

Stock exchange price currents, financial information and market transparency: an introduction

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Financial markets derive their political and societal legitimacy from their ability to produce fair and accurate prices. However, reviewing the literature on how stock exchanges price securities, we find an inherent tension between market organization and price disclosure, which is borne out by this special issue's historical case studies.

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I

Financial markets contribute to economic growth by aggregating savings and allocating them to productive opportunities. Prices guide the decisions that drive this dual function: investors' portfolio choice and issuers' cost of capital. For prices to perform these functions well, markets need to be transparent, that is to say, they must provide accurate information before transactions and a check on their fairness afterwards. Even if some degree of opacity is desirable, transparency is crucial because the prevalence of opaque financial markets is economically suboptimal: they hamper market liquidity; they keep savings down or they allocate them poorly. Financial markets must therefore produce and publish prices that investors can trust as accurate and fair. Publishing such prices is a key financial market function, the foundation of the market's economic and societal legitimacy.

Used as we are to a wealth of instantly available information with hidden costs, we tend to forget that, in the past, information was usually hard to get and difficult to gauge. Merchants shared price information only with counterparties and clients,

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keeping margins fat and outsiders guessing, but their efforts were countered by local authorities promoting printed commodity price currents to boost their fairs, markets, or exchanges. In addition to commodity prices those specialized newspapers also published financial data such as exchange rates, interest rates and later public securities, which in the end led to periodicals dedicated to financial data, starting with Castaing's *Course of the Exchange* in 1698 (McCusker and Gravesteyn 1991). These stock exchange price currents and the information they offer are generally seen by economists and economic or financial historians as representing just the kind of transparent prices financial markets need and should produce, that is to say, as unproblematic.

Are they? The research presented in this special issue suggests they are not. The papers form part of the new, data-driven historical stock exchange research exemplified by the work coming out of the pioneering Antwerp SCOB centre under Frans Buelens, Jan Annaert and Marc Deloof and the Paris DFIH led by Pierre-Cyrille Hautcoeur and Angelo Riva. Presented at two workshops in December 2020 and September 2021 sponsored by the EU-funded EURHISFIRM project (2018–21)¹ and the Amsterdam NEHA, the papers focus on all aspects of price formation, from accounting conventions via market microstructure and regulation to publication. Moreover, drawing as they do on examples, for commodities and securities, from the US, Britain, Finland, Belgium, Germany, Italy and the Netherlands, the papers provide insights from very diverse cases. We want to use this Introduction to highlight the papers' findings, connect them to each other, and also link them to cases known from the literature but not dealt with separately and afresh in this issue.

The two workshops were inspired by insights from the history of commodity and securities markets. Even when sponsored by public authorities, the collection and publication of prices heavily depended on a particular market's organization. As often as not merchants or bankers made and kept markets opaque; wide spreads, notably in early price currents, highlight the extent of market frictions such as asymmetric information and market power. Moreover, as a rule it is hard to know which part of the market price currents actually covered and why, and which parts they did not and why, and how the published information related to actual market structure and performance. The political and economic significance of stock markets as well as the willingness to attract new investors progressively pushed regulators and market participants, not without backlashes, to improve their organization and their dissemination of prices. However, *kerb/curb* or *coulisse* trading existed side-by-side with most or even all official exchanges until well into the twentieth century. Today, the rising importance of 'dark pools' and other opaque trading venues in which financial intermediaries trade securities renders the overall financial market increasingly opaque in spite of massive flows of financial information: the official prices of the exchanges concern a smaller and smaller fraction of the European securities trade.

¹ <https://eurhisfirm.eu/>

We therefore departed from the premise that publishing prices, as a teaser before and a check after transactions, is subject to an inherent conflict of interest between insiders and outsiders, that is to say, between informational rents and market power on the one hand, and transparency and competition on the other. From that premise we derived three main questions:

- What was the relationship between price information, market structures, and regulation?
- What do price currents tell us about the markets they served, the goods listed, the terms and conditions of trade, the individual market's degree of transparency?
- What do differences across Europe tell us about the character of national markets?

The rest of the article is organized as follows. Section II sketches the main theoretical arguments related to markets, organizations and transparency. Section III puts the articles of this special issue into context. Section IV focuses on the main world financial exchanges during the gold standard era, that is to say London, Paris and New York. Section V concludes and puts these issues into the perspective of future research.

