Summary More often than not, economic literature considers Technology Licensing Agreements (TLA) as a homogenous ensemble of contractual arrangements within the category of market agreements distinct from to hybrid forms (alliances and joint ventures) and vertical integration. It then focuses on the determinants of the “price” of technology by examining payment schemes, and on the effects these agreements have on competitiveness. This view tends to neglect the fact that transactions dealing with knowledge vary strongly according to industries and countries because knowledge does not always present the same transfer and protection difficulties through the formal institutional framework. This results in a great variety of TLAs which in reality cover a very wide spectrum of governance structures. It is important to take these elements into account in order to reassess the impact of theoretical contributions and to analyze public policies, notably when they affect intellectual property law and competition law.

Key-Words : Technology Transfer / License / Market for Technology / Alliance / Intellectual Property Rights

*This article is founded on the use of a database belonging to the Institut National de la Propriété Industrielle (French Patent Office) whose administrators we would like to thank, in particular Daniel Hangard and Henri Colette, for their trust in allowing us to access this data. Moreover, we benefited from the financial support of the Ministry of Industry and the Licensing Executive Society. We would also like to extend our gratitude to Messrs Dominique Deberdt and Thierry Sueur, in particular, for their support.
Introduction

Literature on technology licensing agreements has evolved considerably in recent years. The analysis of technology transfers in the framework of international exchanges, which developed during the 1970s, was relegated to the background by studies centered on the dynamics of innovation processes. This evolution reflects those affecting national policies which gave growing autonomy to firms, who found themselves obliged to compete in a “globalized” space. It also relates to the fact that innovation processes increasingly fit into the framework of inter-firm cooperation and “co-opetition” processes. These evolutions are part of the greater movement of market internationalization, the acceleration and complexification of technological development and the increase in the intensity of competition founded on innovation. In this context, studies on the historical evolution of forms of organizational in cooperation show that since the 1980s, in parallel to the development of “joint-ventures” in R&D, there has been an increase in the frequency of license agreements (Hagedorn [1990]).

This development of licensing practices has given rise to a literature around the implications of TLAs in matters of competition on both the static level (use of market power) and dynamic level (control of the innovation process). Intellectual Property Rights (IPR) and license agreements effectively constitute means for other firms of establishing market position and controlling production costs and technological progress. Licensing contracts can also serve to dissuade partners or competitors from entering into an industry or exploring certain areas of research (Combes and Pfister, [1998]). These different “maneuvers” can be justified on the one hand by the innovator’s need to protect the earnings which incited him to undertake R&D action, but can also have a high social cost, notably where technological spill-over is concerned. Here, one enters the debate on the optimal organization of an IPR system in the case of cumulative innovation (Scotchmer, 1991). Licensing practices must therefore be monitored. However, at the same time, the parties’ ability to conclude complex and efficient contracts may be hindered by overly strict antitrust laws (Ordover [1991], Jorde and Teece [1990]).

Thus, not only do license agreements interfere with competition law, they also affect intellectual property law since they organize the diffusion of knowledge while creating remuneration rights in favor of the innovators. They therefore constitute a strategic factor both for firms and for public policy in the matter of innovation and competition.

The development of theoretical literature on these questions has not always been accompanied by studies relating the actual practices of firms in a substantial manner. However we draw
attention to the works of Taylor and Sylberston (1973), Contractor (1981), Caves et al. (1983) and, more recently, Arora (1996), Anand and Khanna (2000), as well as our own studies (Bessy and Brousseau [1998], Bessy, Brousseau and Saussier [2001]). This lack of empirical analysis is linked to difficulties accessing information, but also to a lack of recognition of the specificity of technology licensing contracts in relation to other contracts regulating information-based transactions (brand licensing, franchise contracts).

The objective of this text is to show that whereas in the majority of cases, economic literature considers technology licensing agreements as simple trade contracts (in contrast to JVs, alliances and vertical integration) the majority of contracts observed empirically differ from this model. Whether the approach is evolutionist, neo-institutional or more neoclassical, in the style of strategic “licensing” models, the majority of analyses consider technology licensing agreements as contracts which grant user rights for knowledge transformed by a perfect IPR system into a merchandise like any other. The “perfection” of the patent system is considered to transform knowledge into an information resource indistinct from other information resources, and TLAs are not seen as differing analytically from the licensing of brands, copyright or franchise contracts.

Founded on empirical observations, our analysis reveals that licensing contracts are more complex, for at least two reasons:

- Because of the particular character of knowledge — notably the difficulties in its transmission and protection, which are not accounted for by the concept of codifiability (Bessy and Brousseau, [1997]) — the patent license generally implies exchanges other than that of the patent text: confidential data not protected by the patent (e.g. manufacturing secrets, data from technical tests, etc.), prototypes, training, consultancy and technical assistance, and equipment or input indispensable for the implementation of the exchanged technology. The knowledge is in fact integrated into various interdependent features and is not contained in the text of the patent alone.

- Because of the imperfection of the institutional environment, which makes IPR a very imperfect system and which calls for the intervention of “private” and/or “informal” institutions. The delimitation and enforcement of exclusive user rights on knowledge is a costly and complex operation which is carried out only imperfectly by patent offices and law courts.

1 See Hilgartner [1995] for the notion of data stream.
Many licensing contracts must, consequently, create complex governance structures which set them apart from their usual assimilation with trade contracts. That is why, where IPR is concerned, both tests of theoretical models and recommendations of public policy should be based on a finer awareness of the nature of licensing contracts. Recognizing that many models which formalize licensing contracts only deal with a specific part of what “licensing” represents allows to have a clearer idea of their scope of validity, to identify needs for analytical developments and to specify the application conditions for IPR policies.

Our article seeks precisely to show the diversity of license agreements rather than to draw conclusions from all of these points. In reference to the neo-institutional approach (Williamson [1996], North [1990]), we emphasize the specificity of “governance” problems in transfers of knowledge in order to better understand the structure of technology licensing contracts. Empirical analysis is carried out using a database of contracts. It currently contains 226 technology licensing contracts signed between French and foreign firms and gives rise to monetary payments. In the first part, we return to the explaining factors of the structure of licensing contracts, situating our approach in relation to literature on TLAs which, in a more realistic perspective, focuses on the difficulty in transferring and securing knowledge and on the incompleteness of IPR. The second part presents our database and the variables selected to construct a typology of the structures of licensing contracts. The results of the typology are then presented (3rd part) and discussed (4th part).

