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Pricing Liquidity in Electronic Markets

Foresight Driver Review

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Pricing Liquidity in Electronic Markets

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1. Executive summary

Trading platforms using electronic limit order books increasingly charge different fees for traders submitting limit orders ("makers") and traders submitting market orders ("takers"). In particular, they offer rebates to makers, contributing in this way to the trading profits of high frequency market-makers. This practice is highly controversial. In this report, we discuss the effects of differentiating make and take fees on bid-ask spreads, volume, the supply and demand of liquidity, and market participants' welfare.

We argue that if routing decisions for market orders are based on quotes cum fees and there is no minimum price variation then the make/take fee breakdown (the fraction of the total fee allocated to makers and takers respectively) should have no effect (e.g, it does not affect quotes cum fees or the ratio of limit to market orders).

In reality, the make/take fee breakdown matters because (a) takers' routing decisions are not necessarily based on quotes cum fees due to regulatory requirements (no "trade-through rules"), agency problems, and lack of market transparency and (b) quotes are constrained by the size of trading platforms' minimum price variation (their "tick size").

In presence of a minimum price variation, the make/take fee breakdown can affect the balance of market and limit orders and increase market participants' aggregate welfare. Hence, the differentiation of make/take fees can have a beneficial effect and it could therefore be harmful to restrict the use of make/take fees. Given the lack of evidence on the effects of these fees, pilot experiments should be conducted by trading platforms to assess the effects of these fees, in particular to evaluate whether they can be used to regulate the flow of market and limit orders.

2. Introduction

The growth of algorithmic trading is intertwined with technological and regulatory changes in the organization of securities markets.[1] The widespread adoption of electronic limit order book markets has naturally encouraged investors to automate their trading strategies. Furthermore, the proliferation of new trading platforms has fragmented market liquidity. As a result, investors have to consolidate quotes from many different platforms before choosing how to best execute their orders. Automation greatly reduces the cost of this process. In turn algorithmic trading has served as a catalyst for profound changes in the organization of securities markets. For instance, it has pushed trading platforms to reduce their "latency" (the time it takes for the platforms to send and receive messages to and from other market participants) and to develop new services (e.g., the sale of co-location services or the sale of market data directly to traders).

Algorithmic trading has intensified competition among trading platforms as high frequency traders are very sensitive to trading fees and smart routers facilitate the search for best prices across separate pools of liquidity. As a result, trading platforms have cut their fees (see Figure 1 in the Appendix) and introduced innovative pricing schemes for their trading services.

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[1] I thank two anonymous referees for their very helpful comments and suggestions and Elvira Sojli for comments on a previous version. Of course all remaining errors are mine.

Increasingly, they differentiate the fee paid by traders consuming liquidity (the takers) and the fee paid by traders supplying liquidity (the makers). In particular, they offer "liquidity rebates" (cash payments) to liquidity suppliers in case of execution and fund this rebate with the fee paid by liquidity demanders. Liquidity rebates are one way to lure in high frequency market-making firms since these firms often act as liquidity suppliers and therefore earn the rebate (see for instance "*NYSE adjusts charges in bid to draw traders*", Wall Street Journal, February 3, 2009 or "*The London Stock Exchange bets against maker-taker pricing*", Traders Magazine, July 2009).

Understanding the effects of make/take fees on market quality (market liquidity, price discovery, etc…) and its connection to high frequency trading is important. Some high frequency trading firms and trading platforms have taken strong positions in favor or against these fees (see for instance the responses to the SEC concept release on market structure in 2010). Moreover regulators have raised several questions about make/take fees and wonder whether they should be regulated. For instance, a recent consultation paper by the Committee of European Securities Regulators (CESR) asks: "*What are the impacts of current fee structures on trading platforms, participants, their trading strategies and the wider market and its efficiency? Are there any downsides to current fee structures and the maker/taker fee structure in particular?*"[2] In addition, the new trading environment seems to be characterized by frequent mini "liquidity crises" where the flow of market orders (the demand of liquidity) momentarily exceeds the supply (the flow and stock of limit orders).[3] The flash crash of May 6, 2010 constitutes an extreme and market wide example of this type of phenomenon. The CFTC-SEC advisory committee in charge of making regulatory recommendations in response to the flash crash has proposed using make/take fees, varying according to market conditions, to reduce these transient shortages of liquidity. For instance, the committee writes:[4]

> "The Committee suggests that the Commissions consider incentives to supply liquidity that vary with market conditions. Until recently, the fluctuations in the bid ask spread regulated the demand and supply of liquidity in financial markets. Now, it appears that in a world of HFT, bid ask spreads no longer provide sufficient incentives to offer liquidity in periods of high volatility. Such difficulties in equilibrating supply and demand have counterparts in some markets, where "peak load" pricing strategies of charging higher fees for traffic at peak hours have proven successful at stabilizing demand and supply."

Given this backdrop, the goal of this review is to discuss whether make and take fees have indeed the ability to "regulate" the supply and demand of liquidity in securities markets. I first describe in more detail how platforms price their liquidity and the origins of make/take fees (Section 2). I then use economic reasoning and empirical evidence to analyze the possible effects of these fees (Section 3). Finally, in Section 4, I highlight the policy implications of the discussion and facts provided in Section 3.

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[2] Call for Evidence: Micro-Structural Issues of the European equity markets." Available at http://www.cesr.eu.

[3] For examples of such mini liquidity crises for various U.S stocks, see http://www.nanex.net. For instance, on May 3rd 2011, the price of AMBO fell from $6.74 to $1.59 within a single second, apparently due to a lack of liquidity for an incoming sell market order.

[4] See "Recommendations regarding regulatory responses to the market events of May 6, 2010", available at http://www.cftc.gov/ucm/groups/public/@aboutcftc/documents/file/jacreport_021811.pdf

3. Maker-taker pricing and taker-maker pricing

3.1. Definition

In limit order markets, a transaction occurs when a trader submits a marketable order. This order immediately executes against limit orders previously posted in the market, usually according to price and time priority. Limit orders are conventionally viewed as providing liquidity to market orders since a trade takes place when someone decides to hit a limit order. Thus, trading platforms often refer to traders submitting nonmarketable limit orders as being “makers” (i.e., makers of liquidity), and traders submitting marketable orders as being “takers” (since they consume/take the liquidity provided by makers).

Trading platforms, both in U.S. markets and in Europe, differentiate trading fees between makers and takers. As an illustration, Table 1 (at the end of this section) provides the make and take fees charged by major U.S. trading platforms as of February 2011.

For instance, consider a trade for one round lot (100 shares) on NYSE-Arca (an electronic limit order book operated by NYSE-Euronext in the U.S.) for a stock listed on the NYSE (Tape A). The trader submitting the market order in this transaction (the "taker") pays a fee of 30 cents to NYSE-Arca, while her counter-party (the "maker"), whose limit order is being executed, receives a rebate of 21 cents. The net revenue to NYSE-Arca is 9 cents. This pricing model, which consists in giving a rebate to makers is called the maker-taker pricing model.

The reverse pricing scheme (“taker-maker” pricing) is also used by some trading platforms. In this case, when a trade occurs, the maker pays a fee and a fraction of this fee is rebated to the contra side taker. Some market operators (e.g., Nasdaq or BATS; see Table 1) even operate multiple trading platforms for the same stocks with maker-taker pricing on one platform and taker-maker pricing on the other one.

