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# Random drawing in sequential auctions: investigating the role of a market device in timber sales

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## Abstract

The Office National des Forêts (ONF) in France uses sequential auctions to sell a significant portion of timber from public forests. This mechanism, based on a competitive dynamic between buyers, relies on randomization at two key moments: at the start of the sale, to determine the order in which timber lots are auctioned, and at the end, to break ties between bidders who submit identical offers. This article explains why, from the sociological perspective of markets, this informal institution, which was introduced at the request of municipalities and some buyers to ensure equal treatment, is not legitimized by the ONF. It examines whether participants' perceptions are consistent with patterns of auction prices through an empirical analysis of bid data from these sales. The article also investigates the reasons why the ONF has been randomly selecting winners in cases of tied bids for over two centuries and, more recently, with the digitalization of sales, has opted for a new market device based on the order in which offers were submitted.

**Keywords** Timber auctions · Institutions · Market devices · Market organization · Random drawing · Economic sociology

**JEL Classification** D44 · L73 · Z1

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## Introduction

The French timber sector faces challenges due to a lack of structuring of its economic fabric and a dispersed supply of timber (Cour des comptes, 2020, p. 22). The availability of timber upstream in the supply chain is a crucial issue for the competitiveness of the timber industry. While the volume of timber has increased by 45% in 30 years, its exploitation remains difficult due to natural limitations (e.g., a steep slope in mountainous areas) and the management of private forests (Cour des comptes, 2020, p. 25). Private owners hold three-quarters of forested land (3.5 million people share more than 12 Mha), but only 50,000 of them own more than 25 hectares (52% of the private forest area and 75% of timber sold) (Cour des comptes, 2020, p. 25). The fragmentation of private forests limits their exploitation (only one third is exploited), leading timber buyers to source from the public forest. The latter being the property of the State, local authorities, and public establishments, it is subjected to the forestry regime (Loisier, 2019)—a set of rules instituted under the Ancien Regime, which entrusts the ONF<sup>1</sup> with the protection of the forest, its management, and the organization of timber sales. This regulatory feature gives the ONF a central place in the timber industry. The ONF is the leading timber supplier, accounting for 40% of marketed volume, and is also a key player for many municipalities, whose main source of revenue is timber sales (Escande-Vilbois & Lacroix, 2002).

As such, the question of the mechanism used for the sale of timber is crucial for all the participants concerned. Faced with this major challenge, the legislators—as “market organizers” (Ahrne et al., 2015)—have put in place sale mechanisms in order to attract a regular supply of buyers at a price considered competitive, while ensuring that the ONF and the communities maximize their earnings.

They have drawn up a regulatory framework, which, for the past 15 years, has allowed the ONF to choose freely—depending on the types of timber sold—between supply contracts negotiated by mutual agreement and the auction system<sup>2</sup>. While the first mode of sale, adapted for timber with homogeneous qualities (softwood lumber, industrial wood, and fuelwood), guarantees buyers a volume of timber at a price negotiated in time and ensures visibility in terms of revenue for the ONF and the communities, the use of auctions is preferred for the most valuable timber species (hardwood lumber) that have features of “singular products” (Karpik, 2010), for which value estimation is more complex.

In the latter case, organized competition is preferred for its economic efficiency because it leads buyers, in a context of information asymmetry, to reveal their

<sup>1</sup> The French National Forest Office (ONF) is a state-owned industrial and commercial establishment in charge of managing forests in mainland France and in French overseas departments and territories.

<sup>2</sup> While, in 2005, sales by private agreements represented only 37% of the volume of timber sold, compared to 63% for the auction system (excluding individuals collecting estovers); in 2021, their share reached 59% (41% for auctions) even if sales by private agreements in value represented 48% against 52% for auctions because high-quality timber (oak, wild service trees, etc.) is mainly sold in auctions (ONF 2022). For an analysis of how market organizers were confronted with a path-dependence situation when they tried to reorganize selling methods in the beginning of the twenty-first century, see Marty (2010).

willingness to pay. Theoretically, this public sales mechanism is chosen because it ensures transparency by guaranteeing an equal treatment of bidders and a unique selection mechanism of the winner. The transparency of the sale mechanism is also crucial in the fight against corruption of public officers (Cohen & Mougeot, 2001). To win a lot, it is sufficient—whatever the identity of the bidder—to submit a higher bid than other competitors. It, therefore, appears to be “*a means of ensuring that the timber is sold to whoever will make the best use of it for the benefit of the entire industry*” (Dequiedt, 2006, p. 478). However, in this mechanism based on a competitive dynamic between buyers, market organizers have introduced random drawing at two key moments: at the start of the sale, to determine the order in which timber lots are auctioned; and at the end, to break ties between bidders who submitted identical offers. The presence of this market device then raises the question of the place given to chance in a process, which, by nature, excludes it (Bonnain & de la Pradelle, 1987). How can we explain that, in the sequential auction process implemented by the ONF, random drawing is carried out twice? Should we consider that this market device participates in or, on the contrary, calls into question the expected characteristics of the auction system? To what extent is this, more or less, a formalized practice legitimized by the participants involved?

Our study, which addresses these questions, is based on different contributions from economic sociology paying specific attention to (1) institutions, “*a dominant system of interrelated informal and formal elements—custom, shared beliefs, conventions, norms, and rules—which actors orient their actions to when they pursue their interests*” (Nee, 2010, p. 55) and the way they affect market processes (François, 2011); (2) market devices (Muniesa et al., 2007) and the instruments adopted by public authorities to regulate the practices of economic agents (Dubuisson-Quellier, 2016); (3) the balance of power existing locally between the actors regarding the mobilization of these instruments (Yakubovich et al., 2005; Ansaloni et al., 2017); and (4) price determination mechanisms (Aspers 2013; Eloire & Finez, 2021), in particular those drawn up in the case of auctions (Garcia-Parpet, 1986; Marty, 2015a, b; Smith, 1989; Velthuis, 2003). Based on a field survey conducted among key players in the timber sector and an econometric analysis based on sales data provided by the ONF, we analyze the position conferred to random drawing in this market organization (Ahrne et al., 2015), its scope and the reasons for questioning its use when selecting the first lot auctioned and for breaking ties between bidders.

