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A Socio-economic Analysis of French Public Timber Sales

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Résumé
Une analyse socio-économique des ventes françaises de bois publics
Cette étude socio-économique vise à mieux comprendre le fonctionnement et l'évolution des ventes de bois conduites par l'Office National des Forêts. Le mécanisme d'enchère est l'institution historique qui a été utilisée depuis des siècles en France. La volonté récente de développer la négociation de contrats d'approvisionnement est un changement majeur dans l'industrie du bois française. Cela soulève précisément des questions sur la problématique des prix des bois.

Mots clés : ventes de bois, enchères de bois, prix du bois, forêts publiques françaises, industrie du bois française, institution.

Abstract
This socio-economic study aims to better understand the functioning and the evolution of timber sales held by the French public forest service. The auction mechanism is the historical institution which has been used in France for centuries. The recent will to develop supply contracts through private agreements is a major change in the French timber industry. It accurately raises questions about the timber prices issue.

Key words : Timber sales, timber auctions, timber prices, French public forests, French wood industry, institution.

Classification JEL : B52**,** D44, L73, Q13, Z13.

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1 INTRODUCTION

This study aimes to better understand the functioning and the evolution of timber sales held by the *Office National des Forêts* (ONF), the French public forest service. We offer a socio-economic analysis of general questions about timber sales, such as: the valuation of timber, the objective of the public forest service, but also the impact of the institutional selling procedures on the structure of the wood sector, as well as the role of the social structure and moral factors to maintain or change the auction system.

In fact, timber is a special product. It is a renewable natural resource, but forests take long to grow. The cost of production is not the question when harvesting time comes and the seller needs to estimate the value of a standing timber lot for sale. In that sense, the supply of wood does not rely well on standard production models. Many features come into account when we are talking about forest management and timber sales. The valuation of timber is a central issue. As we will show in this article, it is the demand side that makes the market value of a timber lot.

There are 14 million hectares of forests in France, 26% of which are public forests divided into domanial and communal forests. The domanial forests come from royal or ecclesiastical forests confiscated during the Revolution but also from purchases accomplished by the State since the beginning of the 19th century. The communal forests are also an inheritance from the Revolution. Both of these forests are subject to the forest law. Thus, the sale of public timber needs to be made by a public organism — the ONF. Created in 1964, the ONF succeeded to the "Administration des Eaux et Forêts" created by "Philip le Bel" in 1291 and reformed in the 17th century by Colbert.

Under the control of the Ministry of Agriculture, the ONF is currently in charge of receiving people, protecting nature and forests as well as producing timber. ONF puts on the market 40% of sold timber each year.[1] The use of auction mechanisms is very ancient in France. We can consider that timber auctions, which represent a socially constructed institution, have influenced consequently the shape of the timber industry. Actually, an auction procedure is very useful in order to make a market price emerge. Nevertheless, many reports criticize the lack of competitiveness of the French wood sector (high production cots and foreign trade for wood and wood products showing a debit balance). Most of the complaints are focused on the lack of coordination and organization between the foresters and the wood industry. Thus, the unique use of auctions to sell timber from public forests has recently been reconsidered in France.

This socio-economic study is mainly motivated by this recent institutional change given to the French public forest service which constitutes an unlocking of the institutional matrix represented by the auction system. In 2005, the French government

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[1] A good reference for key data on French forests and the French wood industry is the Memento AFOCEL (2006). Indicators for the sustainable management of French forests are also available from the Inventaire Forestier National (2005).

changed the law in order to allow the public forest service to negotiate supply contracts through private agreements. In revoking the obligation to conduct auctions, the objective of the State is to give more flexibility to the public forest service to improve the efficiency of timber sales in order to help the French wood industry. Truly, it is also due to the lobbying of the *Fédération Nationale du Bois* (FNB), the French national federation for wood, that the State wants the French public forest service to develop supply contract through private agreements with local wood industry. Those new selling contracts are not yet very common, but they give rise to many questions about their application.

The main objective of this paper is to clarify our understanding of the actual functioning of timber auctions and to discuss the evolution of the selling methods embedded in their social context. Our analysis is mainly focused on the auction mechanism, since auctions will still be the main selling method in the future even if there should be a development of private agreements.

Finally and more generally, we would like to stress it is noteworthy to pay attention to timber sales since wood production is still the highest source of revenues from the forest. It is more and more fundamental to manage sustainable forests for their multifunctionalities. But as long as the payments for the other functions of the forest will not reach the cost of a sustainable management, the timber sales revenues must not be neglected. This study on the French case may shed some new light on timber selling practices in other countries.

In the next section, we propose an historical analysis of the evolution of French timber sales. Section 3 presents the sealed-bid first-price auction procedure which is commonly used today in France to sale timber from public forests. In section 4, some brief auction theory background allows us to point out some special features of timber auctions and to discuss their impact on the auction results. Section 5 deals with the rise of private agreements of supply contracts and their consequences on the social structure of the French wood sector. Finally, section 6 concludes this study.

2 A HISTORICAL ANALYSIS OF THE EVOLUTION OF TIMBER SALE PRACTICES

We do not know exactly when the first auction sales for timber took place. Our investigation has led us as far back as 1318, the year of a royal ordinance by Philip V. Nevertheless, a far more precise ordinance dates from 1669, detailing the terms and conditions of the sales in its 52 articles. "*The ordinance has been designated a monument of legislative wisdom and subsisted, almost intact, down to 1827*" (de Colyar, 1912: p.79). It allowed to codify different laws which were sometimes contradictory in order to protect forest rights.

While it is not our aim to go through the history of humankind's relationship with forests, it is however important to understand the situation of French forests back in 1661. It was then that Colbert, the French Minister of Finance under King Louis XIV, decided to launch the "*Grande Réformation*" ("The Big Reformation"). The decisions of the ordinance of 1669 were largely influenced by the situation that prevailed in the

kingdom's forests at that time, pushing it to opt for auction sales as the only way of selling timber.

The Middle Ages was the starting point of the decline in woodland area resulting from an increased need for new arable land for the growing population. The area of woodlands replaced by harvested land is estimated – though no official statistics exist from that period – to have been 30 000 square hectares per year (Badré, 1984). However, we must add to this number the farming practiced by peasants. Indeed, these poor people were often granted woodland for farming from their seigneurs who were intent on keeping an obedient labor force on their lands. This caused significant damage to forests because of the right for mast, which meant that peasants let their herd of hogs scavenge for acorn and beech nuts in the woods. This limited the forest's natural regeneration capacity. In fact, some of these practices are still present in French forests today, such as the right to firewood (*affouage*)[2].

Moreover, despite the use of stone, wood was still used in construction at that time. One of the biggest consumers of construction wood was the Church who – in order to respond to the Catholics' fervent devotion – built so many places of worship that it caused entire forests to disappear. Within 400 years the woodland surface was reduced from 25 million to just 12 million hectares. More than 50% of French forests disappeared without any real measures being taken. Only Colbert's "*Grande Réformation*" implemented strict forestry regulations in order to restrain the medieval practices that had caused so much damage. For a description of the impact of the reforms elaborated by Colbert, especially in history of French forests, see for example: Aymé (1860), Martin (1865), Bechmann (1990), Whited (2000) and Sargent (2004).

2.1 The first royal ordinances: from Philip V to Francis I

Finding a document that would be the first one to establish auctions as the only legal practice in timber trade is not easy. However, already in 1318[3] the ordinance of Philip V mentioned auction sales as the way to sell timber. Article 33 of the ordinance specified that the Masters of Waters and Forests as well as other officers were in charge of organizing auction sales of timber, other sale practices being voidable. By establishing the Royal Supervision of Waters and Forests this ordinance expressed the King's wish to supervise timber trade in order to avoid massive land clearing.

With his ordinance of 1376 Charles V established the first true forestry administration in the French Kingdom. One can find several elements of this ordinance

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[2] The right to firewood (*affouage*) is the possibility given to inhabitants of a village to use wood from a forest owned by the village after paying a tax. The latter is inferior to the price of timber bought on the market.