II

Transparency is a key feature of financial markets and it is determined by the organization of the markets within the framework of national regulations. Transparency is related to two concepts. Disclosure refers to the dissemination of information related to specific issuers such as companies' accounting and governance: the higher the amount of information disclosed by issuers, the more accurate the pricing of their securities. Market transparency refers to the capability of market participants to observe information related to the transaction process (O'Hara 1995; Majois 2008).

Market transparency could be appreciated through two parameters. Pre-trade transparency is the participants' ability to observe standing orders, while post-trade transparency refers to the dissemination of information about the closed deals. Transparency depends on market organization. The process framing the interactions between buyers and sellers to determine the price of an asset – the price discovery system – is the centrepiece of pre-trade transparency. Price-driven markets built around market makers continuously quoting bid and ask prices and order-driven markets where buyers and sellers can directly transact by communicating information on price and quantities to the others are the two archetypal price discovery systems.

Order-driven markets provide greater pre-trade transparency, because participants can follow all the potential supply and demand for a security. On the contrary, bid–ask quotes are just an indication of the real transaction price that is usually determined through private negotiation (Pagano and Röell 1996). Before computers, rules on access to the market played a crucial role. Overcrowding of the floor can hamper participants' ability to observe the trading process even within a highly transparent price discovery system because of the cognitive limits of persons, as shown empirically by Baker (1984). On the other hand, restricted access to trading could generate market

power and thus collusive behaviour among market participants (Biais *et al.* 2005). Traders were able to extract rents by imposing either higher commissions or wider spreads. Pre-trade transparency is often the precondition for post-trade transparency. In practice, only if the price discovery system is transparent can the market organization disseminate the price of closed deals during and after the trading session.

A large stream of literature has considered that a single transparent trading venue is the optimal solution for market economies. It would allow for the production and dissemination of efficient prices à la Fama thanks to its transparency. It would lower transaction costs, thus maximizing liquidity because of the positive externalities of liquidity. It would lead to economies of scale that enable a venue to amortize fixed costs over more trades, and a decrease in information asymmetries coming from the consolidation of trades in a single market. It would enhance competition among market participants. The higher liquidity would thus reduce the cost of capital and bring to the market more issuers. This single transparent market should also set high listing requirements. Disclosure of information on issuers would further reduce asymmetric information and bring to the market more uninformed investors, typically individual investors, and more savings. Informed investors, typically financial intermediaries, need uninformed investors to readjust their portfolios and finance new projects. High listing requirements would thus reinforce the virtuous circle (Coffee 2002; Ramos 2003).

However, a more recent body of literature underscores the fact that informed investors may be reluctant to trade in a transparent market to avoid 'free-riding'. If the collection and treatment of information were costly, informed investors' trading in a transparent market would transfer the information to uninformed investors for free and make it difficult for informed traders to exploit their superior information. Therefore, informed traders may trade less and hamper market informational efficiency and liquidity. In the extreme case of a perfectly transparent market, this would lead to its collapse, as highlighted by the Grossman and Stiglitz (1980) paradox (Harris 2003).

In addition, the persons in charge, be they either large shareholders or managers, may prefer to keep a company private rather than floating it on a high-disclosure-standard market. They will float their company on this venue only if they expect that their benefits from a potential higher liquidity and thus a lower cost of capital will be higher than the private benefits of control. The private benefits of control correspond to the benefit to large shareholders and managers of keeping information on the company private. If the benefits from the listing on a high-disclosure-standard market are lower than these private benefits of control, they will keep the company away from the market (Coffee 2002).

Therefore, a more recent stream of literature builds on the heterogeneity of investors and issuers' preferences. According to this literature, the coexistence of opaque and transparent trading venues could be a better solution than a single transparent market. Because of this coexistence, investors and issuers would be able to find the venues that better match their preferences and enter the market, while the single

transparent market would keep them away. Therefore, this coexistence would lead to the specialization of the trading venues. However, informed investors typically develop strategic behaviour coming from their need to interact with informed investors and thus split their orders between the two venues. Thus, competition among trading venues goes along with complementarities coming from specialization. However, the empirical literature shows that if the opaque venue prevails because of the excessive market power of large informed investors, this can hamper market liquidity and stability (Securities and Exchanges Commission 2013; Gomber *et al.* 2017).

