions in intra-firm communication. In addition, these strategies may fail to produce the expected benefits because of implementation delays which render decisions obsolete. In particular, decentralization of decisions reduces delays because it allows tasks to be performed concurrently.

Second, due to information overload, centralized organizations make decisions at a slower pace than decentralized ones. Accordingly, Sah and Stiglitz (1986, 1988) show that when decision authority is concentrated at the top of the hierarchy, a relatively lower number of projects can be selected in comparison with a situation in which it is decentralized. Decentralization then emerges as an efficient arrangement in situations where projects are on average of good quality.

Third, if the tasks that need to be performed by an organization are heterogeneous, by delegating decision-making to the agent who has the best information relating to a given decision firms can fully exploit economies arising from local capabilities and specialization of tasks (Geanakoplos and Milgrom 1991). Moreover, with task specialization by repeatedly processing the same type of information an agent can lower her unit time of processing this type of information. Nonetheless, the different types of information processed by different agents then need to be aggregated in order to create effective decision-making. In other words, the benefits of specialization are limited by the need to coordinate specialized tasks. Greater specialization leads to an increase of communication costs within the organization because of coordination needs (Bolton and Dewatripont 1994). In accordance with these arguments, organizational design is shaped by the trade-off between specialization and communication; this explains the ubiquity of hierarchical organizations.³ More recently, Dessein and Santos (2006) assume that the information that organizations need to adapt to a changing environment is local in nature, being dispersed among employees. Organizations optimally choose how much to make use of this local information, and the quality of communications among employees. They may opt for an adaptive organizational design which gives employees the flexibility to tailor their actions to the information they alone observe. However, if employees specialize in the tasks in which they enjoy an informational advantage, as was mentioned above communication costs increase because of the need for coordination of specialized tasks. Under these circumstances, delegation with multi-tasking may optimize the trade-offs between the benefits arising from use of local information and communication costs. It follows that organizational designs tend to be of two very different types: either rigid, specialized, and with limited communication among employees, or adaptive, with employees being assigned multiple tasks and intensely communicating between each other.

Fourth, in line with Garicano (2000), let us assume that individuals can be ranked according to the difficulty of the problems they are able to solve, with higher-rank individuals being able to solve all the

problems that can be solved by lower-rank ones plus some other more difficult problems. Experts that are able to solve more difficult problems are correspondingly more expensive, but more difficult problems are less likely to occur. Then a pyramidal knowledge hierarchy with a greater number of less skilled individuals at lower levels and fewer more skilled individuals at higher ones allows us to optimally use individuals' expertise (Garicano and Rossi-Hansberg 2006). In a similar setting, Harris and Raviv (2002) show that decentralization of decision-making down the hierarchy (i.e. to middle managers) may be explained by the need to use more effectively the time of higher-rank individuals (i.e. the CEO) who have greater opportunity cost. Conversely, if the value of solving difficult problems (i.e. companywide coordination of activities) increases, then greater centralization follows.

I.3.3 The decentralization of incentive stream

This stream of literature includes a series of rather heterogeneous studies that share the common purpose of highlighting the characteristics in terms of individuals' incentives of organizational designs which are hierarchically structured and in which a principal located at the top of the hierarchy (e.g. the top manager of a firm) may delegate decision authority to agents (i.e. division managers).⁴ This kind of organizational design is compared with a centralized design where the principal makes all decisions based on the information communicated by agents; agents simply receive instructions and implement the decisions taken by the principal. This literature abstracts from the costs of information processing and transmission in which the information processing stream is interested. Conversely, it focuses attention on the incentive costs that arise with decentralized decision-making. The cost of delegating authority is the principal's *loss of control* over the choice of projects. Thus, loss of control assumes the form of deviation of the firm's action from the objectives of the principal. In fact, agents that are delegated decision authority act in their own self-interest. Hence, they are tempted to hide valuable information in order to pursue objectives that in general are different from those of the principal, and maximize their own utility.

More precisely, most of this literature considers a situation in which agents have private information on their tasks. The principal may hire a middle manager who has no role in production but provides her with informational expertise. The models analyze whether it is desirable for the principal (a) to hire the middle manager or not, and (b) to delegate decision authority to agents or to the middle manager. Therefore, these

studies analyze both the depth of the hierarchy and the decentralization of decision authority.