In all cases, platforms earn, per share traded, the sum of the make fee and the take fee. When trading platforms offer a rebate to one side (takers or makers), they will typically choose it such that it is smaller than the fee charged on the contra side. This is not always the case however as platforms earn revenues from other sources, in particular the sale of trade and quote data. They may therefore use trading services as a loss leader: they lose money on each trade to increase trading volume and generate more revenues from the sale of market data. For instance, BATS BYX uses a taker-maker model in which it loses three cents per round lot (see Table 1). Yet, BATS will earn a fee from selling information on these trades and this revenue presumably exceeds BATS BYX’s loss on each trade occuring on this platform.

The exact implementation of maker-taker pricing varies across platforms. For instance, some platforms may adjust the size of the fee to the type of the participant, his monthly trading volume etc…Moreover, some platforms (especially in Europe) sometimes use value based fees (fees expressed in percentage of the amount traded) rather than volume-based fees.

	Tape A – NYSE Stocks		Tape B – Other Stocks		Tape C – NASDAQ Stocks	
	Make Fee	**Take Fee**	**Make Fee**	**Take Fee**	**Make Fee**	**Take Fee**
NYSE Arca	-21	30	-22	30	-21	30
NDAQ	-20	30	-20	30	-20	30
NDAQ OMX BX	14	-18	14	-18	14	-18
NDAQ OMX PSX	-13	18	-13	18	-13	18
NYSE	-15	23	n.a	n.a	n.a	n.a
BATS BZX	-27	28	-27	28	-27	28
NYSE AMEX	n.a	n.a	-16	28	-30	27
BATS BYX	0	-3	0	-3	0	-3
EDGX	-26	30	-26	30	-26	30
LavaFlow	-24	28	-24	28	-24	28

Table 1. Make and Takes in cents per round lot (100 shares) for some U.S. Trading Platforms

Source: Traders' Magazine, February 2011

3.2. A brief history of make/take fees in the U.S. and in Europe

Maker-taker pricing was first introduced by Electronic Communication Networks (ECNs) such as Island and Instinet (a spin-off of Instinet subsequently merged with Island to give Inet, then acquired by Nasdaq) in the late 90s. These ECNs were operating limit order books where investors could trade Nasdaq stocks and were therefore competing for order flow with Nasdaq dealers. Unlike dealers, ECNs (and trading platforms in general) do not generate revenues by buying at the bid and selling at the ask, acting as contra party for final investors. Rather, they earn revenues by charging a fee each time a trade takes place between buyers and sellers in their market. In January 1997, a change in regulation of U.S. equities markets (known as the "Order handling Rules") required ECNs to display their best quotes along side with dealers' quotes on the Nasdaq ticker. Maker-taker pricing by ECNs emerged in response to this regulatory change.

Indeed, the new obligation to display ECNs quotes on the Nasdaq ticker created a problem since dealers do not charge a fee when they execute an order. The SEC had then two possibilities: require ECNs to display quotes cum fees or allow ECNs to charge a fee (so called "access" fee) when their quotes were hit. As fees were a fraction of the tick size (which became $1/16 on Nasdaq in June 1997), the first option would have required allowing traders to quote in subpennies. The SEC did not choose to follow this route and chose the second option. This approach implicitly gave rise to the practice of charging take fees since access fees are paid by those hitting quotes on ECNs rather than those posting quotes on ECNs.

In 2006, the SEC made further important changes in the regulation of U.S. equities markets. As part of the new set of rules (known as RegNMS), the SEC capped take fees at thirty cents per round lot in U.S. equities markets. Indeed, RegNMS obliges electronic trading platforms to comply with the so called "Order Protection Rule" (sometimes called the no trade-through rule). According to this rule, a trading platform that receives a marketable order must reroute this order to the platform posting the best bid or offer price (depending on whether the order is a sell or a buy order) at the time the order is received. The order protection rule however applies to posted quotes, rather than quotes cum fees. Thus, a platform with tight bid-ask spreads could in principle charge non competitive take fees and still attract trades due to the Order Protection Rule. To avoid this problem, the SEC decided to cap take fees.

More recently, the SEC has considered extending this cap to options markets, which fueled new debates about the role of make/take fees among market participants. [5] Make/take fees are very controversial as they result in significant monetary transfers between market participants (e.g., from takers to makers). Not surprisingly, high frequency market-makers tend to support the maker-taker pricing model since they often act as makers and earn the rebates. For instance, in its comments to the SEC on a change in NYSE Arca's schedule of fees, GETCO (a prominent high frequency market-maker) writes:

> "GETCO strongly believes that the advent of maker-taker pricing in the options markets by NYSE Arca, the Nasdaq Options Market ("NOM") and the Boston Options Exchange ("BOX") has resulted in numerous benefits for the options markets generally and for customers trading on those markets. GETCO further believes that imposing artificial restrictions on maker-taker exchanges such as restrictive fee caps will reduce or eliminate many of these benefits and disadvantage retail investors." (See http://www.getcollc.com/index.php/getco/commentletters/Schedule of Fees and Charges.pdf.)

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[5] See "Proposed Amendment to Rule 610", SEC release n° 34-61902 available at http://www.sec.gov/rules/proposed/2010/34-61902.pdf).

This view is far from being shared by all participants. Instead many have voiced concerns that maker-taker pricing could result in excessive take fees, distorting competition between trading platforms and artificially inflating trading volume. For instance, Citadel Investment Group writes in a petition for rulemaking sent to the SEC:

> "Citadel Investment Group L.L.C. ("Citadel") urges the Securities and Exchange Commission to address distortions in the options markets caused by the excessive fees that may be charged by options exchanges using maker-taker pricing. Specifically, Citadel petitions the Commission to institute a rulemaking proceeding to limit the fees that options exchanges may charge non-members to obtain access to quotations to $.20 per contract." (See http://www.sec.gov/rules/petitions/2008/petn4-562.pdf).

Thus, in the U.S., the regulatory debate on make/take fees has focused on whether the determination of make/take fees should be entirely left to market forces or whether take fees should be capped or even banned (as proposed for instance by Harris, Angel, and Spatt (2011)).

In recent years, maker-taker pricing gained popularity outside equities markets (e.g., in options and futures markets) and outside U.S. securities markets. In particular, in Europe, the implementation of a new E.U directive, MiFID, in 2007 enabled entry of new trading platforms (Chi-X, Turquoise, BATS Europe etc…), operating electronic limit order books. These platforms adopted the maker-taker pricing model, pushing incumbent exchanges to cut their fees and switch to maker-taker pricing (with the notable exception of the London Stock Exchange).[6]

As explained previously, the emergence of maker-taker pricing in the U.S. is closely linked to the particular regulatory environment of U.S. equities markets. The environment in Europe is very different. In particular there is no trade-through rule in Europe and no equivalent to the Order Handling Rules. Hence, the wide adoption of maker-taker pricing in recent years, especially in Europe, cannot only be ascribed to regulation. More fundamental economic forces are likely to be at play as well. For instance, maker-taker pricing is often viewed as a way to attract high frequency market-making firms. As these firms often act as makers, they earn the liquidity rebate and this rebate can constitute a significant fraction of their trading profit per trade, as shown by Menkveld (2010).[7] In fact, some high frequency trading firms explicitly design their trading strategies to earn liquidity rebates (see "*the world of high frequency trading: the six primary strategies*," available at http://wwwT3Live.com).