However, the outputs of market microstructures and their interactions depend heavily on the concrete organizations, which in turn are determined by the concrete historical trajectories of each exchange. An accurate study would require an in-depth analysis of the changes in the microstructures of all the markets involved in these dynamics.

III

In his contribution to this issue, Peter Solar deals with commodity price currents, though his conclusions apply to stock exchange price currents as well. His wide-ranging methodological contribution, based on a long and close experience of price currents, presents a model of criticism that should be required reading for everyone using these sources. Solar focuses on what price currents actually tell us about the goods and prices listed. Having distinguished between private and public price currents, he highlights four problems common to them all: missing observations; price inertia; the interpretation of prices given as a range between high and low; and how to make series out of prices differing in level and in range. In discussing these key issues Solar not only shows the serious dangers of taking data from price currents at face value, he also offers sensible advice on how to tackle them.

From a micro perspective Frederic Steinfeld underscores one of Solar's main points: prices are only as good as the information available to markets. Drawing on his recent PhD thesis about accounting practices in the German chemical industry before World War I, Steinfeld demonstrates how some companies, but not others, amassed huge hidden reserves using progressive depreciation policies, at the same time creating an increasingly large gap between their market capitalization and the true value of their assets (Steinfeld 2021). The disparities between companies became manifest when in 1916 those with large hidden reserves ended up with a much bigger share in the IG Farben cartel than their market capitalization warranted, but curiously neither the German stock exchange nor investors appear to have picked up on what that meant. Then again, chemical companies were known for their cavalier attitude towards providing financial information, in one leading director's words: 'we define the public balance as we please'.

With Mika Vaihekoski's paper we move to what stock exchange data tell us about the institution's functioning. Data from the Helsinki stock exchange are now, like the data for Brussels, Antwerp, Paris and Stockholm, digitally available as collected from source, opening up a marvellous store of information to offset the predominance of

US digital data in finance and financial history research. They allow us to step up from the institutional stock exchange histories, valuable though they are, to consider the stock exchange's actual functions within the financial system using quantitative data. There is still a lot that we simply do not know about stock exchanges' wider economic and societal function. Opinions range from securities trading being an economic powerhouse to being merely a casino where sophisticated players gamble with a nation's wealth (De la Vega 1688; Mackay 1841; Levine 1997; Levine and Zervos 1998). A better understanding must start with some arduous spadework, i.e. establishing the market's internal organization: its microstructure; the listings procedure; the price finding process; regulations and sanctioning. One can then start to consider the listings themselves, the number of securities and of issuers over time, before coming to the crunch of calculating indexes and returns. For reasons of space Vaihekoski's survey of Helsinki's stock exchange limited itself to the market's internal organization and a listings analysis. Set up in the early twentieth century, the market was a highly disciplined one. In Finland there was none of the shouting, pushing and shoving bordering on scuffles which characterized, say, London or Amsterdam; trade was conducted in a very orderly manner, between brokers sitting in rows behind desks facing a dais with desks for the chairman and two secretaries directing the proceedings. After a hesitant start the stock exchange became a central institution for Finnish corporate finance, with a respectable ratio of market capitalization to GDP and listings of companies from all economic sectors.

Frans Buelens and Johan Poukens provide a fascinating comparison of regulations, market organization, and price formation in Antwerp and Brussels during the period 1802–1935. Written as it is from deep experience with the University of Antwerp SCOB system, which Buelens created more than 20 years ago, their article argues that the two stock exchanges demonstrate a clear trade-off between the transparency of prices and market microstructure. With roots going back to the sixteenth century, Antwerp's exchange was the older of the two, but industrialization chose Brussels as Belgium's financial centre and main market for corporate securities, leaving the public bonds business mostly on the banks of the Scheldt river. In both exchanges the securities trade was tightly regulated at first, a handful of government-appointed brokers dealing in the small number of securities admitted. Price currents published comprehensive data about transactions. When in 1867 the government lifted these restrictions, the number of brokers and quoted securities rose rapidly. Price formation now turned into an opaque process easily manipulated by insiders, while published prices became a rough gauge rather than a true reflection of the day's events. The gap between published prices and actual transactions done widened further when banks began matching orders in-house. By the early 1930s only about 10 per cent of securities were regularly traded on the Brussels exchange, though these represented about 90 per cent of market capitalization. As trade seeped away, brokers started fixing prices of the less liquid securities with marked bullish intentions, rendering it even harder to know what the official prices actually reflected. Both trends were considered undesirable, prompting new government regulation in 1935 to stamp them out.

