Tax Incentives for Designated Market Makers*

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Abstract

Stock markets in emerging economies often suffer from illiquidity, with prolonged intraday periods of wide bid-ask spreads and low trading. We show that public policy can boost trading by incentivizing liquidity provision through designated market makers (DMMs). Using a Chilean reform that offered tax benefits to firms hiring DMMs, we identify a causal link between DMM adoption and improved liquidity, reflected in significantly narrower bid-ask spreads. Our novel analysis of intraday spread distributions shows that about half of the spread reduction comes from DMM obligations, and the rest from spillovers to voluntary liquidity providers. The initial narrowing increased trading volume, which may have further reduced spreads through a multiplier effect. A preliminary cost-benefit analysis suggests the regulation's benefits plausibly outweigh its fiscal costs.

Key-words: liquidity, designated market maker, public policy

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1 Introduction

Stock market liquidity delivers broad benefits by enhancing capital access, resource allocation, and risk sharing, ultimately supporting economic growth. However, liquidity arises from the trading among individual investors, who may not fully internalize these market-wide gains. This points to positive externalities and a potential underprovision of liquidity.[1] Liquidity is also self-reinforcing: higher liquidity lowers trading costs, attracting more participants and further improving liquidity, while the opposite occurs in illiquid markets. These dynamics raise two key questions: (i) should regulators intervene to subsidize liquidity provision, and (ii) what form should such policies take?

The literature identifies Designated Market Makers (DMMs), financial intermediaries contracted and compensated by firms or exchanges to provide continuous liquidity, as an effective tool to boost market liquidity.[2] In light of this finding, the Chilean government in 2012 introduced a policy that indirectly subsidized DMMs by offering tax incentives to investors in firms that hired one. The regulator also chose the liquidity obligations of the DMM, including a bid-ask spread cap of 300 basis points. The firms that engaged a DMM to retain the tax benefit are small, with market capitalizations comparable to those near the bottom of the S&P 600 SmallCap Index—where concerns about illiquidity are arguably most pressing.

Our first contribution is to exploit the policy and estimate the causal impact of DMMs on liquidity. We find economically significant improvements in bid-ask spreads and trading volume. Second, we offer a methodological contribution by analyzing the intraday distribution of spreads. We find a substantial increase in the likelihood of spreads well below the binding 300 basis point cap, indicating strong feedback effects in liquidity supply. Third, we conduct an exploratory cost-benefit analysis of the policy

[1]Externalities may arise through several channels, such as improved price discovery and capital allocation, the impact of illiquidity on IPO decisions (Pagano, 1993), and increased participation and risk sharing (Pagano, 1989); see Vayanos et al. (2012) for an overview.

[2]We review the relevant literature below.

and find that the estimated liquidity gains plausibly outweigh the fiscal cost of the tax incentive.

The 2012 policy introduced a plausibly exogenous shock: some firms adopted DMMs, while others did not, enabling causal identification of liquidity provision contracts. Chilean stocks qualify for a capital gains tax exemption if they maintain "exchange presence." Before 2012, this required at least USD 10,000 in daily trading on 25% of the past 180 trading days. The reform expanded eligibility by allowing firms to qualify through a DMM contract, while also raising the threshold for direct qualification to USD 50,000. We focus on firms that met the old but not the new threshold. These "lost-status" firms faced strong incentives to hire a DMM to regain tax-exempt status, largely due to investor pressure.[3]

Using a daily panel dataset, we instrument DMM adoption with the interaction of two indicators: one for the post-reform period and another for lost-status firms. The first stage is strong—lost-status firms became 50 percentage points more likely to adopt a DMM after the reform. Prior to the reform, liquidity trends for lost- and non-lost-status firms were similar, supporting the parallel-trends assumption. Identification also depends on the exclusion restriction: losing exchange presence affects liquidity only through DMM adoption. The instrument's validity rests on several features: fixed turnover thresholds and a predetermined implementation date. The threshold change limits self-selection based on firm conditions, while the fixed date curbs concerns about strategic timing.[4] Further, exchange presence is based on a slow-moving six-month volume average, which limits manipulation. Any anticipatory trading would bias results downward, making our estimates conservative.

[3] Chile's largest investors, pension funds, are restricted from investing in companies without exchange presence. Additionally, other investors, accustomed to the tax exemption, were reluctant to forgo its benefits, prompting them to pressure firms to regain their tax advantage.

[4] Firms expecting larger liquidity gains are more likely to engage a DMM. DMMs are especially valuable during events like equity offerings or buybacks (Skjeltorp and Ødegaard, 2015), which can drive timing strategies.

Our first key finding is that designated market makers significantly improve daily liquidity measures, as captured by the second-stage instrumental-variable estimates. These effects are economically meaningful: for instance, the reduction in the effective spread of 55.7 basis points represents nearly half of the pre-regulation average of 119 basis points for firms that lost exchange presence. The impacts on the realized half-spread and quoted spread are also large, with 69.9 and 179 basis point, respectively.

Our second key finding stems from a novel analysis of how DMM adoption affects the intraday distribution of quoted spreads. We divide spreads into eight intervals and use the share of time the spread falls within each interval as the dependent variable in our instrumental-variables model. As a first validation, we confirm the direct effect of the DMM's presence: the probability of spreads exceeding 300 basis points is virtually eliminated, consistent with the DMM's obligation to narrow excessive spreads.

More interestingly, if the DMM's impact were purely direct—only enforcing a cap—we would expect spreads to cluster just below the 300 basis point threshold. Yet we observe no such bunching. Instead, DMM adoption leads to a marked increase in the share of time in intervals with much tighter spreads. For instance, the share of the 20–40 basis point category more than quadrupled, and in the 40–100 category more than tripled. These spread levels are well below the cap, indicating a strong feedback mechanism: by narrowing spreads directly, the DMM encourages greater liquidity provision by other market participants. Decomposing the total improvement in quoted spreads (179 basis points), we find that the direct and feedback effects each account for about half of the gain.

Furthermore, we find that the introduction of a DMM increases stock turnover by 74%, although this effect disappears once we control for the quoted spread. This indicates that the increase in turnover is primarily driven by the tighter spreads, consistent with a feedback mechanism between trading costs and trading activity. While we cannot pin down the exact feedback mechanism, this channel may also explain the aforementioned increased likelihood of spreads falling well below the 300 basis point threshold. Such feedback effects strengthen the case for policy intervention, suggesting that even modest improvements in market conditions can generate broad shifts in trading behavior.

Beyond estimating the causal effects of DMM adoption, we also evaluate the regulation as a policy intervention from three complementary angles. First, we assess the overall impact of the regulation on market liquidity by relying on reduced-form estimates that do not require strong identification assumptions. These estimates show that the regulation led to significant improvements in liquidity among affected firms, confirming its effectiveness in altering firm behavior and improving market outcomes.

Second, we examine what happened after the tax incentive was withdrawn in 2021. Interestingly, most firms continued to retain their DMM contracts even after losing the tax benefit. This asymmetric response—strong adoption when the incentive was introduced, but limited exit once it was removed—suggests that temporary incentives can lead to persistent behavioral changes, possibly because firms came to value the liquidity benefits of DMMs independently of the tax advantage.

Third, we conduct an exploratory cost-benefit analysis. While necessarily approximate, our estimates suggest that the liquidity gains plausibly outweighed the fiscal cost of the policy. These gains include both direct savings from lower trading costs and harder-to-quantify effects such as valuation increases, higher trading surplus, and broader economic benefits from improved market functioning. The persistence of these gains after the incentive was removed further strengthens the case for a net positive impact.

Our paper builds on recent research examining the causal impact of DMMs on stock market liquidity (Clark-Joseph et al., 2017; Bessembinder et al., 2019; Bellia et al., 2024b; Foley et al., 2020). Clark-Joseph et al. (2017) study market outages due to technological failures, and find that liquidity is severely harmed only when an outage eliminates an exchanges with a DMM. Bessembinder et al. (2019) show that stronger contractual obligations for DMMs at the New York Stock Exchange improve liquidity by enhancing strategic interactions among liquidity providers. Bellia et al. (2024b) find that incentives offered to DMMs on the NYSE Euronext Paris increase liquidity by intensifying competition between market makers. Foley et al. (2020) document that a Toronto Stock Exchange initiative bundling market-making responsibilities between large and small stocks leads to substantial liquidity gains for smaller stocks.

Our main contribution to the literature is the focus on public policy. First, while previous studies examine exchange-led changes driven by private incentives, our setting reflects the regulator's view that liquidity generates positive externalities which may be underprovided by private actors. Second, the impact of a DMM on liquidity depends on her contractual obligations, which vary between settings. This is crucial for our cost-benefit analysis, as we are interested not only in how much liquidity the DMM supplies but also in the cost to society. Third, our analysis of the intraday distribution of bid-ask spreads allows us to disentangle the direct effects of the binding DMM obligations from broader feedback effects via other market participants. The large equilibrium response is an argument in favor of public policy.

Our contribution extends to a wider literature documenting a positive correlation between DMM engagement and market outcomes, including increased liquidity and price efficiency, lower capital costs (Anand et al., 2009), and reduced liquidity risk (Menkveld and Wang, 2013a). DMMs are particularly beneficial for young, small, and less volatile firms (Venkataraman and Waisburd, 2007), as well as for firms anticipating capital market interactions (Skjeltorp and Ødegaard, 2015).

2 Data

2.1 Data sources

Our analysis covers all 160 publicly listed firms on the Santiago Stock Exchange from January 2011 to December 2013. The primary data source is Tick Data Market, which provides intraday trade and top-of-book quote data. Each trade and quote update, defined as a change in the best bid or offer price or quantity, is time-stamped at the microsecond level. Using these data, we compute daily measures of liquidity, prices, trading volumes, trade counts, electronic message counts, and variance ratios.

In addition, we use the Economatica database to obtain data on outstanding shares and market capitalization for each firm. The website of the Bolsa de Santiago Stock Exchange contains information on when firms signed market maker agreements. Our sample includes 160 unique firms, and we construct the main panel dataset at the stock-day level.