## Methodology and scope of the study

This research was carried out mainly with participants from the Grand-Est region and from the Bourgogne Franche-Comté region<sup>3</sup>. We first conducted 60

<sup>3</sup> The “*Grand Est*” and the “*Bourgogne Franche-Comté*” regions are both administrative territories located in the East of France. The “*Grand Est*” region borders four countries (Belgium, Luxembourg, Germany, and Switzerland) and covers 57,441 km<sup>2</sup>. Located south of the latter, the “*Bourgogne Franche-Comté*” region borders Switzerland and covers 47,784 km<sup>2</sup>. Both regions have a rural character, and the forest represents a third of the territory.

semi-structured interviews with groups of participants in the timber sector. In the first group, made up of 28 buyers, three criteria were used to select the participants: their professional activity (operators, sawyers, and packaging and panel manufacturers), the timber species used (hardwood/softwood), and the volume of timber processed (from 10,000 m<sup>3</sup> for the smallest sawmills to nearly 600,000 m<sup>3</sup> for the largest sawmill). In the second group, made up of 13 ONF commercial officers, we accounted for the geographic location of the agencies and their function within the ONF's commercial department in order to get a representative sample of the entire chain of command within the ONF. As for the last group, it is made up of 18 municipal officials and their representatives within the National Federation of Forest Municipalities (FNCOFOR) and its regional branches. The selection of municipalities was made according to their forest areas to take into account the importance of timber sales in their budget (from 57 ha for the smallest to 650 ha for the largest). Finally, we interviewed a forestry expert to obtain details about the sales methods used in the case of private forests. The average duration of the interviews was 1 h and 10 min. The survey was completed by observations made during 6 auction sale sessions held in the Grand Est region, bringing together between 60 and 100 buyers and an over-the-counter sale based on online bids. Finally, the econometric analysis was based on seven standing timber sales provided by the ONF, which took place in June and July 2016 in the Grand Est region. During these seven sales, 1206 lots were put up for sale for a total volume of 383,844 cubic meters. We provide additional details about the data below.

In the first part, we discuss the random drawing of the first lot in a sale. We show that, although this market device of ordering lots based on chance aims to offer equal treatment between sellers, its application in practice varies according to the participants' representations of the price evolution in the sequence of a sale, as well as to the balance of powers between the local authorities and the ONF. We show, in this context, that the lack of legitimacy ascribed to random drawing by the ONF is mainly linked to the absence of a cognitive framework, established by scientific knowledge, confirming the variation of lot prices according to their position in the sale sequence. The development of an econometric model, based on sales data provided by the ONF, allows us to compare the contradictory representations of the participants with the reality of the bids and to conclude that, over the period studied, prices tend to follow a downward trend during the sale.

The second part of our article is devoted to the issue of deciding between tied bids in an auction. We first explain that, although the choices made between tied bids appear to be in contradiction—in terms of market design—with the rule of selecting the highest bidder as the winner, it is in accordance with the participants' desire not to question the sale mechanism used, which is renowned for its ability to build consensus on the value of timber lots. We describe the two institutions used to decide between competitors who have submitted tied bids. We show how, for nearly two centuries, the selection of the winner was made by random drawing, before being replaced—with the recent switch to online timber sales—by arbitration based on the timing of bid submission (i.e., in the case of tied bids, the bidder who submitted the first offer wins) in order to maintain the public nature of this procedure.

All quotes in the main text are from the interviews conducted by the authors with various buyers and sellers, as described above.

## Random drawing of the first lot: an informal institution that sparks controversy

Timber sales, whether by auction or over-the-counter transaction<sup>4</sup>, follow a similar procedure. Carried out throughout the year, these sales are of timber sold “standing” (the customer buys standing timber and is in charge of its exploitation thereafter) or “processed” (the ONF harvest the timber before selling it)<sup>5</sup>. Once the timber has been sold, the buyers must ensure its exploitation within 12 months in order to allow the ONF to continue the forest management of the lot. However, this period can be extended free of charge for 6 months, which can be further extended by additional 6 months for a fee, giving rise to a speculative phenomenon among buyers who delay the exploitation of lots during periods of abundant supply.

From an organizational point of view, timber sales are entrusted to the department heads of the 48 territorial agencies<sup>6</sup> of the ONF. This is to respond as closely as possible to the expectations of local buyers in terms of timber resources. This gives rise to sales where we mainly find buyers located near the forests from which the lots originate. All timber sales have the particularity of being sequential, that is to say that, during a session, several dozen heterogeneous lots (by species, volume, location, types of cut, etc.) are successively auctioned, knowing that there may be interdependencies between them, some being substitutable while others are complementary. It is, therefore, up to the ONF to prepare the sequence of lots as well as possible to integrate all these parameters and maintain the competitive dynamic between buyers. To do this, each department head draws up the list of lots that he or she plans to sell, taking into account the supply needs of the sector and the volume of timber to be exploited within the framework of forest management (improvement cuts, definitive, etc.). The department head prepares a sales catalog, which specifies the location of the plots, the type of species, the number of stems, and the volume by category as well as the contractual clauses specific to each lot. Thanks to this

<sup>4</sup> The private sale procedure was approved by the ONF’s Board of Directors on November 29, 2018. As of 2019, it replaced the auction and competitive bidding procedures still present in the sales regulations. It differs legally because it authorizes the ONF to select the participants, knowing that it is no longer public but private. This modification offers, for example, the possibility of reserving the lots for buyers who guarantee exploitation will be carried out within the French and European sectors. On the other hand, in terms of economic theory, this procedure has the same characteristics as the first-price bid auction system.

<sup>5</sup> According to data recorded on the site “ventesdebois.onf.fr,” the ONF carried out, in 2021, 231 sales sessions on tender relating to 15,699 lots of timber, i.e., an average of 68 lots per sequence. The total volume marketed per tender was 5,002,800 m<sup>3</sup>, split between timber sold standing (92%) and processed (8%).

<sup>6</sup> In regions with many public forests, the agencies generally cover a department (e.g., the Metz agency for Moselle, the Epinal agency for Vosges). In areas with fewer public forests, the geographical coverage is greater (e.g., the Rennes agency for all of Brittany).

market device, potential buyers can more easily identify the lots that interest them in order to estimate their value. In the sales catalog, the lots are classified by territorial agency, then by ownership type (state, departmental, municipal)<sup>7</sup>, and, finally, by alphabetical order. However, the ONF's choice to start the auction sequence by following the order of the catalog is the subject of recurring criticism from municipal officials as well as from buyers. Many of them feel aggrieved by this decision, considering that the order in which the lots are presented in the sales sequence has a significant impact on the prices obtained. It is, therefore, to remedy what is experienced as unequal treatment that these participants wanted to introduce the procedure of random drawing lots for the first lot auctioned<sup>8</sup>. However, given that this institution does not constitute a formal rule, its application on the French territory is not widespread and depends both on the balance of power between the parties involved and on their representation on the presumed effect of the order of auctioning of the lots on the sequence of prices.