Despite being subject to the same government regulation, price formation and publication differed between Brussels and Antwerp. Buelens and Poukens put this down to the febrile corporate securities trade being easier to manipulate than that in staid public bonds. However, one wonders whether local customs and the respective market's microstructure did not matter as much, indeed more. Angelo Riva's comparison of the Genoa and Milan stock exchanges makes this point at length and in detail. Like their Belgian counterparts, these two stock exchanges were subject to the same central government regulation, yet they differed even more from each other than Brussels and Antwerp. Genoa's exchange was the older of the two, a crowded market which bankers kept opaque against brokers' wish for openness, resulting in hushed deals and unreliable quotes. This contrasted with the Milan exchange, where strict admission procedures limited access and open outcry produced an orderly market with price transparency. As a result, the official price quotations of the two cities were like chalk and cheese, even for the same securities. If anything, Italian Unification, direct communication between the two, industrialization and central government legislation affecting both markets tended to increase rather than diminish the disparity between them. Milan complied with emerging political, legal and economic conceptions of how a modern stock exchange should work, but Genoa attracted twice as much business. New legislation, prompted by the 1907 crisis, finally imposed Milan as the model for all Italian stock exchanges to follow towards greater transparency and stability.

The importance of the market microstructure for understanding price fairness and publication is also highlighted by what De Jong, Jonker and Poukens write about Amsterdam. By some accounts the oldest public securities market, it was an unregulated and disorganized one, with several trading venues and a socially diverse community of traders, harming the emergence of public prices. For most of the nineteenth century, two competing stockbrokers' clubs issued their own price currents while continuing to offer after-hours trade to members in their bars. When in 1876 the two clubs finally merged, the new association struggled to impose and maintain some form of order over trading. Until the opening of its own, dedicated stock exchange in 1914, the trading floor remained open to all, rendering disciplined price formation, blackballing of members, or sanctions for misbehaviour illusory. Even then, complaints about irregularities in compiling the official price quotes remained endemic, the stockbrokers' association proving unable or unwilling to strike a proper balance between business margins and transparent prices.

IV

The dynamics underscored by the articles in this issue can be found in the main world markets as well as in other less financially developed countries such as Spain. During the gold standard era, exchanges developed at a fast pace, played an important role in national economies and facilitated the export of capital at a comparable scale with today, relative to either national capital stock or product. Great Britain led this

expansion, followed by France and the United States. In 1910, Henry Lowenfeld counted 89 important exchanges around the world, most of them in Europe and the rest in areas of European settlement (Lowenfeld 1910). The stock exchanges in London, Paris and New York were the centres of this expansion.²

Their organizations were shaped by the ways markets tried to satisfy economic needs within the political and financial systems, legal traditions and local customs in which they were embedded. They were thus very different. The main ‘genetic’ features of the exchanges constrained the available options to build a ‘coherent’ market and to cut trade-offs among different dimensions of market effectiveness. Restricted access may facilitate counterparty risk management and the development of a transparent price discovery system, but it increases the risk of collusive behaviour. On the contrary, open access can bring up traded volumes, but can also harm transparency and increase congestion costs (Neal and Davis 2006).

The London Stock Exchange (henceforth LSE) came into existence formally when it decided to build its own building in 1801 and regulate itself as a ‘subscription room’ in 1812 (Stringham 2002; Neal and Davis 2006). The new building was financed through the issue of shares that could be bought by the public. This funding structure led to a first crucial distinction between the users of the exchange, the members and the building’s proprietors, which paved the way to conflicts of interest. The proprietors derived their revenues from the fees paid by the members to enter the market. They kept these fees very low to encourage membership and discourage the creation of other exchanges in London. A committee elected by current members regulated the admission of new members. However, it kept the doors sufficiently open to raise issues of spates of defaulters and overcrowding on the floor, in spite of subsequent enlargements of the building. Membership was considered easy and inexpensive. From 1876, new members were required to buy at least a share in the building to facilitate a progressive convergence between the two groups, still incomplete by World War I, and to mitigate conflict of interest. However, ‘it was only after 1910 that any attempt to examine applicants was made’ (Michie 1986, p. 174) to alleviate overcrowding, thanks to the growing powers of members who were at the same time shareholders. After the admission of 2,297 members between 1900 and 1909, their number dropped from a peak of over 5,567 in 1905 to 4,855 in 1914 (Michie 1985, 1986; Neal and Davis 2006).