Taker-maker pricing is also related to a practice known as "payment for order flow" in U.S equities and options markets. Payments for order flow are monetary inducements given by market-makers to brokers sending them orders, with a commitment to execute brokers' orders at the best standing quotes. Hence, at first glance, payments for order flow are similar to liquidity rebates for takers. However, these payments are made by market-makers (not trading platforms) and may be contingent on the type of orders routed by a broker to a market-maker

[6] The LSE adopted a maker-taker pricing model in September 2008 but it reverted to an equal pricing scheme in September 2009.

[7] Menkveld (2010) finds that the liquidity rebate on Chi-X (a European trading platform) accounts for about 15% of the net spread per trade earned by one high-frequency market-maker in Dutch stocks (see his Table 4, Panel C).

(e.g., retail vs. institutional flow, small vs. large trades etc…). Thus, the economics of maker-taker pricing is likely to be different from the economics of payments for order flow.

4. Do make/take fees matter?

As explained in the previous section, the origin of maker-taker pricing is closely linked to peculiarities of the U.S. regulatory environment. This does not imply however that absent these peculiarities, maker-taker pricing would have no effect and would not have emerged. In fact, as we already noticed, make/take fees are also used in Europe where the regulatory forces explaining the emergence of maker-taker pricing in the U.S. are not present. Hence, in this section, we discuss whether and how make-take fees could matter, first abstracting from the characteristics of the U.S regulatory environment.

4.1. Defining the issues

Before addressing the question of whether make/take fees matter, it is useful to first discuss and define which dimensions of market quality these fees may affect.

Bid-ask spreads. Most of the regulatory debate on make/take fees focuses on their effect on the bid-ask spread and more generally, the cost of trading for traders submitting market orders (i.e., takers). In this case, it is important to distinguish two types of bid-ask spreads: (i) "raw" bid-ask spreads and (ii) "cum fee bid-ask" spreads. The raw bid-ask spread is simply the difference between the average execution price for buy market orders and the average execution price for sell market orders. In contrast the cum fee bid-ask spread is the difference between the price actually paid or received by takers. For instance a buy market order will pay the ask price plus the take fee. Hence the cum fee bid-ask spread is the bid-ask spread plus twice the take fee. It is a measure of the actual cost of trading for a taker.

Welfare. Bid-ask spreads however are not a sufficient metric for measuring whether differentiating make and take fees is desirable. In electronic limit order books, investors can choose to be makers or takers. The cost of trading for takers is therefore a revenue for makers and the platform. It is therefore not clear why markets should be organized to minimize the cost of trading for takers exclusively. A more encompassing objective would be to account for the welfare of all parties (makers, takers, and trading platforms' profits).[8] In reality, however, investors might specialize in one role (taker or maker) according to their characteristics (e.g., retail investors, high frequency trading firms, index funds etc…). For instance, retail investors are, maybe, more likely to act as takers than more sophisticated investors.[9] In this case, in order to protect retail investors, regulators might be more concerned by the effect of make/take fees on takers' welfare than their effect on makers' welfare.

Volume and Trading Platforms' Profits. Trading platforms are not per se interested in traders' welfare. Their objective is first and foremost to maximize their own profit. In doing so, they are primarily concerned by the effect of their make/take fee structure on trading volume (since their profit from the sale of trading services is equal to the fee earned per trade times the

[8] See Glosten (1998) and Goettler, Parlour and Rajan (2005).

[9] This is unclear however as there are very few studies documenting the type of orders used by retail investors. Using a large sample of Finnish investors, Linnainmaa (2010) find that 76% of the orders placed by retail investors in his sample are limit orders.

number of shares traded of trade minus their operating costs). A trading platform will care about the impact of make/take fees on the bid-ask spread insofar as a small bid-ask spread makes the platform more attractive for takers.

Balancing liquidity supply and demand. Differentiating fees between makers and takers is often viewed as a way to influence traders' decision to post limit orders or market orders and therefore the balance of liquidity supply and demand. This possibility is indeed key for the idea that make and take fees could be used to regulate liquidity supply and demand (see the introduction). The logic is apparently simple: if the make fee is reduced relative to the take fee then being a maker is more attractive than being a taker. Hence, the supply of liquidity relative to the demand should increase. This logic is indeed often implicitly used by trading platforms to justify the maker-taker pricing model. They argue that to attract market orders, they first need to attract limit orders since market orders execute against limit orders. Hence, subsidizing makers is a required investment to attract takers and generate trades. Although intuitive, I argue below that this reasoning is flawed.

To sum up, there are at least four (related but distinct) questions that one may ask about the effects of make/take fees:

1. Does the differentiation of make/take fees affect raw and cum fee bid-ask spreads?

2. Does the differentiation of make/take fees affect social welfare (the aggregate welfare of all market participants)?

3. Does the differentiation of make/take fees affect trading volume?

4. Does the differentiation of make/take fees affect liquidity supply and demand (e.g., the ratio of limit to market orders over a given period of time or the speed at which liquidity suppliers respond to a lack of liquidity)?

The second question is maybe the most important but it is difficult to address empirically. Studying the effects of make/take fees on bid-ask spreads, trading volume or the order flow composition is easier and can indirectly shed light on welfare effects (for instance, in some case, more trading volume may indicate that market participants achieve higher gains from trade).

In addressing these questions, one must be careful in distinguishing two types of changes in make/take fees: (i) changes that leave unchanged *the total fee* earned by a platform per trade (the sum of the make and take fees) and (ii) changes that modify the total fee. For instance, suppose that a platform earns 10 cents per round lot traded and that it divides this charge so that makers and takers pay an equal fraction of the total fee. If the platform changes its fees so that takers now pay 7 cents and makers pay 3 cents (per round lot), the 50/50 breakdown of the total fee is changed (to 70/30) but the total fee is unchanged. If instead the platform now charges 7 cents to takers and 2 cents to makers, both the make/take fee breakdown and the total fee are changed.

A change in the total fee and a change in the breakdown of this fee between makers and takers, holding the total fee fixed, do not necessarily have the same effects. Intuitively, a change in the total fee (whether obtained through a decrease in the make fee or an increase in the take fee) should affect the demand for trading services since this is the price of these services. In contrast, the effects of a change in the make/take breakdown for a given total trading fee are less clear. This distinction is rarely explicitly made in debates about make/take fees, which is a source of confusion (for instance, capping the take fee prevents platforms from achieving any breakdown but does not restrict them in the choice of the total fee). Hereafter, I mainly focus on the effects of a change in the make/take fee breakdown.

There are yet very few formal or empirical analyses of make and take fees. To the best of my knowledge, the only theoretical studies are Colliard and Foucault (2011) and Foucault, Kandel and Kadan (2010), who provide market microstructure models with make and take fees. Evidence on the effects of make/take fees is provided in Malinova and Park (2011) and Skjeltorp, Sojli and Tham (2011) (SKT (2011)). In the rest of this section, I discuss the implications of these studies regarding the effects of make/take fees on bid-ask spreads, volume, the balance of liquidity supply and demand, and welfare.