1- The explaining factors of licensing contract structure

At the beginning of the 1980s, studies based on solid empirical data highlighted that technology licensing contracts generate high transaction costs due to the complexity and risks inherent to technology transfers between firms (Contractor [1981], Caves et al [1983]). Several factors are capable of leading to weakness in the market of technology licenses: the negotiation situation between a small number of parties (“small-numbers bargaining”); opportunistic behavior among parties, amplified by problems of information asymmetry; strong uncertainty concerning the economic performance of the technology; the parties’ risk aversion; and difficulties of exclusion from the collective good constituted by technological knowledge. To a certain extent, the literature then sought to develop models for these different sources of market weakness. Hence “risk sharing” models for risk aversion (see Larson and Anderson [1994]) and “signaling” models for information asymmetry concerning the value of the license (see Gallini and Wright [1990]). Other models, which we will come
return to in greater detail, deal with questions linked to information asymmetry concerning the parties’ effort or with problems inherent to the incompleteness of IPR.

Generally speaking, the literature tends to acknowledge the existence of various types of contracts, however, each class of model refers to a particular type of licensing contract without relating it to the others. Furthermore, attention is focused on the design of modes of payment (as well as on the exclusivity regime of the license). Little is said about the other aspects of the contract, in particular about the safety and governance provisions. Our approach allows to account for the variety in the structure of licensing contracts by taking their different dimensions into consideration. However, before presenting this analytical framework, we shall examine the section of the literature, which focuses on the questions of information asymmetry and incompleteness in IPR.

1-1 Information asymmetry, moral hazard and the incompleteness of IPR

Not all the theoretical literature considers TLAs as contracts which are strictly equivalent to market contracts. Here, we would like to come back to the approaches which focus either on the costs of knowledge transferal or on the incompleteness of IPR.

Among the models which focus on costs of knowledge transferal, we can point out the models where the moral hazard affects the licensor’s effort to transmit know-how. In the model proposed by Macho-Stadler et al ([1994]), for example, the hypothesis is that the payment of royalties allows to reduce the risks of opportunistic behavior on the part of the licensor in the transfer of know-how. Certain approaches formalize the problem of a double moral hazard. Choi ([2000]) proposes an incomplete contract model in which the efforts of the licensor (to transfer know-how) and of the licensee (to absorb it) are not stipulated in the contract, which explains the predominance of contracts with variable royalties.

Arora’s model ([1995]) allows to take into account both the risk of cheating on the part of the licensor and the question of the incompleteness of IPR. In the framework of a principal-agent model, the author shows that the parties will play on the complementarity between know-how and the codified knowledge in the text of the patent. On the one hand, the licensor can emphasize the importance of his title deed (in a way that is complementary with commercial secrecy) and threaten not to transmit the know-how. On the other, the licensee can play on the...

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2 This proposition is tested with a database (non) comparable to our own concerning Spanish firms.
timing of the payments by only paying the licensor once for the totality of the transmitted
know-how (hypothesis of lump sum payments spread out over time). Two complementary
IPR mechanisms and a system of reciprocal and credible threats therefore solve the
transactional problem.

All of these models are based on the idea that the transfer of know-how is not fixed by
contracts. This highlights the incompleteness of IPR. This focus on the definition of IPR is
analyzed in depth by Anand and Khanna ([2000]). Three types of attributes of knowledge and
IPR can be distinguished to explain the difficulties in securing transfers of knowledge: the
limitation of the scope of the patent and the possibility of inventing around it, the difficulty of
specifying instances prohibiting use and making such instances binding, and the tacit
dimension of knowledge. The importance of these three contractual risks is linked to the
“strength” of the IPR within each industry and explains both the recourse to the license and
the structure of license agreements.

Thus, the incompleteness of IPR generates considerable contractual risks. These risks give an
imperfect character to TLAs. This imperfection can be seen in relation to the standard
situation in which the owner of a technological monopoly is considered to be entitled to
appropriate the total earnings of the monopoly while being perfectly protected by an IPR
system. This would effectively prohibit all non-authorized uses of the patent by the patentee.

1-2. Contractual provisions and governance mechanisms

These factors which are capable of giving rise to market weaknesses may explain why a
choice is made between integration and a license. This choice will also depend on the specific
characteristics of companies and markets (Caves et al. [1983]). Companies can nonetheless
protect themselves against contractual weaknesses by adding a certain number of provisions
to their contracts. There is however a risk that these provisions may limit the efficiency of the
contract, each party trying to appropriate the bigger share of income. We shall present the
sources of variation in licensing contract structure in this neo-institutional perspective.
However, rather than reduce the structure to certain prime features of the contract
(exclusivity, mode of payment), we shall try to integrate the totality of the contractual

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3 They conclude that in chemistry for example, property rights are “strong” because these contractual risks are
reduced: low possibility of inventing around, facility in specifying the uses and detecting infringements, low
transmission of tacit knowledge (as opposed to codified know-how easily appropriated by the licensee). On the
other hand, in the electronics industry, property rights are considered as “weak” for the opposite reasons. This
explains why in this industry recourse to crossed exchanges of licenses will be more frequent than in the
chemical industry, an industry in which it is easier to implement a “patent blocking” strategy.
provisions. This will enable us to present the principal provisions which we will retain in our typology.

1-2-1 Safeguards

One of the problems which contracting parties come up against when they are negotiating a technology licensing contract comes from adverse selection. This occurs as, in general, the potential licensee has difficulty anticipating the value of the technology in the framework of his own activities, having only imperfect knowledge about the latter, and as it will depend on the success of the transfer. Therefore, in addition to the problem of adverse selection, there will be the problem of a double moral hazard because the success of the transfer depends both on the efforts of the licensor and those of the licensee.