The LSE was a price-driven market and differences between the members’ actual businesses created further conflicts over price dissemination. In 1847 the LSE stated that members had to be either jobbers or pure brokers without any other financial activity outside the LSE. Unknown in the British provincial exchanges, jobbers quoted continuously bid and ask prices on a subset of securities where they

² On the workings of the Berlin Stock Exchange, see particularly Buchner (2017) and (2018). On Spain, Cagigal and Houpt (2011) and Houpt and Cagigal (2010). For an overview of the main stock markets see Michie (2006).

specialized. Jobbers specializing in a given class of securities formed ‘corners’ and were obliged to deal exclusively with brokers receiving orders from outside and roaming the corners accordingly.³ The 1847 decision prevented brokers from dealing directly with outside counterparties and thus improved price formation (Michie 1985, 1986). This price discovery system supplied a ready market for a large number of securities and allowed for competition among a large number of brokers, but was less transparent than order-driven markets while overcrowding added to opacity.

Conflicts of interest reduced post-trade transparency, creating barriers to the dissemination of prices during the trading session. Proprietors even opposed the adoption of the telegraph and telephone that would have allowed for a constant flow of information from the floor to outside parties. Although of great benefit to members, proprietors worried about giving access to prices to the non-fee-paying public. Only the progressive convergence between proprietors and members loosen the opposition from the 1890s onwards. To circumvent this opposition, the major LSE members installed private telephone lines to fully profit from the possibilities of arbitrage between the LSE and the provincial exchanges (Michie 1987).

If the new technologies facilitated the integration and enlargement of the British securities market, they blurred the boundaries between jobbers and brokers. The former dealt directly with outside parties on many securities sometimes even unlisted in London. Brokers reacted by acting as jobbers to compensate for lost business. However, by 1904, fewer than 10 jobbers dominated arbitrage at the LSE. As a reaction against this concentration, brokers and proprietors obtained in 1909 the enforcement of the single capacity rule that only allowed brokers to receive outside orders (Michie 1985; on the relationship between the LSE and provincial exchanges see also Rogers *et al.* 2020).

Dissemination of after-session prices was ensured by price lists. From 1803, Edward Wetenhall, a broker, published the *Course of the Exchange* twice per week with the price of a few securities. In 1812, LSE officers officially endorsed Wetenhall’s *Course*, which from then on claimed to be printed ‘By authority of the Stock Exchange Committee’.⁴ Their goal was not to allow the clients to obtain the best price, but to easily solve disputes among members arising from the settlement process (Davis *et al.* 2003). From 1823, Wetenhall was authorized to publish the price of the most actively traded foreign securities in the Foreign Stock Exchange, a ‘segment’ of the LSE that competed with the parent home until its absorption in 1832 (Neal and Davis 2006). Publication of daily lists reporting prices of the more important railways shares began in 1844 during the railway mania. In 1867, there were three daily lists for English and foreign shares, foreign stocks and railways.

³ On the long-run history of jobbers, see Attard (2000).

⁴ London Metropolitan Archives. Collections catalogue. https://search.lma.gov.uk/scripts/mwimain.dll/144/RESEARCH_GUIDES/web_detail_rg/SISN+31?SESSIONSEARCH (15 March 2022).