4.2. An irrelevance result

Colliard and Foucault (2011) analyze a model of trading in which investors are either buyers or sellers and can choose to submit limit orders (be makers) or market orders (be takers) to carry out their trades. In this model, traders meet on a trading platform, which charges a fee per transaction. This fee is split between the maker and the taker in the transaction and this split is not necessarily uniform between both sides. In particular, the model allows the maker or the taker to receive a rebate from the platform. The platform chooses its total fee and the breakdown of this fee between makers and takers to maximize its expected profit. One important feature of the model is that there is no minimum price variation, i.e., the tick size is zero. The model has several implications.

First, the make/take fee breakdown affects the raw bid-ask spread but it has no effect on the cum fee bid-ask spread, as shown in the numerical example provided in Table 2.

Fees (per share)	Case 1		Case 2		Case 3	
	Make Fee = 0	Take Fee = 0.07	Make Fee = -0.23	Take Fee = 0.3	Make Fee = 0.3	Take Fee = -0.23
Raw spread (cents)	19.916		19.456		20.656	
Cum fee spread (cents)	20.056		20.056		20.056	
Revenue platform per share traded (cents)	0.07		0.07		0.07	

Table 2. The make/take fee breakdown is irrelevant for cum fee bid-ask spreads

The mechanism that leads to this result in the model is as follows. Start from a 50/50 make/take fee breakdown and consider for instance a decrease in the fraction of the total fee charged to makers. Traders first react to the decrease in the make fee and the corresponding increase in the take fee by using more limit orders since these orders appear relatively cheap. But as a result, the likelihood of execution for limit orders decreases. Traders submitting limit orders optimally react by posting more aggressive quotes to steer traders into using market orders. Hence, the raw bid-ask spread decreases. In equilibrium, the decrease in the raw bid-ask spread is just sufficient for the increase in the take fee to have no effect on the cost of trading for takers, i.e., the cum fee bid-ask spread is unaffected by the change in the make/take fee breakdown.

Another way to understand this result is to observe that ultimately the limit order market is a mechanism to split gains from trade among traders acting as makers and traders acting as takers. The make/take fee breakdown should not affect this split, which ultimately should only depends on the market power of makers relative to takers.

To see this, suppose that all buyers have a valuation of $100 for a security and all sellers have a valuation of $99. Moreover, all trades are for share. Whether sellers or buyers make offers (act as makers) is randomly determined and when a trade takes place, a fee "C" is charged to the parties by the platform matching buyers and sellers. Thus, the gains from trade to be split between a maker and a taker are equal to (100-99)-C=1-C. Last suppose that makers' maker power is such that they must leave 40% of gains from trade to takers (the exact figure is not important for the example). Now, let τ be the *fraction* of the total fee charged to takers (e.g., τ=30%). Hence, parameter τ determines the make/take fee breakdown. When a seller is selected to make an offer (post a limit order), he must choose his offer so that the buyer obtains a surplus (i.e., the buyer's valuation minus the price he pays to buy the asset) equal to 40%×(1-C). For this to be the case, the seller must set his ask price, "Ask", such that

$$100- (Ask + \tau C) = 40\%\times(1-C),$$

that is:

$$Ask = 100 - \tau C - 40\%\times(1-C).$$

A similar reasoning implies that when a buyer is selected to make the offer, he chooses his bid price, "Bid", so that:

$$Bid = 99 + \tau C + 40\%\times(1-C).$$

For instance, if C= 0.07 cents (the order of magnitude of the total fee in U.S markets, see Table 1) and τ = 100% (hence the make fee is zero), then the ask price $99.59958 and the bid price is $99.40042. Hence, as shown in column 1 of Table 2, the raw bid-ask spread is $0.19916 and the cum fee bid-ask spread is $0.20056. More generally, the raw bid-ask spread is

$$\text{Raw bid-ask spread} = Ask - Bid = 0.2 + C\times(0.8 - 2\tau),$$

and the cum fee bid-ask spread is

$$\text{Cum fee bid-ask spread} = \text{Raw bid-ask spread} + 2\tau C = 0.2 + 0.8\times C.$$

Thus, the raw bid-ask spread decreases with the *fraction* of the total fee charged to takers (or equivalently increases in the fraction of the make fee charged to makers) whereas the cum fee bid-ask spread is independent of the make/take fee breakdown.

However, the cum fee bid-ask spread increases in the total fee, C. This has several implications. First, if one wants to minimize total trading cost for takers, reducing the total fee may be more important shifting the make/take fee breakdown in favor of takers. It also shows that it is very important to control for the total level of fee in discussing or analyzing the effect of make/take fees in reality. Indeed, suppose again that C= 0.07 cents and suppose that the fee is equally split between makers and takers. In this case, the bid-ask spread and the cum fee bid-ask spread are respectively \$0.19986 and \$0.20056. Now suppose that the trading platform reduces its make fee at 0.01 cent while leaving unchanged the take fee. The total fee is now C=0.01 + 0.5×0.07=0.045 cents. The cum fee bid-ask spread is now smaller at 0.2+0.8×C= \$0.20036. At first glance, one might ascribe the drop in the cum fee spread to the drop in the make fee. But it just reflects the drop in the total fee. In fact the platform could achieve exactly the same outcome by cutting is take fee at 0.01 cents and leaving its make fee unchanged.

The previous example captures the essence of the effects of fees on bid-ask spreads in Colliard and Foucault (2011)'s model, even though their model is more complex: it allows traders to choose whether to be makers or takers, makers do not post offers that execute with probability one, the fraction of gains from trade captured by makers is endogenous etc…. The important point for the argument is that the *fraction* of gains from trade (net of the total fee paid to the platform) captured by makers does not depend on the make/take fee breakdown.

As the make/take fee breakdown has no effect on cum fee bid-ask spreads, it also does not affect the order flow composition (i.e., the ratio of market to limit orders over a given peof time), the trading rate (the number of shares traded per unit of time) or traders' welfare (their expected profit from participating in the market). Indeed, the order flow composition or the trading rate ultimately depend on traders' choices between market and limit orders. These choices are determined only by the expected surplus net of fees associated with each type of order (i.e., the cum fee bid-ask spreads, not the raw bid-ask spreads). Now, in equilibrium, these surpluses do not depend on the make/take fee breakdown, exactly as in the previous example. If for instance, the platform reduces its make fee, the raw bid-ask spread drops until the point where the division of gains from trade between makers and takers is unaffected. As a result traders' welfare also does not depend on the make/take fee breakdown.

Thus, in Colliard and Foucault (2011), the make/take fee breakdown is largely irrelevant: it affects the quotes posted in the market but it has no effects on quotes cum fees, trading volume, how the supply and the demand of liquidity equilibrate, and traders' welfare. Colliard and Foucault (2011) also show that this irrelevance result persists even when investors can choose among multiple trading platforms to route their orders. The reason is the same: what should matter for investors' routing decisions is not the bid-ask spread, but the bid-ask spread cum fee. Hence, as observed in reality (see Table 1), multiple platforms can co-exist with different make/take fee breakdowns. That is, trading should not gravitate towards the platform charging the smallest make fee or the smallest take fee but to the platform charging the smallest total fee, as standard economic reasoning would first suggest.