### **Random drawing: guaranteeing equal treatment in the presence of price variability**

In general, random drawing is used in order to maintain the social cohesion of a group in the face of the potential risk of conflicts in situations considered as unfavorable by one of the parties involved (Bromberger & Ravis-Giordani, 1987). The acceptance of fate is explained by the belief of the individuals in the capacity of chance, introduced in the procedure, to guarantee an equal treatment among all participants: *“Well, people, they like to be drawn by lot [...] It's a question of coincidence, the game of chance, the French like it”* (Municipal official no. 16). This belief in *“the choice of fate”* (Catani, 1987, p. 278) is particularly present among participants (bidders and sellers) who believe that prices vary as the auction sequence progresses.

### **The belief in price variability over the sale sequence**

Our interviews reveal that municipal officials located at the beginning of the alphabet have the feeling that prices tend to appreciate during the sale. This representation of the upward dynamics of auction prices is also shared by some timber buyers. For the latter, several reasons explain this phenomenon. The increase in auction prices over a sale sequence may come from the wait-and-see strategy adopted by certain buyers at the start of the session who, having difficulty in estimating the trend in the market, do not submit bids on the first lots or submit low bids: *“At the start of the catalog the*

<sup>7</sup> For example, in the department of Meurthe-et-Moselle, the catalog will first offer lots from the state forests of Haye, Parrot, Puvenelle, then those from the communal forests of Baccarat, Bettainvillers and end with the lots from the communal forest of Xirocourt.

<sup>8</sup> Although the people interviewed indicated that they had always known about this procedure, we were unable to determine its genesis, given that it represents an informal institution that has never been mentioned in the forestry regulations.

*sawyer waits to see the price fixed during the sale. So, the first owner to sell his lot will certainly sell it at a lower price than the one who is in the middle or at the end of the catalog. The municipalities that start with an A or a B always sell their timber cheaper than those that start with an S or a T* (Timber buyer no. 7). This strategy of low bids is, according to the buyers, a way to guard against a possible risk of over-inflating the price of future lots by signaling at the start of the sale that timber demand is high.

Another reason relates to the fear of finding oneself at the end of the sale without the necessary volume of timber, leading to an increase in the bids on the last lots put up for sale: *"the first served are always cheaper and the last served are always the most expensive. Lately it's like that, you start a sale by invitation to tender, the first lots are at 50 €, we end the sale at 62 €, 63 €, the municipalities have an interest in being at the end"* (Timber buyer no. 17). The potential risk of overbidding at the end of the catalog is considered very serious: *"I do not agree. We're going to start with the agency X, people will buy, the sale is going on, and of course not everyone is served. So, you know when the sale starts that there is an upward trend, and the more the sale goes on, the more the prices go up, by 5, by 10, by 15% on certain lots. And as our sector is the agency Y or Z, what we could have bought for, let's say, 100 € at the start, we pay 110–120 € at the end of the sale, because everyone bids for the remaining lots. They want to buy, they are going to force the prices up, and all of the sudden we are screwed. So, I do not agree, I am more in favor of random drawing"* (Timber buyer no. 27).

For municipalities located at the end of the alphabet, the risk is also real but for opposite reasons. Municipal officials, for their part, consider that the number of potential buyers decreases drastically as they obtain the volume of timber necessary for their activity: *"We can always say to ourselves that if we did it in alphabetical order, once the first lots are gone, perhaps there would be less interest in the last ones"* (Municipal official no. 5). The lesser competition necessarily translates into a drop in price offers at the end of the sequence or even an increase in the number of unsold lots, which can only push the municipalities to accept a revision of their reservation price: *"Well, the problem is that in my opinion, we risk fighting at the beginning of the alphabetical order because people will want timber, and if everyone is served when it's the turn of a municipality which starts with Z for example, it will always be penalized because it will arrive at the end of the series, and at that point it will be happy to sell its timber at a discount. If it's the last one, it will be discounted."* (Municipal official no. 12).

For some of these municipal officials, dissatisfaction with the procedure is reinforced by the fact that they are required to delegate the sale of their timber to the ONF<sup>9</sup> considered both judge and defendant. They consider that this legal constraint allows the ONF to favor the sale of state-owned timber at the expense of local timber

<sup>9</sup> In 2012, this challenge was the subject of a question before the Conseil d'Etat, the French highest administrative jurisdiction, of compliance with the rights and freedoms guaranteed by the Constitution of Article L-144-1 of the Forestry Code, asked by the municipality of Angles. In its decision, the Conseil d'Etat considered that, if there was, indeed, a limitation of the right of local authorities to dispose of their property, this was justified by the general interest objective of having a national forestry policy, a coherent and concerted approach, in particular with regard to the development of forest resources.



owned by the municipalities, especially since 2002, with a reform requiring the ONF to pursue economic profitability (Boutefeu, 2002). For these municipal officials, this situation would explain the choice of the ONF to position the lots of state timber at the start of the session to ensure better revenue: *“the state lands are more pampered”* (Municipal official no. 1). Based on this observation, these municipal officials believe that the ONF lacks partiality in setting up the catalog order: *“I have the feeling that we are not all in the same boat. They take us for customers, they are at home in the estate, we are customers, we are no longer considered owners”* (Municipal official no. 15). Hence, their wish to impose a random drawing of the first lot permanently at the start of the session: *“It is better to do a random drawing at each sale”* (Municipal official no. 12). Convinced of the presence of a significant variation in prices during the auction sequence, these municipal officials are in favor, like some of the buyers, of random drawing of the first lot at the start of the session: *“It is better to draw lots at the start of each sale”* (Municipal official no. 12). This demand shows that the price is not only the simple result of free transactions but that it can be linked to an institutional process based on a non-economic value (Eloire & Finez, 2021). In this *“field of struggle”* (Garcia-Parpet, 1986, p. 13), the determination of the price implies beforehand an equal marketing of all timber lots. Regardless of the outcome, the equality of opportunity at the start is enough to legitimize the procedure in their eyes.

