Patents and the market for technology in the early 19th century France

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Introduction

From an economic perspective, the transferability of intellectual property rights is one of their essential attributes. Allowing optimal allocation of resources and promoting therefore the use of these rights, transferability strengthens the use of the invention itself, by attracting capital, whose inventor does not necessarily benefit, and by making the invention a commodity. This fundamental feature is probably one of the foundations on which markets for technology are based.

Markets for technology have already been the subject of historical works[1]. Paradoxically, although the French patent laws were among the oldest ones in the emerging industrialized world, the analysis about the use of patents in the market for technology is not really complete[2]. If the institutional framework or the intermediaries have been considered, the assignments themselves have not been studied from a quantitative perspective.

Since the *Ancien Régime*, however, the privileges for inventions could be sold in France. The 1791 French patent laws allowed the patent holders to sell their rights. However, to be valid, such a sale had to be made before a notary and be registered in the prefecture. From the 1820s,

1. N.R. Lamoreaux, K.L. Sokoloff, et D. Sutthiphisal, « Patent Alchemy: The Market for Technology in US History », *Business History Review*, mars 2013, p. 3-38 ; B.Z. Khan, « Selling Ideas: An International Perspective on Patenting and Markets for Technological Innovations, 1790–1930 », *Business History Review*, mars 2013, p. 39-68 ; C. Burhop et N. Wolf, « The German Market for Patents during the "Second Industrialization," 1884–1913: A Gravity Approach », *Business History Review*, mars 2013, p. 69-93 ; A. Nuvolari et J. Sumner, « Inventors, Patents, and Inventive Activities in the English Brewing Industry, 1634–1850 », *Business History Review*, mars 2013, p. 95-120 ; T. Nicholas et H. Shimizu, « Intermediary Functions and the Market for Innovation in Meiji and Taishō Japan », *Business History Review*, mars 2013, p. 121-149.

2. L. Hilaire-Pérez, *L'invention technique au siècle des Lumières*, Paris, France, Albin Michel, 2000 ; B.Z. Khan, *The Democratization of Invention: Patents and Copyrights in American Economic Development, 1790-1920*, Cambridge, Cambridge University Press, 2005 ; G. Galvez-Behar, *La République des inventeurs. Propriété et organisation de l'innovation en France (1791-1922)*, Rennes, Presses universitaires de Rennes, 2008 ; J. Baudry, *Une histoire de la propriété intellectuelle: les brevets d'invention en France, 1791-1844*, Thèse de doctorat, École des hautes études en sciences sociales, Paris, France, 2014.

these registrations were published in the *Bulletin des lois*. This provision was extended by the 1844 patent law and was always implemented. Thanks to this legal requirement, we have the opportunity to analyze an uninterrupted source about all these transactions during the whole 19th century.

Our paper focuses on the first half of the 19th century in France from the adoption of the 1791 patents laws to the 1844 reform. First, we review the French patent system. Next, we focus on the institutional requirements about the transfers of patents and we discuss the sources. Next, we analyze the assignments occuring during this period and we compare them with the data available about all the patents issued during the early 19th century.

Inventing a patent system

Admittedly, many of the problems relating to the right of the inventor appeared long before the French Revolution. The royal declaration on privileges for inventors in 1762 was a moment of drawing a new conception of privileges, which depended on the strong debates about the economic regulation. As demonstrated by Liliane Hilaire-Pérez, the invention was the subject, early in the 18th century, to an administrative mobilization, which was amplified by the spread of the *encyclopédisme*[3]. Thanks to this process, the inventor acquired a new dimension: principles of natural law legitimized the claims of intellectual property, already widely perceived by Denis Diderot for instance[4]. At the very end of the *Ancien Régime* this trend became stronger. In the 1780s, even as the exclusive privilege was the subject of considerable criticism, many agreed that transitional monopolies could be granted to inventors. Inspired by the British patent system, the French royal administration facilitated the granting of privileges for inventions and made procedures of prior expertise easier. In return, it required from privileges holders the deposit of their inventions in order to promote the development of industrial knowledge. Recognition of the natural right of inventors, issuing temporary privileges to reward them and to allow the access to the market and the disclosure of inventions were the three features of a model, which appeared even before the Revolution.

The Revolution of inventors (1791)

The Revolution accelerated this process. The first feature of the revolutionary genesis of the patent was the strong lobbying of inventors' associations in the development of the new patent law. At the end of the

3. L. Hilaire-Pérez, *L'invention technique au siècle des Lumières*, *op. cit.*

4. See D. Diderot, « Lettre historique et politique sur le commerce de la librairie », *in* id., *Œuvres complètes,* Paris, Garnier frères, 1876, p. 30 ; L. Hilaire-Pérez, « Diderot's views on artists' and inventors' rights: invention, imitation and reputation », *The British Journal for the History of Science*, 2002, p. 129-150.

Ancien Régime some associations devoted to the promotion of art and science had came to light. The Revolution promoted the development of new societies defending inventors' rights. One of them, the *Société des inventions et des découvertes* presented in September 1790 a petition to the *Comité d'agriculture et du commerce*, demanding a patent law in France[5]. Stanislas de Boufflers was nominated as a rapporteur[6]. He presented his *Rapport sur la propriété des auteurs de nouvelles découvertes et inventions en tout genre d'industrie* on December 30, 1790. Boufflers was clearly inspired by Diderot's arguments, pointing out that « if there is a genuine property to a man, it is his thought. » [7] For him, the inventions were considered as inventor's products, which property has to be secured.

Boufflers proposed a bill, which was based on these principles, but also on the idea of a contract between inventors and society. As long as the inventor kept his invention secret in his own mind, he remained its absolute master. However, disclosing it to take effectively advantages from it, he took the risk to be dispossessed. If the inventor's protection was legitimate, it had a strong price because of the particular nature of this immaterial object. In order to compensate the society for this cost, the inventor must not only renounce the secret by providing an exact knowledge of his invention but it also must give up its rights after an interval of time. Because this right was considered as the result of a natural one, patent examination by the government was out of the question. Whether conducted by scientists or by members of corporations, such an examination was, in Boufflers' eyes, necessarily arbitrary because it established « a court judging for things that do not yet exist. »[8] For him the government was unable to take a decision about the usefulness of new things, which could only be labeled by the public opinion.