As mentioned previously, common wisdom is that tilting the make/take fee breakdown in favor of makers (i.e., increasing the *fraction* of the total fee charged to takers) is a way to attract more limit orders or to steer away limit orders from competitors. This argument sounds appealing but our discussion so far shows that it is potentially misleading: bid-ask spreads cum fees should adjust to neutralize any change in the make/take fee breakdown as we just explained. This echoes the point of view developed in Angel, Harris and Spatt (2011) who write (on page 40):

> "In competitive markets, the actual spread will not depend on how high the access fees and liquidity rebates are, so long as the difference between them is constant. Traders simply adjust their quoted prices so that the net prices that they pay or receive are the same on average. The make-or-take pricing model thus would appear to accomplish nothing besides reducing quoted spreads and thereby obfuscating true economic spreads, which are the net spreads inclusive of the access fees and liquidity rebates. The obfuscation makes it more difficult for traders to recognize the true costs of their trading."

Accordingly, it is not entirely obvious that altering the make/take fee breakdown can be a tool to "regulate" the relative flows of limit and market orders, as recently suggested by the CFTC-SEC advisory committee formed after the flash crash (see the introduction). The reason is intuitive: in limit order markets, the cum fee bid-ask spread is the variable of adjustment that balances the demand of liquidity and the supply of liquidity (e.g., the ratio of limit to market orders over a given period of time). When there are no restrictions on traders' quotes (i.e., the tick size is zero), quotes will adjust so as to neutralize any effects of a change in the make/take fee breakdown.

We are then left with a puzzle. Why do platforms and participants care so much about the make/take fee breakdown if it is irrelevant? The answer to this question cannot only lie in the way traders optimally trade-off market and limit orders or competitive concerns as often argued since these are features of Colliard and Foucault (2011)'s model. This model however assumes that traders' routing and quoting decisions are frictionless. I now argue that make/take fees may matter in presence of frictions distorting traders' routing decisions or reducing makers' flexibility in posting their price.

4.3. Routing decisions and make/take fees

Trading costs for liquidity demanders depend on quotes cum fees. Hence, in principle, takers' routing decisions should depend on quotes cum fees: buyers (sellers) should route their market orders to the platform posting the best offer (bid) price cum fee at the time of their transaction. However, in reality, this may not be necessarily the case for three reasons: (i) regulation, (ii) agency problems, and (iii) lack of transparency.

Regulation. As explained previously, in the U.S., electronic trading platforms have to comply with the so called "Order Protection Rule" (sometimes called the no trade-through rule). As the order protection rule applies to *raw* quotes rather than quotes cum fees, a platform charging a relatively high take fee can still attract trades if it displays a sufficiently small raw bid-ask spread. Moreover, in the U.S., tape revenues (i.e., revenues generated by the sale of trade and quote information) are split between platforms based on the fraction of time their bid and ask prices are equal to the National Best Bid and Offer prices (i.e., the best quotes across all trading platforms). These features of U.S. markets give strong incentives to platforms to promote artificially low bid-ask spreads. One way to do so for platforms consist in offering liquidity rebates to makers. Indeed, these rebates allow makers to post tighter raw bid-ask spreads and still break even.

To see this, consider again the example in the previous section and let μ be the fraction of the total fee charged to makers (μ can be negative if makers receive a subsidy). The raw bid-ask spread in this example is:

$$\text{Raw bid-ask spread} = \text{Ask} - \text{Bid} = 0.2 + C\times(0.8 - 2\tau) = 0.2 + C\times(2\mu - 1.2),$$

where the second equality follows from the fact $\mu+\tau = 100\%$. Thus, a decrease in the fraction of the total fee charged to makers (a decrease in μ) reduces the raw bid-ask spread. Of course, one problem is that a trading platform can then attract market orders even though its quotes cum fees are not competitive because its take fee is very high. For this reason, as explained previously, the SEC has decided to cap take fees at 30 cents per round lot in U.S. equities market.

To avoid this problem, the no trade through rule should be based on quotes cum fees, rather than raw quotes. This is impractical however when the onus of the order protection rule is placed on trading platforms, as is done currently in the U.S. Indeed, the fees charged to a broker by a given platform may depend on the volume of business done by the broker with this platform. This information is typically not available to a platform's competitors, which prevent them from accounting for fees in deciding where to route orders.

In any case, the singularities of U.S. equities markets regulation cannot fully explain why platforms use the maker-taker pricing model. Indeed, maker-taker pricing is also used in European equities markets where there is no order protection rule and data revenues are not allocated as in the U.S. Moreover, even though these singularities may account for why platforms offer liquidity rebates in the U.S., they do not explain then why some platforms choose to subsidize takers instead of makers (see Table 1).

Agency problems. Routing decisions are often made by brokers rather than final investors. This situation creates a moral hazard problem since brokers' incentives might not be completely aligned with those of their clients. In particular, there is no obligation for brokers to pass liquidity rebates to their clients. If brokers keep a significant fraction of the rebate, they have therefore an incentive to route limit orders to the platform offering the largest liquidity rebate, irrespective of the impact of their routing decision on their client's expected profit. Payments for order flow raise a similar problem: brokers have an incentive to route market orders to dealers from whom they receive payments even if this is not necessarily optimal for their clients. For instance Lee (1993) show that small investors' orders were often executed at inferior prices than those prevailing on the NYSE in the 90s due to payment for order flow arrangements between brokers and third-market dealers.

In such a situation, the make/take fee breakdown matters because brokers' routing decisions are sensitive to rebates rather than prices cum fees. Agency problems however are more likely to be a concern for small investors than for large institutional investors. Indeed, the latter have a greater incentive to closely monitor brokers' routing decisions since they trade larger volumes (hence even small savings in execution costs per share can have large impact on their performance). Moreover, increasingly, institutional investors directly control their routing decisions using "Direct Market Access" or "Sponsored Access," services, i.e., the ability to send their own orders directly to a platform (through the broker selling the Direct Access service).

Transparency. It can be complex for investors to factor the effects of fees in their routing decisions. Indeed, prices in a trading platform are usually displayed net of fees, not cum fees. Moreover, fees can vary greatly across platforms and even among investors depending on their monthly trading volume. It is thus difficult for investors to fully account for the effects of fees in the design of their smart routers (on this point see Chapter 7 in McCleskey (2004)). The consequence is similar to that of the order protection rule: for less sophisticated investors, routing decisions are more likely to depend on raw prices rather than on prices cum fees.

4.4.Price discreteness and make/take fees

In reality, makers' quotes are constrained by the minimum price variation (the tick) set by trading platforms and/or government regulatory bodies. Hence, the bid-ask spread must be an integer multiple of the tick size. This feature prevents traders from fully neutralizing changes in make and take fees when these changes are less than one tick (as they often are). Consider again the numerical example in the previous section when C=0.07 cents and assume that the take fee is 0.028 cents. In this case, the bid and the ask prices are respectively $99.4 and $99.6 and the raw bid-ask spread is equal to two cents. If the take fee is increased to, say, 0.04 cents, the new quotes must be $99.59988 and $99.40012 to maintain unchanged the division of gains from trade (i.e., so that takers still obtain 40% of the gains from trade). The required raw bid-ask spread is then 19.976 cents. However this bid-ask spread cannot be posted, if, for instance, the tick size is one cent. In this case, traders cannot fully neutralize the effects of a change in the make/take fee breakdown to maintain a 40/60 split of gains from trade between takers and makers.