[3] References come from the compedium of law texts: « *Les édits et ordonnance des roys, coutumes des provinces, règlements, arrêts et jugements notables des eaux et forêts* » written by the Superintendent of Waters and Forests Antoine de Sainct-Yon in 1610.

in Francis I's ordinances later on. His ordinance dating from March 1518 mentioned timber trade and preserved auction sales as the main practice. It contained crucial details concerning the organization of auctions, which were present once again in the ordinance of 1669. Article 1 of the ordinance of 1518 specified that "*the sales will be held and knocked down judicially...*" Moreover, the ordinance was supposed to avoid the forming of cartels by forbidding "*all secret monopolies, intelligence, companies, associations, which cause the timber to be knocked down with a dishonorable price*" (Baudrillart, 1825: p.55).

Auction sales remained the main method of selling the Kingdom's timber. Moreover, competition was favored at auctions during this period. Unfortunately, frauds on a local level, especially from the Masters of Waters and Forests, prevented timber sales from creating the expected financial revenues.

2.2 The Ordinance of Waters and Forests, August 1669: Auction sales as the institutional matrix

All in all, it was the reign of Louis XIV that implemented a large-scale forestry administration. Colbert's Reform of 1661, which aimed at putting some order in the management of royal lands, forbade several practices, reduced the number of officers by removing the most corrupt ones and imposed harsh fines through the inquiries of commissionaires: "*The total sum of fines imposed upon forestry officers, merchants, churchmen or private citizens after the Reform of 1661 exceeded 2 million pounds, while more than 70 000 arpents (35 000 hectares) of fraudulently alienated forests were reintegrated into the royal property*" (Badré, 1984: p.75). It was only after he had restored order that Colbert introduced the ordinance of 1669.

The first lines of the ordinance give a good idea of the situation at that time: "[…] *Although the disorder that prevailed in the Kingdom's Waters and Forests was so universal and so chronic that cure seemed almost impossible; nevertheless the Lord has favored our eight years of application in the name of the revival of this noble and precious part of our property, that today We see it flourish more than ever before, and produce with abundance all the advantages the Public may expect, be it for the convenience of private life, for the needs of wartime, or for the adornment of peace and trade growth through long travels in all the parts of the world.*"

These lines inform us, on one hand, about the difficulties that the Administration had to cope with, and on the other hand, about the strategic needs that the forests could meet at that time. Timber made everyday life more convenient but most of all, it enabled the building of military vessels[4] as well as commercial ships, which were supposed to guarantee the Kingdom's success next to such powerful countries as England.

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[4] To give an idea of the needs in wood: to build a ship, 60 hectares of timber forests were necessary at that time.

Title XV of the ordinance of 1669 – "*Plate, saddling, tree marking and sales of timber*" – is the most important one with its 52 articles. We may distinguish three different parts concerning the sales of the King's timber.

Part one is composed of the first 19 articles and it sets the place of the auction, the people in charge of organizing it as well as other conditions prior to the sale. The aim is to control the people who are responsible for selling the Kingdom's timber and set a public location – namely the courts of law – as the place where the auctions are held.

The second part is composed of the articles 20 to 36 and it sets the formalities concerning the organization and the carrying out of auctions. It fixes the rules of publishing the announcement of auctions and the necessary time period between the announcement and the sales. The latter is necessary to attract enough buyers, which should guarantee satisfactory competition. Articles 21, 22 and 23 go further in assuring effective competition by making auctions transparent and not influenced by favoritism. Therefore, some citizens are not allowed to participate in auctions because of their position (churchmen, governors, officers, attorneys/prosecutors). Moreover, punishments exist and the associations of merchants are closely supervised in order to avoid any risk of collusion.

The third part is composed of articles 37 to 52. It specifies the acts of (successful) bidders from sale till exploitation, the way the woods must be harvested and what the bidders are supposed to do once harvesting is over.

Title XV of the ordinance of 1669 was a key act in establishing auction sales as the main practice in the sale of public timber. Although its articles date from more than 300 years ago they still remain relevant and permit us to consider auctions as the institutional matrix in the field of timber sales throughout France. The title may be regarded as a formal rule, which aimed at assuring economic efficiency in a historical situation that was desperately in the need of some transparency concerning timber sales. In the context of persistent collusion and embezzlement from the people responsible for selling the timber, the political regime managed to install an institution (North, 1990) which largely contributed to creating a far more effective system of timber sales.

2.3 The Forestry Act of 1827 – Renewal of auction – The spreading of this type of sale practice

Almost two centuries after the ordinance of 1669 a Forestry Act was adopted for the first time. During a parliamentary audience on December 26, 1826 – dedicated to discussing the new text – the Viscount of Martignac who was also a Minister of State and one of the King's commissionaires declared that the bill would follow Colbert's ordinance closely: "*We preserved in all the adopted measures everything that the ordinance of 1669 had good, useful and well-tried and we added what experience has proven to be necessary in order to remedy the known downsides.*"

Almost two centuries separated the ordinance from the first Forestry Act. The guidelines Colbert had established were still present in the new legislative text. The main reason for this was that, unfortunately, even after Colbert had restored order in the administration of forests for some time, the massive abuse of woodland continued. Indeed, not long after Colbert's death the situation returned to what it had been before.

The sale practices used while Colbert was in power were soon abandoned because of a growing need for deforested land to satisfy the population's requirements. It was not until the 19th century that introducing a better management of forests became a priority on the political scene again. Auction sales, which had proven to be the best practice in terms of timber trade, maintained their dominant place.

The Forestry Act of 1827 affirmed, just as the ordinance of 1669, that auctions were the only way of selling timber. Article 17 stated: "*No ordinary or extraordinary sale, other than auction sale, may take place in the State's forests; the auction has to be announced at least 2 weeks in advance and public notices must be displayed in the department's chief place, at the place where the auction will take place, in the village where the woods are located and in the surrounding villages.*" Auction sales were considered to be the only way for the State to be sure that no massive fraud or cartels took place.

The Viscount of Martignac told the members of parliament at the audience of December 29, 1826: "*The cuttings that allow exploitation must be knocked down. They are an important source of revenue for the State: it was crucial to keep them clean of any frauds, connivances or even errors. This is what we tried to do. Severe measures are taken to guarantee the publicity of the auctions, competition and the freedom of bids.*"

This statement was repeated before the Chamber of Peers (*Chambre des pairs*): "*The cuttings that have arrived to maturity as well as the forest fruits known as mast and pannage must be subject to auctions; these important sources of public revenue must be wisely preserved from fraud and error. Experience in that field has unveiled numerous dangers against which laws must arm the administration. Carefully combined measures will seem necessary to You in order to guarantee, on one hand, the publicity of auctions, competition and the freedom of bids, and on the other hand, order, regularity, the right limits of exploitation and the repression of abuses that may always occur at auctions.*" (Estrade and Morin, 2006: p.247)

What is interesting about this statement is that some disadvantages related to the very functioning of auctions were mentioned but nevertheless, at that time the utility of this sale practice was never questioned. Attention was justifiably drawn to the need to avoid abuses as well as to implement a repressive system for punishing such acts. Despite the existence of bias auctions remained the compulsory practice in timber sale.

If we pay more attention to the changes that occurred in the Viscount of Martignac's justifications, then we can notice the presence of a new argument compared to previous ordinances – protection against error. What was meant here was the risk of wrongly estimating the value of a wood parcel. From a judicial point of view, the inaccurate estimation of the value of the woods proposed to prospective buyers was in no case a factor tending to defeat contractual liability[5].

In fact, the way auction sales function can provide an additional guarantee against

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[5] French law requires that before the co-contracting parties commit mutually, they must correctly estimate the value of the contract's object, using, if necessary, the help of an expert.

the risk of wrongly estimating the value a wood parcel before the sale. Indeed, the numerous competing buyers gathering at the same place at the same time tend to approach the "true" or real value they think the proposed timber represents. This characteristic of the auction system gives more security to the seller against a possible false estimation of the wood parcels. A report published by the commission in charge of studying the bill of the Forestry Act stated: *"This way we can be sure that selling cuttings at auctions provides us revenues that are equal to the real value of the sold woods."* Analyzing these comments makes it clear that public authorities had once again favored auction sales.