On 7th January 1791, Boufflers' bill became the first patent law in France and it was immediately contested by those, who considered that patents were useless privileges. Again the action of the *Société des inventions* was essential. For these inventors, the patent law tended precisely to make an end with the privileges system because inventor's rights were

5. G. Galvez-Behar, « Genèse des droits de l'inventeur et promotion de l'invention sous la Révolution française » ; C. Demeulenaere-Douyère, « Inventeurs en Révolution : la Société des inventions et découvertes », *Documents pour l'histoire des techniques. Nouvelle série*, mars 2009, p. 19-45 ; C. Demeulenaere-Douyère, « Défendre les intérêts moraux et économiques des inventeurs : des formes d'action collective sous la Révolution (1790-1798) », *ARTEFACT*, juin 2015.

6. N. Vaget Grangeat, *Le chevalier de Boufflers et son temps. Étude d'un échec,* Paris, Librairie A.-G. Nizet, 1976.

7. D. Diderot, « Lettre historique et politique sur le commerce de la librairie », *op. cit.*, p. 30.

8. *Archives parlementaires*, 1ère série, t. XXI, p. 734 (30 décembre 1790).

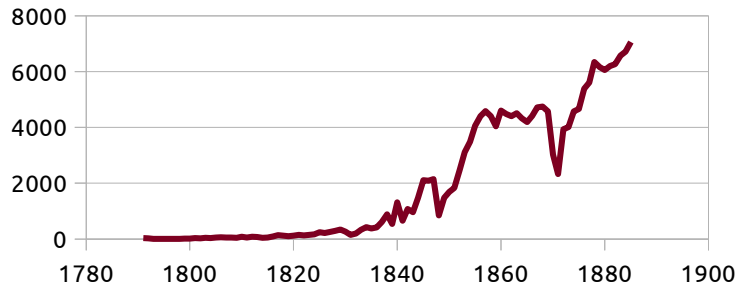
recognized as a natural and "inalienable human" one. Thanks to a strong lobbying, a second patent law, confirming the first one, was adopted in May 1791. In order to draw a strict distinction from the old privileges, the patents were now called "brevets d'invention".

A slow and difficult diffusion

The adoption of the French patent laws in 1791 did not cause any upheaval in the delivering of patents. On the contrary, in a first instance, granted patents were as numerous as applications for privileges at the end of *Ancien Régime*. In the 1780s 16 applications were filed on average each year to the *Comité du commerce*[9]. Between 1791 and 1801, 15 patents were delivered each year. The number of patents continued to stagnate until the reign of Charles Xth (1824-1830), when it begun to rise rapidly. Thus, for nearly thirty years, the patents were slowly being adopted, which was concentrated in certain industries and in certain areas. In fact, between 1791 and 1803, mechanical, textile and chemical industries concentrated almost half of the patents (respectively 21%, 19% and 7.5 %). In addition, the weight of Paris and its region appeared overwhelming. In the first years of enforcement, nearly three quarters of patents were taken in the department of the Seine ; in the 1830s as Parisian patents represented less than half of the patents granted[10].

Figure 1 : Number of Granted Patents, France, 1791-1885

Source : INPI, Guide des sources



Many reasons contribute to explain this slow development. The first one was probably the cost of patents, which was prohibitive. The patent tax was indeed very expensive : for a 15 years patent, it raised 1500 francs whereas worker's wage was 1,5 francs a day in the early 19th century. Added to other administrative costs, this tax made the French patents inaccessible to many inventors. Besides, the heaviness of litigation was another stumbling block. A member of the *Conseil général des manufactures* said in 1819 that « the prosecution, that the patent holders are obliged to undertake, frighten many artists, especially in the

9. L. Hilaire-Pérez, *L'invention technique au siècle des Lumières*, *op. cit.*

10. J. Girardin et Ballin, « Essai sur les brevets d'invention », *in* Association normande, *Annuaire des cinq départements de l'ancienne* Normandie, Caen, Impr. Le Roy, 1841, p. 527-540.

departments, and prevents them from taking patents.»[11] Four years later, Francœur, professor at the Faculty of Sciences in Paris, denounced not only the high cost of such litigations but also the leniency of the courts, asking them to be as severe as in England towards counterfeiters[12].

Mistrust

Because of such shortcomings, the patent laws were subject to some adjustments. An act of September 20, 1792 prevented from patenting financial methods. But more radical projects also appeared trying to undermine the 1791 patent laws. In 1796, it was asked that patents were issued only after a "mature consideration"[13]. This apparent challenge to the principle of non-examination of patents caused, in turn, so strong reactions that the project was abandoned. In 1811 the *Conseil général des fabriques et des manufactures* intended to reform the patent laws but its work remained unsuccessful. In 1814, the issue was raised again, without further success. In 1821, the same commission addressed the issue again and again things were dragging on until the Minister of Trade revived the project in 1826[14]. Patents becoming more and more numerous, the Minister of Trade, the Comte de Saint-Cricq convened in October 1828 a commission to prepare a new patent law. But the reform only came in 1844.

Contrary to its philosophical foundations, the revolutionary patent laws provided a protection only to inventors who were able to pay the cost. This feature could suggest that the French patent system was not democratic but other arguments have to be taken into consideration. The fact that rich industrialists could be reluctant to take patents because of its inefficiency intimates that the slow diffusion of patents was based on factors different from social ones. On the other hand, the refusal of preliminary examination proves that the revolutionary patent law was not based on the same philosophy than the system of privileges, which had begun to evolve at the end of *Ancien Régime*. Moreover, the best proof of the revolutionary rupture is certainly the fact that the French patent system was not abolished despite the critics. It responded to real needs : protecting inventions and, more particularly, allowing their assignment without any governmental intervention.