### The various forms of random drawing

The random drawing of the first lot usually consists of putting numbers written on a piece of paper in a box and asking a customer present in the room to successively draw the hundred, the ten, and the unit in order to designate the first lot offered for sale. From there, *“we open the catalog at the number indicated and then scroll down and start again from the beginning of the catalog once we have reached the end”* (ONF staff no. 12). But, in the absence of a precise rule for this device, other formulas have emerged: *“I see in region Z, it was systematic, first of all the municipalities were all mixed together, not divided by territorial unit like here, and we drew lots for an article number, it fell on a municipality and we proceeded from there afterwards. Whereas here, the few times we made a draw, we have drawn a territorial unit, and within that unit, we proceed in alphabetical order”* (ONF staff no. 3). In this version, the draw is only partial because it does not modify the order of the lots at the ONF branch level<sup>10</sup>. More recently, the implementation of online sales has made it possible to test a new form of drawing lots operated by a digital application: *“we are even going to improvise since the drawing lots are going to be done digitally... we imported the list of lots into Excel and we do it on a little Internet app that pulls a lot number randomly. We left the cap and the papers... we lost a bit of the folklore”* (ONF staff no. 11).

<sup>10</sup> A branch manager explained to us that he did not draw lots strictly speaking but, instead, reserved the order of municipal lots and state lots to show his or her commitment to acting in the interest of the municipalities.

## Random drawing: An institution with weak legitimacy

Despite some participants' desire to randomize the order of presentation of the lots, its use in sales varies across regions according to the balance of power between the directors of the ONF, the municipal officials, and the buyers. It, thus, happens that, locally, the organization—as “*a form of interaction among people*” (Ahrne and Brunsson, 2011, p. 89)—produces common patterns of behavior favorable to random drawing, which becomes institutionalized over time: “*If some here don't do it, Elsewhere it's almost obligatory, it's more of a custom, but if we didn't do it elsewhere, it would be a nuisance for the municipalities [...]*” (ONF staff no. 3). In regions such as Auvergne Rhône Alpes where “*they are very keen on the fact that we start randomly within the catalog*” (ONF staff no. 10), the drawing of lots is a historically well-established practice. Elsewhere, its practice is much less marked. Some municipalities do not show great interest in the sale of timber because the forest resource held represents only a small part of their income. They are not interested in the impact of the organization of the sale on prices and rely on the choices made by the ONF. Others, on the other hand, depend greatly on the sale of timber to finance their budget and believe, from their concrete experience of sales, that it is dangerous to leave the determination of the first batch to chance: “*[...] random drawing is not always fair in fact. Because according to the quality of the catalog, it's quite simple, but if we take the sales of softwoods in the Jura, in principle the lots are always a little less beautiful than the batches from the Doubs. So, depending on how we start, it can give slightly different benchmarks. Sometimes, depending on the order of things, there is a sale, if the draw is not very successful, that does not start the sale on a good basis*” (Municipal official no. 18).

The threat of a price effect caused by the drawing of the first lot is also present among timber buyers. Some cite the fear of seeing the most coveted lots auctioned at the beginning of the sequence, when it is still difficult to gauge the trend in prices that will emerge. If these same lots are offered at the end of the sequence, other buyers are concerned about the risk of overbidding between the buyers who would not have obtained the expected volume of timber.

However, the strongest opposition to the drawing of the first lot comes from the ONF, which does not hesitate to dispense with this informal arrangement, pointing out, first of all, that, during the last discussions held with the representatives of the clients and of the forest communes on the sale of timber, the question of the order in which the lots were presented was not raised. Not being perceived as a thorny subject for its business partners, the ONF does not consider it necessary to randomly draw the first lot, knowing that its implementation may also prove difficult to organize in sales, bringing together several regional agencies. In this type of session, where the lots are classified for each agency in alphabetical order, the ONF sells the lots agency by agency. This succession of independent sales sequences means that it is not one but several draws that the ONF should carry out during the session. According to the sales managers, the multiplication of draws during the sequence would add confusion in the monitoring of the lots and reduce the pace of the sale. To overcome this difficulty, the ONF could group all the lots from the agencies in alphabetical order. However, this solution was rejected because, on the one hand,

it would annoy customers by extending their presence time at the sale: *“Sales must meet customer expectations and the agencies are still geographical and known to our customers. Some customers will buy in some branches and not in others. Lots cannot be mixed across regional agencies. This would reduce clarity for buyers”* (ONF staff no. 13), and, on the other hand, it would complicate the holding of the sale. For example, random drawing could lead a sales director not to start the session in the order of his or her lots, forcing him or her to wait until the end of the sequence to put the rest of his agency’s lots up for sale, which *“in terms of convenience, that’s not good at all”* (ONF staff no. 12).

In addition to the constraint of sales involving several agencies, there is also that of the recent marketing of hardwoods labeled “EU Transformation.”<sup>11</sup> Reserved only for buyers subscribing to this label, these lots are systematically placed at the start of the session: *“so as not to have to juggle between a labeled lot and an unlabeled lot”* (ONF staff no. 12).

Finally, the opposition to the random drawing of the first lot was reinforced by the fear of encouraging data entry errors among customers who are not yet familiar with online sales: *“with our online sales system, we already have so many problems, the customer who gets the wrong lots, etc.. If, in addition, there, we do not start from the first lot. No, no, I am really not in favor. I don’t see the point, and then, no, no, really not”* (ONF staff no. 10). The confusion that this could create among buyers is counterproductive, while keeping the order of the catalog easier to create a dynamic that brings customers in: *“into a sort of stress tunnel, which will be a stress that will lead to higher prices and bids”* (ONF staff no. 13).