The uncertainty concerning the value of the technology leads the licensee to prefer payments in the form of royalties, that is to say to make the remuneration of the licensor depend on the value which is actually transferred to him. In this configuration, the licensor bears part of the licensee’s industrial and commercial risk. Although this incites him to make efforts, at the same time he exposes himself to opportunistic behavior on the part of the licensee. These contractual risks are the principal reason why the licensor prefers, for his part, the principle of a lump sum payment. However, such a payment formula deprives him of influence over the licensee’s marginal costs and therefore of the possibility of monitoring the latter’s level of production.

Given this radical antagonism between the interests of the licensee and those of the licensor, payment schemes can only be a partial solution to problems of adverse selection and moral risk linked to the transfer of technology. That is why the parties can try to complete their effects by implementing safeguards. Moreover, these safeguards are also intended to control other transactional risks.

In fact, the uncertainty of the value of the transferred technology is not the only problem. From the licensee’s point of view, the “strength” and quality of the IP deeds he is acquiring the rights of use for are uncertain. He can therefore request provisions guaranteeing this quality, in particular to ensure him that the rights he is acquiring are not subject to contestation for infringement, or to assure him that he will receive compensation in the case of a lawsuit made against him by third party. Following the same logic, the licensee can make sure that he will benefit from the improvements made to the technology by the licensor.
For his part, the licensor has to protect himself against the risk of the transferred knowledge being disclosed. To a certain extent, the very principle of IPR gives him the right to prohibit the use of technology which is known by a third party. IPR therefore make transfers of knowledge reversible, whereas in theory this is not the case. That said, the IPR system is not without faults and it is not always possible for the victim of infringement to have his rights respected, notably if the infringement is subtle and if the legal system is slow. Safeguarding contractual mechanisms will then be implemented to limit the licensees’ abilities to benefit opportunistically from transferred knowledge. In this way, confidentiality and non-competition provisions allow the licensor to protect himself against non-desired uses of the transmitted knowledge by providing him the opportunity of sanctioning the dishonest licensee. The provision covering the restitution of technical documentation in the case of rupture allows to limit the reproduction of the transmitted know-how.

The uncertainty about the potential uses made of the technology leads the licensor to implement protection provisions to protect himself against the licensee’s opportunistic behavior. First of all, the user rights are transferred in a restrictive form, both limited in terms of the geographical zone of application and delimited to particular product markets concerned by these rights. Geographical restrictions also allow the licensor to avoid direct competition with his licensees on markets where he is using the same technology. He therefore does not lose his monopoly position despite having a licensing policy. In order to accept such restrictions, the licensees often request in return a principle of territorial exclusivity. In this way they hope to compensate for the restrictions of use by benefiting from a monopoly income. It is in the interest of the licensors to accept this principle of territorial exclusivity because, on the one hand, it reinforces the market value of their technology, and on the other, it controls licensees (both because their activities are not interdependent and because he can practice benchmarking between them). Finally, the licensor can be reassured not only that the licensee will use the technology, by introducing a provision of minimal performance (especially if the license is exclusive), but also that he will respect standards of use.

These provisions allow to monitor the everyday use of the technology, however they are inefficient against strategies seeking to opportunistically invent around the transferred knowledge. Grant back provisions guarantee the licensor a right over developments carried out by the licensee. On the one hand, they allow him to benefit from developments he is incapable of anticipating due to the uncertainty of his position. On the other, they considerably lower the licensees’ incentive to invent around. As a result, the latter have less of
an opportunity to develop skills, which might enable them to become competitors of the licensor in the long term.

1-2-2 Governance mechanisms and institutional environment

Safeguards nonetheless have limits because it can turn out to be a complex operation to make them binding given the limits of legal systems (lack of expertise, delays in decision making, inability to verify; Cf. Williamson, 1985). The parties can then introduce relational governance provisions. These concern the supervision, renegotiation and resolution of legal disputes.

In the first place, these provisions can define the steps to be taken for contractual obligations to be correctly carried out and grant the licensor auditing rights to monitor the licensee’s behavior. This supervision can be applied to the licensee’s industrial facilities and production. The licensor can also safeguard against the risk of cheating where the intensity of use of the license is concerned, notably by checking the licensee’s books.

The greater the technical and commercial uncertainty, the greater the parties’ tendency to give themselves margins for maneuver. Negotiation zones and procedures are defined as ways of redefining mutual obligations and thus maintain the possibility of cooperation within the framework of technological joint development processes or industrial and commercial cooperation.

In parallel, the more cooperative and open the agreement becomes, the less able the legal system is to regulate the potential conflicts between the parties. It is therefore in the best interest of the latter to implement procedures for the private resolution of conflicts, notably by instituting arbitration procedures. These arbitration procedures prove all the more necessary because the formal institutional environment is inefficient, in other words, because the IPR system is incomplete.

Introducing mechanisms of supervision, renegotiation and private resolution of conflict leads to the creation of governance mechanisms that differ from the “market”, mechanisms which can be of the “hybrid form” and even tend towards “hierarchy”. This private governance compensates for the flaws of the collective mechanisms which structure the management of transactions in the “market”. When these mechanisms are flawed, the transactional risks are high and the parties must then implement complex and costly bilateral governance structures.
The “public” institutional environment is imperfect in the sense that IPR are not devoid of ambiguity with respect to the outline and extent of the exclusive user rights that they grant IP title holders, and because the effective defense of this exclusivity of use requires great efforts on the behalf of these title holders. It therefore does not allow to easily incorporate these rights and the resources that they represent into the contract. Economic agents must then take responsibility for numerous aspects of the governance of their transactions and are subject to strong levels of uncertainty. In certain circumstances, however, they benefit from collective mechanisms — constitutive of the institutional environment, even if not formal and public institutions — which facilitate the governance of relations by “completing” the IPR system (Bessy & Brousseau; 1997, 1998). The presence or the absence of these mechanisms in the different economic spaces (industry, country, network, etc.) goes a long way to explaining why TLAs can tend towards simple trade contracts, or, on the contrary, towards virtual hierarchy. These collective mechanisms generally have a professional basis and allow for simpler contracts to be drawn up than in the cases where the totality of coordination problems must be resolved bilaterally through the contractual tool and the creation of *ad hoc* “governance” structures.