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11. Archives nationales (now AN), F^{12} 196 bis, 23th December 1819. The term of « artists » refer to industrial ones.

12. *Dictionnaire technologique ou nouveau dictionnaire universel des arts et métiers,* Paris, Thomine et Fortic, 1823, p. 461-473.

13. J.-F. Eude, *Rapport au Conseil des Cinq-Cents,* cité *in* A. Huard, *Répertoire de législation et de jurisprudence en matière de brevets d'invention*, Paris, Cosse et Marchal, 1863, p. 13.

14. AN, F12 196 bis: Meetings of November 18, 1824, 20 October 1825 and April 6, 1826.

A new institutional framework for the market for technology

During the *Ancien Régime*, it was already possible to sell his privilege on invention or to make somebody else benefit it. Such transfers, however, had to be included in the initial grant of the privilege or to be later authorized by the King. Sometimes it is true, the sale occured before authorization, what suggests the gap between the dynamics of the market for technology and the slowness administrative procedures[15]. In 1762, the *Déclaration royale concernant les privilèges en fait de commerce* said that the privileges granted to inventors were personal rewards. If privileges could be assigned freely to children and grandchildren of patentees during their own life, selling privilege to any other people had to be authorized by the royal administration. So, during the *Ancien Régime*, transferring privileges was, theoretically at least, under the control of the royal administration like the privileges themselves.

Creating transferability

With the 1791 patent laws emerged a new paradigm and patent assignments were at stake. Article 14 of the first 1791 patent law (7th January 1791) stated as follows:

> "Any patent owner shall be entitled to form establishments throughout the Kingdom, and even to allow other individuals to put it into practice and to use its resources and processes; and in any case, it may use it as a movable property"

This change to the old rules was fundamental. Preliminary authorization was no longer necessary. Considering the patent as "a movable property" the new law makes *a priori* possible any purpose related to personal property and this assimilation was reinforced by tax rules[16]. To some extent, a new institutional framework for the market for technology was created and the Act of 25 May 1791 clarified things about the practice of this right. Article 15 provided that selling a patent required an agreement guaranteed by a notary. Besides both parties had to declare the assignment to the *Directoire* – later the prefecture – in their own department. Such a process was important. If it was not enforced, it did not lead to the cancellation of the sale itself, much less the patent, but if the buyer wanted to pursue any infringer, he had to respect such a registration procedure[17].

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15. L. Hilaire-Pérez, *L'invention technique au siècle des Lumières*, *op. cit.*, p. 247.

16. *Journal des notaires et des avocats*, Librairie du Journal des notaires et des avocats, 1832, p. 80-83 ; *Supplément à la troisième édition du dictionnaire du notariat: A-D. Tome premier*, Journal des notaires et des avocats, 1836, p. 249-250.

17. T. Regnault, *De la Législation et de la jurisprudence concernant les brevets d'invention, de perfectionnement et d'importation, par Théodore Regnault,…*, l'auteur (Paris), 1825, p. 185-187 ; A. Perpigna, *Manuel des inventeurs et des brevetés, par Antoine Perpigna,… 3e édition… mise en harmonie avec la loi du 25 mars 1838 et*

As ambiguously as for the patents themselves, patent assignments has to be known. In 1794, the revolutionary government had created the *Bulletin des lois* in order to publish all the general acts, including the patents. On 5 Vendemiaire an IX (27th September 1800), an order of the *Premier Consul* made this publication compulsory every three months in the *Bulletin*. But if the delivered patents were actually published, it may not be the case for the sold ones. In 1824, however, the *Bulletin* began to publish the assignments within each delivering patent decree and from April 12, 1842, sold patents were published independently of granted ones. They will be throughout the 19th century.

The 1844 reform reinforced the 1791 provisions about transferability. Even if the notion of "movable property" was not mentioned anymore, article 20 of the 1844 patent law indicated that each patentee could sell the "property of his patent". The same administrative requisites as the previous ones were expressed : the contract had to be made with a notary and to be registered at the prefecture. Every three months, these transfers should be published in the *Bulletin des lois.* However the new patent law added some provisions. First, the assignment had to be registered in the department where the agreement had been concluded. Second, the transfer necessitated to pay the whole cost of the patent. In a case of a 15 years patent, this represented a 1 500 francs spending (minus the fees already paid). Third, the 1844 patent law pointed that a patent buyer could automatically take advantage from the improvement certificates, which could have be delivered before or even after the sale.

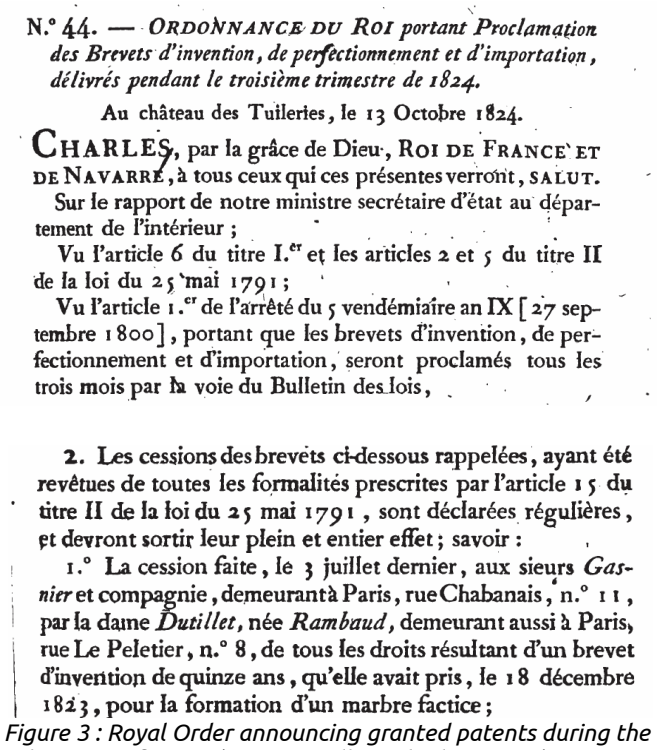
Even if assimilating patents to property was strongly debated in the 1840s, patents were considered as transferable assets[18]. The intervention of a notary, which permitted to have legal and genuine contracts, the procedure of registration, which looked like the one for the land Registry, and even the fiscal provisions made the patents comparable to movable goods. But, of course, a major difference remained : invention were not only immaterial goods but also uncertain ones. Because of the absence of official preliminary examination, French patents were, in a sense, only defined by themselves. Since 1800, they were indeed issued *sans garantie du gouvernement* ("without governmental guarantee", the famous "SGDG"). As a consequence, the risk of having a non-valid patent – because of default of novelty, for instance – was only supported by the patentee. Such a feature had some implications for the patent transfer. Selling a patent could be void if the patent itself was invalidated by a