In its historic form that had crossed centuries, auction sales remained the rule in selling public timber and prevailed throughout the 19th century.

2.4 The sales of public timber in the 20th century: a new sale practice and resistance to change

The monopoly held by auction sales for many centuries was first weakened in 1926. For the first time in centuries, public forest timber was allowed to be sold under tight conditions by private agreement, in negotiated sales.

However, auctions remained the main sale practice in France. In fact, sale by private agreement was limited to certain types of woods that were not sold at auctions or could not be sold there because of their small value. That was the case, for instance, of burned forests, windfalls or damaged woods. These parcels, which do not answer the main demand, had to be sold by finding niches. But when it came to the "classical" sale of public timber, the system of auctions was never questioned.

A historical analysis of legislative changes throughout the 20th century shows that certain inflexibility exists concerning the sale practices of timber. The part of the Forestry Act about sale practices was slightly transformed in 1969 to allow sales by mutual agreement. Nevertheless, their use remained related to some sort of dispensation: *"Sales by mutual agreement can be used, as a dispensation of the above-written Article 17, exclusively for imperious technical and commercial reasons."*

Despite the Duroure report[6] in 1982 stressing the necessity to propose new sale practices to secure the future of forests, sales continued all over the country to be carried out in the form of auctions.

According to several reports on the forest industry, it lacked competitiveness due to the absence of significant change in the field of sale practices. One of the reports, written by former minister Jean-Louis Bianco and entitled "*The forest: a chance for France*" (1998), was based on the Duroure report and heavily criticized the organization of timber sales. It noted that there was a serious problem related to the competitiveness of timber prices in the French wood industry in 1998. Meanwhile, in 1985 a report by the company Jaakko Pöyry had placed France first among European countries in terms of competitiveness in timber supply. Bianco showed that as a result of the random character of the auction system a sawmill that processes 20 000 cubic meters of logs is forced to buy hundreds of lots and estimate 5 to 10 times more lots on the parcel. This means significant waste of time and energy.

Modernizing sale practices was one of the main suggestions Bianco made: "*A quantified objective must be debated concerning the negotiated supply contracts in order to guarantee a provision with stable and foreseeable prices in the industry. […] The amount of 30% of sales a few years from now would not be unreasonable.*"

The situation described in the reports was taken more seriously starting from 2001. That year for the first time since centuries the law on forest orientation allowed other sale practices than auctions to be used in situations not covered by a dispensation. Article 11 of Chapter 2 about the sale practices of the ONF (National Forestry Office) now stated: "*Sales by private agreement may be used for technical, commercial or economic reasons in the case of and according to the modalities defined in the decree by Council of State. Supply contracts lasting several years may be signed.*" However, since the application decrees were not properly composed the use of sales by private agreement have remained extremely rare on the field and the difficulties related to supply persist.

The Juillot report affirmed these supply problems in 2003, making them the first

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[6] Roger Duroure wrote this report as a Member of Parliament. In his propositions, he suggests to generalize sales of harvested timber which can reduce the risks linked to the persistence of standing timber sales. Indeed, timber sales allow the seller to stock wood the way he wants, stopping buyers from making their timber supply in advance. Moreover, if the two methods are conserved (standing timber and harvested timber), the seller takes the risk of cutting wood and proposing this wood without finding a potential buyer (who has already constituted a stock purchasing standing timber). R. Duroure recommends to change the actual legislation in order to put on market harvested timber, proposed in private treaty sales: "*we have to delete the obstacle that does not allow the Office to proceed like this in national forests and broaden the cases in which the seller can use private treaty sale of harvested timber*" in "Propositions pour une politique globale forêt-bois". Rapport Duroure, 1982, NS, *Revue Forestière Française*.

element of its analysis. It repeated the remarks of Bianco report[7] and recommended also more contractualization during sales by private agreement[8].

The law of February 23, 2005 "*on the development of rural territories*" finally implemented this in its Article 134-7: "*Cuttings and the products of cuttings in the State's forests and woods are sold by the National Forestry Office either through auctions or calls for tenders, either by private agreement, according to the conditions fixed in the decree by Council of State.*"

From now on, the people at the ONF in charge of selling timber are free to choose between auction sales and sales by private agreement. 80 years after the appearance of the first dispensation, sale by private agreement has become an independent sale practice promoted by the ONF.

Before presenting the rise of those new private agreements, let's analyze the timber auction procedures as they take place nowadays in France.

3 THE FRENCH SEALED-BID FIRST-PRICE AUCTIONS

Thus, auctions are a long tradition to sell timber from public forests in France. The auction mechanism does not seem to have much evolved during all those years. The most important change probably occurred in the late 90's when it has been decided to abandon the decreasing oral auction in favour of the sealed-bid auction. In the decreasing or the descending price auction (also called Dutch auction) the auctioneer begins with a high price which is lowered until a buyer is willing to stop the auction and to pay the last announced price. In the first-price sealed-bid auction, the bidder who submitted the highest bid wins the good and pays the amount of the bid. The main

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[7] *"Founded in general on individual sales of small-size heterogeneous lots, they have multiple consequences: high direct costs, difficulty to rationalize the logging and transport, necessity to have a costly important security stock to compensate the lack of visibility in timber supply, brakes for the concentration or standardization of the first transformation. Once well adapted to small firms located in proximity markets, theses methods are now unanimously recognized by sellers and buyers as an important origin of impairments, on open markets where concentration is a necessity."* (Juillot, 2003: p.37).

[8] *"[...] A part bound to be proposed in private treaty sales, by reference to sales conditions and price lists negotiated and announced in advance. These private treaty sales should be applied to isolated lots or on multiple, annual or semi-annual deliveries (usually called timber supply contracts). This plan tries to reduce uneconomical costs of timber mobilisation linked to the estimation of articles which have not been bought, to the obligation to maintain important security stocks, to the difficulty of rationalizing logging and transports in the actual plan. It should permit to adapt the timber industry more easily to the downstream market which needs more homogeneous products."* (Juillot, 2003: p.40).

motivation to change for the first price auction was to give more information about the market valuation to the seller but also to the bidders[9].

In the texts, there are three auction formats that may be used: the sealed-bid first-price auction, the oral decreasing auction and the oral increasing auction (also called open-out cry auction or English auction). But, the increasing oral auction is not used in France. The refusal evoked by buyers and sellers are based upon their mental representations which influence their knowledge concerning this auction protocol. According to sellers, the increasing auction facilitates collusions between buyers, especially in timber sales, where the participants are often the same. The presence of a social network settled in a regional area reduces competition between buyers. The risk is that during an ascending auction participants may refuse to make a higher bid and share the timber once the sale is finished. For the buyers, opposition to using the increasing auction is as strong although the reasons are different. With the increasing auction buyers are afraid to get worked up with the prices of timber during the sales. There is a hazard to have a price war, particularly during the periods in which the supply of wood is inferior to the demand. This danger is also underlined by the agents of the ONF for whom it raises a moral problem. They think that they have a mission of public service towards the timber industry. As a result, they prefer to use other auction protocols. Finally, both the buyers' and sellers' representations, even if they are different, appear unanimous against the increasing auction. This common opinion acts as a social brake to the application of the increasing auction for timber sales in France.

Hence, most of timber auctions held by the French public forest services are first-price auctions of standing timber lots. Some few oral decreasing auctions are still held in France, but those exceptions concern sales of harvested timber in the Eastern region of France influenced by the Germans.

So let's concentrate on the sealed-bid first-price auctions of standing timber lots here. We first present the auction rules, than we will pay some attention to the characteristics of the good sold, the standing timber lots, and finally we will briefly characterize the bidders.

3.1 Auction rules

Bidders may submit their bid by mail before the sale, but most bidders attend the sale and submit their bid when the seller announces the lot or the tract they are interested in. The highest bidder wins the auction and pays the submitted price (first-price auction) unless the highest bid does not reach the seller's reserve price. French public timber auctions are thus *lumpsum* sales since each bidder offers a total bid for an

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[9] Indeed, sealed-bid first price auctions are conducted "with transparency", *i.e.* when there are five or more bids, the two highest losing bids are publicly revealed. But to keep secret the identity of the bidders who submitted the losing bids, the seller only reveals the highest losing bid when there are only three or four bids, and he does not reveal any losing bid when there are two or less bids.

entire tract of standing timber.[10]

Sequential auctions

Timber auctions are sequential auctions of heterogeneous goods. Usually about one or two hundred lots are put on sale successively. Lots are all different from each other, but a sale catalogue describes their composition, volume, location, etc. The catalogue is available before the sale so the potential buyer can visit the lots.