We restrict our sample to stock-days with at least one trade. This selection is necessary because calculating liquidity measures for the regressions (such as spreads and volatility) requires trade data. Since zero-trade day observations cannot be included in the regressions, we apply this filter throughout the paper to ensure a consistent panel in all analyses. The original dataset contains 114,441 observations, of which 46.8% are stock-days without trades. We proceed with the remaining 60,883 observations.[5]

2.2 Summary Statistics

We estimate a variety of standard liquidity measures (see Appendix A for exact variable definitions). Each measure is calculated daily for each stock and, in the full panel, is

[5] To assess the impact of a DMM on zero-trade days, we collapse the daily panel into two stock-level observations—pre- and post-regulation—and compute changes in zero-trade days and other variables. Appendix Table A.1 shows that DMM adoption has no significant effect on either the number or percentage of zero-trade days.

winsorized at the 1st and 99th percentiles to mitigate the impact of outliers. Intraday, we impose an assumed maximum bid-ask spread of 500 basis points (5%), to ensure that extremely illiquid periods do not bias our main results. One motivation is that an investor can trade via a broker-dealer or investment bank even when the order book is extremely thin—a 5% cost of such operation seems reasonable.[6]

Table 1 presents the summary statistics for the full panel. The average (median) firm in the sample has a market capitalization of approximately USD 3 billion (1 billion),[7] For context, in 2012, the average market cap of an S&P 400 mid-cap index stock was USD 4 billion, compared to USD 1 billion for an S&P 600 small-cap index stock.

Daily trading activity is low. The average daily turnover is approximately USD 2 million, which corresponds to an annual turnover of 16.6% of market capitalization. The median number of trades per day is 28 and the median number of messages is 68 (defined as any trade or update to the best bid or offer in the order book). The low ratio of messages to trades indicates minimal algorithmic trading activity. The average trade size is USD 30,000. There is significant variation in stock prices, with a mean price of USD 23 and a standard deviation of USD 576 (the minimum price of 0 in the table is due to rounding in the exchange rate).

The Chilean stock market is illiquid, with an average time-weighted quoted bid-ask spread of 186 basis points. Recall that this figure incorporates an imposed upper intraday limit of 500 basis points, applied to replace even larger spreads observed during periods of extreme order book thinness. The quoted depth is also low; the mean is close to the average and the median are close to the trade size. This suggests that market orders often eliminate all shares offered at the best price in the order book.

The average effective half-spread is 66 basis points—about one-third lower than the

[6]As a robustness check, we also run the main analysis using a 10% threshold and all results hold (Appendix Table A.2).

[7]We use the 2012 exchange rate of CLP 500 = USD 1 throughout the paper, and convert all relevant values to USD.

quoted half-spread of 93 basis points—indicating that investors tend to trade when markets are more liquid. A decomposition of the effective spread shows a five-minute price impact of 16 basis points and a realized spread of 50 basis points. The price impact, only a quarter of the effective spread, reflects adverse selection and informed trading. The high realized spread likely compensates for market maker inventory and monitoring costs, along with potential rents from limited competition. These costs are likely high due to low volumes and strong order flow directionality: the average absolute order imbalance is 0.58,[8] suggesting frequent one-sided pressure. Given Chile's market size, imperfect competition is a plausible concern.

As a proxy for market efficiency, the median variance ratio is 1.13, indicating momentum at the one-minute frequency. The distribution is strongly right-skewed, with an average variance ratio of 2.1. This measure is likely influenced by the high levels of intraday illiquidity (e.g., wide spreads), which directly impact the midpoint returns used in the variance ratio calculation. The trade-based realized volatility is low on average, with the 25th percentile being zero. This happens on days when the few trades execute at the same price, resulting in no price variation.

2.3 Intraday liquidity

How often do periods of extremely wide spreads and low trading activity occur throughout the trading day? To address this question, we classify the quoted spreads into eight intervals (bins) and compute the proportion of the trading day in which the spread falls within each interval. In addition, we measure the dollar turnover corresponding to each bin.

Table 2 presents summary statistics on the distribution of quoted spreads across the eight intervals. On average, for all stocks and days, the spread is between 0 and 20

[8] Defined as $\frac{|B-S|}{B+S}$ for daily buyer (B) and seller (S) initiated market order volume, e.g., buy volume of 79 and sell volume of 21 yields an imbalance ratio of 0.58.

basis points only 13% of the trading day. However, the standard deviation of 21% is substantial, indicating significant variation in the prevalence of highly liquid periods. Similarly, spreads in the 20-40 basis point interval occur 12% of the time and in the 40–100 basis points interval 21% of the time. At the other extreme, spreads exceeding 500 basis points occur 18% of the average trading day, with a notably high standard deviation of 33%, highlighting the large variability in extreme illiquidity between stocks and days.

Trading volume (columns 3 and 4) is strongly negatively associated with spreads. This is consistent with investors being price-sensitive and trading less during illiquid periods; but also with liquidity providers withdrawing supply when demand for trade is low. Although the two most liquid spread intervals (below 40 basis points) account for only 25% of the time, they contribute to 50% of total daily volume. In contrast, the four most illiquid categories (spreads exceeding 200 basis points) account for 36% of the time but contribute less than 2.5% of the total market volume.

3 Identification Strategy

In this section, we outline the institutional context and Regulation No. 327, which are essential for constructing an instrument to capture plausibly exogenous variation in firms' decisions to engage in a DMM. We then detail the empirical model and identify assumptions.

3.1 Institutional Setting

We begin by defining "exchange presence," which plays a key role in Chile's capital gains tax treatment, and then describe the regulatory change that introduced a new path to achieve it through DMM engagement.

3.1.1 Exchange presence

In Chile, stocks classified as having exchange presence are granted a capital gains tax exemption.[9] For those lacking exchange presence, investors must pay capital gains taxes at the moment they realize profits, at their progressive personal income tax rate that reaches a maximum of 40%.[10]

The Chilean Securities Regulator traditionally defines the exchange presence based on stock turnover. Specifically, a stock must have a minimum daily transaction value of 200 Unidades de Fomento (UF), equivalent to approximately USD 10,000,[11] on at least 25% of the last 180 trading days. Thus,

$$\text{Exchange Presence}_{it} = \begin{cases} 1 & \text{if } \%\text{DaysAboveTreshold}_{it} \geq 0.25 \\ 0 & \text{otherwise} \end{cases} \tag{1}$$

where:

$$\%\text{DaysAboveTreshold}_{it} = \frac{1}{180} \sum_{\tau=t-180}^{t-1} \mathbb{1}_{i\tau}^{\text{turnover}_{i\tau} > \text{USD10,000}} \tag{2}$$

3.1.2 The Regulatory Change

In January 2012, the Securities Regulator introduced Regulation No. 327 to enhance stock market liquidity by expanding the criteria of exchange presence.[12] The new rule introduced two changes. First and foremost, firms could achieve exchange presence not

[9] This exemption was introduced in 2001 as part of broader capital market reforms aimed at improving investor participation, market depth, and liquidity in the stock market (Agostini and Siravegna, 2014).

[10] Institutional investors, such as pension funds, are always exempt from capital gains taxes, regardless of whether the stocks they hold have exchange presence.

[11] During 2012, the exchange rate of UF 1 = CLP 22,500 = USD 50,00, approximately.

[12] Regulation No. 327 (in Spanish).

only through the stock turnover criteria but also by engaging a designated market maker:

$$\text{Exchange Presence}_{it} = \begin{cases} 1 & \text{if } \%\text{DaysAboveTreshold}_{it} \geq 0.25 \quad \text{or firm engages DMM} \\ 0 & \text{otherwise.} \end{cases} \tag{3}$$

A firm chooses to enter into a DMM contract with a large broker-dealer and negotiates compensation. The arrangement is overseen by the stock exchange under a self-regulatory framework, rather than being formally co-signed by the exchange. The contract specifies standardized obligations for the DMM, including maintaining a maximum quoted bid-ask spread of 300 basis points (3%) and a minimum quoted depth of 500 UF on the bid and ask side, which is approximately USD 25,000 per day. These obligations end on each trading day when the DMM has bought and sold a total of USD 25,000. In addition, the contract lasts for a minimum of six months, after which the DMM must reveal her trading activity to the firm, and the parties may decide to renovate the contract. All these requirements apply uniformly to all DMM contracts and are part of the policy design, trading off the liquidity benefits with the cost for society through foregone tax revenues.[13] The DMM in Chile does not have special status, privileges, or trading costs advantages,[14] and simply submits her quotes to the public limit order book as any other investor.

The second regulatory change raised the turnover-based criteria from USD 10,000 to USD 50,000 (200 UF to 1,000 UF). The new threshold is as follows:

$$\%\text{DaysAboveTreshold}_{it}^{Post} = \frac{1}{180} \sum_{\tau=t-180}^{t-1} \mathbb{1}_{i\tau}^{\text{turnover}_{i\tau} > \text{USD50,000}} \tag{4}$$

[13] This standardization contrasts European regulation (MiFID II, 2018), which stipulates that any firm using a market-making strategy must enter a formal DMM agreement with the exchange, but under contract terms that are potentially individually negotiated.

[14] In contrast, NYSE DMMs enjoy execution priority relative to same-priced limit orders by public investors; and both NYSE and NASDAQ DMMs typically enjoy lower trading fees.