augmentée de la législation industrielle des pays étrangers, du texte des lois françaises et d'un résumé de la jurisprudence en matière de brevets, l'auteur (Paris), 1839, p. 142-152 ; J.-E.-M.-P.L. de Villeneuve, *Jurisprudence de XIXe siècle, ou Table décennale du Recueil général des lois et arrêts, de 1831 à 1840*, 1841, p. 132-133.

18. G. Galvez-Behar, « La propriété industrielle est-elle une propriété ? Le débat sur la loi relative aux brevets d'invention à la Chambre des pairs (1843) », *Entreprises et histoire*, 2007, p. 108.

court. In the French patent system, since no state administration took the responsibility to give the patent a mark of recognition, the value of a patent depended only on the confidence of stake-holders or on a court decision : patents gave, in fact, highly risky rights.

Fragmented sources



N.° 44. — *ORDONNANCE DU ROI portant Proclamation des Brevets d'invention, de perfectionnement et d'importation, délivrés pendant le troisième trimestre de 1824.*

Au château des Tuileries, le 13 Octobre 1824.

CHARLES, par la grâce de Dieu, ROI DE FRANCE ET DE NAVARRE, à tous ceux qui ces présentes verront, SALUT.

Sur le rapport de notre ministre secrétaire d'état au département de l'intérieur ;

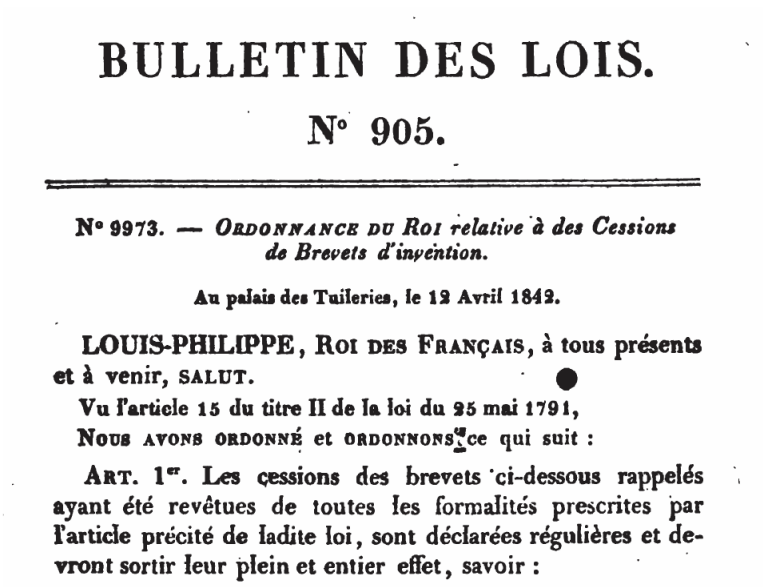
Vu l'article 6 du titre I.er et les articles 2 et 5 du titre II de la loi du 25 mai 1791 ;

Vu l'article 1.er de l'arrêté du 5 vendémiaire an IX [27 septembre 1800], portant que les brevets d'invention, de perfectionnement et d'importation, seront proclamés tous les trois mois par la voie du Bulletin des lois,

2. Les cessions des brevets ci-dessous rappelées, ayant été revêtues de toutes les formalités prescrites par l'article 15 du titre II de la loi du 25 mai 1791, sont déclarées régulières, et devront sortir leur plein et entier effet ; savoir :

1.° La cession faite, le 3 juillet dernier, aux sieurs *Gasnier* et compagnie, demeurant à Paris, rue Chabanais, n.° 11, par la dame *Dutillet*, née *Rambaud*, demeurant aussi à Paris, rue Le Peletier, n.° 8, de tous les droits résultant d'un brevet d'invention de quinze ans, qu'elle avait pris, le 18 décembre 1823, pour la formation d'un marbre factice ;

Figure 3 : Royal Order announcing granted patents during the 3d quarter of 1824. (Source : Bulletin des lois, 1824*)*



BULLETIN DES LOIS.

N° 905.

N° 9973. — *ORDONNANCE DU ROI relative à des Cessions de Brevets d'invention.*

Au palais des Tuileries, le 12 Avril 1842.

LOUIS-PHILIPPE, ROI DES FRANÇAIS, à tous présents et à venir, SALUT.

Vu l'article 15 du titre II de la loi du 25 mai 1791,

NOUS AVONS ORDONNÉ et ORDONNONS ce qui suit :

ART. 1er. Les cessions des brevets ci-dessous rappelés ayant été revêtues de toutes les formalités prescrites par l'article précité de ladite loi, sont déclarées régulières et devront sortir leur plein et entier effet, savoir :

Figure 4 : Royal Order announcing patent assignments. (Source : Bulletin des lois, 1842)

The implementation of these administrative rules left traces, which are essential sources to think about the market for technology in 19th century France. These sources are, in fact, multiple and heterogeneous. The first set consists of the original patent files stored at the French patent Office (INPI). Unfortunately most of the administrative correspondence relating to 19th century patents was removed and the records relating to the life of patents have apparently not been preserved. However some files contain some information about the sale of patents. For example, the file from the 1842 Gay-Lussac' and Lacroix' application about a sulfuric acid manufacturing process contains a letter from the *Manufacture royale des glaces de Saint-Gobain* informing the Minister of the sale of patent[19]. The retrospective catalogs published in 1826 and in 1842 include also some information on patent assignments but only for

19. L.-J. GAY-LUSSAC et A.-A. LACROIX, « Procédé de fabrication de l'acide sulfurique. », Brevet 10314, INPI.

patents still in force at the moment of their publication[20]. At last, the database, which has been established by the INPI about 19th century French patents, contains also important information: for the period 1791-1844, 644 patents are labeled as assigned[21].

