Part I

Introduction

1 The economics of contracts and the renewal of economics

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1 Introduction

To an economist, a contract is an agreement under which two parties make reciprocal commitments in terms of their behavior – a *bilateral coordination arrangement*. Of course, this formulation touches on the legal concept of the contract (a meeting of minds creating effects in law), but also transcends it. Over the course of the past thirty years, the "contract" has become a central notion in economic analysis (section 2), giving rise to three principal fields of study: "incentives," "incomplete contracts," and "transaction costs" (section 3). This opened the door to a revitalization of our understanding of the operation of market economies . . . and of the practitioner's "toolbox" (section 4).

The goal of this chapter is to provide an overview of recent developments in these analytical currents, to present their various aspects (section 5), and to propose expanding horizons (section 6). The potential of these approaches, which have fundamentally impacted on many areas of economic analysis in recent decades, is far from exhausted. This is evinced by the contributions in this book, which draw on a variety of methodological camps and disciplines.

2 The central role of the notion of the contract in economic analysis

Even though the notion of the contract has long been central to our understanding of the operation of decentralized social systems, especially in the tradition of the *philosophie des lumières*, only recently have economists begun to render it justice. Following in the footsteps of Smith and Walras, they long based their analyses of the functioning of decentralized economies on the notions of market and price system. This application of Walrasian analysis, in which supply meets demand around a posted price, does not satisfactorily account for the characteristics of a decentralized economy (cf. Ronald Coase's chapter 2 in

this volume). First, and paradoxically for a model of economic analysis, it does not account for the costs of operating the market. Next, it assumes the pre-existence of collective coordination (implicitly institutional) – the properties of the traded merchandise are fixed in advance, all market actors effectively participate in the tâtonnement process, etc. – in contradiction with the idea that the market is truly decentralized. Finally, this model is unrealistic because, in practice, agents exchange goods and services outside of equilibrium and in a bilateral context, i.e. without knowledge of the levels and prices at which other agents are trading, and without knowledge of whether these prices clear the market.

Contract economics was born in the 1970s from a twofold movement of dissatisfaction *vis-à-vis* Walrasian market theory:

- On a *theoretical* level, new analytical tools were sought to explain how economic agents determine the properties, quantities, and prices of the resources they trade in face-to-face encounters. If these agents are subject to transaction costs, if they can benefit from informational advantages, or if there are situations in which irreversible investments must be made, then it is reasonable to expect that one will not see the same goods traded at the same price and under the same rules as on a Walrasian market. Price theory and, by extension, the analysis of the formation of economic aggregates (prices, traded quantities and qualities, etc.), were fundamentally affected by the work of Akerlof (1970), Arrow (1971), and Stiglitz (1977), among others.
- On an *empirical* level, problems associated with the regulation of competition drove a renewal of economic thinking. The analysis of certain types of inter-firm contracts, such as selective distributorship agreements, long-term cooperation agreements, etc., was revamped. Previously considered anti-competitive, the beneficial welfare effects of these arrangements had been ignored. The devices available to public authorities for creating incentives and controlling producers of services of public interest were also subjected to a reexamination. Economic theory had not considered the possibility that either party could appropriate the rent from monopolistic operation of such services. Demsetz and Williamson, Baron and Laffont, to name only a few, renewed the approach to these issues of "regulation."

This twofold origin explains the remarkable development of contract theory and its key contribution to a fundamental redesign of all areas of economic analysis, from the study of microeconomic interactions to that of macroeconomic aggregates (such as the labor market), passing on the way the various domains of applied economics, finance, international trade, industrial organization, etc.

This success is essentially attributable to the analytical power of the notion of contract. On the one hand, the idea of contract focuses attention on elementary social structures, those that regulate coordination at a bilateral level. On the other hand, despite its simplicity as a concept, the contract allows us to examine a number of key issues. We can point to at least four:

- First, the analysis of contracts allows us to reexamine the exact nature of *difficulties associated with economic coordination*, while deepening our understanding of the functioning and the basis of coordination mechanisms.
- Second, this approach illuminates the details of *various provisions for coordination*: routines, incentives, the authority principle, means of coercion, conflict resolution, etc.
- Third, analysis of the origins of contracts sheds light on how agents *conceptualize the rules and decision-making structures* that frame their behavior.
- Finally, studying the *evolution of contractual mechanisms* helps us understand changes in the structures that frame economic activity.