Just before the regulation took effect, 48% of the firms met the old stock turnover criteria. Following its implementation, this percentage dropped to 41%, indicating that a significant number of firms no longer met the new stricter standard. We note that some firms already had DMM contracts in place before the regulation in 2012. However, these maintained laxer standards in terms of liquidity provision and did not grant Exchange Presence status.[15]

3.2 The Instrument

The regulatory increase in the turnover threshold for exchange presence is central to our identification strategy. We define a cross-sectional dummy variable set to one for firms that lost status on the regulation's implementation date, February 1, 2012.[16] Specifically, we identify firms that met the old turnover criterion of turnover exceeding USD 10,000 on at least 25% of the last 180 trading days but did not meet the new criteria with a USD 50,000 threshold:

$$\text{Lost-status}_i = \begin{cases} 1 & \text{if } \%\text{DaysAboveTreshold}^{\text{Post}}_{i,\text{Feb1,2012}} \leq 0.25 \\ & \text{and } \%\text{DaysAboveTreshold}^{\text{Pre}}_{i,\text{Feb1,2012}} > 0.25 \\ 0 & \text{otherwise} \end{cases} \tag{5}$$

On the day the regulation took effect, ten out of 153 firms lost status due to stricter volume requirements. Eventually, 25 firms engaged a DMM, including seven of the ten that lost status (compliers). To estimate the impact of a DMM on stock market liquidity, we use $\text{Lost-status}_i \times \text{Post}_t$ as an instrument for the (endogenous) decision of a firm to engage a DMM. Post_t is a dummy variable equal to one after the implementation date.

The loss of exchange presence status created strong incentives for firms to engage a

[15] In Table A.3 we add to the main IV specification a dummy variable for the presence of an old-style DMM agreement, which does not meaningfully affect the first- or second-stage coefficients.

[16] Note that $\textit{Lost-status}_i$ is a permanent characteristic, and does not change if a firm subsequently hires a DMM to maintain Exchange Presence.

market maker and retain the designation. Two key factors drove this pressure. First, Chile's largest institutional investors, pension funds, are legally restricted to investing only in stocks with Exchange Presence.[17] Losing this status would force pension funds to divest, cutting off a critical and stable capital source. In addition, other investors, having benefited from the tax exemption in the past, were unwilling to relinquish these advantages and pushed firms to restore their tax-exempt status.

Importantly, on the implementation date, 78 firms in the sample had never met the exchange presence requirements, while 65 had always met them. The lost-status firms lie squarely in the middle of the trading volume distribution. This intermediate position is advantageous for identification, as it allows a balanced comparison group with both higher- and lower-volume firms.

Figure 1 shows the monthly evolution of DMM adoption for the full sample (green solid line), and the breakdown into lost-status and non-lost status firms (which we discuss in the subsection below). The average DMM adoption rate increases rapidly to 12% within six months of the regulation. Afterwards, there is minor fluctuation in the fraction due to some firms engaging a DMM only temporarily, as well as firms leaving or joining the stock exchange.

Table 3 replicates the key summary statistics from Table 1, disaggregating lost-status and other firms before and after regulation implementation. Lost-status firms have low turnover by international standards, although in our sample there are ample firms with higher and lower levels. Due to the presence of a few very large firms, the average market capitalization and turnover of lost-status firms are about ten times smaller than those of the average firm. Accordingly, spread measures for lost-status firms are approximately 50% larger.

[17] See Investment Regime of Chilean Pension Funds.

3.3 Identification Assumptions

We conduct a difference-in-differences instrumental variables (DiD-IV) analysis. It is a difference-in-differences framework in which endogenous treatment is instrumented using a policy shock or exogenous variation, allowing for causal identification among compliers. We estimate the following model:

$$\text{DMM}_{it} = \gamma_1 \text{Lost-status}_i \times \text{Post}_t + \gamma_2' \text{Controls}_{it} + \mu_i + \mu_t + \epsilon_{it}, \tag{6}$$

$$Y_{it} = \beta_1 \widehat{\text{DMM}}_{it} + \beta_2' \text{Controls}_{it} + \nu_i + \nu_t + \varepsilon_{it}. \tag{7}$$

Equation (6) is the first-stage regression, where DMM_{it} is a dummy equal to one if firm i has an active DMM contract on day t. Equation (7) is the second-stage regression, where Y_{it} denotes a liquidity measure. $\widehat{\text{DMM}}_{it}$ is the predicted value from the first stage. Both regressions include firm and time fixed effects and control for standard liquidity determinants: log market capitalization, log dollar turnover, realized volatility, and the inverse of the dollar share price. All standard errors are clustered at the firm and date level.

One concern is that the instrument $\text{Lost-status}_i \times \text{Post}_t$ has little variation in the time-series when using daily data, potentially inflating statistical significance. While we apply two-way clustering in all analyses, we further adress this concern by collapsing the panel into pre- and post-regulation averages and then re-estimating the IV model. Results remain robust (Appendix Table A.4), confirming that our findings are not artificially inflated by using a daily panel.

Identification in a DiD-IV framework is based on three core assumptions: instrument relevance, exclusion restriction, and parallel trends. We examine each in turn in the sections that follow.

3.3.1 Instrument Relevance

Figure 1 showed that the average DMM adoption rate rose rapidly to 12% within six months of the regulation. More importantly, the rate among lost-status firms jumped to 60%, visually reinforcing that losing status is a strong predictor of DMM adoption.

To assess instrument relevance formally, we estimate the first-stage regression specified in Equation (6), with the results shown in Column 1 of Table 4. Following the regulatory change, firms that lost their exchange presence status were 50 percentage points more likely to engage a DMM, rising from an unconditional probability of 12% to 62%. This substantial increase highlights the strong incentive these firms faced to regain status and preserve the associated tax benefit. Most DMM adoptions occurred within six months of the implementation of the regulation (Figure 1).

The first-stage Kleibergen-Paap rk Wald F-statistic is 14.19, which exceeds the conventional threshold of 10 and thus satisfied the standard criterion for instrument relevance (Stock et al., 2002). While the statistic is not exceptionally large—partly due to the limited number of compliers (i.e., lost-status firms that engage a DMM)—we are not overly concerned about weak instrument issues. This is because the reduced-form effect of the instrument on liquidity is large and highly significant.[18] Provided that the exclusion restriction holds (as argued in 3.3.3), this effect must operate only through DMM adoption, supporting the instrument relevance.

3.3.2 Parallel Trends

The next identifying assumption is the standard parallel trends assumption in difference-in-differences estimation: absent the regulation, liquidity outcomes for lost-status ("treated") and non-lost-status ("control") firms would have evolved similarly. Figure 2 shows monthly trends in effective spreads (top panel) and quoted spreads (bottom panel) for

[18] See Table 7 for results.

both groups. Before the regulation, the trajectories of lost-status and non-lost-status firms are closely aligned, which supports the parallel trend assumption.[19]

3.3.3 Exclusion Restriction

The exclusion restriction assumes that the loss of exchange presence affects liquidity exclusively through its impact on DMM adoption. The credibility of this assumption rests on four key arguments.

First, the instrument, lost-status, is determined by predefined regulatory turnover thresholds, which are exogenous to firm-specific conditions. This mitigates concerns about self-selection, where firms expecting the greatest liquidity gains would be most likely to adopt a DMM. Because the thresholds are fixed and externally imposed, they are not subject to manipulation by firms deciding whether to engage a DMM.

Second, the regulation took effect on a fixed implementation date, reducing concerns about strategic timing. Firms could not preemptively appoint a DMM in anticipation of major corporate events, such as equity offerings. Our identification strategy exploits only the variation in DMM engagement triggered by the policy's effective date.

Third, exchange presence is determined by trading volume over the preceding 180 trading days, a relatively slow-moving metric. This limits the potential for manipulation in anticipation of the regulatory change. For instance, even if investors attempted wash trading to boost volume and preserve the tax exemption, such last-minute actions would have little effect on the six-month average used to calculate exchange presence.

Fourth, some investors may sell their holdings in anticipation of a firm losing exchange presence to realize capital gains while still exempt from taxes. However, this is not a major concern. Such behavior would temporarily increase trading volume before DMM adoption, biasing our estimates downward and leading us to underestimate the true

[19] Appendix Figure B.1 displays the same trends after applying the controls from Equation (7). The results remain unchanged: pre-regulation trends remain similar across groups.

effect of DMMs on trading activity.

4 Impact of a DMM on Liquidity

We estimate the effect of DMM adoption on key liquidity outcomes. We start by analyzing its impact on average daily measures. We then examine how it alters the distribution of intraday spreads, separating direct effects from broader equilibrium responses.

4.1 Effects on Daily Spreads

We estimate the second-stage regression (Equation (7)) using the following liquidity measures as dependent variables: effective spread, price impact, realized spread, quoted spread, quoted depth, variance ratio, and absolute variance ratio.

Table 4 reports the results. Engaging with a DMM reduces the effective spread by 52.6 basis points (column 1), an economically large effect that accounts for nearly half of the pre-regulation spread of 119 basis points for lost-status firms (Table 3). Decomposing the spread reveals that the improvement is fully due to a reduction in the five-minute realized spread, which declines by a large 69.9 basis points. The realized spread is often considered a proxy for the gross profits of liquidity providers. It is unclear whether this reduction is due to financial intermediaries facing lower inventory costs or whether end-users increasingly use more aggressively priced limit orders in the presence of a DMM. The second effective spread component, the price impact, increases by 14.2 basis points, relative to a pre-regulation average of 12 basis points.[20] Although the impact of the price is of less general concern in this market, the enhanced liquidity caused by a DMM seems to attract more informed investors as well.

[20]The effective spread decomposition into adverse selection and inventory components fails when inventory-related price pressures are persistent, in which case the price impact component reflects both inventory and information effects. This limitation does not affect our findings, which are largely driven by reductions in the realized spread.

Column (5) shows that engaging a DMM reduces the quoted spread by 179 basis points, more than half of the pre-regulation spread of 315 basis points for lost-status firms. This partly reflects the requirement of the regulation for DMMs to keep spreads below 300 basis points. The DMM's role is crucial during thin or empty order book periods, explaining the large effect on the quoted spread (a time-weighted intraday average). The impact on the trade-based effective spread is smaller, as few trades occur during very illiquid periods.

Column (6) shows no significant impact on quoted depth. Although the DMM contract mandates a total bid and offer volume of USD 25,000, this requirement adjusts dynamically. For example, after purchasing USD 10,000, the DMM's bid can decrease to USD 15,000, reflecting partial fulfillment of her obligation. Additionally, there is no evidence that engaging with a DMM enhances price efficiency, as indicated by the 30-minute to one-minute Variance Ratio and the Absolute Variance Ratio (columns 7 and 8).