In this situation, the make/take fee breakdown starts being important as it can complement the role played by the bid-ask spread in balancing liquidity supply and demand (because cum fee bid-ask spreads are not constrained by the tick size). This intuition is formalized in Foucault, Kadan, and Kandel (2010) (henceforth FKK (2010)). They consider a model with two sides: the market-making side, which is specialized in providing liquidity, and the market-taking side, which consumes liquidity to satisfy its trading needs. FKK (2010) interpret the market-making side as proprietary trading firms specialized in high frequency market-making and the market-taking side as brokers using smart routers to execute market orders when the bid-ask spread is tight. In this model, the bid-ask spread widens after a trade as market orders consume the liquidity available at the best quotes. Market-makers monitor the market to be first to reinject liquidity at good prices after a trade (and therefore benefit from time priority) and market-takers monitor the market to be first to hit competitive quotes when they are posted by market-makers.

In this way, FKK (2010) captures one key driver of high frequency trading: one must be first to react to a change in the state of the market (e.g., an increase or a decrease in the spread) to exploit it. For instance, a brochure from IBM describes algorithmic trading as "*The ability to reduce latency (the time it takes to react to changes in the market [...] to an absolute minimum. Speed is an advantage [...] because usually the first mover gets the best price*" (see "Tackling latency: the algorithmic arms race", IBM 2008). In the same spirit, an article from Traders Magazine explains traders' demand for speed by "*The reality is that order is only there for one person. So if you react faster, you fill the order.*" (see "The Race to Zero," Traders Magazine, p.38, 2009).

In FKK (2010), liquidity supply is measured by the speed at which electronic market-makers reinject liquidity after a transient drop in market liquidity due to a trade and liquidity demand is measured by the speed at which market-takers hit competitive quotes. These speeds depend on the aggregate monitoring intensities of each side. FKK (2010) show that these intensities depend on various factors such as the masses of traders on each side, traders' monitoring costs (which depend on their technology), and traders' expected profit per trade.

Liquidity supply and liquidity demand (i.e., the speeds of reaction of both sides) are not well balanced in general because one side can be much faster than the other in grabbing profit opportunities. For instance, suppose that there are relatively few high frequency market-makers. Then, unless monitoring costs are much smaller for market-makers, the aggregate monitoring intensity of market-takers is higher than that of market-makers. As a result, in aggregate, takers react much faster to trading opportunities than market-makers. That is, good quotes are hit very quickly when they appear in the market relative to the time it takes for makers to submit new limit orders after a trade.

Imbalances in the speeds of reaction of makers and takers that are too large are not desirable for a trading platform because the relatively "tardy" side slows down the trading process. In the previous example, makers' sluggish reaction slows down trading since takers tend to wait for small bid-ask spreads before submitting market orders. Conversely, a very fast reaction of market-makers is useless for a platform if takers are not equally quick in hitting good quotes. Hence, a trading platform has an incentive to balance the speeds of reaction to trading opportunities of the taking and the making sides, i.e., to balance the speeds at which liquidity is consumed and supplied. Ultimately, this is a way for the platform to increase the rate at which makers and takers are matched (the trading rate) and its trading revenue.

FKK (2010) suggests that the make/take fee breakdown can be used precisely to this end when the tick size is positive. To see this, suppose again that makers are relatively slow in reacting to a trading opportunity (i.e., an increase in the bid-ask spread). In this case, the platform can increase the trading rate without changing its revenue per trade by decreasing the make fee while increasing the take fee by the same amount. *If the fee change is small enough relative to the tick size*, it cannot be neutralized by an adjustment in quotes and the effect of this change is therefore to increase makers' profit per trade. Thus, it incentivizes makers to monitor the market more closely to increase their chance of being first to reinject liquidity after a transient increase in the spread and therefore to be first in queue to execute the next trade. The flip side is that takers have less incentive to be fast. This effect is of second order however when their aggregate monitoring intensity is already high (e.g., there are many takers relative to makers). Of course, if instead makers' aggregate monitoring intensity is higher, the logic works in a symmetric way: takers should be charged a smaller fee than makers.

Thus, in this model, a change in the make/take fee breakdown can be used to generate more trades per unit of time by speeding up the process at which makers and takers "find" each other. Thus, if the tick size is positive, the make/take fee breakdown is not neutral: a change in this breakdown affects the trading rate.[10] In the limit case in which the tick size is zero, FKK

[10] In this case, a limit order market is what economists call a "two-sided market." A market is two-sided when two sets of agents (the two sides) interact through an intermediary (e.g., a platform) and the allocation of the intermediation fee between the two sets of agents affects the trading volume on the platform (see Rochet and Tirole (2006)). For instance, the market for payment cards involves two sets of participants (merchants and consumers) and intermediaries (banks). The two sides in a limit order market are liquidity suppliers (makers) and liquidity demanders (takers). As shown by the literature on

(2010) also obtain the irrelevance result derived in Colliard and Foucault (2011): the platform cannot affect the trading rate by fine tuning its make/take fee breakdown since any change is neutralized by a change in ask and bid prices.

FKK (2010) makes several predictions on the factors that should affect the difference between the take fee and the make fee (what they call the "take/make spread"). In particular, their model implies that maximization of the trading rate requires rebates for makers when (i) the size of the market-making side is small relative to the size of the market-taking side or (ii) monitoring costs are higher for market-makers. Moreover, rebates for makers are also optimal when makers capture only a small fraction of the gains from trade (for instance because competition among market-makers is fierce and the tick size is small). Under symmetric conditions (e.g., the market-taking side is small relative to the market side), the model prescribes rebates for takers (as observed in some markets). It is worth stressing that these factors may vary across stocks (e.g., the number of takers could vary systematically across stocks), which implies that the make/take free breakdown that best balances the supply and demand of liquidity could be stock specific.

In FKK (2010), differentiating make and take fees is primarily a way for a trading platform to maximize its expected profit by raising the trading rate (the frequency at which takers are matched with makers). In doing so the platform unvoluntarily improves traders' aggregate welfare (the sum of makers and takers' expected profits per unit of time). The reason is that liquidity suppliers and demanders are matched more quickly when the platform optimally chooses its make/take fees, so that gains from trade are realized more frequently.[11] This point is important. Make/take fees are often viewed as a zero sum game between the side receiving the rebate and the side funding the rebate. FKK (2010) provides a counter-point to this view: if the differentiation in make/take fees helps to better balance the supply and demand of liquidity, then it can result in an aggregate welfare improvement. For this reason, regulators should be careful in taking actions that prevent platforms from differentiating their make and take fees.

5. Evidence

Two empirical studies analyze the effects of varying the make/take fee breakdown on measures of market quality.

The TSX experiment. Malinova and Park (2011) study a change in the fee schedule of the Toronto Stock Exchange (TSX). Prior to October 1, 2005, all trades on the TSX were subject to a uniform value based trading fee equal to 1.8 basis points. This fee was paid by takers whereas no fee was charged on makers. On October 1, 2005, the TSX started using a maker-taker pricing model for Canadian stocks listed on the TSX and cross-listed on Nasdaq. The liquidity rebate has been fixed at $0.00275 and the take fee at $0.004 (per share). For other stocks, the fee structure remained unchanged (until July 2006). For cross-listed stocks with a price less than $22.22, the fee paid by takers increased (relative to the previous fee schedule)

two-sided markets, it is in general optimal for the intermediary while subsidizing one side and charge the other side (see Rysman (2009)). This is consistent with the practice of giving a rebate to makers or takers.