There are interdependences among the lots. Some may be close substitutes; whereas there may be synergies among others. For example, two distinct lots but close to each other may offer cost savings for some buyers. Thus, it is tricky to look at the efficiency of the auction mechanism from a theoretical auction model which only considers the sale of a unique object.

The sequential aspect of timber auctions is important since most of the buyers want to buy more than one lot and thus actively participate in more than one auction. Besides, sequential auctions raise the question of the order of the lots in the sale. The ONF, the French public forest service puts on the market timber from *domanial* forests which belong to the state, but he also conducts auctions on the behalf of local communities whose forest are administered by ONF. So, to eliminate any conflict among the communes and the public forest service, the first lot is sometimes randomly drawn, then the director of the sale follows the order of the catalogue in which the lots are gathered by territorial units and by forests. Actually there is no clear answer to the question whether it is better to be in the beginning or at the end of the sale, but since every person may have his own opinion, the random draw seems quite fair to everybody.

Secret reserve price

Given the structure of the timber market (few buyers) and the flexibility of the seller (who is not constraint to sell since the timber is still standing), it is in the seller's interest to fix a reserve price. That reserve price is kept secret in French public timber sales. There is no clear rule how the reserve price is defined by the director of the sale (or the commune). The reserve price is based on the appraisal value made by the technician who did the tree marking, but also on the current market for wood and on the prices obtained in previous sales.

A remarkable fact about the secret reserve price in French public sales is that the seller does not commit to any price. The reserve price is usually defined before the sale, but the seller might increase or decrease it as the auction proceeds. The seller may decrease the reserve prices if the appraisal values have been over estimated given the market state and if many lots go unsold. On the opposite, the seller may increase some reserve prices if the objectives in terms of receipts are already met. Actually, the seller may even change the reserve price when he sees the bids. In this way, he can use the bids to revise his estimation of a lot. This practice can have an important impact on the bidders' strategies if they are aware of it. Indeed, if the bidders know that their bids

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[10] In the U.S. for example, there exists another type of auction known as a "scaled sale" in which bids are made on a per unit basis. The payments to the Forest Service are based on the winning bidder's unit prices and the actual volumes measured by a third party (a "scaler") at the time of harvest.

influence the seller's appraisal value for the lot, there is an incentive for them to send the seller bad signals which of course is not favorable to the seller's interests. This is particularly true when the timber supply is high and there are many unsold lots.

Nevertheless, if the highest bid is not high enough from the seller's point of view, then the lot is withdrawn and the seller must announce a reserve price. If the lot is sold to the highest bidder, or if there is no bid, which happens regularly, then the seller does not give any reserve price.

Negotiation of unsold lots

So, in timber auctions it is quite usual for the seller to end up a sale with unsold lots. When the French timber market was difficult a few years ago, unsold lots reached more than 50% of a sale. Such a high level of unsold lots may result from quantitative and qualitative problems between supply and demand, but also from a selling mechanism problem in such timber auctions. Indeed, a sequential auction mechanism may not be adapted to the sale of heterogeneous lots. For example, some bidders may not bid for some lots because they prefer the followings and hope to win the most valuable lots for them. Thus, it may be difficult to reach an efficient allocation with a sequential auction mechanism.

Besides, it is well known in French public timber auctions that unsold lots can be negotiated after the sale. If the negotiated price of withdrawn lots is not supposed to be lower than the highest bid received during the auction, it is quite usual that the negotiated price is below the ex post announced reserve price. Again, this fact has an impact on the bidders' strategies. Since they can negotiate unsold lots below the reserve price, this lowers their incentives to submit aggressive bids during the auctions.

Finally, the practice of secret reserve price and negotiation of unsold lots may lead to strategic behavior by the bidders. For example, a bidder who sees he is the only buyer interested in a lot, may submit a very low bid just to constrain the seller to announce his reserve price and so he is better informed to negotiate the lot afterward.

3.2 The timber lots

Timber is sold by lots which contain all the marked timber in a well defined area. Usually this area is about 12 hectares on average, but there is a wide range going from less than 1 hectare to more than 300 hectares. A typical lot would contain about 500 cubic meters of wood, but again the total volume of wood in a lot can range from less than 20 cubic meters to more that 2500. Not only those lots are heterogeneous, *i.e.* different from one to another (volume, species, qualities, location, etc.) but they are also composed of heterogeneous wood. Indeed, standing timber lots may contain many species, many qualities of wood, trees may have different diameters, etc. This is particularly true since there are many non-even age mixed stands in France.

As a consequence, when it is time to harvest, the public forest service does not really decide the characteristics of the timber lots. The seller must sell timber produced by the forest. Nevertheless, he has to decide how to compose the lots (size, type of cutting, composition, etc) and how much to offer each year. Of course, those aspects have an impact on the buyers' valuation of each lot and also on their bidding strategies.

But let consider that lots are already defined, and the director of the sale needs to know what is the lowest acceptable price for each lot.

As a matter of fact, it is not straightforward for the seller to know what his real reservation value for a lot is. Timber takes so long to grow, that it is not production cost that matters when time comes to harvest. In addition, the public forest service should also take into account non-market values of the forest (recreation value, carbon sequestration, biodiversity…) in choosing when and how to harvest. Indeed, to define a pertinent reserve price, the seller must know what are the most important objectives he wants to achieve. Is it to maximize the total revenue of a sale? the volume sold? to meet a budget balance? to maintain timber market prices? to supply the wood industry to preserve the French wood sector? to maintain and manage French public forests for other non-market uses and services?

Actually, the public forest service has multiple objectives which explain why it is a difficult task for the seller to determine what the reserve price should be. We will later see that, from a game theory point of view, not announcing a reserve price might have negative impacts on auction results. From a practical point of view, the seller's difficulty to assess his own reservation value can explain why the French public forest service does not commit to any reserve price.

Finally, it is mostly the market demand that defines the market price. Indeed, the use of auctions helps the seller to better know the market demand and the market valuation of different timber lots. Using past timber auction results, the seller can estimate the value of a lot depending on its characteristics. This transaction evidence appraisal approach has been developed in the 80's by the US Forest service (see Préget and Waelbroeck (2006) for a hedonic price function for French public timber auctions). The objective of a seller is thus to compose lots that attract as many bidders as possible and to make sure he is getting a "fair market price" for each lot depending on the characteristics of the lot. The decision concerning which part of a forest will be logged depends on several factors resulting from a silvicultural management but also on the need of the wood industry and the revenue objectives of the ONF.

The valuation of a timber lot for a potential buyer is easier since he knows more or less the harvesting and transportation costs of a particular lot, what he can produce with the wood and at what price he would be able to sell the products. So, even if there are uncertainties concerning the volume and the quality of a timber lot, it is easier for the buyers than for the seller to determine their reservation value (*i.e.* the maximum price they are willing to pay for the lot).

Nevertheless, the potential buyer usually needs to see the lot, i.e. to conduct a "cruise" of the tract before the auction in order to make a correct estimation of his value. The catalogue gives general information about the lots, but the seller does not commit to anything, especially, the volume announced is just an estimate. The prospecting costs are relatively important in timber auctions. Most buyers visit the lots they intend to bid on and since they do not know in advance which lots they will win, they need to prospect many more lots than they want to buy.

3.3 The buyers

The world wide market for wood influences timber prices everywhere. Nevertheless, standing timber needs first to be harvested, thus timber sales have quite limited geographic markets and almost only local buyers participate to French public timber sales. The cost of trucking logs to mills limits the size of the geographic market.