All results remain robust under alternative treatment and control definitions. We expand the treatment group to include all firms eligible for the tax exemption when engaging a DMM—both lost-status and small firms without prior exchange presence. The control group includes large firms that always had exemption and were not affected by the regulation (Appendix Table A.5). We also tested the original treatment group with a refined control group of only large firms not affected, giving similar results (Appendix Table A.6).

4.2 Effects on the Intraday Distribution of Spreads

We have shown that introducing a DMM improves both the quoted and the effective spreads. A key question is *how* this improvement occurs. Is it primarily due to the direct effect of the binding spread obligation at the 3% threshold? Or does the DMM also influence limit order strategies of other investors, fostering narrower spreads through equilibrium effects?

To investigate, we propose a novel analysis of the intraday distribution of quoted spreads. Based on the eight spread categories of Section 2.3, we use the proportion of time the spread falls within each category as dependent variable in our DiD-IV model. Our hypotheses are as follows: First, if the DMM's impact is purely direct, the probability mass of spreads above 3% should disappear and shift to just below the threshold. Second, if equilibrium effects on other investors exist, the presence of a DMM should also increase the proportion of times with narrower spreads.[21] This analysis clarifies whether a DMM improves liquidity solely by eliminating extreme spreads or also by prolonging liquid periods.

Table 5 reports the results. We confirm a strong direct effect: the DMM's maximum spread obligation virtually eliminates periods with spread exceeding 300 basis points. Specifically, for the 300-400, 400-499, and 500+ basis point categories, a DMM reduces probabilities by 9.7, 7.5, and 36 percentage points, respectively. Given pre-regulation averages of lost-status firms of 10.5%, 8.4%, and 32% for these categories, we observe that extreme illiquidity was common but can be nearly eliminated by a DMM.

We also find strong evidence of positive equilibrium effects. The percentage of time the spread falls within the 20–40 basis point range increases significantly by 4.8 percentage points (Column 2), an economically large increase relative to the full sample average of 12% (Table 2). The increase is even greater for the next intervals: 22 percentage points for the 40-100 basis point range (Column 3) and 20 percentage points for the 100-200 basis point range (Column 4). Despite the DMM's spread obligation at 300 basis points, its presence substantially increases the prevalence of much tighter spreads. Since these spreads are unlikely to be quoted by the DMM herself, we interpret this as

[21] The DMM is only obligated to improve spreads up to 3%. If further improvement were profitable, she would likely have done so before officially assuming the role.

an equilibrium effect on other investors' limit order submission strategies.

Notably, we do not observe significant clustering of spreads just below the 300 basis point ceiling. Column (5) shows an increase of 9.2 percentage points in the 200-300 basis point range, but this is statistically insignificant and much smaller than the 53 percentage point reduction in spreads above 300 basis points (sum of coefficients in columns 6-8).

The results in Table 5 further allow for a decomposition of the impact of the DMM on the average spreads into a direct and indirect effect. We identify the direct effect by assuming that the three categories with spreads exceeding 300 basis points shift to 300. Using the IV coefficients of Table 5 to capture the change in probability mass of each category, we calculate the direct impact on the average spread as:[22]

$$0.097 \times (350 - 300) + 0.075 \times (450 - 300) + 0.36 \times (500 - 300) = 88.1 \text{ basis points,}$$

or 49.5% of the total 187 basis point improvement (Table 4, Column 5). This leaves a 50.5% improvement in spreads due to the indirect effect that the DMM strongly improves the ocurrence if spreads from 300 basis points to much below this threshold.

5 Potential Mechanisms

We next invest two potential channels with which the DMM affects liquidity. The key question is why the average spread tightened much beyond the regulatory obligation of 300 bps.

[22]In the equation, we assume that the average spread in the 300-400 bps category is 350; even though in reality the spread distribution within the category may not be uniform.

5.1 Volume and Liquidity Feedback

It is well-known that liquidity and trading volume are self-reinforcing: a more liquid market makes trading cheaper, while more trading improves liquidity. In this subsection, we ask whether the initial tightening of spreads, due to a binding DMM obligation to 300bps, raised trading volume; which in turn may have tightened spreads further via a multiplier effect.

Table 6 presents the IV results using the logarithmic dollar turnover as the main dependent variable. Engaging in a DMM increases stock turnover by 74% (column 2), although the effect is only marginally significant (t-stat is 1.75). However, once we add the quoted spread as a control variable (column 3), the effect of the DMM on turnover disappears (coefficient of 5.7%). This is suggestive evidence of a DMM primarily tightening the spread, and indirectly raising turnover. In fact, the coefficient on the quoted spread is negative and highly significant, suggesting that a 179 bps reduction in spread (i.e., the effect of a DMM on spreads, Table 4) is associated with a 179*0.0037=66% increase in turnover—close to the estimated coefficient of 74% in Column 2.

We believe that the self-reinforcing effect between spreads and turnover is a plausible explanation for why a DMM reduces spreads beyond the binding DMM obligation. That said, to truly separate both effects, one needs to estimate a simultaneous equation model with two exogenous instruments for turnover and spreads—which is beyond the scope of this paper.

5.2 Competition Between Liquidity Suppliers

Recent literature shows that DMMs can stimulate competition between DMMs and voluntary liquidity providers, enhancing overall liquidity (Bessembinder et al., 2019; Theissen and Westheide, 2023; Bellia et al., 2024b). We argue that this competition hypothesis is unlikely to explain our results. First, the DMM in our setting receives a monthly lump sum from the firm, instead of trading fee discounts from the exchange as in aforementioned papers. This means that in our setting, there is no reduction in the marginal cost of supplying liquidity. In her optimization, she simply faces the constraint to maintain spreads below 300 basis points. Furthermore, our DMM does not enjoy any advantage over other investors, in terms of fees, information access, or execution priority, suggestion no material change in the competitive landscape.

Second, the competition channel cannot easily explain the results in Table 5, that i) a DMM improves the likelihood of spreads much below the 300 bps threshold, and ii) that there is no bundling of spreads just below this threshold (column 5). To see this, suppose liquidity providers initially set an equilibrium spread of 400 basis points, at which point they have no incentive to undercut quotes and tighten the spread. If a DMM enters, required to enforce a 300 basis point cap, the other liquidity providers certainly have no incentive to tighten spreads further. Thus, we would expect the entry of a DMM to lead to a clustering of spreads just below the threshold and no increase in the likelihood of spreads much below the threshold. As our findings contrast both predictions, we conclude that the DMM entry does not appear to significantly alter the competition between liquidity providers.

6 The Regulation and Cost-benefit Analysis

This section turns to a policy evaluation of the 2012 regulation, focusing on its effects and effectiveness. We first estimate its impact on liquidity using reduced-form methods, then assess whether these gains persisted after the tax incentive ended. Finally, we conduct a cost-benefit analysis to evaluate whether the benefits justified the fiscal cost.

6.1 Effect of Regulation on Liquidity

We aim to answer the regulator's central question: Did the policy intervention improve overall market liquidity? This overall effect corresponds to the reduced-form estimates or the intention-to-treat effect: The average impact of the regulation on all firms subject to it, regardless of whether they adopt a DMM. These estimates rely on fewer identifying assumptions than the IV model.[23]

Table 7 reports the reduced-form results, obtained by regressing liquidity measures directly on the instrument $\text{Lost-status}_i \times \text{Post}_t$. The findings indicate that firms affected by the regulation experienced large and statistically significant improvements in liquidity. We forego a detailed discussion of the coefficients, as they are equal to those of the IV model (Table 4) multiplied by the first stage IV coefficient (0.5). We emphasize that this first-stage coefficient implies a high compliance rate, raising DMM adoption from a sample average of 12% to 62%. This highlights the regulation's effectiveness in changing firm behavior and catalyzing liquidity provision in a setting with underdeveloped trading infrastructure.

The following sections explore whether the improvements persisted after the tax incentive was repealed and whether the policy's benefits outweighed its fiscal costs.

6.2 Repeal of the Tax Incentive for DMM Adoption

In March 2020, the Chilean Congress passed Law No. 21.210, which repealed Regulation No. 327.[24] As a result, Chilean stocks that engaged a DMM could no longer qualify for

[23] Estimating the causal effect of DMM adoption via two-stage least squares requires three assumptions: instrument relevance, the exclusion restriction, and parallel trends. In contrast, the reduced-form estimates rely solely on the parallel trends assumption.

[24] The legal change was driven by concerns that some firms exploited the tax benefit without aiming to improve liquidity. A key case was the sale of a controlling stake in the mining company SQM by Canadian investor Nutrien to China's Tianqi. Shortly before the deal, SQM engaged a DMM, allowing Nutrien to avoid nearly USD 1 billion in capital gains taxes. The move was widely seen as tax avoidance, with SQM's DMM engagement viewed as fiscally—not liquidity—motivated. Due to pressure from the government and public opinion, SQM ultimately paid the taxes.

exchange presence status, thus eliminating the associated capital gains tax exemption for investors. The law came into effect on March 1, 2021.

We analyze the behavior of "new lost-status" firms—those that, as of March 1, 2021, had an active DMM contract to qualify for exchange presence, but did not meet the required trading volume threshold. As a result, these firms lost their exchange presence status with the implementation of the new law. Notably, in the six months following the regulatory change, only 12% of these firms terminated their DMM contracts (while the other 88% chose to renew it). This response contrasts sharply with the 2012 episode, when 70% of the affected firms adopted a DMM within six months to retain the tax-exemption.

One might suspect that firms maintained DMM contracts simply by inertia or because they were locked in by contract terms. However, this is not the case. By default, each contract expires every six months, after which it needs to be renovated or canceled. The 88% of new lost-status firms who chose to renew the contract after expiration made an active decision. We interpret this as firms with a DMM rationally learning about its advantages, which they believe outweigh the associated costs. A more behavioral explanation is that temporary interventions can lead to persistent changes, even after the underlying incentive is removed. For example, Allcott and Rogers (2014) show that repeated exposure to a policy can help agents internalize new norms or habits.