The problem is that such records are not homogeneous. Some assignments mentioned in the INPI database are not in the catalog[22]. Actually, the only continuous source about assignment are those published from 1824 in the *Bulletin des lois,* which gives, despite changes over time, some details about :

- The kind of transfer. "Total transfer" (when all the patent rights are assigned) have to be distinguished from "partial" ones (only some rights are sold in a specific area for instance), "licenses", "property changes" (such as when someone one inherits a patent).
- The place where the transfer was registered. According to the 1791 patent law, the transfer has to be registered in the department of each parties; unless they live in the same one. When the parties live in a foreign country, the transfer may be registered in Paris.
- Of course, the date of registration has to be distinguished from the date of the transfer itself. Both are often mentioned but not always.
- The notary (name, city) who drafts the transfer contract. Such an information allows to use notarial records to find contracts for this transaction.
- The buyer is characterized with several information: names, profession, city and address, if the buyer is a company or not.
- The patent at stake is characterized by its title, its date of granting and its duration.

All these information are quite interesting. But the question remains whether such a source is a relevant indicator about the market for technology. Actually, these transfers were only one part of all the

20. Ministère de l'intérieur, *Catalogue des spécifications de tous les principes, moyens et procédés pour lesquels il a été pris des brevets d'invention, de perfectionnement et d'importation depuis le 1er juillet 1791, époque de la mise à exécution des lois des 7 janvier et 25 mai précédens, jusqu'au 1er juillet 1825*, Paris, France, A. Boucher : Mme Huzard, 1826 ; *Catalogue des brevets d'invention d'importation et de perfectionnement*, Paris. I had no access to the first catalog but reproductions included in the INPI *Guide des sources* suggest that both are based on the same model.

21. I thank the INPI for having given me access to the complete database on which further statistics are based.

22. 1BA3668, Hebert and Hussiez patent, which was void in 1835.

transactions dealing with patents. Some of the agreements were not registered, either the parties did not want to pay the taxes due to the sale, either they did not want to make their deal public. Progressively, licenses and patent contribution to capital were not considered as transfer anymore. In the late 19th, they progressively disappear from the *Bulletin des lois*. Only notarial archives or private records can give information about these essential part of patent transfer.

Approaching the market for patents

Pending the implementation of a comprehensive database – a project I am working on with Alexis Grillon – we can focus on two kinds of sources in order to have an overview on patent assignments in the first half in 19th century France : the INPI database, by being aware of its lacks, and the registrations of assignments provided by the *Bulletin des lois*. The information provided by the *Bulletin* must also be considered carefully since it deals first with assignments not with patents: one patent may be sold more than one time and, moreover, an assignment is always registered several months after the agreement itself. However, they provide a good estimate for understanding the volume and intensity of the transactions.

Magnitude of assignments

Fig. 4 : Patent Assignments Registrations (1825-1885)

Source : Bulletins des lois

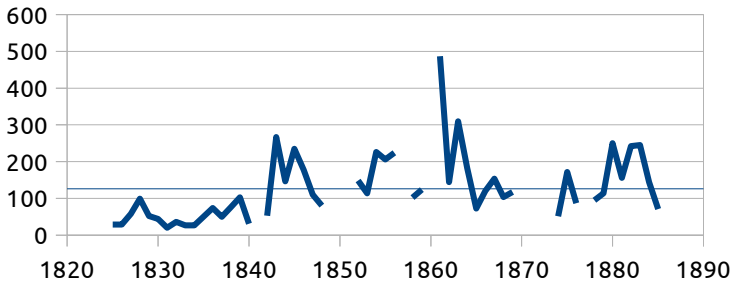


Fig. 5 : Granted Patents and Patent Assignments Registrations(1825-1885)

Source : INPI & Bulletin des lois

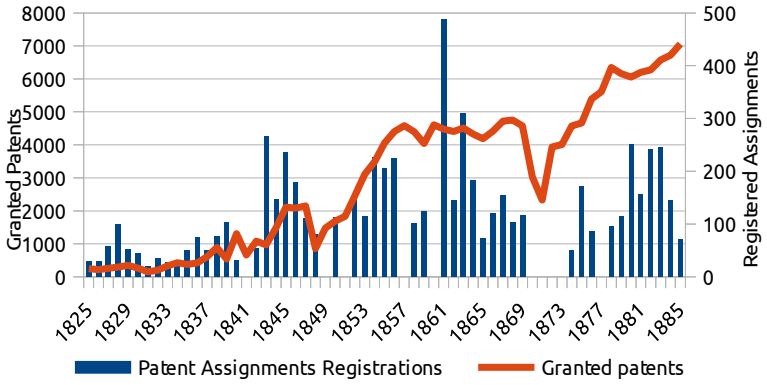
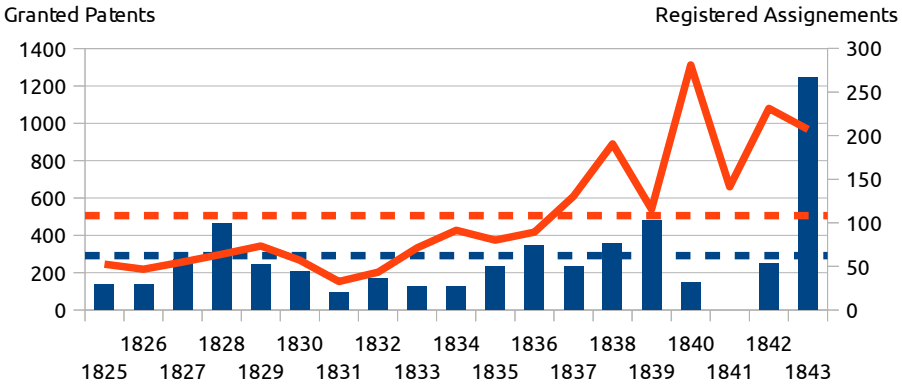