[11] Trading is a search problem. In FKK (2010), make/take fees can be seen as a way to optimally balance the search intensities of makers and takers, leading to a faster rate at which liquidity suppliers and liquidity demanders find each other.

while for stocks with a price higher than \$22.22, the fee paid by takers decreased.[12] This feature is interesting since it enables Malinova and Park (2011) to analyze the effect of an increase or a decrease in take fees by considering stocks with different prices.

This change in the fee schedule of the TSX also corresponds to a change in the total fee. Indeed, for stocks with a price less than \$6.875, the total fee increased whereas for stocks with a price greater than \$6.875, the total fee decreased. This feature implies that effects documented in this study may be due to a change in the make/take fee breakdown or/and the change in the total fee.

One interesting feature of the TSX experiment is that the change in fees only applies to cross-listed stocks. Thus, one can analyze the effects of the change in make and take fees on market liquidity and trading volume while controlling for other factors affecting these variables by using the stocks unaffected by the change in fees as a control group. Overall, Malinova and Park (2011)'s sample contains 73 "treated" stocks (stocks that experience a switch to maker-taker pricing) and 374 control stocks (stocks that do not experience a change in the fee schedule).

Malinova and Park (2011) obtain several interesting findings. First, treated stocks experience, on average, a decrease in their bid-ask spread (quoted and effective), relative to control stocks.[13] However, the effective spread cum fee does not change significantly. Hence, the average effect of the implementation of maker-taker pricing on the bid-ask spreads on the TSX are in line with the predictions of Colliard and Foucault (2011): the liquidity rebate induces makers to post tighter raw bid-ask spreads but, after accounting for take fees, there is no effect on bid-ask spreads.

This average effect however masks interesting cross-sectional differences. First the reduction in the effective bid-ask spread is much stronger for stocks that experience an increase in their take fee (stock with a price below \$22) than for which the take fee decreases. Again this result is consistent with Colliard and Foucault (2011). In this model, a decrease in the make fee or an increase in the take fee leads to a decrease in raw bid-ask spreads. Thus, when the make fee decreases *and* the take fee increases, the reduction in measures of raw bid-ask spreads (quoted or effective) should be strong, as found in Malinova and Park (2011). In contrast, a decrease in the take fee and a decrease in the make fee exert two opposite forces on raw bid-ask spreads so that the net effect of these changes on the raw bid-ask spread can be small, as again found by Malinova and Park (2011).

Interestingly, treated stocks for which the total trading costs is reduced (stocks with a price greater than \$6.875) experience a decline in their cum fee effective bid-ask spread (this decline however is not statistically significant). In contrast, the cum fee effective bid-ask spread increases significantly for other treated stocks, i.e., those for which the total trading fee increases. Again this is consistent with the analysis of fees in Foucault and Colliard (2011): effective spreads cum fees should be increasing with the total fee. Hence, they should drop

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[12] To see this, let p be the price of a stock. The take fee before October 2005 for this stock was $\$p\times0.00018$ and it is \$0.004 after this date. Thus, the take fee decreases if $0.004< p\times0.00018$, that is, if $p > 22.22$.

[13] The effective bid-ask spread on a trade is the absolute difference between transaction prices and the mid-quote at the time of the trade. This is a measure of price impact.

when the total fee decreases and they should increase otherwise, as observed by Malinova and Park (2011).

Malinova and Park (2011) also find that the quoted depth of treated stocks (the number of shares offered at the best quotes) increases significantly after the adoption of maker-taker pricing by the TSX. As for the effective bid-ask spread, the effect is much stronger for stocks that experience an increase in the take fee (stocks with a price less than $22).

On average, across all treated stocks, there is no change in takers' trading costs since the average effective bid-ask spread does not change. Yet, Malinova and Park (2011) finds that the adoption of maker-taker pricing results in a significant increase in the trading volume (measured in number of shares) and the number of transactions of treated stocks, on average. This finding suggests that a change in the make/take fee breakdown can alter the trading rate, even in absence of change in trading costs for liquidity demanders. This result is in line with FKK (2010) in which a change in the make/take fee breakdown can increase the trading rate, without changing bid-ask spreads.

The Nasdaq OMX BX experiment. Skjeltorp, Sojli and Tham (2011) (SST (2011)) exploit the fact that Nasdaq OMX operates two different trading platforms (Nasdaq and Nasdaq BX), one using maker-taker pricing and the other using taker-maker pricing (see Table 1 and the discussion in Section 2). Their sample period runs from July 2009 to March 2011. Over this period, Nasdaq and Nasdaq BX have changed their make and take fees several times (not necessarily both fees at the same time). For instance, the take fee increased on Nasdaq on February 11, 2009 while rebates paid to takers on Nasdaq BX increased on January 11, 2010. SST (2011) study how these changes affect the speed at which liquidity demanders respond to prices posted by liquidity suppliers and vice versa. In contrast to Malinova and Park (2011), SST (2011) do not consider the effects of make and take fees on bid-ask spreads. Rather they focus on the role of make/take fees in equilibrating the supply and demand of liquidity (in terms of speed at which liquidity is provided and consumed).

SST (2011) find evidence of clientele effects: the level of algorithmic trading on Nasdaq BX is higher than on Nasdaq. Moreover, the compensation required by makers to cover their adverse selection costs (costs incurred when a limit order is hit by a better informed investor) is smaller on Nasdaq BX. This finding suggests that Nasdaq BX might be used by algorithmic investors who use algorithms to minimize execution costs (agency algorithms) rather than to quickly exploit private information. Thus, the coexistence of various make/take fees schedules may serve to screen different types of investors. In fact, payment for order flow has been interpreted as a way to screen uninformed from informed investors (see for instance Battalio and Holden (2001)). It is not clear however how the differentiation of make/take fees suffices to screen different types of investors since, in contrast to payments for order flow, liquidity rebates are usually not contingent on investors' characteristics (e.g., whether the investor is a retail investor or an institution).[14]

The core of SST (2011)'s study consists in running event studies around the changes in make/take fees in their sample to analyze how make/take fees affect the speed at which

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[14] This is the case for Nasdaq. On some platforms, trading fees may depend on traders' characteristics (e.g., whether the trader is an algorithmic trader or not, see Hendershott and Riordan (2010)).

makers (on Nasdaq BX only) post aggressive new quotes after a trade (a measure of the response of liquidity suppliers to liquidity demand) and the speed at which takers (on Nasdaq BX only) hit aggressive quotes (a measure of the response of liquidity demanders to liquidity supply). They find that a change in fee rendering Nasdaq more attractive for makers or takers has a negative effect on the speed at which liquidity is supplied and the speed at which liquidity is consumed on BX. This is roughly consistent with the logic in FKK (2010). For instance, when makers receive a relatively higher rebate on Nasdaq, they have relatively less incentive to reinject liquidity on Nasdaq BX after a trade on this platform.