The starting point of this literature is the so-called "Revelation Principle."⁵ This principle states that if (i) there are no information processing and communication costs, (ii) the design of complex contracts does not involve any additional cost, (iii) agents do not collude, and (iv) contracts cannot be renegotiated *ex post*, an organizational design with centralized decision-making is always optimal, in the sense that it is not dominated by any organizational design that relies on delegation of decisions. In fact, the outcome obtained by any design of this latter type can be replicated by a centralized one. Then the objective is to identify organizational arrangements that while providing agents with adequate incentives, effectively deal with the loss of control problem and so come as close as possible to the outcome of a centralized design. Note, however, that if the framework of the Revelation Principle applies, decentralization never dominates centralization. So the implicit assumption is made that decentralization is driven by other factors (e.g. information overload problems, communication costs).

Alternatively, the assumptions of the Revelation Principle may not hold. An interesting departure is to assume that agents possess specific knowledge (or local information) which cannot be communicated to the principal in a timely fashion.⁶ Then the delegation of decision authority may serve the purpose of inducing agents to use their privately held information. Accordingly, Aghion and Tirole (1997) show that the principal, by giving subordinates formal decision authority over both initiation and ratification of projects on the quality of which she is poorly informed, improves the incentives of agents to search for projects. The associated benefits for the principal can outweigh the costs that arise from the implementation of projects that sometime have limited value to the principal, but provide great private benefits to agents. This is more likely to happen the less informed is the principal and the larger is the extent of the private benefits of the agent. In this situation, delegation is likely to increase both an agent's initiative to acquire information and her participation in the contractual relationship. Conversely, decisions about projects that potentially have a large payoff to the principal and about interdependent projects would be better centralized, as there is a great opportunity cost for the principal if the agent selects a suboptimal project.

Baker *et al.* (1999) depart from this framework in that they assume that the principal always keeps formal authority, as "[she] can restrict the subordinate's actions, overturn his decisions, and even fire him" (p. 56). So the authority which is delegated to the agent is informal. In

other words, even though the agent can be given the authority to select and ratify projects with no interference from the principal, this latter keeps the right to renege on her former decision, overrule the agent, and implement a different project. Baker *et al.* rely on a repeated game model and consider two situations, depending on whether the principal has the information necessary to assess the project before it is ratified by the agent or not. In the former situation, decision authority is delegated if the principal values her reputation for delegating authority more than what she would save by overruling an agent's choice of a specific project. In the latter situation it is the threat of the principal retracting the subordinate's authority over future projects that induces the subordinate to abstain from choosing a project which may badly hurt the principal. Then delegation follows. This study again shows that delegation gives agents stronger incentives to search for and develop projects. Nonetheless, with an informed principal, the greater incentive arising from delegation vanishes the more aligned are the agent's and the principal's objectives. Moreover, delegation is more likely if the principal has not much to lose from the agent's decisions. With an uninformed principal, it is a low extreme value of the private benefit that the agent can extract from a project that makes delegation feasible. Lastly, independently of whether the principal is informed or not, a high discount rate decreases the likelihood of delegation.

An interesting variation on this theme is offered by a situation in which even if the agent does not possess any specific knowledge, she has different priors from those of the principal as to the best course of action (see Van den Steen 2006; see also Zabojnik 2002). Under such circumstances, and similarly to what happens in a private information setting, delegation of decision authority has a positive motivational effect if the agent's effort is more useful when the right decision is made. In fact, the agent expects a higher return from her effort when she is in charge of decision-making and can choose the decision that according to her priors is the right one. Nonetheless, delegation poses coordination problems that are greater the more divergent are the principal's and the agent's priors, as each party wants to follow the course of action that she considers best. In contrast to a situation with private benefits, these problems cannot be alleviated through an incentive compensation scheme. In fact, such a scheme, in addition to making the agent care more about coordination, also induces her to behave in accordance with her priors. So disagreement between the agent and the principal engenders a trade-off between motivation and coordination. It follows that delegation will increase in the importance of the agent's effort and decrease in the importance of coordination. This also

implies that the principal may delegate decision authority and abstain from overturning the agent's decisions with the aim of "firing the troops," even though she knows that delegation can make decisions worse.