The existence of such mechanisms will depend totally on the “technical” characteristics of the industries in question. The stronger the interdependencies between the technical areas, the more the firms have to carry out technology exchanges, which incites them to develop mechanisms facilitating exchange (Bessy & Brousseau, 1998). However, these mechanisms also stem from spontaneous processes. The repetition of contractualization processes enables firms to create common languages, to specify the interpretations of rights granted by the IP title deeds, to generate conventional practices, to circulate information and to harmonize practices. One then observes the development of a virtuous circle where contractualization generates collective mechanisms which, in return, facilitate the formation of TLAs (Arora and Fosfuri, 2002).

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4 Professional associations (professional trade unions, chambers of commerce, etc.) can define rules and provide means to facilitate the application of these mechanisms, enabling the contracting parties to economize both on the costs of drawing up the agreements and on their execution. Arbitration courts, for example, come from this reasoning. They allow contracting parties to benefit from more specialized judges to arbitrate their conflict. Contracting in a more complete and less hazardous universe, the agents can have recourse to transactional contracts more easily.

5 This logic of industry-based determination is nonetheless primarily accepted in horizontal agreements. In the framework of vertical relations, on the other hand, managerial discretion is stronger. The general characteristics of the industry influence licensing contracts less than the particular situation in which the two parties find themselves. The nature of the licensing contracts is then strongly influenced by the specificities of the relational
In total, according to the transaction categories and the institutional environment, license agreements will be of one of the following two forms:

- a “transactional” contract according to Macneil’s categories [1974]. These are relatively complete contracts which essentially structure the principles of a transfer of user rights between two parties;
- relatively incomplete “relational” contracts which first and foremost put in place a structure of ad hoc “governance” to carry out processes of knowledge sharing and production as well as technological, industrial and commercial cooperation.

More exactly, technology licensing agreements fit into a continuum delimited by these two poles. This continuum corresponds at the same time to two phenomena (Bessy & Brousseau, 1998):

- a growing collectivization in the governance of relations stemming from the collective mechanisms made available to the agents which facilitate the transfers of knowledge and allow to secure them;
- a drop in the cost of technology transfers. According to North [1990], the collectivization of governance enables private agents to have recourse to collective mechanisms allowing them to save on resources when defining and executing agreements.

“Transactional” contracts — simple, complete and basing themselves on external mechanisms of application — are therefore less costly than “relational” contracts — complex and requiring the design of a specific “governance” structure and resources dedicated to it.

2 The empirical understanding of the structure of licensing contracts and their explaining factors

To empirically account for the structure of licensing contracts and their explaining factors, it is necessary to constitute a database combining information on the attributes of transactions, firms’ strategies, the institutional environment and the different contractual provisions. It is costly to constitute such a database. The majority of empirical studies are therefore based either on monographic surveys or on statistical surveys carried out on small samples corresponding to particular industries.

situation. Moreover, all things being equal, this occurs more frequently in the context of relational licenses than in transactional licenses.
The most systematic statistical survey on the diversity of TLAs is Anand and Khanna’s study (2000) which deals with a base of 1612 licensing contracts involving at least one US firm during the 1990-93 period. This study nonetheless has the drawback of identifying the contractual forms in a relatively crude manner (by opposing the license category to JVs and only distinguishing licenses according to their exclusivity regime). Moreover, the data used does not allow to distinguish the nature of the transfer and the quality of the institutional environment. In fact, the industry is used as a “proxy” both of the degree of knowledge codification and the strength of IPR. However, the more precise data we have in our possession enables us to finely describe and to distinguish the attributes of transactions — i.e. the form which the knowledge takes when transferred — and the quality of the institutional environment on the one hand, and the characteristics of contractual governance structures on the other. This allows for a better understanding of the diversity of TLAs and their causes.

2-1 Presentation of our database

This precise data results from direct access to the texts of the contracts and the use of a coding grid structured in four parts describing the partners, the nature of the exchange being made, the contractual safeguards and the governance structure implemented. Through reading the contract we had access to precise data on the totality of transfers taking place between the licensor and the licensee, which enabled us to avoid using the industry as a proxy for this transfer as Anand and Khanna do (2000). In their study, in fact, the degree of codification of knowledge is approximated by the industry and related to the difficulty in transferring and securing the transfers of knowledge. In our case, since we have very precise data on the transfers carried out — whose difficulty is, incidentally, not correlative to the degree of codification — the industry appears as a proxy which tends to account for the quality of the institutional environment alone. That said, we also have another means of evaluating this quality since the contracts explicitly mention the existence of collective governance mechanisms when these apply, such as arbitration courts, for example. There is also enough data to describe the specificities of the relationship between the two contracting parties (capital links, other contractual links).

Our database is composed of 226 contracts, randomly selected in licensing contracts which gave rise to payments (attesting to their activity) over the 1994-1998 period within seven industries. The contracts are distributed equally between these industries so as to guarantee a high representation of sub-samples thus constituted. These licensing contracts were taken
from the database constituted by the INPI’s Office of International Technology Transfers (See appendix at the end of text). It was in an equivalent base that Macho-Stadler et al (1996) studied the licensing contracts involving Spanish firms. However, unlike this study, which is based solely on characteristics noted by the administrations, we have undertaken to establish systematic qualitative coding based on the wording of the contracts.

2-2 Characteristics of firms

The general characteristics of the firms involved in the agreements are summarized in table 1. The French firm is a licensor in 61.8 % of the contracts of our sample. On the contrary, in 38.2% of cases, the French firms are licensees. Let it be noted that the industry-based differences are not significant.

More than two thirds (64.9%) of the contracts take place between large firms, 17.1% between SMEs (in particular in the seed industry) and 18% between firms of a different size.

Five zones of exchange were distinguished. In 41.7 % of cases, the French firm concluded a licensing contract with a firm in an OECD country outside of the E.U. and in 43.5% of cases within the E.U.

77.4% of the licensing contracts concern firms operating in identical industries. There are nonetheless industry-based variations which are significant. The “electrical appliances” and “machines and mechanical appliances” industries respectively carried out 40.0% and 36.7% of their licensing contracts with other industries.