Fig. 6 : Granted Patents and Patent Assignments Registrations(1825-1843)
Source : INPI & Bulletin des lois



While throughout the 19th century, 3 000 patents are issued on average each year, the number of registered assignments is itself one hundred per year. Moreover, the number of registrations and the number of granted patents are not really correlated (Fig. 4 & 5)[23]. If the 1844 reform seems to introduce a strong break in the granting of patents, it does not represent a comparable change for the assignments. Focusing on the period before the 1844 patent law, the gap between granted patents and registered assignments is maybe less important than for the whole 19th century but the ratio registrations-granted patents remains especially low. This is confirmed by data about the patents themselves from the INPI Database. For this period, about 5% of the granted patents are the subject of an assignment. Although this database is not complete since all the assignments have not been taken into account, the use of confidence intervals suggests that the ratio 'sold patents-granted patents' does not exceed 15% during this period and is probably around 5%. Besides, the ratio seems to decrease from the 1820s with the rise of the patents themselves.

Table 1.Assigned and Granted Patents (1791-1844)
Source : INPI Database & Guide des sources

Year of granting	Patents considered as sold by INPI DB	Granted Patents	(1) / (2)	Max CI (0,95)
1791-1799	5	113	4,22%	*22,45%*
1800-1809	17	439	3,87%	*13,04%*
1810-1819	63	856	7,36%	13,81%
1820-1829	191	2081	9,18%	13,27%
1830-1839	289	4207	6,87%	9,79%
1840-1843	64	4084	1,57%	4,61%
N =	629	11780	5,38%	7,10%

What is possible to conclude from this, despite the uncertainty of the source, is the narrowness of patent assignments, which represent only a

23. A linear model on the number of registrations and the number of granted patents from 1825 to 1885 has a multiple R-squared = 0.3437, even if p-value = 7.029e-05. However problems of heteroscedasticity have to be fixed.

tight part of the patents. If the Revolution did not cause any quantitative rise in patenting, it may neither accelerate significantly the patent assignments. Besides, if the market for patents looks to be more intense at the very late 1820s, this trend does not remain for a long time.

The problem of patent cost

Going beyond those general data is necessary to have a better understanding of the patent assignments. A Logit model based on the INPI Database suggests that two variables have an effect on the probability of being assigned : the year of deliverance (negative effect) and the initial term of the patent (positive) (see Annex). The first one seems to confirm the relative decrease of assignments but the limitations of this sample must not be forgotten.

For this reason, the analysis is completed by the study of 267 transactions, which were published in 1843 in the *Bulletin des lois.* This corpus is important enough for detailed statistical studies and it is homogeneous in time. Note, however, that the registrations of certificates of addition and of patent for improvement are excluded so that we can focus on the sale of the patents themselves. A distinction has to be drawn however between the patents, the transfers and the registrations. So the 267 sales recorded in 1843 deal with 203 different patents. In fact, the analysis focuses on five different issues: the transfers, the patents involved in them, the initial holders of these patents, the seller of each patent, and finally their buyers.

A first step is therefore to deal with the patents, which were involved in assignments by comparing them to all granted patents. Of course, the reference granted patents are not the same according to considering the INPI Database or the 1843 registrations. For the former, the parent population consists of all patents issued in the period from 1791 to 1844 since the first patent labelled as "sold" was delivered on 1791 and the last one in 1843. For the later, the parent population consists of all patents issued from 1828 to 1843 since the maximum term of a patent is 15 years. From a statistical point of view, the comparison of these two populations requires a systematic use of the Chi-Squared test and sometimes of confidence interval.

After this methodological clarifications, we can consider the different types of kinds of assigned patents. The 1791 patents laws established three sorts of patents :

- Patents for invention, which protected "every discovery or new invention"[24] ;

24. Patent law of 7th January 1791, article 1.

- Patents for improvement, which protected "every way to bring every kind of production to a new kind of perfection"[25] ;

- Patents for importation, which protected "anyone who [would bring] first in France a foreign discovery"[26].

In practice, hybrid categories were used and some patents were labeled as ones "for invention, improvement and importation" ! Furthermore, the difference between patents for improvement or certificate of addition was far from being clear. It is the reason why in order to facilitate comparisons, only the two first kinds of patents have been considered.

Table 2. Assigned and Granted Patents by sort of patents

	INPI Database			
	Assigned Patents		**Granted Patents**	
	n	**%**	**n**	**%**
Importation	101	16,72%	1519	13,65%
Invention	503	83,28%	9607	86,35%
Total	604	100,00%	11126	100,00%
P-value	0,03			

	Bulletin des lois			
	Assigned Patents		**Granted Patents**	
	n	**%**	**n**	**%**
Importation	31	15,66%	1124	13,26%
Invention	167	84,34%	7352	86,74%
Total	198	100,00%	8476	100,00%
P-value	0,32			

The number of patents differs from N=203 because ambiguous patents have been removed from the sample

Concerning the data issuing from the INPI database, Chi-Squared test suggests that patent assignment are more related with patents for importation. However, this over-representation is very slight. Actually, this very light effect fits with the result of the logistic regression.

The influence of the kind of industry on the probability is one other interesting aspect. If the logistic regression does not suggest such an effect, the distribution of assigned and granted patents from INPI Database are not totally the same. The fact is that the ceramic industry is a bit overrepresented whereas railways, mining and metallurgical industry and precision instruments industry are underrepresented. However these characteristics are not confirmed in the sample from the *Bulletin des lois.* Anyway the relationship between assignment and the class industry is all but evident.