A weakness of this literature is that decisions relating to different aspects of organizational design (e.g. the depth of the hierarchy, delegation of decision authority, use of different work practices and incentive schemes) are often analyzed in isolation. Of course, there are exceptions.⁷ Athey and Roberts (2001) explicitly recognize that the design of incentive schemes and the allocation of decision authority are inter-linked. They analyze, though in a very specific setting,⁸ the trade-off that may arise between motivating agents' effort, which is done best by rewarding agents on precise measures of their effort (i.e. an input measure), and inducing them to take the right decisions, which may require linking their rewards to the total value created (i.e. an output measure). They show that if the need to elicit effort from agents prevails and the compensation scheme relies on a comparative performance evaluation, it may be optimal not to assign decision authority to the best-informed party; in fact, under these circumstances agents have very bad incentives for selection of the right decision (see also Jensen and Meckling 1992). Raith (2005) considers delegation of decision authority to agents in a hidden information setting similar to that of Aghion and Tirole (1997), and contextually analyzes the optimal design of agents' compensation schemes – that is, whether to rely on input- or output-based compensation. A compensation that is commensurate to agents' effort does not give the agent much incentive to use her specific knowledge; conversely, if compensation is closely correlated with the principal's profit, the agent incurs high income risk. The model shows that delegation implies a shift towards an output-based payment scheme. Therefore, the greater the information advantage of the agent and the more valuable is the information she possesses, the more likely is delegation, and the larger is the weight on output in the agent's compensation scheme, even if the agent's effort can be measured quite precisely.

1.3.4 On the dynamics of organizational design

The above approaches consider the costs and benefits of different organizational designs (e.g. more or less hierarchical, more or less decentralized) and highlight factors on which these costs and benefits depend. So they adopt a static approach and provide theoretical predictions as to which organizational design will emerge depending on the contingencies which firms are facing.

Nonetheless, as will be documented in the following chapters of this volume (especially Chapter 4), organizational designs happen to be very resilient (or sticky). So the question arises why are firms so reticent to modify the (supposedly optimal) organizational design they have chosen under certain contingencies when these contingencies have changed? In other words, what explains inertia in organizational design?

Various explanations have been offered by the theoretical literature on firm organization. Behavioralist theorists of organizations (see March and Simon 1958; Cyert and March 1963) point to the bounded rationality of economic agents and the costs involved by decision-making activity under uncertainty to have access to, store, process, and transmit information. As there is no guarantee that a decision to modify the organization may be optimal, and designing a new organization is costly, firms prefer to stay with their current organizational design unless abnormally poor performances trigger change.

The literature on population ecology contends that structural inertia is the outcome of an ecological–evolutionary process: selection tends to favor stable organizations – that is, organizations whose structure is difficult to change (Hannan and Freeman 1984). In comparison with other institutions, business firms enjoy the advantage of a high level of reliability and accountability (i.e. the capacity to collectively produce a product of given quality repeatedly and to document the sequence of decisions and related outcome, see Hannan and Freeman 1984, p. 153). But in order to assure reliability and accountability, a firm’s organizational structure needs to be reproducible over time. This is obtained by processes of institutionalization and by the creation of standardized routines, two factors which make firms highly resistant to change.

Evolutionary theories of economic change (see Nelson and Winter 1982) help us to understand why organizational routines may be a source of structural inertia. According to such a stream of literature, routines are the repertoire of a firm’s idiosyncratic collective actions; they are built through a cumulative process based on past experience of problem solving activity and involve automatic coordinated responses to specific signals from the environment.⁹ So, due their very nature, they can be modified only incrementally and at considerable cost, with this leading to lock-in effects which extend to the firm’s entire organizational design.

Two further bodies of theoretical literature are key for understanding the sources of inertia that can hinder changes of organizational design.

On the one hand, the literature concerned with the investment behavior of firms under uncertainty in the framework of real option theory (Dixit and Pindyck 1994) has argued that when an investment decision entails sunk costs and future market conditions are uncertain, there is an additional opportunity cost of implementing the decision which stems from the lost option value of delaying it until new information is available. Any change of a firm's organization design implies sunk costs, and its returns are uncertain by nature. So, it might be optimal for a firm to postpone it until new information is collected.

On the other hand, there are political forces within organizations that may hinder organizational changes (see Milgrom 1988; Milgrom and Roberts 1990a). The reason is that adoption by a firm of a particular organizational design leads to a particular distribution of quasi-rents among firm's employees. Therefore, if the firm is going to change its organizational design, a change which is likely to have considerable distributional implications, individual employees will try to influence the nature of the change so as to protect or augment their own quasi-rents. As such influence activities absorb employees' time and attention, which otherwise could be used in directly productive activities, they engender substantial costs. In order to avoid them, a firm may refrain from implementing organizational changes that would improve productive efficiency, unless failure to do so threatens survival (Schaefer 1998).

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