During that year, the LSE charged its Share and Loan Department with the collection and publication of prices on the consolidated list. A daily supplement was printed containing quotations for small companies' securities, which though not officially listed, had a special settlement date at the LSE.⁵

Because of its microstructure, the LSE holds a *de facto* monopoly of trading in London.⁶ By contrast, the microstructure of the New York Stock Exchange (henceforth, NYSE) led to the creation of competing and complementary markets in town. From the 1792 Buttonwood Agreement, the subscribing brokers established fixed commissions and mutual preference in transactions. In contrast with London, where the commissions were flexible until 1912, the enforcement of minimum commission was central to the creation of the NYSE and remained so throughout its history. The profitability of the members was thus a function of their capacity to enforce both the commission and the number of members. The NYSE opted for a limited and fixed number of members in 1869. Candidates had to pay entry fees and, from 1868, buy an expensive seat from a retiring member. When the NYSE decided to build its own building in 1863, its members financed the estate and became its owners. Furthermore, until the 1860s, a 'black ball' from the NYSE governing body was an effective tool to limit membership (Michie 1986; Neal and Davis 2005).

The members of the NYSE differentiated their functions when traded volumes rose during the 1860s. At least from 1865, some brokers started trading on their own account in specific securities in a designed trading post, while others went through the floor to deal in different kinds of securities. To minimize the risk of missing an order when leaving a given post, 'specialists' emerged as brokers' brokers, always located at a given post and often undertaking both brokerage and trading on their own account. In contrast to London, transactions on the NYSE floor were held at open outcry in the post where the securities were traded to confer transparency and ensure clients got a fair price. In 1910, the NYSE regulated the activity of these specialists for the first time by requiring that they first got their clients' authorization to act as counterparty for their orders (Michie 1987; Simon and Trkla 2005).

The quality and quantity of listed securities was another major difference between the LSE and the NYSE. The LSE quoted securities from all over the world, while the NYSE dealt almost exclusively in US securities. Furthermore, in the case of domestic stocks, the NYSE mainly listed railroads while the LSE offered a trading venue to all kind of securities and an official listing was not a prerequisite for trading securities on the floor. The dominance of railroads on the NYSE listings was coherent with the

⁵ Ibid.

⁶ Apart from some kerbside brokers, who ran occasionally substantial business, particularly after the end of the official LSE session. The only exception was the Mincing Lane market that specialized in (rubber) plantations, which was founded in 1909 when the LSE started screening listings more severely (Michie 1987).

NYSE restricted membership and organization.⁷ It mitigated counterparty risk and contributed to making the business manageable by a fixed number of members. Interestingly, neither the NYSE nor the LSE were concerned with the accounting standards followed by their listed companies (Davis *et al.* 2003).

In contrast to London, membership and listings restrictions led to the creation of other markets in New York. During the Civil War, the demand for trading rose because of the large public debt issues and wartime uncertainty. A new market, the Open and Government Boards, was formed. In 1869, the NYSE merged with its rival and its 1,065 members, achieving unification of the market. However, this lasted for only a short period, as new exchanges formed soon after. In 1885, some of these rival exchanges merged to form the Consolidated Stock Exchange with 2,403 members. The NYSE prohibited its members from joining the new rival. Still other brokers formed the Curb. By 1913, the NYSE had 1,100 members, the Consolidated 1,225 and the Curb at least 200 members. These exchanges differed markedly in terms of transparency and had oscillated between competition and complementarity, a substantial part of the business being done on securities traded on just on one market.

To mitigate competition and enforce minimum commissions, the more transparent NYSE limited the dissemination of its prices during the sessions. Unlike London, the NYSE quickly adopted the ticker and telephone for the benefit of its members, but it engaged in long-lasting legal and commercial battles to enforce its property rights over the prices it produced and to control their dissemination. It tried to remove tickers from the Consolidated Exchange and outside brokers' offices, but even so it had difficulty in supervising the use of NYSE prices by those who legitimately received them. If the courts protected the property rights of the NYSE over its prices, the enforcement of these rights was difficult from an operational point of view, namely because the NYSE authorized its members to join regional exchanges (Michie 1986; Mulherin *et al.* 1991; see also White 2013 on the relationship between the NYSE and US regional exchanges).

Like New York, the main organizational features of the Paris Stock Exchange (henceforth, PSE) led to the formation of another well-differentiated market, the *Coulisse*, in spite of the law reserving the monopoly over listed securities to the PSE operators, the *agents de change*. The *agents de change* were *officiers ministériels*, having the same status as notaries combining public with commercial duties. By law, they were pure brokers; their number was fixed at 60 in 1816 and then raised to 70 in 1898. They bore full and unlimited liability for their clients' debts vis-à-vis their fellow brokers (Lagneau-Ymonet and Riva 2015).