Interestingly, they also find that a change in only one fee (e.g., the take fee) has an effect on the speeds of reaction of *both* makers and takers. For instance on February 11, 2009, the take fee increased on Nasdaq, making Nasdaq BX relatively more attractive for takers. Accordingly, SST (2011) finds that this increase reduces the average time it takes for good quotes to be hit by takers. But it also increases the speed at which makers post aggressive limit orders after a trade although makers were not directly affected by the change in fees. Hence, there is an externality: the faster reaction of takers seems to induce a faster reaction of makers. In other words, liquidity demand begets liquidity supply and vice versa, which also is a prediction of FKK (2010).

6. Policy implications and future

The previous analysis yields several policy recommendations that we summarize in this section.

1. It might be harmful to prevent trading platforms from differentiating make/take fees since these fees can play an important role in equilibrating the supply and demand of liquidity as long as the tick size is positive. Intuitively, these fees complement the role of the bid-ask spread in this equilibration process when the set of possible quotes is constrained by platforms or by regulation. Thus, they can increase the rate at which makers and takers are matched and as a result enhance social welfare. In this respect, the differentiation of make/take fees may have played a role in the explosion of trading volume in the recent years.

2. Traders can neutralize the effects of make/take fees by adjusting the prices at which they trade in the market, especially if the price grid is very fine. Thus, policy decisions regarding make/take fees should be made jointly with policy decisions regarding the tick size. In particular, a too small tick size might not be desirable. Indeed, a too small tick size reduces platforms' ability to influence traders' order placement strategies with make/take fees as quotes will adjust to leave quotes cum fee unchanged. With a very fine grid (or even a zero tick size), one for instance might lose the possibility of inducing traders to submit more limit orders when the market lacks liquidity (as suggested by the CFTC-SEC advisory committee-see the introduction).

3. Routing decisions are more complex in presence of make/take fees as traders must account for the fact that the prices posted in trading systems do not correspond to the price they will receive or pay. This is problematic since make/take fees may severely distort traders' routing decisions and platforms' pricing strategies if traders do not factor fees in their routing decisions. One way to alleviate this problem is to require platforms to show prices cum fees but this requirement is difficult to implement in practice (as fees

may be broker specific). A simpler way is to account for trading fees in evaluating whether brokers comply with best execution and to require brokers to pass liquidity rebates to their clients.

4. The recent debate on make/take fees may have been too much centered on the make/take fee breakdown and not enough on the total level of trading fees paid to trading platforms. Indeed, a reduction in this total level should in principle benefit both makers and takers, by reducing the fraction of gains from trade extracted by platforms.

5. Empirical evidence regarding the effects of make/take fees is very scarce. Existing empirical studies have focused on cases in which both the total fee per trade and the breakdown of this fee between makers and takers has changed. Hence, it is difficult to isolate the effects of the make/take fee breakdown in these studies. That being said, empirical findings seem to indicate an effect of make and take fees on trading volume and the speed at which liquidity is supplied and consumed.

6. To collect further evidence, it would be useful to conduct pilot experiments in which the make/take fee breakdown is changed for a subset of securities while keeping the total fee unchanged.[15] Such experiments would allow researchers to directly test whether variations in make/take fees can alter liquidity supply and demand and traders' order placement strategies. Results from these experiments would also help to design and calibrate more complex pricing schemes in which the make/take fee breakdown could vary according to market conditions (excess liquidity demand, volatility etc…) or according to stock characteristics. Alternatively, one could use lab experiments as done for other issues in market design (see for instance Bloomfield and O'Hara (1997) for an experimental analysis of order preferencing, a practice related to payment for order flow).

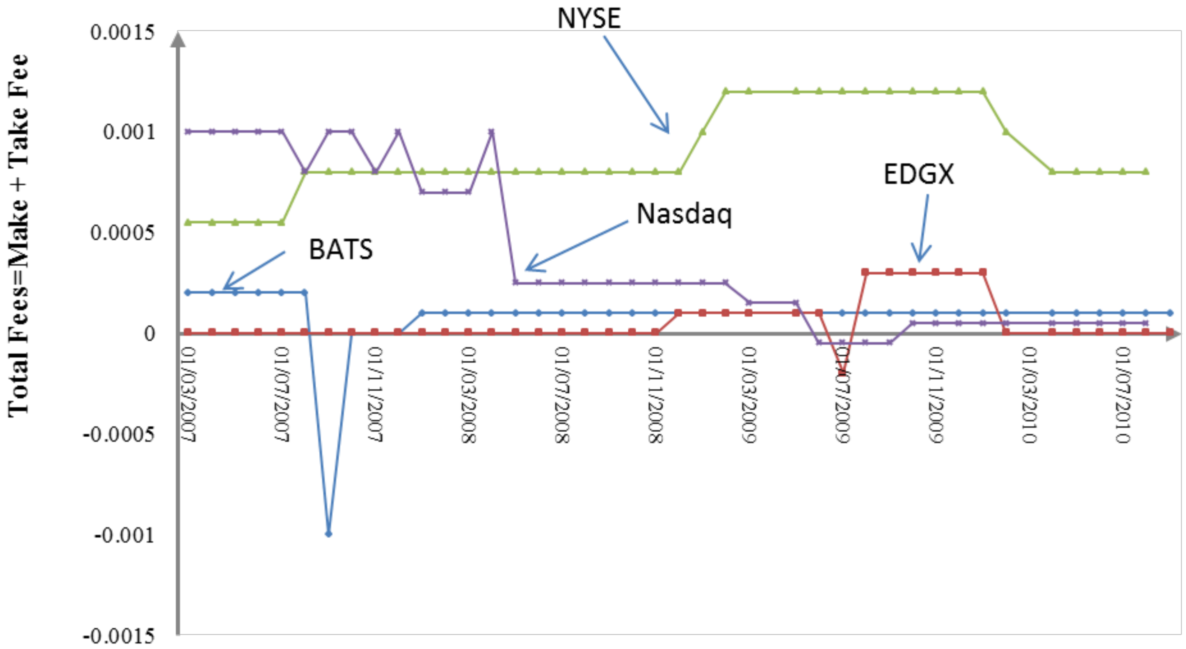
What is the future of make and take fees? Historically, the emergence of these fees was closely linked to features of the regulatory environment of U.S. equities markets. If these features could entirely explain why platforms differentiate make and take fees, this differentiation would not exist outside U.S. equities markets. However European platforms and derivatives markets in the U.S. also use the make-taker pricing model, which suggests platforms' decision to differentiate make and take fees is not driven only by regulatory constraints. In particular, make/take fees may help to better equilibrate the supply and demand of liquidity in securities markets. Their effectiveness however depends on the size of the tick and make/take fees will disappear if minimum price variations constraints vanish. Indeed in this case, traders can neutralize any effects of the fees on the balance of liquidity demand and supply by simply adjusting their quotes. In the immediate future, more empirical research is needed on make/take fees to identify which economic role(s) they play.

[15] Such pilot experiments have been conducted in U.S. securities market to analyze the effects of post trade transparency in bond markets for instance (see Goldstein, Hotchkis and Sirri (2007)).

7. Appendix

Figure 1

Evolution of Fees for Tape A stocks (i.e., listed on the NYSE) on 4 platforms: EDGX, BATS, Nasdaq, NYSE from March 07 to December 10



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