The contractual approach thus allows us to analyze coordination mechanisms within a simplified but rigorous framework. It not only illuminates the properties of contracts, but also those of other harmonization instruments, such as markets, organizations, and institutions (cf. Oliver Williamson's chapter 3 in this volume). These collective arrangements reveal mechanisms comparable to those typical of contracts (participation incentives, allocation of decision rights, provisions to give credibility to commitments, etc.).

It should be noted that the analysis of contracts must also be clear on the limits of this approach to economic activity. Specifically, this is true for organizations and institutions that are not reducible to the notion of the contract. On the one hand, organizations and institutions have a fundamentally collective character: an individual will join them without negotiating each rule governing the relations between members. Moreover, the evolution of this relational framework cannot be controlled by any individual acting alone. On the other hand, the properties of organizations' and institutions' collective arrangements do not derive uniquely from the content of the bilateral relationships linking each of their elements, but also from the communal articulation of these arrangements – in other words, the topology of the interaction networks.

The contractual approach is also relevant because of the exchanges it makes possible with other disciplines. These include law, of course, but also management, sociology, anthropology, political and administrative sciences, and philosophy. The notion of the contract is simultaneously

broader in scope and more general than the notion of the market. This has allowed the economic analysis of the contract to export some of its results, notably the difficulty of creating perfect incentive mechanisms, the incentive–insurance dilemma, or the impossibility, under many conditions, of drafting complete contracts (cf. Alt and Shepsle 1990). But the contractual approach has also provided a gateway for imports that have proven indispensable to advances in economic analysis (cf. section 6). Other intellectual and methodological traditions have allowed us to extend the economics of contractual coordination. Legal analysis, for example, specifies the role of various mechanisms that ultimately guarantee the performance of contracts and brings to light their "embedding" into the general rules that give them meaning and complete them. Management sciences emphasize that economic agents concretely act on the complementary relationship between contracts and imperfect incentive provisions to resolve coordination problems (e.g. Koenig 1999).

3 Three principal currents

3.1 Origins

While we can speak of "contract economics" in general, it is worthwhile to distinguish between several branches of contract theory, into which various analytical traditions have converged that were themselves renewed in the process. While these currents all sprang from dissatisfaction with the standard analytical model of the market, different methodologies gave rise to them.

One of the new models derives from the lineage of the standard model. Arrow's work on the functioning of insurance markets (Arrow 1971), and that of Akerlof (1970) on the market for used automobiles, led to the theory of incomplete information. Challenging the assumption that all actors on a market have access to symmetrical, or identical, information, the authors drew attention to the consequences of one individual having an informational advantage. They emphasized the importance of implementing disclosure mechanisms to limit the ability of the "informed" to take advantage of the "under-informed." This line of research dates from the 1960s.

As early as the 1930s, however, other foundations of modern contract analysis were laid. Coase was the first to enunciate the idea that the existence of coordination costs on the market justifies resorting to various coordination mechanisms in a decentralized economy, especially hierarchical coordination within firms (cf. Coase 1937, 1988). Some forty years later this analysis was taken up and expanded by Williamson.

But Coase was not the only influence on Williamson. The latter's early work in the 1960s represented the Carnegie behaviorist school, along with Cyert and March (Cyert and March 1963). Here we find the lineage of theories of the firm whose formulation began in the 1930s, but whose full development occurred primarily in the 1950s. Managerial and behaviorist approaches to the firm (from Berle and Means 1932 to Simon 1947, passing over Hall and Hitch 1939), as well as the controversies surrounding their development (cf. Machlup 1967), permitted considerable advances in the understanding of non-price coordination. Starting in the 1970s, many of these advances were revisited by economists interested in the properties of contractual, organizational, and institutional means of coordination.

Another "school" had a profound influence on contemporary contract theory: property rights (Alchian 1961, Demsetz 1967, Furubotn and Pejovich 1974). In a certain sense, Coase also laid the foundations for this approach with his analysis of the problem of externalities (Coase 1960), which brought to light the implications of property-rights definitions for the issue of efficiency. This contribution then merged with further developments from the Chicago school. Comparative analysis of alternate property-rights systems revealed that the allocation of residual rights (the right to determine the use of resources and to appropriate the ensuing income) may, or may not, motivate an efficient use of resources. This approach yielded essential elements of theories of the firm and of contracts (Alchian and Demsetz 1972, Klein, Crawford and Alchian 1978). Under certain types of relational arrangements, only a reallocation of property rights can overcome economic agents' propensity to be opportunistic. This school also focused economists' attention on the specific consequences of the manipulation of incentive systems.