Beyond the evocation of these organizational constraints, the rejection of the draw at the ONF is based on the absence of belief of an effect on the price caused by the order of presentation of the lots: *“No, we never saw any impact. We looked at it, we never saw it, because in fact when the client... When he makes his estimates, he is not aiming for an exact number of lots, and he can decide to buy it anyway. For me, it’s more about the representation that the municipalities have”* (ONF staff no. 10). The drawing of lots procedure seems perfectly useless in this case: *“I don’t do it. There are indeed some who claim that depending on the placement of the lot in the catalog and then in the sale, it can have an influence on the price. It leaves me skeptical because, well, if the lot is beautiful, whatever its position in the catalog, it will be interesting. If it is not beautiful, you can put it anywhere you want, it will not draw attention. Moreover, buyers will see certain lots or they will not see them. So I’m not sure that has an impact. Some think so, but I have never seen proof of that”* (ONF staff no. 4). For these sales managers, any price variations are not attributable to the sequential nature of the auctions but to the presence of contingent factors (heterogeneity in the quality of the lots, market conditions, buyers’ mood, type of buyers present, stocks timber from buyers, etc.), which, taken simultaneously, can, from one sale to another, direct the price trend in opposite directions: *“There are people who ignite the sale at the start and afterwards who calm down and conversely, there*

<sup>11</sup> This label ensures that companies process or ensure the processing of oak trees purchased within the EU in order to preserve the production chains.

are people who, from the second third of the sale not having their volume, panic a little. There are no absolute rules. It depends on the sale, on the market condition on the day of the sale. There are no rules” (ONF staff no. 10). We can conclude that, in the representation they have of these sales, the sequential auction format, by ensuring opposing price trends over a long period of time, provides the equal treatment desired by municipalities and customers. For these sales managers, the virtue conferred on the procedure for drawing lots for the first lot is more a fantasy among its supporters than an economic reality, so much does the latter depend on complex external factors: “At the end of the day, it’s the little whims of mayors who imagine themselves... And then, on top of that, there’s no logic in all that” (ONF staff no. 4). They consider that the use of this informal institution is not there to correct a hypothetical impact of the order in which lots are auctioned on prices but more to guarantee participants a fair sales process: “When we are really in a very marked situation of very strong tension or very strong absence of demand, the fact of going first or last, that does not change much. So, there is a psychological effect to this coin toss story. And then, I also think that it was also for... I know that in our sales there were frequently municipalities that were present, it was a matter of having, well, a form of fairness, that it wasn’t always the same municipality who goes last” (ONF staff no. 12).

Overall, it appears that buyers and sellers in this market hold sometimes-opposing beliefs about the impact of the auction sequence on prices. To shed light on whether these perceptions are reflected in empirical patterns in timber sales, the next section brings in new data from timber auctions held by the ONF in 2016 and develops an econometric approach to identify the effect of the sale sequence on price trends.

### **A downward price trend revealed by the analysis of auction data**

The sales of timber by the ONF can be analyzed using the so-called sequential auction model. The theoretical analysis of this type of auction is complex due to the constant evolution in the amount of information available to buyers: information relating to the level of competition, the number of participants, the average market price, etc. This type of auction is “dynamic” because buyers take into account, when choosing their bid for a given lot, the sequence of lots that will be put up for sale afterward.

The theory of sequential auctions does not provide a definitive prediction regarding the evolution of prices during a sale: the price trend (increasing, decreasing, or non-monotonic) depends on the format of the auction (e.g., first price, second price, English, etc.), the adequacy of timber demand and supply (Engelbrecht-Wiggans (1994) and Jeitschko (1999)), the cost of participation, and buyers’ risk aversion (McAfee & Vincent (1992)). In the econometric analysis that follows, we approach the question empirically and start from the direct observation of bids during several sales conducted by the ONF. Our objective is to identify whether there is a specific trend in the evolution of prices over time.

## The data

The database used is based on the results of seven standing timber sales held in June and July 2016 in the Grand Est region. During these seven sales, 1206 lots were auctioned for a total volume of 383,844 cubic meters. For each lot put up for sale, we have access to data on the characteristics of the parcels making up the lot, the bids received, and the result of the sale. The characteristics of the lots include the type of forest (state or communal), the type of stand as well as the composition (volume of the main species), the type of cut required, and the mode of devolution (standing timber, harvested timber).

The seven sales are heterogeneous in the number and size of lots auctioned. The smallest sale had 65 lots, whereas, in the largest sale, 434 lots were auctioned. Sales also differ in the average volume of timber per lot auctioned, which ranges from 47.9 to 729 cubic meters. The share of community versus state-owned lots is similar across sales, with the majority of lots being community owned.

## The econometric model

An analysis of the price trend within a sale must account for the significant heterogeneity of the lots. Indeed, the various lots offered for sale vary in terms of volume, composition of species, type of cut, etc. This difference in characteristics translates into a difference in the level of bids: for example, lots containing a larger volume or rarer species will receive higher prices regardless of their relative order within the sale. Similarly, damaged or hard-to-access lots will receive lower bids regardless of their position in the sale. The objective of the econometric model is to identify whether there is a trend (increasing or decreasing) *after* taking into account the heterogeneity in the lots' characteristics.

Our approach specifies the average bid per lot as a function of the objective characteristics of the lot (forest type, stand type, volume of species), a fixed effect for the sale, as well as the order of the lot within the sale. The sale fixed effect allows us to control for differences across sales. Therefore, the effect of the lot order on the average bid will be identified from within-sale variation in bids over the sale sequence. In order to compare sales with different length sequences, the order of the last lot in each sale is normalized to 1, whereas the first lot is normalized to zero (so as to obtain the relative order of each lot within a sale, this variable ranging from 0 to 1). The model estimated is specified as follows:

$$y_l = b_1x_{l1} + b_2x_{l2} + \dots + b_kx_{lk} + a_1r_l + a_2r_l^2 + a_3r_l^3 + a_4r_l^4 + f_v + u_l$$

where the indices  $l$  and  $k$  correspond to the lot  $l$  and to the characteristic  $k$ , respectively, the coefficient  $b$  corresponds to the characteristic  $k$ ,  $y$  corresponds to the average bid for the lot  $l$ ,  $r$  is the relative order of the lot in the sale, the term  $f$  is sale fixed-effect controlling for the heterogeneity across sales, and  $u$  is an error term. A polynomial of degree 4 for the relative order of the lot is used; this specification allows flexible estimation of the price trend (increasing, decreasing, non-monotonic)<sup>12</sup>. The above model is

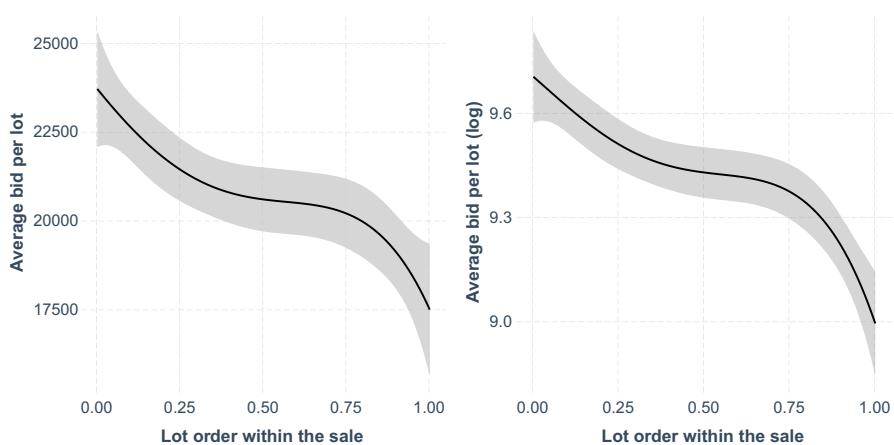
<sup>12</sup> The results are robust to the degree of the polynomial used.

estimated by the ordinary least-squares method using all lots that received at least one bid. For the average submission, we test two specifications: logarithm and level (euros).