French firms with foreign capital are present in 34.0% of the contracts. This proportion reaches more than 40% in the “automobile” and “electrical appliances” industries.

Firms having links in capital represented 20.6% of the contracts. The industry-based differences are very significant: 42% of the contracts are intra-group licensing contracts in the chemical industry and only 7% in “domestic appliances” and 8% in the seed industry.

23.2% of the contracts involved firms having had earlier contracts. There also, the industry-based differences are very significant. This proportion reached 32% in “chemistry” and in “pharmaceutical products” and 40% in “electrical appliances”.

One finds these same industries in Anand and Khanna’s study (2000).
2-3- The active variables of the typology

In order to identify the interdependencies between the characteristics of the contracts, we elaborated a typology based on the technique of rising hierarchical classification, using the criterion of variance (CAHQUAL procedure of SAS software). The distance used to measure the proximities between the observations is the chi-square distance.

The analysis was carried out using a set of variables considered to be active (see table 2) which allow to characterize the terms of the licensing contract\(^7\), the principal safeguards and governance provisions.

It should be noted that the right to use brands or models, in addition to the transfers of (codified/tacit) resources and input, was not directly introduced as an active variable of the typology\(^8\). We made the hypothesis that the nature of the transfers brought about by the license is co-determined with the type of contractual structure. This co-determination will also depend on the nature of the institutional environment, which can be approximated by the industry, and relations between the parties, characterized here as capital links (whether intra-group contracts or not)\(^9\). These variables, which we do not integrate into the construction of our typology, will nonetheless serve to organize and comment it, and in particular to specify the underlying strategies of each type of contractual structure (see table 2).

3- Presentation of the typology

We are presenting the results in the form of a statistically robust partition in seven typological classes. This level of partition allows to properly minimize the intra-class variance while maximizing the inter-class variance. The presentation of the classes is ordered according to the growing complexity of the transfer of knowledge which we shall evaluate based on the diversity of resources transferred by the licensor to the licensee, since it is this characteristic which induces the strongest opposition between the contractual relations observed\(^10\). We can already note that the increased difficulty of the transfer goes hand in hand with the increased complexity of the contractual structure (i.e. the contracts become more relational). In spite of this, and as is suggested by the factorial analysis of the correspondences which structure the two factorial axes following the payment, safeguard and governance provisions, the

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\(^7\) Given the difficulty interpreting the durations of the contracts, this characteristic was not introduced.

\(^8\) For the construction of the variables of transfers of rights and resources see appendix.

\(^9\) The other information on earlier contracts between firms and on their size turned out to be too fragile to be taken into account in the typology.

\(^10\) This result stems from a factorial analysis of correspondences.
relationship between the complexity of the transfer and the governance mechanism is not of a fixed nature. This can be interpreted in our analysis as a dependence on the “specific” institutional framework surrounding the relationship between the two contracting parties.

As we will demonstrate in greater detail at a further point, the first three classes correspond to transactional contracts. However, this is for quite different reasons. In the first case, the technical interdependencies between firms produced an industrial structure within which all the actors are interdependent, making the potential retaliation strategies between contracting parties very credible. In the second case, the collective instances assure the policing of the market. In the third, it is a particular case where the public system of IPR is not flawed. For these reasons, the actors can then quite easily secure their exchanges of knowledge. In the extreme cases, notably in class 1, one can even notice that there is strictly speaking no transfer of knowledge because this is an area of technology where all the parties have the same knowledge — where they are on the same frontier of research — and they only transfer user rights.

It is not the same in the following cases where the licensor really transmits knowledge to the licensee, either to enable him to carry out additional developments (classes 4 and 7) or so that he uses it on markets where the licensor is not present (classes 5 and 6). According to the strategic issues (i.e. whether or not the licensor is a direct competitor of the licensee) or the quality of the institutional environment, the governance structures — which are relational in essence — will vary and will take shape through the implementation of different payment schemes, safeguard systems and warranty mechanisms for the execution of the agreement.

**Class 1: contracts for market sharing without the transfer of resources** (35 contracts)

The first typological class principally contains non-exclusive contracts (80.0%) and involves practically no transfer of “tacit knowledge” or codified data. The contract grants a simple right to use a patent, which implies that technological knowledge is common, in compensation for payments which are mixed in 54.3% of cases. The risk of commercialization is therefore often shared by the parties, however, the licensor has the possibility of multiplying the licensees.

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11 It should be noted that this class gathers practically all the contracts which result from dispute settlements with respect to infringement (7 contracts out of a total of 9). Given the cost of legal disputes, the uncertainty of their result, and the negative effects on the brand image from the surrounding publicity, many infringement disputes are resolved through transactional negotiations sometimes leading to the establishment of licensing contracts.
Close to half of the contracts in this class (42.9%) are made by Domestic Appliances firms, which confirms the observations made in this industry in which competition is strong, technological knowledge shared and complementary (Bessy and Brousseau 1998). The non-exclusivity of licenses is often linked to strategies of standard setting by the market leaders. The acuity of competition can also explain the fact that reselling the license and sub-licensing are forbidden. Generally, these are the only safeguards mentioned in the contracts of this typological class.

Where the governance provisions retained in the analysis are concerned, the proportion of renegotiation provisions and provisions defining a mechanism of conflict resolution are slightly inferior to the overall average. On the other hand, it is in this type of contract that the supervision mechanisms for the respect of contractual obligations are the most common (45.7%). Procedures of auditing the licensee’s books are also very present (88.6%). It should be noted that in reading the contracts of the Domestic Appliances industry, we remarked that the provisions dealing with the definition of the royalty base are very detailed. The measure of the intensity of use of the license constitutes an important contractual problem, which can explain the recourse to modes of mixed payment.

In the end, these are transactional contracts (or contracts of coordinated exploitation) for sharing a market, characterizing an industry where technology is a merchandise like any other. This situation notably stems from the fact that all the firms in the industry have to use the same technology because de facto standards exist. Consequently, all the firms are on the same technological frontier and have nothing to learn from each other. However, they must pay user rights to the first company that patents technology which will be incorporated into the standard (either in a race for a standard or following an agreement between industrialists — an agreement generally concluding in the creation of a composite standard based on IP elements retained by the different members of the consortium having succeeded in imposing their standards). This engenders situations of generalized interdependence between firms which dissuade them from not respecting the agreements, hence the relatively simple contractual structures.