Finally, it would be impossible to ignore the contributions of other disciplines. Economic analysis of the law has concentrated on certain aspects of contractual relationships. It is also noteworthy that one of the primary concepts in the economic analysis of contracts, the notion of the "hybrid form" proposed by Williamson (1985), drew directly on Macneil's (1974) socio-legal analysis. On another level, economic views of non-market coordination were profoundly influenced by developments in management sciences, by sociology and psycho-sociology, by administrative sciences, and by the history of organizations, as is evinced by the frequency of references to Barnard, Simon, and Chandler (Barnard 1938, Simon 1947, Chandler 1962). As to the economics of institutions, which develops an analysis more concerned with the role of the institutional environment on the design and the performance of contracts, it traces its roots to history, to political science, and to ethnology (cf. Eggertsson 1990, North 1990).

Arising from these precursors, three schools dominate the field of contract economics today: incentive theory (IT), incomplete-contract theory (ICT), and transaction-costs theory (TCT). These are distinguished by differences in their underlying assumptions, leading them to emphasize different problems. The standard models of these three theories are described in the appendix to this chapter by M'hand Fares.

3.2 Incentive theory

Incentive theory (IT) draws on several of the traditional hypotheses of Walrasian economic theory. Notably, it assumes that economic agents are endowed with substantial, or Savage, rationality (Savage 1954), that they possess complete information concerning the structure of the issues they confront along with unlimited computational abilities, and that they have a complete and ordered preference set.

The information available to these agents is "complete" in the sense that, even though they cannot precisely anticipate a future that remains stochastic, they do know the structure of all the problems that may occur. What they cannot know, where applicable, is what issues will in fact arise, nor in what sequence. Thus, they envision the future on the basis of probabilities (objective or subjective). This links to the notion of risk, as described by Knight (1921) (even though Knight did not account for subjective probabilities). Given this theoretical framework, agents imagine the most efficient solutions as functions of the different possible states of nature and compute their expected values. These calculations are possible since agents are endowed with unlimited abilities in this area. In other words: calculating costs them nothing in terms of time or resources. Finally, since agents' preference functions are complete and stable over time, they effectively choose optimal solutions.

The assumption that diverges from the Walrasian universe is that the two contracting parties do not have access to the same information on certain variables. This is an evolution toward a more realistic conception. In a decentralized economy, there is no reason why one party should know, *ex ante*, the private information of the other (such as her preferences, the quality of her resources, her willingness to pay, or her reservation price). Depending on whether the variable on which there is asymmetric information is exogenous – i.e. not subject to manipulation during the exchange by the party possessing it – or endogenous – i.e. vulnerable to such manipulation – we speak of models of adverse selection or moral hazard, respectively. Adverse selection, for example, is exemplified by a potential employer's uncertainty concerning a job seeker's level of competence, while moral hazard refers to uncertainty about the level of effort the latter will supply.

Incentive theory (IT) starts from a canonical situation in which an under-informed party – called the "principal" – puts into place an incentive scheme to induce the informed party – the "agent" – to either disclose information (adverse-selection model) or to adopt behavior compatible with the interests of the principal (moral-hazard model). The incentive scheme consists of remuneration being conditional on signals that result from the agent's behavior (such as the choice of an option from a list of propositions considered a "menu" of contracts or as the visible result of the effort supplied when the effort itself is not observable).

The existence of such an incentive scheme relies on two key assumptions:

- While the principal is under-informed, not knowing the true value of the hidden variable, she does know both the *probability distribution* of this variable and the agent's *preference structure*. The principal can thus put herself "in the place" of the agent to anticipate the latter's reactions to the set of conceivable remuneration schemes, and then select the one she prefers from those acceptable to the agent.
- There is an *institutional framework*, hidden but competent and benevolent, which ensures that the principal respects her commitments. Thus, any proposition made by the principal is credible to the agent. Moreover, the proposed remuneration scheme is based upon "verifiable" information, i.e. observable by a third party.

The solution to adverse selection problems relies on the design of a "menu of contracts" that will induce self-revelation by the agent of her private information. The principal designs a set of optional contracts – i.e. a set of payment formulae linked to various counterparts by the agent. While he does not know the agent's private information, he knows the set of possible values it may take. Since he also knows her preferences, she is able to design a contract that maximizes the agent's utility for each possible value of that private information. When the agent faces the resulting set of possible options, she spontaneously chooses the contract that maximizes her utility, allowing the principal to infer private information. Of course, the principal's interest is to obtain this revelation in exchange for the lowest possible payment.