## Results and interpretation

Figure 1 below show the evolution of prices predicted by the econometric model for a hypothetical sale where all the lots are identical (having objective characteristics fixed at the average of the lot in the base of data). The graph on the left uses the level specification (euros), while the graph on the right uses the log specification of the average bid per lot. The gray band provides the 95% confidence interval. Regardless of the specification chosen, the econometric model predicts a significant and decreasing trend for the evolution of prices during the sale, once the heterogeneity of the characteristics of the lots is taken into account. In particular, the average bid per lot decreases from 23,000 euros to 17,500 euros, this reduction being statistically significant at the 95% confidence level.

This decreasing trend is in agreement with the results of several other empirical studies of sequential auctions (Ashenfelter, 1989; Ashenfelter & Genesove, 1992; Beggs & Graddy, 1997; Deltas, 1999; Deltas & Kosmopoulou, 2004; Gandal, 1997; Lambson & Thurston, 2006; Lusht, 1994; Vanderporten, 1992). Several theoretical studies find evidence supporting this trend: McAfee and Vincent (1992) show that buyers' risk aversion can lead to a decline in prices during a sequential sale, Branco (1997) and Menezes and Monteiro (2003) suggest an explanation based on the complementarity of the lots. For example, buyers would bid higher early in the sale if the acquisition of Lot A reduces the cutting cost of Lot B subsequently put up for sale. Engelbrecht-Wiggans (1994) justifies this trend by a decline in the number of buyers over time. Other justifications refer to the cost of participation (von der Fehr, 1994), the uncertainty of future supply (Jeitschko, 1999), or the



**Fig. 1** Effect of lot order on an average bid. The left panel shows the effect on the bids in levels (Euros); the right panel shows the effect on the bids in logarithm

budget constraints of participants (Pitchik & Schotter, 1988). It should be noted that these justifications do not necessarily apply to all sales of timber by the ONF. In particular, the uncertainty of future supply is not present for ONF sales because buyers have access to the sales catalog, detailing all the lots that will be put up for sale. However, it seems reasonable to consider buyers to be averse to the risk of not being able to stock up if they wait too late in the sale.

The decreasing price trend highlighted by our econometric model leads, for the period and the sample of sales studied, to the conclusion of unequal treatment between timber sellers (municipalities) due to the order of presentation of the lots chosen by the ONF. This situation, considered suboptimal by the municipalities located at the end of the alphabet, tends to legitimize their request to draw the first lot randomly: *“So there, it is perhaps much more equitable, this draw by lot”* (Municipal official no. 5). In this case, the use of a lottery to determine the first lot auctioned appears to be a simple means of ensuring a more egalitarian sale mechanism, putting an end to the suspicions of favoritism raised by some municipal officials.

### **The introduction of a system to decide between identical offers**

Auction procedures are, in general, organized in such a way that they lead to the identification, at the end of the auctioning process, of a single winner without any intervention other than the manifestation of bids made orally or in writing. Thus, the ONF sales' regulations stipulate that, in the case of ascending-price auction and first-price sealed-bid auction, the timber lots are awarded to the bidder with the highest bid greater than the reserve price. In the case of decreasing-price auction, the regulation specifies that the winner is the bidder who orally announces that he or she will take the lot first before it is withdrawn from the sale by the ONF. Finally, in the new procedure of private sale by mutual agreement, the sale regulations indicate that the lot is transferred to the buyer who wrote the best bid. However, upon closer inspection, it is perfectly conceivable for the four procedures to end up in a situation where bidders find themselves tied, requiring a way to decide between the competitors.

To achieve this, the Forestry Administration has developed a commercial framework, which legitimizes the value of the price offered by buyers and guarantees equal opportunities when determining the auction winner.

### **The rejection of overbidding as a mechanism to decide between identical offers**

If we look at the functioning of the four sale mechanisms, we see that the different designs can lead to the presence of bidders with identical price offers. With regard to the oral auction formats, a distinction is made between the ascending auction



procedure for which, *"the bids start on the basis of the opening price stated by the auctioneer and are spoken out loud in ascending order according to a tariff specified in the conditions of sale and displayed in the adjudication events room. Adjudication is pronounced in favour of the highest bidder after three consecutive calls are made without attracting a bid"* (ONF, 2008, p. 25). It is, therefore, plausible that the sales manager finds himself in the configuration where several professionals come forward at the same time when the last price is announced, in the absence of a new higher bid in the room. This hypothesis is just as plausible in the second oral procedure, the descending auction, where *"the opening price stated by the sale conductor is reduced successively according to a tariff specified in the conditions of sale and displayed in the adjudication events room. Adjudication is pronounced at the price reached when a buyer calls out the words "je prends" (I'll take it)"* (ONF, 2008, p. 24). It is enough for several professionals to signal simultaneously in the room their desire to buy for the winner of the lot to be determined with precision. As for the written auction procedures, where the bids are sent before the sale or delivered during the session, the observation is identical. The design chosen by the ONF does not contribute to preventing the presence of tied bidders at the end of the sale of the lot. Ultimately, none of the auction formats shaped by the ONF are able to decide between bids at identical prices. It is, therefore, aware of this limitation that arbitration devices have been introduced in the sales regulations. But, while the solution of a new competition between tied candidates was conceivable, the forest administration retained a market organization, which has the particularity of entering into contradiction with the principle of a sale to the highest bidder.<sup>13</sup>