⁷ According to Michie (1986, 1987), Neal and Davis (2005) and White (2013), the NYSE applied a volunteer policy of severe selection and listed only major and well-established companies from mature sectors. O'Sullivan (2016) challenges this view. In her view, the first market for US industrials was London. However, it was not because of the lower listing criteria of the LSE but because of the vested interest of crucial stakeholders.

Given the legal limit on the number of brokers, candidates had to buy their *office* (the right to trade at the exchange granted by the state) from a retiring broker, after receiving the approval of the General Assembly of the *agents de change* and appointment by the Ministry of Finance. The exchange committee established the *office's* price and the amount of the operating funds required from new entrants to ensure homogeneous guarantees to investors and fellow brokers. Specific partnerships, authorized by law in 1863, enabled the brokers to raise the large capital required. The need for approval by the associates of the exchange committee reinforced these guarantees (Hautcoeur and Riva 2012).

In practice, the brokers were coopted on strict social and wealth conditions to form a socially homogeneous group and provide high guarantees to the investors and their fellow brokers. Homogeneous credit among brokers smoothed trading by mitigating counterparty risk. A wealthy and uniform group would avoid excessive risk taking and ensure a consistent compliance with the rules, among which were the fixed commission rates. The government set the maximum commissions, and the exchange committee the minimum. Competition among brokers and from the *Coulisse* pushed the *agents* to align with the minimum (Verley 2007; Hautcoeur and Riva 2012).

To reinforce investors' protection and cope with unlimited liability, a mutual fund was established in 1818, funded by an internal assessment proportional to each brokers' transactions. To handle moral hazard coming from the mutualization of risks, the PSE developed strong supervision. This supervision was an important incentive to develop a highly transparent trading process around open outcry, which was restored by the post-revolutionary legislation. Self-regulation shaped the organization of the exchange and set the rules of trading until 1890 when the government adopted a *Réglement d'Administration Publique*, which largely replicated the rules of the PSE (Riva and White 2011; Hautcoeur and Riva 2012).

The PSE organized open-outcry transactions for different sets of securities and operations around pits where each broker had at least a trading clerk. If forward transactions remained largely unchanged over time, spot trading knew important reforms to adapt it to the expansion of the market. Before the 1870s, spot transactions were carried out at open outcry, but the increasing number of securities to be quoted during the trading session made this process difficult to manage. The PSE thus introduced the quotation *par opposition*. Officers of the PSE, the *coteurs*, recorded in an order book the prices of buying and selling orders for each security with the names of the brokers concerned. A broker who received an order had to check the book by referring to the *coteur*. If he could not find any orders in the opposite direction with a suitable price, he would ask for the registration of another *opposition* on the order book. By bringing together the offers and demands, the order book made it possible to determine prices. The first price of the day was a fixing based on the orders received from the closing of the previous day until the opening of the session. The number of pits increased over time to accommodate the development of the market. By 1913, trading was organized around eight groups with around 700 traders on the floor (Lagneau-Ymonet and Riva 2015).

The Municipality of Paris was the owner of the PSE building, the brokers funding the maintenance but also the extension of the building which was completed in 1902. Because it was public property, access to the building during the trading session was open to the public. Investors were thus able to follow the trading and transmit orders to their brokers. However, crowding made it difficult for investors to follow the negotiations. Brokers thus installed blackboards, then electric boards to facilitate the task. Telegraphs and telephones were also installed and managed by the Postal Administration (Lagneau-Ymonet and Riva 2015).

The prices of transactions were published in the official list, the 'Cours authentique et officiel'. As *officiers ministériels*, the brokers certified the authenticity and the official character of the published prices. The list published in chronological order all the spot prices quoted during the session 'par opposition'. In the case of forward prices, because of their huge number, only the first, the last, the higher and the lower prices were published.

Like the NYSE, the PSE enforced high listing requirements based on rules and on what the exchange committee called the 'jurisprudence', a body of unwritten guidelines. The PSE aimed to avoid the trading of excessively volatile securities that would have endangered the solvability of the inventors and thus of the brokers. Furthermore, foreign securities had to gain governmental approval for listing, while French securities, if of sufficient size and thus of public interest, were always listed. However, like the LSE, the PSE established in 1892 a segment for the securities of unlisted companies. Like New York and London, the PSE was not concerned with the accounting standards of the listed companies. However, French law required an audit for listed companies (Lagneau-Ymonet and Riva 2015).