There are about fifty potential buyers in a typical French public timber sale, but all the buyers are not interested in all the lots. Most buyers have precise demands about the species, the qualities, the diameters of the trees, etc. Actually there are many timber markets which are more or less independent. Therefore, the number of actual bidders for a given timber lot may be quite low. It is only 2.46 bidders on average in the study by Préget and Costa (2004) and 22% of the lots did not receive any bid.

All the bidders are not interested in the same lots because the potential buyers are different: there are logging enterprises, sawmills, paper mills, board factories, etc. Moreover, the bidders have different sizes and different locations. Consequently, they have very different qualitative and quantitative demands. Some bidders may need only one or two lots whereas some others may want more than fifty.

Thus, there is an important asymmetry of bidders in timber auctions. Of course, this is related to the fact that lots are heterogeneous, but it would be very tricky to define distinct timber markets, since they are all connected and interdependent in some ways. As a matter of fact, there is a resale market for logs. There is not much information about this resale timber market, but since the lots are very heterogeneous, many bidders do not need all of the logs they buy, so they sell the rest to other buyers. Besides, many buyers are just loggers that buy lots to harvest the wood and then sell it to the wood industry.

4 SOME INSIGHTS FROM THE AUCTION THEORY

Auction theory has expanded considerably for the last 25 years. Based on non-cooperative game theory, auction theory takes into account the strategic interactions of the agents in simple framework models that yet often lead to important analytical difficulties. Actually, the above presentation of French public timber sales shows that timber auctions differ a lot from most theoretical auction models. Nevertheless, we propose in the following to position timber auctions in the auction theory literature so as to extract some pertinent results for timber market design and to discuss some of the most important features of timber auctions from an auction theory perspective.

4.1 A basic auction framework

From an economic point of view, what justifies the use of an auction mechanism is the asymmetry of information. If the seller would know the buyers' valuations for the

good, he would go to the buyer with the highest valuation and would offer to sell the lot at the highest buyer's valuation price if that value is above his own reservation value. The seller conducts an auction so as to make the potential buyers to compete for the good and thus to reduce the benefit they get from their private information.

The agent that organizes the sale is assumed to be a monopolist facing a limited number of potential buyers. Auction theory assumes the seller has the capability to commit to the auction rules he defines himself (allocation and payment rules). If the seller's commitment is not reliable, the bidders would react through their bidding strategies and the seller would lose his market power.

Let first consider the sale of only one object with a known number of risk neutral bidders. Each bidder has his own private value for the object. Moreover, all the bidders are assumed to be ex ante symmetric in the sense that the private values are random variables independently drawn from a same commonly known distribution function.

In this simple auction framework, it has been proven that the four standard auctions (the ascending, the descending, the first-price and the second-price auctions[11]) lead to the same expected revenue for the seller. This result is known as the equivalence revenue principle (see for example: Riley and Samuelson, 1981; Masking and Riley, 1985). Naturally, this theorem relies on strong assumptions that are not satisfied in most applied auctions.

4.2 Private values model versus common value model

The model described above is an *independent private values* model. There is an opposite reference auction model called the *common value* model in which the value of the object is imperfectly known at the time of the auction but is the same to all the bidders. It is usually assumed that the bidders only receive a signal or an estimation of the true value of the object.

The auction literature has mainly developed around those two extreme paradigms even if they were conciliated in the *affiliated values* auction model (Milgrom and Weber, 1982). We can first wonder which assumption on bidders' valuations fits best the case of timber auctions. Actually, many arguments may justify both of these models and both assumptions have been used in the literature on timber auctions.

We can argue that since the volume and the quality estimated are different depending on the usage of the wood (especially for hardwood), timber auctions are independent private value auctions because each bidder have his own utility of the wood and his own harvested cost. Studies assuming the symmetric independent private values model for timber auctions include Johnson (1979), Hansen (1985, 1986), Paarsch (1992b, 1997), Cummins (1994), Elyakime *et al.* (1994), Carter and Newman (1998), Campo, Perrigne and Vuong (2000), Li and Perigne (2003) and Athey, Levin and Siera (2004).

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[11] In a second-price sealed-bid auction, or Vickrey auction, the bidder with the highest bid win the object but pays the amount of the second highest bid.

Nevertheless, the few buyers that participate in timber auctions know each other quite well. We believe that this argument better shows that the bidders are asymmetric. Indeed the location of each bidder compared to the location of the lot is common knowledge, and it is the transportation costs that influence most the harvesting costs[12]. The buyer's plant and location and the characteristics of his timber demand (volume, quality) are not private information. Also, since log piles are highly visible, mills cannot readily conceal their inventory position. So, obviously, there are private values components in the valuation of each lot by each bidder, but the assumption of symmetric bidders is quite disturbing.

Opposed to the independent private values assumption, it can be argued that the most prominent component in valuing a standing timber lot is uncertainty as to the volume and the quality. So a common value model would better fit the case of timber auctions.

Empirical results from Haile (2001) on U.S. Forest Service timber sales suggest a common value element is also introduced by resale opportunities. The bidder's willingness to pay increases with the expected competition level in the resale market. Haile distinguishes the purely private usage value for the buyer and the estimation that each bidder has upon the fact of winning the auction and which includes the resale opportunities. As a matter of fact, resale opportunities need to be taken into account in French timber auctions since the lots are so heterogeneous. Once harvested, woods need to be sorted depending on their use.

The choice among the private values and the common value models is not simple. Haile, Hong and Shum (2004) propose nonparametric tests for common values in first-price sealed-bid auction, but their application on lumpsum U.S. timber sales yields to mixed results.

4.3 Secret reserve price

To our knowledge, all the timber auction models in the literature assume the seller perfectly knows his reservation value for the good, but we saw in section 3.2 it is a real challenge for the public forest service to assess the value for a given timber lot. Yet, this fact is crucial when the objective is to define the optimal reserve price. It is important here to make the difference between the seller's reservation value which is his own private valuation for the lot, and the reserve price which is an optional selling instrument the seller can choose.

Announcing a reserve price is a common practice in auctions so as to insure a minimum selling price. Besides, it has been shown that announcing a reserve price can increase the seller's expected revenue and that there exists an optimal reserve price, even if that reserve price may ex post lead to an inefficient allocation (*i.e.* not selling the

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[12] Of course, for very high quality lots, the harvesting costs and the location of the lot are much less important components of their value.

object whereas there is a bidder with a valuation higher than the seller's value). See for example Myerson (1981). Announcing a reserve price leads to more aggressive bidding, but it is the commitment not to sell the good below the reserve price that makes the reserve price profitable for the seller.

The practice of a secret reserve price is less common in auction literature, but some articles refer to the use of a secret reserve price: Ashenfelter (1989) in arts and fine wines auctions; Hendricks, Porter and Spady (1989) and Hendricks, Porter and Wilson (1994) talk about random reserve price in auctions for oil and gas leases.

Yet, Riley and Samuelson (1981) claim there is no advantage for the seller to keep his reserve price secret in an independent private values model. Considering French timber auctions, Elyakime, Laffont, Loisel and Vuong (1994) show it is strictly better for the seller to impose a minimum bid than to fix a secret reserve price. From their analysis, it is always better for the seller to announce his reserve price.

Nevertheless, many articles justify the use of a secret reserve price in some particular frameworks. For example, under some conditions on bidders preferences and the distribution of private values, Li and Tan (2000) show that the use of a secret reserve price can be profitable for the seller when the bidders are particularly risk averse. In common value second-price auctions, Vincent (1995) gives an example in which a secret reserve price increases participation and the linkage between the price paid and the value of the object. From a study on eBay internet auctions, Bajari and Hortacsu (2003) suggest that it is better to use a secret reserve price than to fix a minimum bid.

Thus, the use of a secret reserve price can be justified by the existence of a common value component, by risk averse bidders, by the fact that announcing a reserve price lower the bidders participation, etc. Nevertheless, a clear analytic response to the question on secret reserve price still does not exist.