25. Patent law of 7th January 1791, article 2.

26. Patent law of 7th January 1791, article 3.

Table 3. Assigned and Granted Patents by Industry

	INPI Database			*Bulletin des lois*		
CLASSE	**Assigned Patents (1)**	**Granted Patents (2)**	**Confidence Interval on (1)/(2)**	**Assigned Patents (1)**	**Granted Patents (2)**	**Confidence Interval on (1)/(2)**
01. Agriculture	2,28%	2,34%	[0,47-1,48]	1,01%	2,51%	[-0,15-0,95]
02. Food industry	7,65%	5,80%	[0,96-1,68]	4,02%	6,18%	[0,21-1,09]
03. Railways	0,49%	1,29%	[-0,05-0,8]	1,01%	1,67%	[-0,23-1,43]
04. Textile industry	16,94%	16,64%	[0,84-1,2]	14,07%	15,82%	[0,58-1,2]
05. Mechanical industry	9,77%	10,15%	[0,73-1,19]	12,06%	10,47%	[0,72-1,58]
06. Navy & sailing	3,91%	2,83%	[0,84-1,93]	1,51%	2,42%	[-0,08-1,32]
07. Building	7,17%	6,03%	[0,85-1,53]	8,54%	6,42%	[0,73-1,94]
08. Mining & metallurgical industries	1,63%	2,72%	[0,23-0,97]	4,02%	2,63%	[0,49-2,57]
09. Household Equipment	3,42%	3,75%	[0,53-1,29]	4,02%	4,09%	[0,32-1,65]
10. Road Transport	2,61%	3,40%	[0,4-1,14]	4,02%	3,54%	[0,36-1,91]
11. Weapons	1,63%	1,82%	[0,35-1,45]	1,01%	1,70%	[-0,22-1,41]
12. Precision Instruments	2,12%	3,28%	[0,3-0,99]	1,01%	3,30%	[-0,12-0,73]
13. Ceramic Industry	3,75%	1,92%	[1,17-2,74]	3,52%	1,68%	[0,57-3,61]
14. Chemical industry	10,91%	9,81%	[0,86-1,36]	14,57%	9,10%	[1,06-2,14]
15.Lighting – Heating – Cooling industry	7,82%	8,01%	[0,71-1,24]	9,55%	8,36%	[0,65-1,63]
16. Clothing industry	6,03%	6,44%	[0,64-1,23]	5,03%	6,41%	[0,31-1,26]
17. Industrial Arts	4,40%	5,41%	[0,51-1,11]	5,53%	5,16%	[0,46-1,69]
18. Office Material	2,28%	2,04%	[0,54-1,7]	1,51%	2,03%	[-0,09-1,57]
19.Surgery and Medicine	3,26%	4,04%	[0,46-1,15]	2,51%	4,31%	[0,08-1,09]
20. *Articles de Paris*	1,95%	2,27%	[0,38-1,34]	1,51%	2,20%	[-0,08-1,46]
	100,00%	**100,00%**		**100,00%**	**100,00%**	
N=	**614**	**11219**		**199**	**8554**	
P-Value on Chi-Squared	3%				14%	

The key factor is actually the initial term of patents. As said, the 1791 laws allowed to take out a patent for 5, 10 or 15 years. This choice had a double economic dimension: it defined at times the maximum length of the monopoly and also the cost of the patent. 5 year patents costed 300 F, 10 years patents 800F and 15 years ones 1 500F. Long-term patents represented a very significant investment.

Table 4. Assigned and Granted Patents by Initial Term

	INPI Database		*Bulletin des lois*	
Term	Assigned Patents	Granted Patents	Assigned Patents	Granted Patents
5	26,43%	52,08%	32,67%	51,87%
10	35,56%	27,21%	28,22%	27,81%
15	38,01%	20,71%	39,11%	20,32%
N=	613	11219	202	8672

What appears clearly is the over-representation of 10 and 15 years patents in the assigned ones. Of course, this result is not surprising. The longer was the initial term of the patent, the longer the operating time offered to the buyer. Even if there was a possibility of extending the patent term, this procedure was scarce and complex. Moreover, the initial term of a patent is due to its price, a signal of its value. In the absence of a formal examination - there was one but unofficial - the legal, technical and, consequently, financial value of the patents was based on the expertise of intermediaries like technical associations, jury of exhibitions and, at last, on the court decisions. But before being reviewed by such institutions, the patent value depended on the patentee himself. His own investment in the patent cost provides the buyer an objective sign of its value and constitutes an incentive for the transaction.

Concluding Claims

Despite their limitations, these analyses suggest some conclusions about the patent assignments in the early 19th century France. The 1791 patent laws made the assignability theoretically easier but they did not lead to much frequent assignments in the medium term. As we have seen, the later were limited to less than 10% of patents - probably 5%. Patents for importation were transferred more than the average but they were not significantly over-represented. The distribution of assignments by industry generally fits with that of the patents themselves. The key factor was actually the duration of patents : even if they were much more expensive, long patents might appear as the safest ones to justify transactions : they provided a potentially longer period of use and a probably better value.

In fact, the initial cost of patents is not only a main issue for applying but also for assigning them. This suggests the question whether the link between capitalist and inventor is and what is, ultimately, the quality of the patentee. It also calls to question the impact of the 1844 reform on assignments. By decreasing the effective cost of patents, the 1844 patent reform introduced undeniably strong demand on applications and promoted increasing issuances since preliminary examination was absent whereas the informal one was made much more difficult by this patent

take-off. In a sense, the 1844 made more uncertain the value of patents. It is probably one of the reasons why patent assignments did not increase as quick as the patent themselves after 1844. The assignment costs raised while the issuance cost lowered. Of course, the total cost of the patent could remain the same for a given term. But, by postponing this entire payment, the 1844 patent law had the signal of the patentee's confidence in his patent disappeared. The financial risk on patent value was increased and had now to be shared by the patentee and the buyer.