By contrast, the *Coulisse* was a loosely organized market. It was illegal *de jure* for almost all the nineteenth century, but *de facto* tolerated and even protected by the government. The *coulistiers* acted as brokers on their own account and also as investment bankers. Their number was not fixed and no membership criteria were established until 1899. The *Coulisse* was opaque: orders were not centralized; transactions were often bilateral and at low voice; prices were not registered systematically, and were published by newspapers without guarantee for investors. The differences between the two markets led to complementarity and competition. The *Coulisse* developed substantial business of unlisted securities, but competed with the PSE on the most liquid ones. From 1892 on, competition also involved a number of mid-cap French firms traded on the two markets. Individual investors mostly sent their orders to the PSE, while professional intermediaries split their orders between the two markets. This architecture of the Paris financial centre remained quite stable over the century, but it was reformed in the 1890s. In 1893, the creation of a new financial transaction tax gave the *Coulisse* legal status, *de facto* dismantling the (already mostly formal) monopoly of the PSE. However, following a crisis that hit the *Coulisse*, a new law in 1898 re-established and for the first time enforced the monopoly of the brokers over all transactions in the securities they listed, while moral suasion from the government pushed the *Coulisse* to strengthen its organization

(Hautcoeur *et al.* [forthcoming](#)). Competition and complementarities also characterized the relationships between PSE and the regional exchanges. However, since Paris centralized most trading, the business of the regional exchanges did not affect the PSE, while the opposite was not true (Ducros and Riva [2017](#)).

V

Coming back to our main question, historical stock exchange prices are clearly not unproblematic because transparency was, and is, determined by market organization. The rules framing the transactions thus influence the production and dissemination of prices, the central coordinating mechanism of market economy. Embedded as they are in specific political, economic and financial systems, these rules follow concrete historical trajectories leading to marked heterogeneity. Over the last two decades, exchanges have converged towards the transparent electronic order-driven market model, but differences are still appreciable. Parallel to this convergence, new types of opaque markets – such as multilateral trading facilities, crossing networks, dark pools – emerged and concentrated a large share of trading, while OTC markets are always busy. Public markets today struggle to attract new companies or to retain those already listed against the onslaught of private equity and widespread share buy-backs (Hautcoeur *et al.* [2010](#); Lazonick [2010](#); Doidge *et al.* [2017](#); Ewens and Farre-Mensa [2020](#)).

Clearly, technological innovation hits markets today as it did from the mid nineteenth century. Still, as Madhavan states in his influential survey on market microstructures: ‘this [the increased use of electronic trading] does not mean that investigations of market structure is irrelevant. The point to keep in mind, however, is that what ultimately matters is . . . the protocols that translate that order into a realized transaction’ (Madhavan [2000](#), p. 234). This is why history can materially enrich our understanding of financial market dynamics and through these lenses the understanding of the dynamics of past economies and the way those dynamics structure our present and future.

Reaching this goal requires a diachronic and comparative analysis of market organizations and large, high-frequency datasets. However, history can only be written from sources. In-depth markets’ descriptions can mainly be delivered for a limited number of well-organized and relatively ‘successful’ exchanges compared to all the trading venues that have existed over time. Sources are often rare for many less formal markets, particularly if they ceased to exist, in spite of the fact that these markets at some point played an important and sometimes central role.

Studies on market organizations are needed to understand not only price formation and dissemination, but also the large set of data produced by historical markets. Large and high-frequency market data are required for both event studies and studies of long-term dynamics. The creation of these datasets requires huge efforts to conceive harmonized data semantics and documentation practices, as well as large investments in technologies capable of transforming old paper records into new digitized versions at large scale. The work with historical sources, the transcription of data in electronic

format, their harmonization within common semantics and their transformation into coherent time series require a large range of interdisciplinary competences and local knowledge to deal with the different aspects of markets embedded in very different historical contexts. The goal of the EurHisFirm project is to assemble and develop these competences and knowledge.

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