The canonical moral-hazard problem occurs when one relevant dimension of the agent's input is not observable by the principal – one dimension is costly to the agent, and that affects the principal's welfare. For instance, an employer cares about an employee's productivity. However, he cannot deduce the efforts she actually supplied from the observed productivity, because the productivity of a single agent depends on many other variables that are not under her control and not observable to the principal (coworkers' efforts, the productivity of capital, randomness in the production process, etc.). To incite the agent, the apparent optimal

remuneration mechanism would be to linearly index her wage on her observed productivity. However, if the agent is risk averse, she will not accept such a payment scheme, as it could provide her with negative or very low remuneration, even when the poor outcome would not be attributable to her own level of effort. Because of risk aversion, the agent would prefer to be paid a fixed wage. However, in that case she would not be motivated to provide her best effort. To solve this "incentive versus insurance" dilemma, the optimal payment scheme combines a fixed base pay and a variable bonus indexed on the observed result; yielding a nonlinear payment scheme.

Into this analytical framework, which was formulated during the first half of the 1980s, many refinements were subsequently incorporated that considerably extended its reach (cf., for example, Salanié 1997). First, the theories of adverse selection and moral hazard were combined. Subsequent extensions included teaming one principal with several agents, letting informational asymmetry apply to several variables, repeating interactions over time, etc. Chapter 10 in this volume by Eric Malin and David Martimort provides a good overview of the analytical strength of this theoretical framework.

3.3 Incomplete contract theory

Incomplete contract theory (ICT) is the most recent. Its initial purpose was to model some of Williamson's propositions about vertical integration (Grossman and Hart 1986), but subsequent developments led it in different directions. ICT thus came to examine the impacts of the institutional framework on contract design, though its roots lay in the study of the effects of property-rights allocations on the distribution of the residual surplus between agents and on their incentives to invest.

In terms of its assumptions, ICT is also close to "standard" neoclassical theory. In particular, agents are deemed to possess Savage rationality. However, it is distinguished from both Walrasian theory and incentive theory by a key hypothesis. ICT postulates that complete contracting of agents' future actions is impossible when no third party can "verify," *ex post*, the real value of some of the variables central to the interaction between the agents. Here the institutional framework is no longer implicit. On the contrary, the issue here is that the "judge," symbolizing the authority that ultimately ensures the performance of the contract, is incapable of observing or evaluating some relevant variables – such as the level of effort or of some investments. It follows that contracting on unverifiable variables is useless, and other means must be found to ensure efficient coordination.

To focus on the issues arising from non-verifiability (failure of the institutional framework), ICT assumes that there is no asymmetry in the parties' information. Both observe all the available information during each period of trade, while the "judge" cannot verify some of it, which is therefore non-contractible. Uncertainty arises because each agent has to act on the non-contractible variable in the absence of complete information on the outcome of his behavior since he cannot anticipate with certainty what the other will do. Formally, this is represented by contracting over two periods. During the first period the agents realize non-verifiable investments. The second period is devoted to trade, the characteristics of which, in terms of price and quantity, are the only verifiable variables. This generates a dilemma: since it is possible to contract only on verifiable variables, agents can commit only on the characteristics of their trade in the second period. Now, the level of investment realized by the parties in the first period depends upon this contracted level of trade. However, once the actual level of the investments is known by the end of the first period, along with the state of nature in which the trade will take place, the *ex ante* contracted level of trade is no longer optimal. *Ex post*, it would thus be optimal to renegotiate the amount of the trade. But, if the agents anticipate this renegotiation, they will no longer have an incentive to efficiently invest *ex ante* (since the contracted amount of trade is no longer credible).

The solution to this coordination dilemma consists of signing a commitment constraining the scope of the *ex post* negotiations in order to provide an incentive to each party to invest optimally *ex ante*. This arrangement assigns a unilateral decision right to one of the parties to determine the effective level of trade *ex post*, while a default option protects the interests of the second party by establishing a minimal level of trade. Two families of models have been created deriving from this framework. The first is represented by the work of Hart and Moore (1988). An efficient level of investment is not obtained from the beneficiary of the default option, since this option is insufficiently sophisticated to motivate him to invest at the optimal level under all conditions. The *ex ante* inefficiency follows from the fact that the default option is contingent on the state of nature that materializes. The second family is an extension to the work of Aghion, Dewatripont and Rey (1994), who postulate that the default option may provide an incentive for the beneficiary to invest optimally. They assume that the judge will be capable of verifying, and of rendering enforceable, default options of great complexity and that he will oppose any renegotiation of these provisions.

ICT thus establishes a direct link between the ability of judicial institutions to observe or evaluate the nature of implementable contracts