Did this inconsistency in the "democratization of invention" reduce the market for patents? Three arguments may qualify this assumption. First such a hypothesis about the influence of the patent cost on assignments is still to be effectively tested. This requires implementing the database on patent assignments in 19th century France. Besides, it seems that actors have found some ways to avoid the new requirements on transfers. While in the first half of the 19th century, licenses or contributions to firm capital were considered as assignments, the legal acception of this notion became much more restrictive in the late century. Consequently licensing was no longer subject to such frequent records. The relationship between the market for French patents and the French market for technology had not the same practical framework. It makes more difficult to track the market for technology but finding new relevant sources is a challenge which historians are used to.

Annex 1 : Logistic Regression

```
Call:
glm(formula = CEDE ~ ANNEE + CLASSE + DUREE + TYPE + VILLE_REST,
    family = binomial(logit), data = INPI)

Deviance Residuals:
    Min       1Q   Median       3Q      Max
-1.0419  -0.3424  -0.2572  -0.2045   3.0764

Coefficients:
                                                                        Estim
ate Std. Error z value Pr(>|z|)
(Intercept)
2.452e+01  6.732e+02   0.036    0.971
ANNEE
-2.867e-02  3.607e-03  -7.948  1.9e-15 ***
CLASSE[T.01C]
1.289e+01  2.581e+02   0.050    0.960
CLASSE[T.02C]
1.303e+01  2.581e+02   0.050    0.960
CLASSE[T.03C]
1.171e+01  2.581e+02   0.045    0.964
CLASSE[T.04C]
1.292e+01  2.581e+02   0.050    0.960
CLASSE[T.05C]
1.262e+01  2.581e+02   0.049    0.961
CLASSE[T.06C]
1.287e+01  2.581e+02   0.050    0.960
CLASSE[T.07C]
1.292e+01  2.581e+02   0.050    0.960
CLASSE[T.08C]
1.215e+01  2.581e+02   0.047    0.962
CLASSE[T.09C]
1.295e+01  2.581e+02   0.050    0.960
CLASSE[T.10C]
1.242e+01  2.581e+02   0.048    0.962
CLASSE[T.11C]
1.279e+01  2.581e+02   0.050    0.960
CLASSE[T.12C]
1.243e+01  2.581e+02   0.048    0.962
CLASSE[T.13C]
1.341e+01  2.581e+02   0.052    0.959
CLASSE[T.14C]
1.284e+01  2.581e+02   0.050    0.960
CLASSE[T.15C]
1.268e+01  2.581e+02   0.049    0.961
CLASSE[T.16C]
1.292e+01  2.581e+02   0.050    0.960
CLASSE[T.17C]
1.243e+01  2.581e+02   0.048    0.962
CLASSE[T.18C]
1.322e+01  2.581e+02   0.051    0.959
CLASSE[T.19C]
1.270e+01  2.581e+02   0.049    0.961
CLASSE[T.20C]
1.270e+01  2.581e+02   0.049    0.961
DUREE
1.384e-01  1.069e-02  12.946  < 2e-16 ***
TYPE[T.brevet     de     d_importation     et     de     perfectionnement]
-3.462e-01  1.080e+03   0.000    1.000
TYPE[T.Brevet                    de                    perfectionnement]
1.116e+01  6.217e+02   0.018    0.986
```

```
TYPE[T.Brevet                                                    d_importation]
1.109e+01  6.217e+02   0.018    0.986
TYPE[T.Brevet  d_importation,  d_addition  et  de  perfectionnement  ]
1.234e+01  6.217e+02   0.020    0.984
TYPE[T.Brevet      d_importation      et      de      perfectionnement]
1.138e+01  6.217e+02   0.018    0.985
TYPE[T.brevet                                                      d_invention]
6.949e-02  8.697e+02   0.000    1.000
TYPE[T.Brevet                                                      d_invention]
1.106e+01  6.217e+02   0.018    0.986
TYPE[T.Brevet  d_invention,  d_addition  et  de  perfectionnement  ]
-2.636e-01  6.927e+02   0.000    1.000
TYPE[T.Brevet  d_invention,  d_importation  et  de  perfectionnement  ]
1.120e+01  6.217e+02   0.018    0.986
TYPE[T.brevet      d_invention      et      de      perfectionnement]
1.777e-01  1.080e+03   0.000    1.000
TYPE[T.Brevet      d_invention      et      de      perfectionnement]
1.127e+01  6.217e+02   0.018    0.986
TYPE[T.Brevet          d_invention          et          d_importation]
1.177e+01  6.217e+02   0.019    0.985
VILLE_REST[T.AUTRE]
-4.401e-01  4.078e-01  -1.079    0.280
VILLE_REST[T.Bordeaux]
-1.875e-01  5.104e-01  -0.367    0.713
VILLE_REST[T.Lille]
7.647e-02  6.181e-01   0.124    0.902
VILLE_REST[T.Londres]
-5.186e-01  4.459e-01  -1.163    0.245
VILLE_REST[T.Lyon]
-7.453e-01  4.821e-01  -1.546    0.122
VILLE_REST[T.Marseille]
-1.518e-01  5.213e-01  -0.291    0.771
VILLE_REST[T.Nantes]
1.915e-01  6.194e-01   0.309    0.757
VILLE_REST[T.Nîmes]
-5.411e-01  8.289e-01  -0.653    0.514
VILLE_REST[T.Paris]
-3.628e-02  4.046e-01  -0.090    0.929
VILLE_REST[T.Rouen]
-4.839e-01  5.592e-01  -0.865    0.387
VILLE_REST[T.Saint-Etienne]
-6.431e-01  7.206e-01  -0.892    0.372
VILLE_REST[T.Saint-Étienne]
-1.127e+01  8.827e+02  -0.013    0.990
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

(Dispersion parameter for binomial family taken to be 1)

    Null deviance: 4839.5  on 12570  degrees of freedom
Residual deviance: 4514.6  on 12524  degrees of freedom
  (5293 observations deleted due to missingness)
AIC: 4608.6

Number of Fisher Scoring iterations: 13

P-Value likelihood ration test : 1.275232e-43
```