Moreover, the previous analyses assume there is a credible commitment from the seller on his secret reserve price, *i.e.* the seller can not change the reserve price when he sees the bids. But in French timber auctions that commitment does not exist. The ONF may change the reserve price at any time. As a matter of fact, in practice, many lots are sold at price below the a priori reserve price (Costa and Préget, 2004). That proves the seller uses previous auction results and the buyers' bids to revise his secret reserve price. But in fact, if the reserve price is secret, then it should be optimally fixed to the seller's reservation value. Indeed, there is no strategic impact on bidders' strategy to fix a higher reserve price. For the seller it is always profitable to sell the lot if the highest bid exceeds his reservation value. So, if the seller changes the secret reserve price when he sees the bids, that means he revises also his own reservation value. This proves the seller does not perfectly know his reservation value. Yet, it is a crucial assumption in auction theory which deals with optimal reserve price: the seller perfectly knows his reservation value. Obviously, the ONF uses the bidders' bids to revise its estimation of a lot. Of course, if the bidders take this into account in their bidding strategies, that practice may create an incentive for the bidders to send bad signals to the seller.

4.4 Sequential auctions

Sequential auctions are studied in the auction literature but lead to formidable analytical difficulties. Indeed, analysis of sequential auctions is delicate because the amount of information varies continuously during a sale. At the beginning, the agents don't know much about the market conditions, the level of competition, the market prices, etc. But along with the sale, information gets better.

There are many articles on sequential auctions, but given the multiple specific assumptions of each models (on the auction type, private or common value setting, perfectly identical goods or not, goods with complementarities or not, unit or multi-unit demand from the bidders, etc.) it is not easy to focus on pertinent literature for timber auctions. Besides, given the complexity of sequential auctions, most articles only consider the sale of two goods, or present only examples. So it is difficult to draw general and robust results from the literature on sequential auctions.

However, many empirical studies on sequential auctions refer to the "declining price anomaly". From a theoretical point of view there should be no trend in the price sequence, but in practice many studies show evidence of decreasing prices.[13] Consequently, many articles offer theoretical justifications to explain this phenomenon: bidders' risk aversion (McAfee, Vincent, 1992), complementarities among goods (Branco, 1997 ; Menezes et Monteiro, 2003a), a decreasing number of bidders in successive auctions (Engelbrecht-Wiggans, 1994), participation costs (von der Fehr, 1994), supply uncertainty (Jeitschko, 1999), budget constraints (Pitchik and Schotter, 1988), the possibility for the winner to buy other units at the same price (Black and de Meza, 1992) or to choose the preferred good among the left ones (Gale and Hausch, 1994), etc.

We are not aware of any studies that focus on the pattern of prices in timber auctions. The only insight we have on this question for French timber auction comes from the empirical research on timber appraisal of Préget and Waelbroeck (2006). Unexpectedly, they found that prices tended to increase during the sales of fall 2003 Lorraine timber auctions.

As we have suggested earlier, it might be difficult to reach an efficient allocation of heterogeneous timber lots with a sequential auction mechanism. An efficient allocation would be an allocation where each lot is attributed to the bidder with the highest valuation for the lot taking into account the potential complementarities among the lots.

Gale and Hausch (1994) study a two sequential second-price auctions in which two bidders have private values for each item. They show that a buyer may submit a low bid for the first item ("bottom fishing") despite its being his less-preferred item. Using an example, they show that the sale has declining prices, is inefficient, and gives lower expected revenues than the efficient right-to-choose sequential auctions in which

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[13] See for example: Ashenfelter, 1989; Ashenfelter and Genesove, 1992; Vanderporten, 1992; Lusht, 1994; Beggs and Graddy, 1997; Gandal, 1997; Deltas, 1999; Deltas and Kosmopoulou, 2000; Lambson and Thurston, 2003.

the winner chooses her preferred item among the remaining items.

When there is a correlation between the valuations, the bidder may be careful to not reveal his information in the first auctions. In a theoretical model, Caillaud and Mezzetti (2003) analyse this phenomenon when two identical items are sequentially sold in ascending auctions and the reserve price is announced before each auction. When there is perfect correlation between the two items' valuations, some bidders may choose not to participate in the first auction (even though their valuation is above the reserve price of the first auction) so as to incite the seller to lower his reserve price in the second auction. Even if the framework is more complex in timber auction, there is no doubt that some bidders might have this kind of strategy.

An alternative mechanism to sequential auction would be to auction simultaneously all the lots. For example, in the U.S., the FCC uses a simultaneous multiple-round auctions and package bidding to allocate licenses for electromagnetic spectrum.[14]

Under the assumption of common value auctions, Hausch (1986) claims there is no clear dominance among the two mechanisms (sequential versus simultaneous auctions). Nevertheless, as the number of items increases, it is more likely that the seller prefers sequential auctions. There are so many lots that are sold in a timber sale, that indeed simultaneous auctions would be quite difficult to handle in practice.

4.5 Collusion and manipulations

"The most important issues in auction design are the traditional concerns of competition policy - preventing collusive, predatory, and entry-deterring behavior." (Klemperer, 2000, p.102)

The collusion issue is widely studied in auction theory, but it is also a complex topic. From a general perspective, the lower the number of participants, the bigger is the risk of collusion. Moreover the assumption of anonymous and symmetric bidders usually retained in auction models does not hold in timber auctions. Timber buyers know each others quite well, which might help them to coordinate.

For Mead (1967), ascending oral auctions would be more vulnerable to collusion than sealed-bid first-price auctions because oral auctions allow identifying the bidders, and so facilitating retaliation against the ones who failed to cooperate (exclusion and punishment). Indeed Robinson (1985) shows that cartels are stable in the ascending oral auction, but not in the first-price auction. Nevertheless, what is important to Robinson is less that the auction is oral or written, than the fact that the bidders from the cartel may or not regret their collusive strategy if one of them starts to deviate. Thus, from his analysis, decreasing oral auctions and first-price auctions would be less vulnerable to collusion than the increasing oral auction.

There are many empirical works on collusion in U.S. timber auctions. Brannman

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[14] See Krishna and Rosenthal (1996) for a study on simultaneous auctions with synergy within the independent private values assumption, with global and local buyers.

(1996) studies the impact of potential competition on selling prices in oral ascending auctions and in sealed-bid first-price auctions. His results suggest there is collusion in both auction formats. Baldwin, Marshall and Richard (1997) also found that a collusive model outperforms a non cooperative behavior model for Pacific Northwest public forest timber sales in the late 70's. More recently, Sareen (2004) showed a phenomenon of tacit coordination between dominant buyers in Ontario timber auctions.

Even if we are not aware of any studies on collusion in French timber auctions, that topic needs to be closely taken into account. Besides, the sequential and repeated pattern of timber auctions with the population of same bidders increases the risk of coordination. Although there is no explicit collusion, the seller needs to be concerned with tacit coordination. For example, there might be a tacit geographic rule among the local buyers: no bidder would dare to compete for a lot that is to be found in a well known bidder's area. Even if this example is efficient regarding transport costs, such a tacit rule may lead to biased auction prices since it lowers competition.

The existence of a social network between the buyers lead to the respect of moral obligations built among the group. It is risky to break the social rule "one does not take over the neighborhoods' area" since one can be put away from the network (social sanction). This has been analyzed by Ben-Porath (1980) for the diamond market. As explained by Granovetter (1985), social relations are responsible for the production of confidence in economic life. Fraud is more efficient if it is conducted by teams, and teams require an internal confidence level. Indeed, the strong structure of the network participates to the setting up of an "organized fraud" which would be much less easy if individuals were atomized.

From another perspective, Jacobsen (1999) reports about timber auction in Russia that when the number of bidders is low, the auction may easily become a bilateral negotiation between the seller and the most likely buyer. The result of a such negotiation could be a Nash equilibrium in which both parts divide the total surplus among themselves depending on their relative market power.

5 IMPROVING TIMBER SALES

Even if it is not an actual objective of the French government to improve the auction mechanism used to sell timber, we think that it would have been useful to question some practices in timber auctions while developing a new format of sale with private agreements.

In the following, we propose to summarize the main issues of timber auctions that appear to be the most questionable. Then, we briefly present the supply contracts that the French public forest service intends to develop through private agreements. Finally, relying on recent interviews from the concerned agents, we point out the main problems with the application of the new law on timber sales.