This asymmetric response between the policy's introduction and withdrawal–be it due to learning or behavioral channels–carries important policy implications. It suggests that some of the economic benefits of the intervention may have outlasted its fiscal cost, being the foregone tax revenue while the incentive was active. We examine this possibility more closely in the next subsection.

6.3 Cost-benefit Analysis

We now provide an exploratory assessment to shed light on the potential costs and benefits of the regulation. On the cost side, firms that lost exchange presence engaged a DMM to retain their capital gains tax exemption, resulting in foregone tax revenue for the government. As there are no public records on such revenues, we estimate the magnitude following González et al. (2021):

$$\text{Tax revenue} = \text{Tax rate } \times \text{Realized capital gains by retail investors.} \tag{8}$$

Because institutional investors are always exempt from the capital gains tax, the relevant tax base is limited to gains realized by retail investors. These gains are obtained by multiplying the investors realized return by the total value of stocks sold by retail investors. The latter is calculated as the product of overall trading volume, the retail share of that volume, and one-half; since half of retail volume are assumed to be sells that close a position and realize a return. Trading volume in Chile is approximately 16.6% of market capitalization, meaning we can express the tax revenue as:

$$\text{Tax revenue} = \text{Tax rate } \times \text{Realized return } \times \frac{1}{2} \times \% \text{ by retail } \times 16.6\% \times \text{Market cap} \tag{9}$$

Based on the Budget Office report (Ministry of Finance, Government of Chile, 2019), the weighted average marginal tax rate of individuals reporting capital gains is 26.3%. The same source reports an average realized return of 35%.[25] According to the Santiago Stock Exchange, the retail share of trading volume averaged 42.3% during the period (González et al., 2021). Substituting these values, the foregone tax revenue is an annual $0.263 \times 0.35 \times 1/2 \times 0.42 \times 0.166 \times \text{Market cap} = 0.0032 \times \text{Market cap}$, or 32 basis points

[25] Many investors realize their returns after having invested for multiple years in a stock, hence the large realized returns.

of market cap for any firm receiving the tax exemption.

On the benefit side, our paper estimates a direct gain from improved liquidity. Assuming market order traders pay the cost of liquidity, a DMM saves them 55.7 basis points (effective spread, Table 4). Applying this improvement to trading volume of 16.6% of market cap yields a cost saving of 9.2 basis points of market cap. This figure is a lower bound on the total benefits, as we do not account for several additional effects:

- **Valuation effect:** Venkataraman and Waisburd (2007) find that U.S. stocks experience a cumulative abnormal return of roughly 5% around the announcement of a DMM. Such a one-time valuation gain annualized using a discount rate of 10%, corresponds to 50 basis points of market cap per year.[26] In unreported tests, we ran the event study for the announcement effect of DMM engagement, and found a 0.7% return on the announcement day, which however was insignificant due to a low number of compliers.[27]

- **Gains from trade:** Trading volume increased by 74%, suggesting a greater trading surplus, since investors only transact when expected benefits exceed costs.

- **Macroeconomic benefits:** Levine and Zervos (1998) estimate that a one percentage point increase in the trading volume-to-market cap ratio increases per capita GDP growth by 0.027 percentage points, another significant effect of increased trading activity.

- **Positive externalities:** Enhanced liquidity improves price discovery, lowers the cost of capital, and broadens market participation. These effects are difficult to quantify but likely significant.

[26] Other studies report even larger effects. For instance, Anand et al. (2009) find cumulative abnormal returns exceeding 7% following DMM announcements on the Stockholm Stock Exchange.

[27] The event study has less statistical power then our main analysis, because it compares prices just before vs after announcement. The main analysis uses more information because a DMM affects liquidity for many months.

The case for net benefits is further strengthened by the evidence from the previous subsection, which showed that the liquidity gains largely persisted even after the tax incentive was removed. In sum, although this is only an exploratory assessment, the evidence suggests that the regulation's benefits plausibly exceed the fiscal costs. A more comprehensive analysis is left for future research.

7 Conclusions

This paper shows that public policy can play a critical role in enhancing stock market liquidity, particularly in illiquid markets. Exploiting a Chilean regulatory reform that offered a tax incentive to firms hiring designated market makers (DMMs), we provide causal evidence that engaging a DMM significantly reduces bid-ask spreads and increases trading volume.

Our novel analysis of intraday spreads reveals that these improvements stem equally from the direct contractual obligations of the DMM and from indirect spillover effects on other liquidity providers. In addition, our results are consistent with a self-reinforcing liquidity–volume feedback loop, in which initial improvements in spreads lead to increased trading activity, further enhancing liquidity beyond the immediate regulatory effect.

An exploratory cost-benefit analysis suggests that the benefits of the regulation can plausibly outweigh its fiscal costs. Importantly, our findings highlight a key distinction between private and public approaches to liquidity provision. Although stock exchange-led initiatives are shaped by private incentives and may fail to internalize the broader social benefits of liquidity, public regulation is better positioned to address these externalities. By aligning incentives with market-wide outcomes, well-designed policy interventions can correct under-provision and meaningfully improve market quality in underdeveloped settings.

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Figure 1: Designated Market Maker Adoption Rate

This figure shows the monthly share of firms engaging a DMM following the regulatory change (Feb 1, 2012), presented for the full sample as well as separately for lost-status and non-lost-status firms.

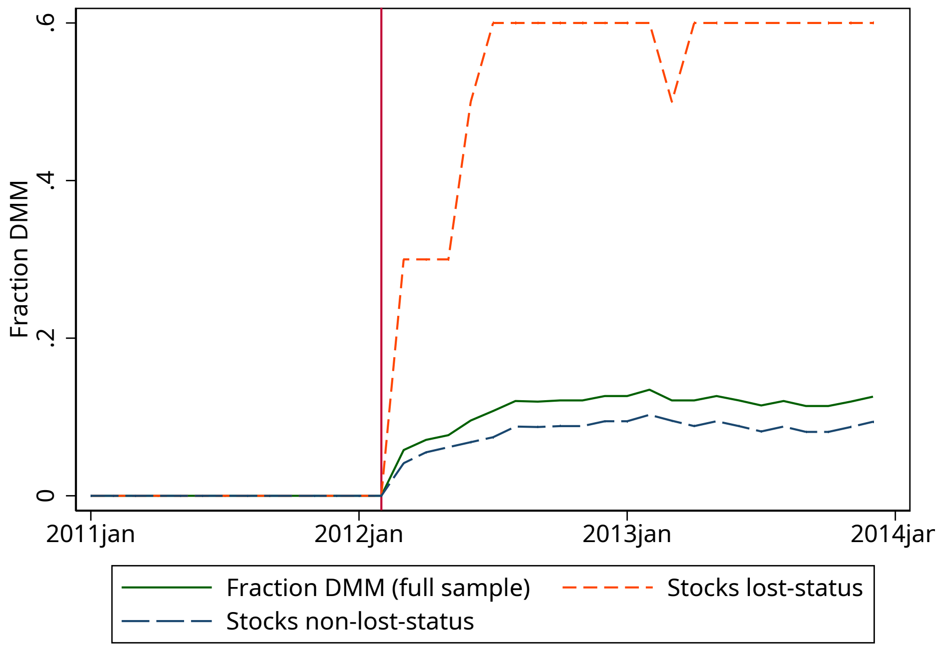
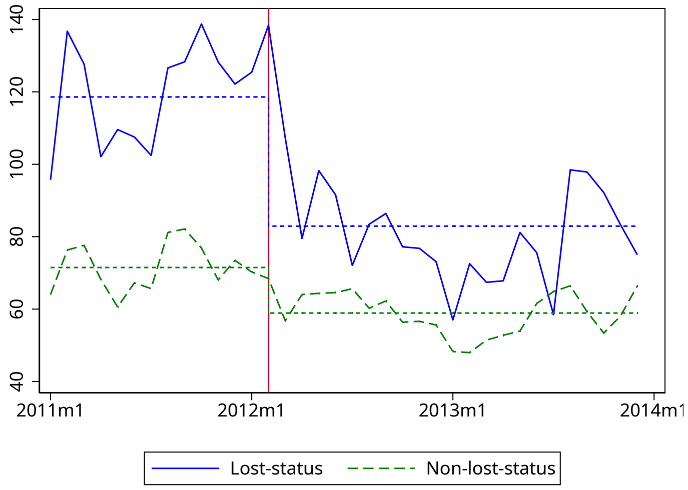


Figure 2: Liquidity Trends: Lost-status versus non-lost-status Firms

This figure plots the monthly averages of the effective spread (top panel) and the quoted spread (bottom panel) over time, separately for the group of firms who lost-status on Feb 1, 2012; and the remaining firms.

Effective spread (bps)



Quoted spread (bps)

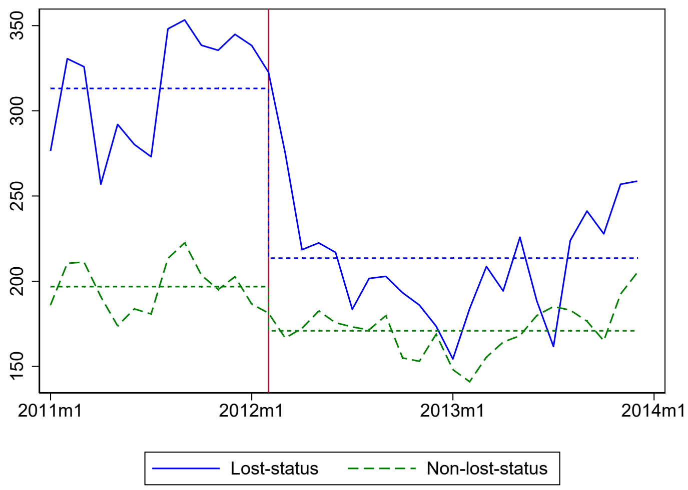


Table 1: Summary Statistics for the Full Sample

This table presents summary statistics for the full daily panel. The liquidity measures are defined in Section A. Variable Messages counts the number of observations in the raw data, consisting of quote changes to the best bid or offer and trades. Absolute Variance Ratio is the absolute of the deviation of the Variance Ratio from 1. Other variables are self-explanatory.