**Class 2: transfers structured by professional rules** (66 contracts)
The second class is constituted by contracts whose exclusivity regime and modes of payment are close to the average. These contracts give rise to very few transfers of knowledge and also
incorporate few safeguards. Although reselling the license and sub-licensing are almost systematically authorized, only the provision of minimal performance is significantly over-represented (25.8% compared to 17.3% overall). There is an exception with regard to references to professional standards (28.8% compared to 15.0% overall) and professional instances of dispute settlements (50.0% compared to 45.1% overall). Governance provisions are systematically under-represented and very significantly for the renegotiation provision (12.1%) and the provision defining a supervision mechanism (9.1%). This “poverty” of the contractual structure may be related to the relative importance of the contracts within the seed industry (42.4%), an industry in which there are standards for licensing contracts. License agreements often pass via agents, in general professional organisms, in charge of the centralization and distribution of royalties. Let us also point out that in this industry, exclusivity corresponds to a single license. The licensor maintains the possibility of producing and selling in the territory of the licensee, while the latter in fact is responsible for obtaining the certification of variety on his territory. The cost of registering on the national catalogue and the cost of maintaining the certificate\(^\text{12}\) function as a specific investment which the licensee has to make viable. This avoids recourse to provisions of minimal performance. In this second case, private institutions compensate for the weaknesses of public institutions and allow agents to externalize the governance of their relations.

**Class 3: commercial valorization of technology on foreign markets** (35 contracts)

Contracts of this class are characterized by payments uniquely in the form of royalties (94.3%) and by the absence of worldwide exclusivity (54.3% compared to 39.8% overall). In these contracts, where risks are shared, transfers of knowledge principally affect codified data (74.3%). However, these contracts are also characterized by the fact that they give a right to use a brand (37.1%) and models (17.1%) to govern these informational exchanges. The license agreement is therefore principally oriented towards the commercial valorization of technology among several licensees. This can allow companies to break into foreign markets. In return, the licensor imposes restrictions of use on the license (34.3%) and controls the innovative activity of licensees by imposing a “grant-back” provision in 65.7% of cases. He also imposes usage constraints (62.9%) and confidentiality constraints (88.6%). On the contrary, the safeguards with respect to IPR are significantly under-represented. It nonetheless guarantees the licensee the right to use improvements brought to the technology under license

\(^{12}\) In this typological class, the costs of maintaining title deeds are borne in 37.9% of cases by the licensee compared to 19.0 overall.
With the exception of auditing rights on the facilities and the products of the licensee, governance provisions are very significantly under-represented.

In total, these contracts can be considered as transactional contracts whose governance is based on the legal framework (well defined IPR, abilities of the legal instances) and not on ad hoc mechanisms (class 1) or professional mechanisms (class 2). This would therefore seem to be the class in which contracts are the most transactional and the most representative of what the literature applying agency models deals with.

**Class 4: licensing the development of technology** (23 contracts)

This class gathers contracts characterized almost systematically by a very wide, if not to say worldwide, geographical exclusivity (78.3%). Let us point out that this exclusivity is strong because the licensor loses his user rights. The mode of payment always includes royalties, but the share of mixed payment is relatively high (43.5%). The transfers of tacit knowledge and codified data are very frequent (respectively 60.9% and 87.0%), which should be seen in connection with the systematic presence of confidentiality provisions (95.7%). Although the licensor also very frequently guarantees the licensee a right to use improvements made to the sub-licensed technology (78.3%), he also seeks to control the licensee’s innovative activity through a “grant-back” provision which is slightly over-represented in the contracts of this typological class (56.5%). These characteristics lead to the conclusion that the licensing agreement is oriented towards the development of a technology by the licensee, which the licensor does not wish to exploit himself. This hypothesis is coherent with the fact that the licensor relatively infrequently imposes usage constraints (34.8% compared to 43.8% overall). On the contrary, the licensor rarely agrees to compensate the licensee in the case of the patent being disputed by a third party (17.1%). Finally, where safeguards are concerned, reselling the license and sub-licensing are authorized in practically all cases (respectively 95.7% and 87.0%), which illustrates the fact that the licensee keeps a margin for maneuver in order to exploit the technology that he develops.

Where the governance provisions are concerned, the possibility of renegotiation (39.1%) and the licensor’s right to audit the licensee’s books (95.7%) are significantly over-represented. That may be related to the exclusive character of the relationship. On the one hand, the renegotiation provision allows to regulate the situation of bilateral dependency. On the other, the right to audit the licensee’s books enables the licensor to protect himself against the licensee’s opportunistic behavior with respect to the payment of royalties. However, the
supervision mechanisms (8.7%), auditing rights over the facilities and products of the licensee (13.0%), reference to instances of professional arbitration (21.7%) are significantly under-represented.

It is therefore a purely relational contractualization, however one in which the design of complex governance and protection mechanisms is not primordial because the two parties are not interdependent and are active in relatively separated fields of competition. The relational factors are therefore reduced.

**Class 5: contracts based exclusively on lump sum payments** (16 contracts)

The totality of the contracts of this class are based exclusively on lump sum payments\(^\text{13}\). Consequently, the licensee fully bears production and commercialization risks and is not exempt from competition because 50.0% of the contracts are not exclusive. Although these contracts incorporate important transfers of “tacit knowledge” and codified data (respectively 68.8% and 81.3%), in the case of the latter, the use of the license is generally restricted to a site or to particular equipment (50.0%) and to confidentiality constraints (81.3%). In exchange, the licensee benefits from different warranties. On the one hand, lump sum payments are very often fractioned (41.2% compared to 10.6% overall), which suggests that in this case he has a means of retaliation at his disposal should there be opportunistic behavior on the part of the licensor in the transfer of know-how\(^\text{14}\). Moreover, the licensee often benefits from a perpetuation of the license when improvements are made by the licensor (62.5%) and the latter guarantees an absence of infringement problems (56.3%) and agrees to compensate in the case of a suit (50.0%). The strong under-representation of governance provisions, apart from a provision defining a mechanism of dispute management and conflict resolution, may be explained by the specificity of the mode of payment. However, it shows that legal mechanisms are not efficient in ensuring conflict resolution. These contracts correspond to intermediary contracts between the transactional and relational contracts described by the theoretical models created by Arora, models directly inspired by practices in the chemistry industry (Arora & Fosfuri, 2002). This industry is strongly represented in this sub-sample.