5.1 Improving timber auction mechanism

The literature on auction theory gives interesting insights for an economic analysis of timber auctions. Nevertheless, "Good auction design is not "one size fits all." It must be sensitive to the details of the context." Klemperer (2002, p.184). Besides, as Roth (2000) says, to deal with applied cases, other tools need to be developed to address the complexity that comes from the strategic environment itself, and from participants' behavior. Computational methods are very useful to analyze games that may be too complex to solve analytically. Laboratory experiments help to better understand how bidders behave. Empirical analyses from real data give precious information to understand real auctions in practice. Therefore, we believe that many approaches need to be combined in order to improve the market design for timber sales. In addition to the economic approach, a sociologic point of view also helps.

We believe there is a crucial issue: it is the capability of the seller to commit to a set of rules. As we said before, credible commitment is crucial in auction theory. So the way the French public forest service official modifies the secret reserve price when he sees the bids and allows the negotiation of unsold lots after the sale are two practices that necessarily affect the bidders' strategy and thus the equilibrium outcome. These two practices are linked, but we are not aware of any model that would examine them in the context of timber auctions. Nevertheless, McAfee and Vincent (1997) develop a theoretical model in which the seller posts a reserve price but can not commit never to attempt to resell it if the object fails to sell. They show that "as the length of time which the seller can commit to keeping the object off the market goes to zero, her revenue converges to her expected revenue from an auction with no reserve price." Thus they explain that although the seller would sometimes like to impose take-it-or-leave-it offers, he often cannot credibly commit never to attempt to renegotiate in the event that no sale occurs. This inability prevents the seller from extracting much surplus from the transaction, a phenomenon called the "Coarse conjecture."

In a timber auction, there is no way the seller can commit to never put unsold lots for sale again. Nevertheless, he could commit to not negotiate the unsold lots immediately after the sale. The unsold lots could then eventually be rearranged or modified and auctioned again in the next sale campaign which takes place many months later, sometime the coming year. Since lots are standing timber, there should be no hurry for the seller. In addition, the ONF should be able to commit easily on this practice. This recommendation would probably give back to the seller some market power in timber sales.

However, the main concern in timber sales is not only the share of the transaction surplus, it is also the efficiency of the allocation procedure. As we saw earlier, the sequential mechanism might not be the best procedure regarding the efficiency objective. In fact, negotiation of unsold lots may have a positive impact on the efficiency issue, since it gives to the buyers a second chance to fulfill their needs.

The issue of the reserve price is interesting. As a matter of fact, if the seller does not have much information on his own reservation value, it might be quite reasonable to not announce any reserve price, and to keep the right to withdraw the lot if the highest bid does not reach an updated appraised value from the seller's point of view. Nevertheless, the seller has to be aware of the negative impact of this rule. So to prevent the strategy of the bidders to send him bad signals by lowering their bids, he might want

to commit to a secret reserve price if he is able to define a pertinent one before each auction. Announcing a reserve price can be quite dangerous if the timber market is not really competitive and if there are many unsold lots. The risk is to sell only the lots that have been under estimated by the seller and to sell most of them at the reserve price. Indeed, there is a real threat of collusion or even tacit coordination at the reserve price here. So finally, even if it appears to be awkward from most auction models, it might be the less bad option given to the seller in this context.

Still related to the seller's commitment, we know that prospecting costs of bidders' cruises represent important social costs which are deducted from the timber price and that the seller should try to reduce. As an idea suggested by Barzel (1982), it would be in the seller's interest to prevent any cruises if this would have no impact on the number of bidders and their belief on the value of each lot. As the matter of fact, it might be difficult for high quality hardwood lots to forbid the bidders to visit the lots, but for more standard products, the public forest service could increase the timber sale efficiency if he could prevent bidders to visit the lots by giving reliable and complete information. Of course, it is crucial for the seller's reputation to commit to give all the information (good or bad).

Finally, even if game theory is a powerful tool to better understand strategic impacts of different rules, different environments, different assumptions, etc., theoretical auction models quickly reach some limits of complexity. As a matter of fact, every result from auction theory relies on strict assumptions. Thus, implementation of new rules needs to be conducted carefully. From our understanding of the French timber auctions, there are a few assumptions that should be relaxed in order to better fit the timber auction case. The most important are to take into account that timber auctions are *sequential* auctions of *heterogeneous* goods with *asymmetric* bidders. However, the combination of those three features leads to extreme analytical complexities. The will to develop sales by private agreement must not lead to consider the question of the analysis of auction as a secondary one. On the contrary, we will see that actually the price fixing of supply contracts relies on the auctioned prices. Thereby, the auction mechanism continues to represent a priority issue for the research on timber sales.

5.2 The rise of private agreements

The present time represents in the trade of public timber a revolution as big as Colbert's ordinance was in its time. The law for development of rural territories of 2005 and its decree of 2006 allow the authorities to take a new look at the established auction institution. Besides the possibility to choose between sales by private agreement and auction, this new legislation brings a deep change into the industry in terms of timber supplies. The institutional lock-in[15] that has been in place for more than three centuries is about to be changed.

Several causes have lead the legislature to adapt the legal system to the new priorities of some of the industry's agents.

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[15] For a description of the phenomenum of "lock-in" see for example Arthur (1989) or Hathaway (2003).

Competition on the international timber market is one of the reasons mentioned by the industry's representatives. Leaning mainly on the above-cited reports that highlight the industry's low level of competitiveness, the FNB (the French national federation for wood) lobbied the authorities in order to obtain a sale practice which would guarantee regular supply as well as a price fixed in advance. Thus, due to the development of sales by private agreement, which in most cases concern annual or even multi-year contracts, the companies in need of a volume of timber have better control over their supply costs. On the one hand, they no longer need to go estimate the standing timber for each lot that interests them in the catalogue. On the other hand, the supply contracts that have been negotiated by private agreement mostly concern a particular species and determined quality. One of the contracting parties is no longer in possession of a heterogeneous parcel forcing him to sort the wood and build a network of buyers to sell the species and the qualities he is not interested in. Thus, the buyer of a supply contract can dedicate himself entirely to the management of his industrial activities.

Indeed, it is important to note that supply contracts that should develop in France are supposed to be on harvested wood (logs piled at roadside). Thus, not only the selling method is changing from auction to negotiation, but the object to be traded is also changing. Most agents (buyers and sellers) do not make the distinction, but to analyse the situation it is important to make the difference. Indeed, a supply contract is not a selling method, it is a product. We could imagine that a supply contract is put on sale through an auction. Besides, there exist auctions of harvested timber. Supply contract of standing timber might be difficult to establish, that may be why people confuse supply contracts of harvested wood with the selling method used to sell them which is negotiation of private agreements.

As a consequence, some arguments given in favor of negotiation of supply contract are actually arguments to trade harvested wood. For example, for public timber producers, the will to propose timber in a supply contract negotiated by private agreement follow an economic goal. From their point of view, it appears that selling standing timber at auctions as it is done today prevents them to gain the value added from logging and sorting the wood. Actually, the ONF wants to take back this value added captured by the forest loggers. Since timber lots are very heterogeneous, sorting wood once it is harvested is assumed to be quite profitable. Nevertheless, some ONF officials disagree with that argument. They think that harvesting costs are under estimated, and moreover, it is important to know exactly what the buyers want in order to sort the wood efficiently.

The real argument for changing the auction selling method is indeed political. The development of supply contracts should reduce log exports and promote the processing of timber in France. The authorities' goal is to maintain industrial activity and employment in the forestry business stricken since many years. Selling standing timber at auctions has promoted the international trade of hardwood timber towards Eastern countries and China. Logging costs being extremely low, the timber is sent in containers, logged abroad and returned as finished product. France's role is limited to the production of timber thus leaving the transformation – the source of added value and employment – to foreign countries. This situation explains why several agents in the timber industry compare France with a developing country. Consequently, by giving the supply contracts that have been negotiated by private agreement solely to industrial companies, the authorities wish to relocate timber processing into local plants.