	Full sample (2011-2013)						
	Mean	SD	Min	P25	P50	P75	Max
Price (usd)	23	576	0.00	0	1	17	52,600
Market cap (millions usd)	3,037	4,691	1	98	1,190	10,949	27,800
Turnover (1000s usd)	2,076	9,497	0	22	267	5,578	1,030,000
Volume (in 1000 shares)	9,510	212,000	0	22	226	7,807	34,500,000
Trade size (1000s usd)	30	334	0	3	9	34	40,000
Trade count	96	166	1	4	28	280	4,759
Messages	210	356	1	14	68	594	7,055
Bid ask spread (bps)	186	156	14	59	129	491	500
Effective spread (bps)	66	80	0	20	39	147	500
Price impact (bps)	16	28	-23	0	7	45	163
Realized spread (bps)	50	83	-163	6	21	137	500
Quoted depth (1000s usd)	34	28	0	14	28	69	151
Order Imb Ratio	0.58	0.35	0	0.25	0.58	1.00	1.00
Realized volatility (bps)	5.35	11.79	0	0	1.42	13.16	80.10
Var Ratio 30 min	2.10	2.53	0.43	1.00	1.13	4.07	16.48
Abs Var Ratio 30 min	1.19	2.49	0	0.05	0.28	3.07	15.48
Count	60,883						

Table 2:
Market Break-down and the Intraday Distribution of Spreads and Turnover

For each stock and day, we calculate the fraction of the time the intraday quoted bid-ask spread lies within each of the following intervals: 0-20 bps, 20-40 bps, 40-100 bps, 100-200 bps, 200-300 bps, 300-400 bps, 400-499, and 500+ (i.e., the fraction of the day we impose the maximum spread of 500 bps). For the full sample, we show the mean and st dev of the fraction of the day the spread falls within each category. We also report the turnover (in 1,000s usd) in each category.

	Fraction of time		Turnover (1,000s usd)	
Spread-interval (bps)	Mean	SD	Mean	SD
0-20	0.13	0.21	688	1836
20-40	0.12	0.17	399	935
40-100	0.21	0.24	343	734
100-200	0.18	0.24	98	259
200-300	0.10	0.20	19	72
300-400	0.05	0.14	5	21
400-499	0.03	0.12	2	8
+500	0.18	0.33	12	51

Table 3:
Summary Statistics for Lost-status Firms, before and after the Regulation

This table is identical to Table 1, but reports means and standard deviation for four subsets of the data: the sample of stocks with lost-status versus all others (non-lost status); both in the period before the SVS regulation on Feb 1, 2012 (PRE) and the period afterwards (POST).

	Lost status-PRE		Lost status-POST	
	Mean	SD	Mean	SD
Market cap (millions usd)	297	380	268	357
Turnover (1000s usd)	169	2,427	122	1,247
Bid ask spread (bps)	313	134	214	129
Effective spread (bps)	119	84	83	69
Price impact (bps)	12	31	25	42
Realized spread (bps)	106	90	57	78
Quoted depth (millions CLP)	14.48	16.03	27.81	24.71
Order Imb Ratio	0.75	0.32	0.78	0.31
Realized volatility (bps)	6.09	14.60	3.46	10.40
Var Ratio 30 min	1.65	2.40	1.59	2.41
Abs Var Ratio 30 min	0.73	2.38	0.73	2.37
Count	1,806		3,029	
	non Lost status PRE		non Lost status POST	
Market cap (millions usd)	3,282	4,887	3,271	4,772
Turnover (1000s usd)	2,318	12,700	2,200	7,837
Bid ask spread (bps)	197	165	171	151
Effective spread (bps)	71	86	59	75
Price impact (bps)	13	21	18	30
Realized spread (bps)	59	89	41	77
Quoted depth (millions CLP)	27.31	21.66	39.02	30.66
Order Imb Ratio	0.55	0.35	0.57	0.35
Realized volatility (bps)	6.64	13.15	4.74	10.81
Var Ratio 30 min	2.05	2.35	2.19	2.64
Abs Var Ratio 30 min	1.12	2.32	1.28	2.60
Count	20,305		35,743	

Table 4: Impact of a Designated Market Maker on Stock Market Liquidity

This table is identical to Table 6, but uses as dependent variables liquidity and price efficiency measures defined in Section **??**. This table represents the 2SLS IV-DiD regression results of Equations 6 and 7. Column (1) shows the first stage results with dependent variable DMM_{it}, a dummy indicator whether firm i on day t engaged a designated market maker contract. The Instrument is Lost Status_i times Post_t, a dummy indicating whether a firm lost exchange presence status upon introduction of Rule 327 due to a tightened trading volume criteria, times Post which equals 1 after Feb 1, 2012. The predicted value is used in the second stage regression. Volatility is the realized intraday volatility and is standardized to have unit variance. The regression contains firm and year-month fixed effects, and standard errors are clustered on the firm and date level.

	First stage	Second stage						
	(1) DMM	(2) Eff spread	(3) Price Impact	(4) Realized Spread	(5) Quoted Spread	(6) Quoted Depth	(7) Var Ratio	(8) Abs Var Ratio
Lost Status×Post	0.49***							
	(3.91)							
$\widehat{\text{DMM}}$		-55.7***	14.2***	-69.9***	-179***	5.40	-0.25	-0.18
		(-3.36)	(2.67)	(-3.59)	(-3.39)	(1.00)	(-1.46)	(-0.99)
Ln Turnover	0.0045***	-4.75***	1.68***	-6.43***	-11.8***	3.13***	0.072***	0.075***
	(2.85)	(-9.41)	(9.87)	(-11.1)	(-11.7)	(15.9)	(10.1)	(10.9)
Ln Market cap	-0.057	-24.7***	-8.39***	-16.3***	-50.4***	10.3***	0.21***	0.20***
	(-1.61)	(-4.33)	(-5.90)	(-2.74)	(-4.34)	(5.08)	(2.97)	(2.80)
Volatility	-0.0066***	12.8***	3.01***	9.82***	10.8***	-0.83***	-0.017	-0.011
	(-2.77)	(14.2)	(10.5)	(9.87)	(10.8)	(-5.83)	(-1.40)	(-0.95)
Price inverse	-0.000073	0.0029	0.011***	-0.0076	-0.023	0.00058	-0.00014	-0.00012
	(-0.76)	(0.17)	(2.60)	(-0.44)	(-0.88)	(0.13)	(-0.54)	(-0.46)
Observations	60,883	58,908	58,908	58,908	60,791	60,791	60,790	60,790
R-squared	0.15	0.070	0.032	0.061	0.123	0.079	0.003	0.003
Number of firms	160	160	160	160	160	160	160	160

Table 5: Impact of a Designated Market Maker on the Distribution of Intraday Bid-ask Spreads

For each stock and day, we calculate the fraction of the time the intraday quoted bid-ask spread lies within each of the following intervals: 0-20, 20-40, 40-100, 100-200, 200-300, 300-400, 400-499, and 500+ basis points (i.e., the fraction of the day we impose the maximum spread of 500 basis points). We use these as independent variables in the 2SLS IV model of Equation (7), with the instrument for DMM_{it} being variable $\text{Lost-status}_j \times \text{Post}_t$. We report the second-stage results, as the first-stage is identical to that of column (1) in Table 4. The regressions contain firm and year-month fixed effects, and standard errors are clustered on the firm and date level.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Spread interval (in basis points)							
	0-20	20-40	40-100	100-200	200-300	300-400	400-499	500
$\widehat{\text{DMM}}$	-0.020	0.048***	0.22***	0.20***	0.092	-0.097***	-0.075**	-0.36**
	(-1.14)	(2.83)	(4.23)	(2.72)	(1.50)	(-3.47)	(-2.55)	(-2.57)
Ln Turnover	0.0092***	0.0089***	0.011***	-0.00014	-0.0052***	-0.0036***	-0.0031***	-0.017***
	(7.33)	(7.93)	(7.84)	(-0.079)	(-5.07)	(-5.43)	(-5.65)	(-7.69)
Ln Market cap	0.071***	0.057***	0.023	-0.026	-0.038***	-0.019***	-0.018***	-0.051*
	(5.09)	(5.28)	(0.87)	(-1.17)	(-2.92)	(-3.07)	(-2.89)	(-1.92)
Volatility	-0.012***	-0.011***	-0.0084***	0.0027	0.0071***	0.0062***	0.0049***	0.010***
	(-7.71)	(-8.15)	(-4.40)	(1.02)	(6.47)	(8.82)	(7.39)	(4.17)
Price inverse	0.00014**	0.00011**	-0.000055	-0.00010	-0.00010*	-0.000067	-0.000040	0.00011
	(2.36)	(2.22)	(-0.66)	(-1.27)	(-1.81)	(-1.60)	(-0.89)	(0.82)
Observations	60,883	60,883	60,883	60,883	60,883	60,883	60,883	60,883
R-squared	0.028	0.028	0.011	0.020	0.020	0.019	0.017	0.061
Number of firms	160	160	160	160	160	160	160	160

Table 6: Impact of a Designated Market Maker on Turnover

This table represents the 2SLS IV-DiD regression results of Equations 6 and 7. Column (1) shows the first stage results with dependent variable DMM_{it}, a dummy indicator whether firm i on day t engaged a designated market maker contract. The Instrument is Lost Status_i times Post_t, a dummy indicating whether a firm lost exchange presence status upon introduction of Rule 327 due to a tightened trading volume criteria, times *Post* which equals 1 after Feb 1, 2012. The predicted value is used in the second stage regression. The dependent variables in columns 2-3 are log dollar turnover. The regression contains firm and year-month fixed effects, and standard errors are clustered on the firm and date level.