To understand why the market is built this way—market designers refusing to organize overbidding between bidders—it is important to look for the practical obstacles of this type of social engineering (Rilinger, 2022). This means moving beyond the standard, a socially uncontaminated economic approach to see this sale system as a process *"for managing ambiguity and uncertainty of value establishing social meanings and consensus"* (Smith, 1989, p. 163). This is particularly true in the case of singular products (Karpik, 2010) such as lots of timber sold on the stumpage, which are both *incommensurable* and *uncertain* (Marty, 2015a, b). Indeed, it suffices to look at the lots of standing timber made up of superior or precious hardwoods to realize that, on the one hand, there is a lack of equivalence in the qualities of the timber observed in the field by the buyers and that, on the other hand, there is uncertainty about the quality and volume of timber sold standing. The difficulty for the participants to agree on the characteristics of these lots prevents any possibility of commercial *"objectification"* (Orléan, 2003) of the lots, a problem that is reinforced by the lack of commitment of the ONF on the volume and quality of timber indicated in its sales catalog. Therefore, faced with this persistent uncertainty about the lots, the participants in the sale rely on the *"personal network"* (Karpik, 2010, p. 45) to resolve the question of the definition of their value. Although they have their own estimate, they recognize the value attributed by the network of interpersonal relationships, agreeing to delegate to the community the power to judge

<sup>13</sup> We find this same arbitration in certain wholesale fish auctions (Matras-Guin, 1987).



the price of the lots. This finding helps to explain that, in the sales regulations, the selection of the winner, in the event of identical bids, does not favor the overbidding procedure, which is the source of possible “*slippage*” (ONF staff no. 8) but market devices that legitimize the price established collectively: “*Behind that there is quite simply perhaps a question of respect. Each customer made the offer he intended to give on the lots, we respect that [...] It is a question of respecting the offers made by the customer. [...] We judge the offers for what they have been made and then, in the event of a tie, we award the prize at random, that’s how it is*” (ONF staff no. 12).

Thus, in the event of identical offers, we better understand the *infeasibility* (Rilinger, 2022) of an approach to allocating lots through a new auction, as suggested by auction theory. Although it would be possible, on a technical level, re-auctioning and overbidding would lead to not recognizing the process of social construction of value of those singular goods built by the community members participating in the auction.

### **The market devices used to break ties: from random drawing to the bid submission time**

In the long history of timber auction regulation, the first mention of the arbitration procedure in the event of identical offers dates back to the royal ordinance of November 26, 1836. Ties between winning bids are decided using a random draw. This system was used until 2020. When the ONF switched to online auctions, the use of randomization to break ties was replaced by the time at which the bid was submitted: in case of identical bids, the first bidder to submit their bid wins the lot.

### **The random tie-breaking rule: two centuries during which arbitration was entrusted to chance**

During the previous two centuries, the Forestry Administration relied on randomization to decide between tied bidders. We can also read in the sales regulations that, in the case of ascending auctions, “*if the last price is taken by several professionals at once, the lot is drawn by lot*” (ONF, 2008, p. 25). The same goes for descending auctions, “*if the Bureau deems that several professionals have made a bid simultaneously, the lot is drawn by lot [...]*” (ONF, 2008, p. 25). It should be noted that, for this procedure, it is, nevertheless, possible for one of the professionals to prefer a re-auctioning instead of the draw, in which case, “*they will then compete against one another for the lot*” (ONF, 2008, p. 25), although, in practice, this solution seems to have never been adopted. Finally, in the case of auctions based on tenders and sales by call for tenders, the rule specifies that “*in the case of equal bids, the lot is drawn by lot*” (ONF, 2008, p. 24 and 36).

Operationally, random drawing takes place in the room between the professionals present.<sup>14</sup> On the announcement of the confirmation by the sales manager of the

<sup>14</sup> The sales regulations do not give any details in the event that, among the professionals to be decided upon, some may not be present in the room while the procedures for adjudication on tenders and calls for tenders authorize suppliers to tender from a distance.

proven simultaneity of the offers made by the bidders, the ceremony of the drawing of lots begins. Participants, still in the running for the prize, are invited to come to the front. The director then hands them his kepi in which are arranged pieces of paper on which the names of the bidders are written. During this staging of chance, one of the bidders is invited to draw one of the papers and give it to the director. The latter then indicates the name of the winner to the candidates as well as to the room, taking care to show the losers the presence of the other papers in the kepi<sup>15</sup> with their names written on it. This moment, which marks the end of the ritual of the drawing of lots, does not suffer from any contestation on the part of the losers. The latter accept the fatality linked to this procedure, considering that, at the time of the draw, they all benefit from the same probabilities of success: *“It’s just luck, it shouldn’t have been for you and then that’s all”* (Timber buyer no. 2).

However, on closer inspection, we see that the participants are satisfied with *“a procedure which under egalitarian aspects, enshrines [...] an inequality”* (Bonnain & de la Pradelle, 1987, p. 237), given that, in the end, only one bidder emerges as the winner and, in the event of a repeated draw, the loser can always draw the wrong number (Bromberger & Ravis-Giordani, 1987, p. 132). The fact of not having drawn the right paper is a simple temporary lack of luck, which is accepted by all: *“It is just luck. It’s like the France football team. In football, you need luck, if you’re not lucky, it’s not worth it. You have to be lucky”* (Municipal official no. 11). Thus, despite the inequality sealed by random drawing, which inevitably leads to a winner and losers, this system is legitimized by the participants who see in it the guarantee of equal treatment.

### The end of the random tie-breaking rule with the switch to online auctions

The Forestry Administration has recently been arbitrating, in its new online tenders, according to the order in which bids are submitted: *“If a buyer has submitted several tenders for the same lot, it is the tender carrying the highest amount which is retained. The sale is pronounced for the benefit of the buyer who has submitted, within the prescribed period, the tender carrying the highest amount, provided that this amount is at least equal to the withdrawal price set by the ONF. In the event of equivalent bids, the lot is sold to the buyer who submitted his bid the earliest”* (ONF, 2018, p. 10).

Under the new system of online auction, arbitration is now based on the voluntary action of bidders to send their bids to the ONF as quickly as possible, a new configuration that grants a double advantage for the protagonists. For the customer, this new market institution gives him the opportunity to be more active in the lot allocation process in the event of similar offers. Subject to the random nature of the draw in the old procedure, the bidder is now able to act to ensure their win. All a bidder has to do is be quicker than their competitors when submitting bids: *“[...] it is certain that we favor people who are young and alert rather than people who are*

<sup>15</sup> We can see an illustration of this practice in the film *“Les grandes gueules”* directed by Roberto Enrico.

*necessarily a little older. Young people are more reactive on a keyboard, that's for sure, but we had to make a choice*" (ONF staff no. 10). By removing the delegation previously granted to chance to determine the winner of the lot, the rules prevent the bidder from feeling victim of any bad luck in the event of an unfavorable draw. The bidder finds himself solely responsible for the result established by the new arbitration system.