**Class 6: common exploitation of “business models”** (21 contracts)

\(^{13}\) It should be noted that these lump sum payments are often linked to maximum authorized production capacities, for a factory, for example. In certain cases, there is a provision for royalty payments in the case of overproduction.

\(^{14}\) This would verify Arora’s model (1995).
The contracts of this class almost systematically incorporate a mode of payment in the form of royalties (95.2%) and territorial exclusivity (76.2%). The resources transferred in this class are very diverse and cover the right to use brands (52.4%) and models (19.1%), tacit knowledge (71.4%), codified data (81.1%) and physical input (57.1%). In the absence of a provision of minimal performance, the licensor protects his interests through a practice of “bundling” which is very strongly over-represented (52.4%) and by the implementation of “grant-back” provisions (61.9%). He also imposes strong usage constraints (95.2%) and covers himself against the risk of leaks of knowledge through confidentiality provisions (85.7%) or provisions obligating the restitution of technical documentation in the case of breach of contract (85.7%). The authorization for the reselling the license to a third party is under-represented (47.6%) in this class, which confirms that the parties’ identities are important factors. Although the licensor doesn’t give an IPR warranty, he guarantees the licensee the benefit of the improvements he makes to the technology under license (61.9%). The renegotiation provision is strongly over-represented (47.6%) and a mechanism of dispute management and conflict resolution exists in all cases. The licensor’s right to audit the licensee’s facilities and products (85.7%) as well as his books (81.1%) is also over-represented. These contracts can be likened to franchise contracts with territorial exclusivity. It is not exclusively technical knowledge that is transferred, but a marketing concept in addition to the right to use a label of quality.

In total, these contracts are characterized by a more complex contractual structure than in the previous cases. Contrary to class 3, the sales of input and the transfers of the right to use brands and models are not sufficient in themselves to guarantee the transfers of knowledge which are relatively more predominant. The legal environment is also insufficient to resolve disputes. Hence the necessity of constructing ad hoc governance structures.

**Class 7: cooperative technology transfers** (30 contracts)

The contracts of this class systematically incorporate transfers of “tacit knowledge” (80.0%) and codified data (100.0%), and in more than half of the cases the sale of input (56.7%). The very strong over-representation of the “grant back” provision (93.3%) and the safeguard guaranteeing the licensee will benefit from improvements (86.7%) show that the license deals with technologies in development. This is also confirmed by the reciprocity of transfers of knowledge. The licensee transfers test and development data to the licensor in 63.3% of cases. Given the strong bilateral dependence, contractual protections are prominent. The licensor imposes constraints concerning confidentiality (96.7%) and the restitution of technical
documentation in the case of breach (56.4%). Usage constraints are also over-represented (73.3%). Almost all the contracts of this class are based on territorial exclusivity (76.7%). More than half impose mixed payments (53.3%) and in 40.0% of cases a clause of minimal performance. The principle of “bundling” is also highly represented (36.7%), which further strengthens relations of exclusivity.

This set of characteristics would suggest that these licensing contracts relate to industrial and commercial cooperation agreements involving a massive transfer of resources. In 50.0% of cases the licensor imposes restrictions in the use of the license and provides very strong warranties against infringement problems (63.3%) and for compensation in the case of an infringement suit (73.3%). Given the high contractual risks inherent to this configuration, the parties allocate resources to manage the licensing agreement, as illustrated by the very strong over-representation of governance provisions in the contracts of this typological class, with the exception of the reference to professional standards (13.3% compared to 15.0% overall). These contracts are found, however, in close to half of the cases of intra-group contracts (43.3%).

4-Synthesis and Discussion

Our typology of licensing contracts allows to bring to light a continuum of different contractual structures. This continuum based on the growing intensity of transfers of knowledge goes hand in hand with the greater complexity of the contractual structure, and, in particular, the existence of specific governance provisions. From this point of view, the first three classes relate to the most transactional contracts, whereas the latter two classes are constituted by more relational contracts. Classes 4 and 5 occupy an intermediary position. This order is not perfect, as can be interpreted by the differences in terms of the institutional environment. We noted, for example, that within transactional classes, class 3 is characterized by a very weak amount of governance provisions, which would suggest that the legal framework is sufficient to guarantee the transactions. This characteristic is also to be linked to the high level of transfers of the right to use brands and models. These rights are relatively more enforceable in court than the right associated with the patent. From this point of view, the licensor may, through these rights, attempt to monitor opportunistic behavior on the part of the licensee. This same mechanism should apply in class 6, where rights to use brands and models are most predominant. However, there is then no notable absence of governance provisions. This difference is linked to the greater intensity of transfers of tacit knowledge,
but also to exclusivity. This last characteristic, which reinforces the link of bilateral dependency between the parties, implies *ad hoc* governance provisions.

According to our data, the industry doesn’t appear as a factor unequivocally determining the contractual structure. However, industry-based differences in transfers of resources are significant (see appendix). That said, none of our classes correspond to specific industries. And yet, in several studies, the industry is an essential proxy to explain the structure of TLAs, to the extent that it accounts for both the nature of the transfer and the institutional environment.

Moreover, we can refer in passing to the argument of the “strength” of IPR advanced by Anand and Khanna (2000). Although the possibility of codifying knowledge in a concerned industry constitutes a necessary condition for the optimal delimitation of IPR, it is not to be assumed that the industry can be used as a “proxy” of the “strength” of IPR. On the one hand, where the industry is concerned, there are other variables to be taken into consideration such as the existence of intermediary institutions regulating the definition of IPR. The seed industry illustrates this point well. On the other hand, precisely taking into account the resources transferred through licensing contracts enables one to monitor the industry-based effect in the determination of the contractual structure. For example, it isn’t rare in industries such as chemistry and pharmaceutical products for licensing contracts to incorporate the transfer of tacit knowledge, contrary to what happens in the “electronics” industry. As we have seen, this leads the licensor to introduce numerous provisions to protect himself against non-desired usages of the transferred knowledge (grant-back provision, confidentiality provision, etc). Generally speaking, the distinction that is made between codified and tacit knowledge to explain the differences of contractual structures is not relevant with respect to our empirical data which shows that the two types of knowledge are transferred at the same time.