	First stage	Second stage	
	(1)	(2)	(3)
	DMM	Ln turnover	Ln turnover
Lost Status×Post	0.50***		
	(3.92)		
$\widehat{\text{DMM}}$		0.74*	0.057
		(1.75)	(0.19)
Ln Market cap	-0.049	1.75***	1.49***
	(-1.43)	(11.5)	(13.1)
Volatility	-0.0053**	0.28***	0.31***
	(-2.45)	(15.9)	(19.6)
Price inverse	-0.000070	0.00080**	0.00068**
	(-0.72)	(2.39)	(2.38)
Quoted Spread			-0.0037***
			(-11.1)
Observations	60,883	60,883	60,791
R-Squared	0.643	0.075	0.117
Number of firms	160	160	160

Table 7: Reduced-Form Impact on Stock Market Liquidity

This table presents the reduced-form estimates of the impact of the Lost-status × Post instrument on various liquidity measures. The dependent variables include the natural logarithm of total traded value, the average value of trades, the number of trades, a measure of order book activity, liquidity imbalances as the absolute difference between buy and sell orders relative to their sum. All regressions control for firm size, price volatility, and price level. The model includes firm and year-month fixed effects, and standard errors are clustered at the firm and date level.

	(1) Eff spr	(2) Pr Imp	(3) Realized Spr	(4) Quoted Spread	(5) Quoted depth	(6) Var Ratio	(7) Abs Var Ratio
Lost-status×Post	-27.9***	7.08***	-35.0***	-88.6***	2.67	-0.12	-0.091
	(-3.19)	(3.11)	(-3.59)	(-3.46)	(0.88)	(-1.33)	(-0.94)
Ln Turnover	-4.98***	1.74***	-6.72***	-12.6***	3.15***	0.071***	0.074***
	(-9.75)	(10.0)	(-11.3)	(-12.5)	(16.5)	(9.84)	(10.7)
Ln Market cap	-21.5***	-9.21***	-12.3**	-40.3***	9.99***	0.22***	0.21***
	(-3.96)	(-5.95)	(-2.12)	(-3.54)	(4.90)	(3.21)	(2.99)
Volatility	13.2***	2.92***	10.3***	12.0***	-0.86***	-0.015	-0.010
	(14.2)	(10.0)	(9.94)	(12.1)	(-6.18)	(-1.29)	(-0.86)
Price inverse	0.0070	0.0095**	-0.0025	-0.010	0.00019	-0.00012	-0.00011
	(0.40)	(2.07)	(-0.13)	(-0.34)	(0.039)	(-0.47)	(-0.41)
Observations	58,908	58,908	58,908	60,791	60,791	60,790	60,790
R-Squared	0.411	0.125	0.378	0.660	0.434	0.068	0.070

Appendix A Definitions Liquidity Measures

The effective half spread is a trade-based measure calculated as the equal-weighted average across all T trades for a given stock on a specific day, expressed in basis points:

$$\text{Ef\_spread} = \frac{1}{T}\sum_{t=1}^{T}\frac{p_t - m_t}{m_t}D_t \times 10,000,$$

where p_t, m_t and D_t are the price, midpoint and trade direction, respectively. The effective spread is further decomposed into the five-minute price impact:

$$\text{Price\_Impact} = \frac{1}{T}\sum_{t=1}^{T}\frac{m_{t+5min} - m_t}{m_t}D_t \times 10,000,$$

and the realized spread:

$$\text{Realized\_Spread} = \frac{1}{T}\sum_{t=1}^{T}\frac{p_t - m_{t+5min}}{m_t}D_t \times 10,000.$$

Similar to the bid-ask spread, when the effective spread exceeds 5%, it is capped at 5%, with the realized spread adjusted accordingly.

Realized volatility is calculated as the sum of squared one-minute transaction price returns, expressed in basis points. To focus on intraday volatility, we exclude overnight returns and standardize the measure across stocks and days to have a mean of zero and unit variance for ease of interpretation.

The Variance Ratio 30 is defined as the daily variance of equally spaced one-minute midpoint returns divided by the variance of 30-minute returns, multiplied by 30. If prices follow a random walk, the variance ratio equals one. A ratio greater than one indicates momentum at the one-minute frequency, while a ratio below one suggests mean reversion. Furthermore, we consider the absolute value of the Variance Ratio 30 minus one, as both positive and negative deviations from one signal violations of market efficiency.

Appendix B Additional Figures and Tables

This appendix contains the following additional results.

Figure B.1 shows the liquidity trends between lost-status and non-lost status firms, after applying controls. It confirms that the parallel trends assumption holds visually.

Table A.1 estimates the impact of a DMM on the fraction of trading days with zero-trades, using a cross-sectional variation of the main 2SLS IV model.

Table A.2 repeats the main 2SLS IV model, but uses spread measures where the imposed maximum is 10% intraday (as compared to the 5% upper limit used in the main specification).

Table **??** shows simple OLS regressions of the impact of a DMM on stock market activity and market quality.

Table A.4 shows the 2SLS regression using data collapsed to a single observation in the pre and post period.

Table A.5 shows 2SLS regressions of the impact of a variation of our instrument (lost status firms including other small firms) on market quality.

Table A.6 shows 2SLS regressions of the impact of the instrument (lost status) on market quality, but using large firms only as a control group.

Table A.3 shows 2SLS regressions of the impact of the instrument (lost status) on market quality, but uses as additional control variable "old DMM".

Figure B.1:
Liquidity Trends after control variables: Lost-status versus non-lost-status

This figure plots the monthly difference in effective and quoted spread between lost-status and non-lost status firms. The differences are the coefficients $\delta_{\tau,i}$ on the interaction dummies between year-month fixed effects (T_τ) and the lost-status dummy (LS_i) from the following daily panel regression:

$$Y_{it} = \sum_{i=0}^{1} \sum_{\tau=1}^{36} \delta_{\tau,i} T_\tau \times LS_i + \beta Controls_{it} + \varepsilon_{it}$$

Control variables are Ln Turnover, Ln Market cap, Volatility, and the inverse price (as in Table 4). The omitted case is Dec 2013 for the lost-status stocks, so all coefficients are relative to this month. The SVS regulation was implemented on Feb 1, 2012. For brevity, we report results of two spread measures—other liquidity measures are available upon request.

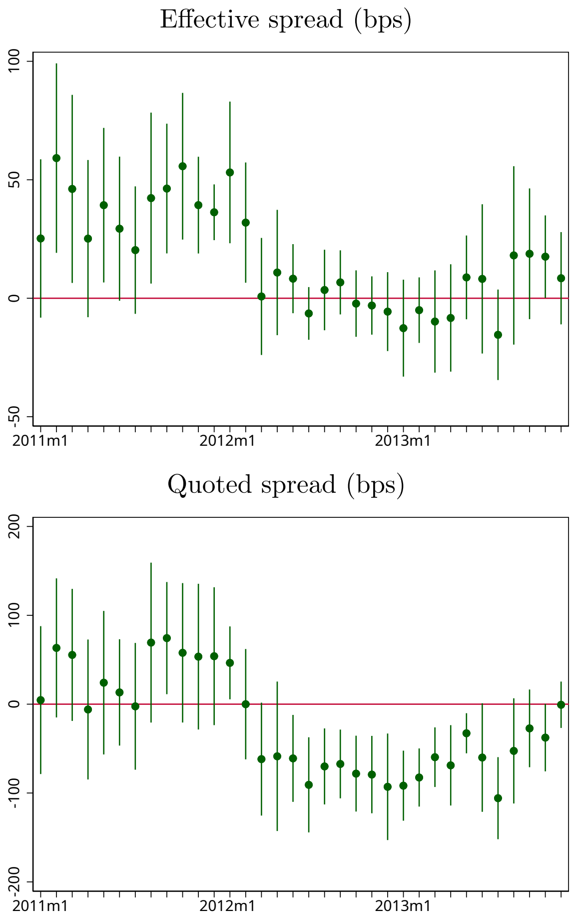


Table A.1: The impact of a Designated Market Maker on Zero-trading days: Cross-sectional Evidence

We estimate the main IV model (7), but on cross-sectional data to analyze the impact of a DMM in the number of zero-trade days. Specifically, starting from the daily panel, for all regression variables we create the difference between the average in the PRE and POST period (i.e., before and after Feb 1, 2012). The variable DMM takes a value of 1 if, in the post-period, the firm ever hired a DMM. Column (1) contains the first-stage regression, while column (2) contains dependent variable Zero Days, which counts the number of trading days in the PRE and POST period without any trades. Then, ΔZero Days is the difference in the POST minus PRE period. Similarly, Column (8) shows the difference (in percentage points) of the fraction of zero-days in the PRE vs POST period.

	(1)	(2)	(3)
	DMM	ΔZero days	ΔZeroDays%
Lost-status × Post	0.65***		
	(4.59)		
$\widehat{\text{DMM}}$		16.7	-0.0037
		(1.05)	(-0.17)
ΔLn market cap	-0.20**	-6.71	0.052*
	(-2.05)	(-0.40)	(1.83)
ΔVolatility	-0.12	24.1	0.028
	(-1.11)	(1.29)	(1.27)
ΔPrice inverse	-0.00031	-0.048	0.00037***
	(-1.39)	(-0.48)	(6.63)
ΔLn Turnover	0.019	-17.5***	-0.069***
	(0.99)	(-5.53)	(-13.3)
Constant	0.085***	43.6***	0.021***
	(3.36)	(8.44)	(3.04)
Observations	143	143	143
R-squared	0.279	0.237	0.622

Table A.2: Impact of a Designated Market Maker on Stock Market Liquidity: Maximum Possible Spread of 10%

In the main panel data, we impose a maximum bid-ask spread of 5% at any point in time. This limits the impact of a DMM on spread in times of extreme illiquidity, i.e., the spread is excessive. In this table, we repeat the main IV analysis from Table 4 but construct spread measures assuming a maximum level of 10% of the midpoint. The maximum spread is also applied to the effective spread and realized spread, which the table also reports. Column (1) repeats the first stage, and columns (2-5) the second stage regressions with the different spread measures.