For the ONF, encouraging buyers to submit their bids as soon as possible appears, at first glance, as an additional means of stimulating competition, particularly during sales where bidders sometimes tend to adopt a wait-and-see approach before submitting their offers. If it is always possible to enter several bids per lot, only the highest will be retained, hence the interest of not delaying too long in preparing bids. Similarly, with this new procedure, the rhythm of the sale is not broken as with the random draw, which promotes tension among customers. The rapid sequence of lots is facilitated.

However, it would be wrong to believe that the reason for this institutional change in winner selection lies primarily in the hope of greater gains for the sellers. The abandonment of the drawing of lots is, in fact, the consequence of the decision taken by the ONF to sell the lots of timber<sup>16</sup> online in order to reduce the transaction costs<sup>17</sup> linked to the holding of the sales offline (room rental, presence of agents in the room to control the progress of the sale) and to increase the competitive dynamic<sup>18</sup>. Due to the dematerialization of sales, it was simply no longer possible for the ONF to maintain the public nature (Bonnain & De la Pradelle, 1987, p. 237) of the drawing of lots procedure. The failure of buyers to be present at the time of drawing the winner of the lot risked creating mistrust among them vis-à-vis the sales managers: *"When you are in the room, you have 2 people who have an equal bid, you take an innocent hand, you draw one of the two papers and it awards the prize. But, when we are at a distance [online], nobody sees us performing the draw, whether it is a computer or not [...] Online, we no longer see the draw happening. We would have been like "yeah, you chose him because you get along better or whatever". While there, now at least the fact of using something, the speed of the submission of the bids, it is indisputable. There is no one who can challenge the result"* (ONF staff no. 10). It is, therefore, aware of this lack of transparency that the ONF preferred to abandon the procedure of drawing lots and replace it with that of the speed of bid submission. Through this choice, which was not challenged by customers during meetings to present the online sales system organized in the

<sup>16</sup> Online sales take place on the platform developed by the ONF: "ventesdebois.onf.fr". After several series of tests in 2019, the first sale on the platform took place in Langres on January 21, 2020. Note that the ONF has committed for the moment to maintain a mixed system for the largest sales in which buyers will be able to participate in the sale from their homes or by being present in an auction room. It is a question of responding through this organization to the request of buyers to maintain social relations during sales.

<sup>17</sup> The reduction in transaction costs is also important for buyers, such as stave mills, who are no longer required to travel over a large distance to attend sales.

<sup>18</sup> Thanks to digitalization, buyers can participate in several sales on the same day. They no longer hesitate to take part in sessions where only a few lots may interest them.

regions by the ONF, the ONF was concerned with maintaining the public nature of the system of arbitration in order to maintain equal treatment between purchasers connected remotely.

The difference between the old and new procedures to break ties lies in a selection of the winner, which is no longer entrusted to chance but to the technical rationalization of the computer tool, capable of chronologically classifying the submission of offers. At the level of the operating mode, the designation of the winner is carried out, thanks to the timestamp<sup>19</sup> at which the bid was submitted by the buyer. Thanks to this mechanism, it is possible to obtain a reference time unit: *“we have no problem, because in fact we record when we click, the person clicks to validate his offer. Even if the offer arrives less quickly than that of the neighbour, it is the moment when you have clicked that you record and not the moment when we receive the offer”* (ONF staff no. 10). The numerical timestamp sequence used to identify the time of submission of bids thus appears difficult to dispute, attributing to this new market institution the same power (François, 2011) as that granted to the random draw in deciding between identical tenders.

## Conclusion

The mechanism adopted by the ONF in the case of timber sales from public forests gives a privileged place to the auction system. The choice of this method of sale is the result of a trade-off between the complex interests of the various players in the forest sector. Recognized for its properties in terms of economic efficiency in a context of information asymmetry, the auction framework seeks to optimize the budgetary revenues of forest owners (ONF and local authorities) through staged competition. At the same time, auction procedures must be analyzed as socially organized market devices in order to collectively define the value of lots and ensure their distribution among buyers (Smith, 1989). It is, therefore, to respond to this double injunction that random drawing intervenes twice in the sales sequence, at the start of the session, to decide the order in which lots will be auctioned, and at the end of the auction, to decide between bidders who submitted identical bids.

However, the role of chance in timber auctions seems to be diminishing with the gradual abandonment of randomization in sequential auctions. One of the reasons for this is linked to the digitization of timber sales pursued by the ONF. While the random draw was a formal institution valued by the participants to decide between identical offers, its legitimacy risked being jeopardized by the switch to online sales, which are not held in public, starting in 2020. It is, therefore, to remedy this pitfall that the new market device for selecting the winner, based on the order in which the offers are submitted, has replaced that of random drawing of the winner. The second reason has its origin in the unequal legitimacy granted to this procedure to

<sup>19</sup> The timestamp is a digital counter that represents an amount of time elapsed since a reference instant. For example, in the Unix system, the starting reference is January 1, 1970 (time 0).

reduce possible price inequalities in the sales sequence. While the random assignment of the first lot put up for sale is the means claimed by the municipal officials to ensure equal treatment before the start of the sequence, the procedure is contested by the ONF for practical reasons. The ONF's sales managers may acknowledge the presence of upward and downward price variations in market sequences, but they consider that they are linked to contingent factors (economic conditions, degree of competition, heterogeneity of the quality of the lots, etc.) and not to the order of presentation of the lots.

The analysis of the use of random drawing in auctions requires examining the sequential format built to sell timber lots and the conditions of its feasibility. This involves studying the approaches used by decision-makers to guide the organization of these sales and understanding how this market device becomes an institutionalized element employed in some regions and not in others. More generally, to better understand the role of market devices used to guide the behavior of participants, it is important to consider the socio-historical conditions that led to their legitimization.

**Author contribution** All authors contributed to the study conception and design. The first draft of the manuscript was written by GM, and all the authors commented on previous versions of the manuscript. The econometrics analysis of the data was performed by EC. All the authors read and approved the final manuscript.

**Data availability** The datasets generated during and/or analyzed during the current study are available from the corresponding author on reasonable request.

**Code availability** The code used to analyze the data is available from the corresponding author on reasonable request. The software used was R.

## Declarations

**Ethics approval** Not applicable.

**Consent to participate** Not applicable.

**Consent for publication** Not applicable.

**Conflict of interest** The authors declare no competing interests.

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