Apart from updating the diversity of contractual structures, our results highlight the interest there is in accessing more detailed information. The drawback is that the operation of codifying the contracts is particularly heavy and can only be carried out on a limited number of contracts. Moreover, this work creates particular problems concerning the coding and interpreting of texts. The text of the contract can refer to other texts which we have no access to (contract framework, other contracts, etc.) or to implicit agreements between the parties. This is particularly true for the identification of governance structures. For example, in the
framework of an intra-group contract, certain aspects may be discussed within instances of
discussion which are not explicitly mentioned in the contract.

Nonetheless, the wealth of information accumulated is of great use. The precise study of
contractual provisions enables one to more clearly monitor what falls under national and
international legal mechanisms, industry-based institutions and firms’ strategies where the
definition and valorization of IPR are concerned. This is what we shall seek to analyze in the
future by enlarging our database with new contracts. The accumulated data shall be completed
by a series of indicators aiming to characterize institutional environments (on national and
industrial levels) with respect to intellectual property law and firms’ strategies using statistical
surveys carried out among the latter. The enlargement of our database would also offer the
possibility of doing more robust tests on industry-based effects and on links between certain
variables.
Bibliography


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Appendix: The technology licensing contracts database and the particular problems of information coding

The deposition of technology transfer contracts at the INPI (Office of International Technology Transfers) is linked to the obligation for French contracting parties to declare sums received from abroad or paid abroad during the previous year concerning contracts with foreign firms on the acquisition of rights of industrial property and all intellectual elements of scientific and technical assistance.

The nature of the information

Apart from the information from the computerized database, which principally deals with the value of the transfers between the French and foreign firms, we were able to directly access the text of the contracts and the contract declaration filled out by the French contracting parties.

This administrative declaration contains information which enables one to characterize the following: the licensor and the licensee (registered company name, address, country), the French party in detail (size, foreign participation, industry) the date and duration of the contract, the object of the contract (manufacturing process, products manufactured or sold, etc), the nature of the operation (reselling or licensing of patents, brands, designs or models, etc.; transfer of know-how, provision of engineering services, etc), the territory granted (whether exclusively or not), the financial conditions (lump sum payment, royalties, rates and base) and the existence of earlier contractual links between the parties. The text of the contract is enclosed in the file.

Unfortunately, all of this information does not feature in the computerized databases of the administration, which obliges us to seek the information in the paper files.

The 226 contracts which we drew semi-randomly (according to industries), exclusively concern concessions of patent licenses but can also include know-how licenses or brand and model licenses.

Problems inherent to the coding of information

The identification of the foreign firm’s industry and size was established through reading the contract, in particular its introduction, which may have induced errors in coding. Let it also be noted that the attempt to code the framework which the licensing agreement fits into, using the introduction as a basis, was not very productive. Although one can identify the sub-licensing agreements (4% of the contracts) with precision, the identification of the contracts corresponding to dispute settlements in infringement (4%) or corresponding to more vast cooperation agreements (18.6%) is more hazardous.
Coding the transfers of resources

In our reading of the contracts we wished to be as precise as possible concerning the nature of the resources transferred from the licensor to the licensee. An initial partition consisted in distinguishing the contracts in which user rights cover other elements of intellectual property, other contracts in which there was no explicit reference to the right to use a brand, a model or know-how.

According to this initial partition, 66.4% of the contracts mention user rights for elements of industrial property other than the patent. Industry-based differences are very significant. The right to use the brand (22.2%) is found principally in the pharmaceutical industry (50.0%) whereas the right to use models (9.3%) is more common in the automobile industry (30.0%) and the “electrical appliances” industry (20.0%). The right to use “know-how” is present in 57.8% of the contracts but covers contrasting industry-based situations.

A second entry consisted in very precisely identifying the nature of the resources which are transferred without necessarily making reference to industrial property rights. According to this second perspective, “plans” and “red books” are the resources most often transferred from the licensor to the licensee (54.9%). “Prototypes and equipment” come next (50.4%)\(^\text{15}\), followed by “test and development data” (42.9%) and “products and services” (3.1%). “Training of personnel” (30.1%) and “delegation of personnel” (28.8%), which involve sending consultants, are transferred in a relatively lesser proportion. Finally, “commercial data”, “consultancy services” and “management methods” are the least transferred resources, respectively 14.6%, 12.9% and 4.9%. Contrary to the previous transfers, for these three last types of resource, the industry-based differences are not significant.

Here also, the industry-based differences are very significant. It should be noted that “domestic appliances” and “the seed industry” are the industries in which the least transfers of resources from the licensor to the licensee occur and, in particular, indicators of transfers of “tacit knowledge” (consultancy services, training and delegation of personnel). In this respect they contrast with the “chemistry”, “automobile” and “electrical appliances” industries in which transfers of different types of resources are relatively high.

\(^{15}\) This is in part linked to the fact that in the seed industry we considered the transfer of basic seeds as a transfer of organic material.
# Table 1 Characteristics of firms

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Table 2: data by typological class

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*: The construction of these two variables is presented in table 3 of the appendix.

The results in bold indicate that the variable is significantly (to a limit of 0.1%) over-represented within the class; in bold and in italics means that it is significantly under-represented.
Table 3 (frequency in %): Transfers from the licensor to the licensee

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<th>Nature of the transfer</th>
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<th>07</th>
<th>08</th>
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***: THE HYPOTHESIS OFDEPENDENCE IS ACCEPTED SIGNIFICANCE AT 1 PER THOUSAND.

**: SIGNIFICANCE AT 1%.

*: SIGNIFICANCE AT 5%.

THE SUB-TOTALS IN BOLD CORRESPOND TO THE PRESENCE OF AT LEAST ONE TYPE OF TRANSFER