	(1) DMM	(2) Eff spread	(3) Price Impact	(4) Realized Spread	(5) Quoted Spread
Lost Status × Post	0.47***				
	(3.51)				
$\widehat{\text{DMM}}$		-72.3***	3.46	-75.8***	-257**
		(-2.62)	(0.61)	(-2.87)	(-2.43)
Ln Market cap	-0.062*	-27.8***	-11.4***	-16.4**	-69.9***
	(-1.70)	(-3.99)	(-6.16)	(-2.50)	(-3.26)
Ln Turnover	0.0047***	-6.54***	1.97***	-8.51***	-18.2***
	(2.92)	(-11.2)	(9.18)	(-13.5)	(-10.0)
Volatility	-0.0066***	12.2***	3.95***	8.27***	12.3***
	(-2.78)	(14.2)	(11.0)	(8.90)	(6.70)
Price inverse	-0.000075	-0.026	-0.0024	-0.023	0.065
	(-0.72)	(-0.94)	(-0.34)	(-0.92)	(0.86)
Observations	60,883	59,361	59,361	59,361	60,791
R-squared	0.13	0.077	0.026	0.068	0.089
Number of firms	162	160	160	160	160

Table A.3: Impact of a Designated Market Maker on Stock Market Liquidity: Controlling for old-style Market Maker Contracts

This table shows the main two-stage IV model from Table 4, but uses as additional control variable "old DMM", a dummy indicating whether a firm on a given date had an DMM arrangement based on contract that does not comply with the conditions of Rule 312. Some firms held such contracts, even after Feb 1, 2012, the introduction date of Rule 312. Column (1) shows the first-stage regression, and the remaining columns the second stage results with different liquidity measures.

	(1) DMM	(2) Eff spread	(3) Price Impact	(4) Realized Spread	(5) Quoted Spread	(6) Quoted Depth
Lost Status×Post	0.47***					
	(3.74)					
$\widehat{\text{DMM}}$		-57.8***	13.9**	-71.7***	-187***	5.34
		(-3.31)	(2.43)	(-3.49)	(-3.48)	(0.94)
Old DMM	-0.50***	-19.0	-2.50	-16.5	-74.8*	-0.51
	(-3.40)	(-1.43)	(-0.42)	(-0.92)	(-1.92)	(-0.16)
Ln Turnover	-0.50***	0.0039	0.011***	-0.0068	-0.020	0.00060
	(-3.40)	(0.23)	(2.61)	(-0.39)	(-0.71)	(0.13)
Ln Market cap	0.0041***	-4.75***	1.68***	-6.43***	-11.8***	3.13***
	(2.64)	(-9.39)	(9.91)	(-11.1)	(-11.7)	(15.9)
Volatility	-0.051	-24.6***	-8.38***	-16.2***	-50.0***	10.3***
	(-1.49)	(-4.31)	(-5.96)	(-2.72)	(-4.29)	(5.08)
Price inverse	-0.0064***	12.8***	3.01***	9.81***	10.8***	-0.83***
	(-2.76)	(14.2)	(10.5)	(9.85)	(10.7)	(-5.83)
Observations	60,883	58,908	58,908	58,908	60,791	60,791
R-squared	0.18	0.069	0.032	0.061	0.123	0.079

Table A.4: Impact of a Designated Market Maker on Liquidity: Collapsed Data

This table presents the results of the second-stage instrumental variables (IV) model using collapsed data, where all variables are averaged to produce a single observation for the pre-event period and a single observation for the post-event period. This approach ensures that each lost-status firm engaging with a designated market maker (DMM) is represented only once—in contrast with the main daily panel, where a single event generates many treated observations.

	(1) Eff spread	(2) Price Impact	(3) Realized Spread	(4) Quoted Spread	(5) Quoted Depth	(6) Var Ratio	(7) Abs Var Ratio
$\widehat{\text{DMM}}$	-62.4**	24.0***	-86.4***	-182***	25.0***	-0.12	-0.046
	(-2.56)	(3.17)	(-2.99)	(-4.51)	(4.53)	(-0.86)	(-0.30)
Ln market cap	28.3	-0.060	28.4	26.3**	-1.15	-0.19**	-0.19**
	(0.72)	(-0.018)	(0.69)	(2.11)	(-0.13)	(-2.21)	(-2.15)
Volatility	-0.16	0.0040	-0.16	-0.0088	0.017	0.000018	0.000014
	(-0.89)	(0.61)	(-0.92)	(-0.32)	(1.59)	(0.097)	(0.077)
Price inverse	-62.4**	24.0***	-86.4***	-182***	25.0***	-0.12	-0.046
	(-2.56)	(3.17)	(-2.99)	(-4.51)	(4.53)	(-0.86)	(-0.30)
Ln Turnover	-1.31	0.61	-1.92	-26.6***	1.66**	0.11***	0.11***
	(-0.26)	(1.01)	(-0.36)	(-10.8)	(2.48)	(6.68)	(7.23)
Observations	Observations	286	286	286	286	286	286
R-squared	0.090	0.452	0.124	0.798	0.234	0.299	0.329
Number of firms	143	143	143	143	143	143	143

Table A.5:
Impact of a Designated Market Maker on Stock Market Liquidity: Lost status and Small as Treatment

This table represents the 2SLS IV regression results of Equations 6 and 7, but uses a different instrumental variable, (Lost-status+small)×Post. Lost-status+small$_t$ is a dummy equal to 1 for all firms who did not meet the updated trading volume requirements for exchange presence on Feb 1, 2012, which includes the firms who lost status, but also smaller firms who never had exchange presence. Post$_t$ equals 1 after the introduction date of Rule 327 on Feb 1, 2012. Column (1) shows the first stage results with dependent variable DMM$_{it}$; the predicted value is used in the second stage regressions. The regression contains firm and year-month fixed effects, and standard errors are clustered on the firm and date level. The number of firms is lower in this sample, because 15 entered after Feb 1, 2012, setting small$_t$ to missing.

	First stage	Second stage						
	(1) DMM	(2) Eff spread	(3) Price Impact	(4) Realized Spread	(5) Quoted Spread	(6) Quoted Depth	(7) Var Ratio	(8) Abs Var Ratio
(Lost Status+Small)×Post	0.25***							
	(3.51)							
$\widehat{\text{DMM}}_{LS+S}$		-107***	24.9***	-132***	-249***	-13.9	-0.26	-0.21
		(-3.66)	(3.61)	(-3.94)	(-4.45)	(-1.31)	(-1.05)	(-0.81)
Ln Turnover	0.0047***	-4.48***	1.64***	-6.12***	-11.5***	3.21***	0.074***	0.076***
	(3.00)	(-8.14)	(9.23)	(-9.71)	(-10.9)	(15.5)	(9.83)	(10.6)
Ln Market cap	-0.056	-27.7***	-7.46***	-20.3***	-54.4***	9.08***	0.19***	0.18**
	(-1.48)	(-3.83)	(-4.86)	(-2.60)	(-4.06)	(3.99)	(2.72)	(2.53)
Volatility	-0.0071***	12.4***	3.08***	9.34***	10.4***	-0.95***	-0.017	-0.011
	(-2.87)	(13.2)	(11.0)	(9.09)	(9.76)	(-5.80)	(-1.34)	(-0.89)
Price inverse	0.000040	0.033	-0.0012	0.034	0.019	0.0010	-0.00058	-0.00059
	(0.10)	(0.64)	(-0.13)	(0.66)	(0.25)	(0.068)	(-1.01)	(-1.02)
Observations	58,395	56,486	56,486	56,486	58,304	58,304	58,306	58,306
R-squared	0.580	0.041	0.025	0.025	0.094	0.051	0.003	0.003
Number of firm	145	145	145	145	145	145	145	145

Table A.6: Impact of a Designated Market Maker on Stock Market Liquidity: Only Large firms as Control

This table represents the 2SLS IV regression results of Equations 6 and 7, but uses as control group only the subset of 'Large' firms, those which always satisfied Exchange Presence. Thus, the small firms who never had exchange presence are excluded as control group. Column (1) shows the first stage results with dependent variable DMM_{it}, a dummy indicator whether firm i on day t engaged a designated market maker contract. The Instrument is Lost $Status_i$ times $Post_t$, a dummy indicating whether a firm lost exchange presence status upon introduction of Rule 327 due to a tightened trading volume criteria, times Post which equals 1 after Feb 1, 2012. The dependent variables are liquidity and price efficiency measures defined in Section **??**. The regression contains firm and year-month fixed effects, and standard errors are clustered on the firm and date level.

	(1) DMM	(2) Eff spr	(3) Pr Imp	(4) Realized Spr	(5) Quoted Spread	(6) Quoted depth	(7) Var Ratio	(8) Abs Var Ratio
Lost-$status_L \times$Post	0.51***							
	(3.82)							
$\widehat{DMM}$		-60.9***	14.8***	-75.7***	-187***	3.68	-0.22	-0.15
		(-3.61)	(2.69)	(-3.77)	(-3.44)	(0.64)	(-1.14)	(-0.75)
Ln Market cap	-0.051	-20.6***	-8.64***	-12.0**	-49.4***	10.7***	0.22***	0.20**
	(-1.25)	(-3.60)	(-5.27)	(-1.98)	(-3.59)	(4.52)	(2.76)	(2.57)
Volatility	-0.0067**	11.4***	3.22***	8.21***	12.0***	-1.01***	-0.018	-0.012
	(-2.39)	(12.3)	(9.92)	(8.21)	(10.7)	(-6.39)	(-1.31)	(-0.89)
Price inverse	-0.000023	0.016	0.017	-0.00054	0.034	-0.011	-0.0010	-0.00097
	(-0.064)	(0.53)	(1.64)	(-0.016)	(0.39)	(-0.69)	(-0.91)	(-0.88)
Ln Turnover	0.0049**	-5.80***	1.69***	-7.49***	-15.0***	3.57***	0.083***	0.085***
	(2.36)	(-11.8)	(8.49)	(-12.6)	(-13.1)	(14.9)	(8.92)	(9.52)
Observations	49,822	49,279	49,279	49,279	49,802	49,802	49,754	49,754
R-squared	0.20	0.120	0.031	0.096	0.158	0.092	0.003	0.003
Number of firms	74	74	74	74	74	74	74	74