The difficulties of supply that some agents encounter in the timber industry has caused regrets and even a feeling of guilt to some people in charge of selling timber (ONF and communes). The « *intrapsychic conflict between the pleasure and moral valuation* » (Etzioni, 1986: p.177) has led agents to take into consideration in their preferences others factors besides the benefit realized from the timber parcel put up for sale. If, in the seventeenth century Colbert justified the setting up of auctions with the need to struggle against frauds in the French kingdom during timber sales, then three hundred years later, the reason given does not concern the maximization of benefit obtained during the sales but the future of the timber industry.

In reality, this political will resulted in the redaction of the « *State – ONF* » Plan for the period 2007 – 2011. The aim of this Plan is to raise the supply contracts negotiated by private agreement to 35% in domanial forest and to 25% in communal forest. Supply contracts consist of guaranteeing a certain volume and quality of harvested timber during a fixed period. The procedure to fix the price is written in the contract to assure clarity to both co-contracting parties. The aim of the buyers is to ensure a regular supply. For the sellers, contracts give a high visibility of the timber industry's different needs. Meanwhile, the development of supply contracts involves managing the supply on a regional scale leading to changes in the constitution of timber lots. Until now, each agency composes its own lots for the auction sales more or less independently. However, a supply contract may now be composed of wood from domanial and communal forests and so leads to a more integrated management among the different agencies in each the region.

5.3 *The problems faced with this new policy*

Resisting the change

The new legislation concerning timber sale practices implies a deep change in the organization of public timber sales. Indeed, supply contracts are not supposed to be negotiated with forest loggers (Marty, pers.com 20 June 2007). The exclusion of forest loggers from supply contracts accounts for a structural change in the timber industry which does not correspond to the standard idea of a transition between stable states. According to the standard model the adaptation is uniform for all agents, but in the reality the transition is more like a complex phenomenon wherein the final state is uncertain.

The uncertainty is interrelated to « *the unavoidable weaving of temporality* » (Koleva, 2002). Whereas the legislation of timber trade waited during a long time before being deeply changed, once the law was published it took just one year to apply its decree. To compare, the time to see habits and networks change is rather slow. This leads to the resistance of some agents in the timber industry concerning the path drawn by the institutional matrix.

Thereby, due to the influence of forest loggers' social network and some economic and moral arguments mentioned by a part of the timber industry, the social inertness around auction leads to a more complex change in timber sale practices.

The impact of the social structure in the evolution of timber sale practices.

The impact of the social structure, particularly in the shape of social networks, affects economic results (Granovetter, 2005). Thus, in order to fight the promoting of contracts that have been negotiated by private agreement at the expense of auction, forest loggers organize opposition using their influence in the timber industry.

Most of the buyers are united in the FNB (the French national federation for wood). This lobbying entity who influences the decisions concerning forestry policies gathers, in a single identity, professions which often tend to have different objectives. Hence, clashes sometimes occur, e.g. in the policy of timber supply. The evolution of legislation tends toward a scission between forest loggers and sawyers in the FNB.

A moral factor steps in favor of a reconsideration of the contracts in the « State – ONF » Plan. Besides the disappearing of companies, change of the majority in communes and staff transfers at the ONF, agents on the local forestry market often remain identical. A relational propinquity is created between the different agents. This relational propinquity establishes a relation based upon trust between the seller and buyer in trade exchange, which at the same time could result in a reciprocity system. This reciprocity system (Polanyi, 1944), working simultaneously with the trade system, causes a dependence between the forest seller and buyer. As a result, reserving the supply contracts strictly to processing industries, the social relation settled between timber sellers and forest loggers may deeply change. Indeed, some ONF agents have the feeling of betraying a favored customer which proves the influence of moral values in their judgment.

The principle of equity is clearly highlighted concerning the refusal to purpose supply contracts to forest loggers – a decision made by the ONF. The questioning is about the legitimacy of the ONF's decision about the consequences for the forest loggers. This situation exposes the ambiguity in the choices realized by the ONF's local agents to give contracts. The strength of social relations between forest loggers and sellers takes influence in the tenacity to locally maintain or not the auction as the institutional matrix for public timber sale practices. Other forces add to this strength to restrict the local development of supply contracts.

The cost to introduce supply contracts of harvested wood

The aim given in the « State – ONF » Plan raises questions about the capacity to realize on a large scale supply contracts for harvested timber on the French territory. Hitherto, only the ONF's agencies in Alsace and Moselle used to harvest timber themselves and sell harvested timber. The generalization of this practice on bigger volumes induces problems for the ONF and communes, especially about knowing who will harvest the timber. Nowadays, the ONF does not have enough staff and the required skills to assume this job.

This is a fundamental constraint for the ONF's agents, even if they should be favorable to supply contracts. In that case the argument is to say that harvest work could be outsourced to companies specialized in logging activities.

The risk of information loss about the real value of timber

According to the members of the timber industry, the price setting of timber is another big issue. Indeed, an auction provides information about the estimation of timber value to all the participants. Despite the existence of standards for timber qualities, ratings stay greatly subjective and bring numerous discussions between the protagonists of a sale. It is possible to find significant differences about the value of a

parcel among forest loggers depending on the future using of the timber. The differences of the buyers' prices can be very significant. Till now, the size of the volumes proposed at auctions in different parts of France allowed agents to identify and follow the trend on the timber market.

The difficulty of the supply contracts concerns the price revision depending on the market evolution. The risk in a supply contract for the co-contracting parties is to have an inadequacy between the prices they use and the rates found on the rest of the territory.

Finally, the solution that seems to have been put into practice consists of setting the prices of supply contracts and their revision depending on the prices obtained at auction sales. This solution – which reveals the primary role admitted to the auction system to maintain relevant information about timber prices – raises questions from agents in the timber industry. With how much reliability will the prices obtained at auctions expose the market value, meanwhile the volume of timber allocated in the catalogue will be smaller than in the past? Moreover there may be bias in timber appraisal value from auction prices, since it is more likely that supply contracts develop for standard softwood products, but not so much for high quality hardwoods. Besides, auction prices correspond to standing timber lots; it might be not so easy to convert those price indices to negotiated harvested wood prices.

Agents' reservations about the possible consequences on timber prices of the introduction of supply contracts are various. For some buyers, and even for some sellers, the small volumes will lead to a price escalation during auctions, notably because of forest loggers who would have just these sales to guarantee their supplies. Others are of the opinion that since supply contracts will be settled depending on the prices obtained during auctions, buyers should avoid to confront each other during auction sales in order to maintain low prices. A theoretic applied study on timber market with auctions and negotiation would shed some light on this issue. But, the various concerns about consequences have in common a mistrust concerning the reality of the prices applied in timber sales, whatever be the sale practices used by the co-contracting parties[16].

6 CONCLUDING REMARKS

In this article we focused on the selling mechanisms for timber from French public forests. The interest of our socio-economics approach was to consider these selling modes as evolving social constructions. The adaptation of selling methods depends on the power struggle among the wood sector agents. In France, the auction mechanism is the historical institution used for centuries to sell public timber. This competitive selling system partly explains the present structure of the French timber

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[16] First applications will take place in September 2007. It will be interesting to see the evolution of the prices during the sales and the evolution of the agents' representations during each new participation.

industry.

From the perspective of the auction theory, French timber auctions present interesting features. The seller's reserve price is kept secret and some unsold timber lots are negotiated after the sale. Thus, contrary to what is usually assumed in auction theory, there is not much commitment from the seller in French timber auctions. In addition, timber sales are sequential auctions of very heterogeneous lots with asymmetric bidders. As a consequence, most auction models do not fit the case of timber auctions. In fact, we showed that in order to set a pertinent reserve price to get a "fair market price", the difficult and crucial issue for the seller is first to define his own reservation value. The recent will to develop supply contracts through private agreements is a major change in French public timber sales and accurately raises questions about the timber price issue.

Because timber is a special product, the difficulty to define a "fair market price" remains the central issue in public timber sale. The auction mechanism has been used for a long period of time to overcome this problem to a certain extent. Actually, the auction mechanism keeps its role of price discovering, since the price of negotiated supply contracts is in some way supposed to be indexed on auction prices. Nevertheless, auction prices may lose a significant part of their pertinence if auction sales account for a volume of wood that becomes smaller and smaller as more and more timber is sold through private agreements.

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