A HELICOPTER DROP OF INSTITUTIONAL INVESTORS AND STOCK LIQUIDITY

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ABSTRACT

Using the launch of the Shenzhen Hong Kong Stock Connect (SZHKConnect), I examine the effects that an increase in institutional trading has on the liquidity of eligble stocks listed on the Shenzhen Stock Exchange. The difference-in-difference approach finds that an increase in institutional trading improves liquidity measured by quoted spreads and proportional spreads, though it is only significant at the 10% level. Conditioning on a stock being eligible however, the intensity of trading activity through the SZHKConnect is not significantly correlated with stock liquidity. Overall, I find that there is weak evidence that an increase in institutional trading is associated with stock liquidity.

JEL Codes: G14, G15

Key Words: Market Microstructure, Financial Liberalization

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I. INTRODUCTION

Chinese stock markets are puzzling. In contrast to stock markets in developed economies, a large portion of participants in the Chinese stock markets are retail traders, who trade around 80% of the volume in the $7.6 trillion market.[1] The amount of instability and irrational behavior in the Chinese stock market (e.g. surges in stock prices after stock splits) has long been blamed on the dominance of retail traders. A natural question that arises then is whether an increase of institutional investor presence improves market quality. This question becomes increasingly important as the Chinese stock market becomes more open to foreign investors and MSCI gradually includes certain Chinese mainland stocks into its emerging markets index. The question also has implications for both current and future participants in the Chinese stock market. Indeed, Blomberg published an article named: *In China, It's Global Money Managers vs. Mom and Pop*. The full scope of this question is beyond the intent of this paper, rather I focus on a specific dimension of market quality: liquidity measured by quoted spreads, proportional quoted spreads and quoted depth in Renminbi.[2] Specifically, I use the establishment of the Stock Connect program between the Stock Exchange of Hong Kong (henceforth written as SEHK) and Shenzhen Stock Exchange (henceforth written as SZSE) to examine the causal effect of an increase in institutional investor trading on market liquidity in the Shenzhen Stock Exchange.

The Shenzhen Stock Exchange is one of two stock exchanges in mainland China, the other being the larger Shanghai Stock Exchange. As of April 30th, 2018, it had a market cap of $3,547 billion and a monthly trade volume of $763 billion, making it the 8th largest stock exchange in the world, and the 4th largest in Asia in terms of market capitalization. The Shenzhen-Hong Kong

[1] https://www.bloomberg.com/news/articles/2017-09-27/in-china-it-s-global-money-managers-vs-mom-and-pop
[2] Renminbi is the official currency of mainland China, currently 1USD=6.87Renminbi, henceforth Renminbi will be written as RMB.

Stock connect (henceforth written as SZHKConnect) was launched in December 5th, 2016 and was designed to allow foreign investors increased access to the Chinese mainland stock market. It is the sister program of the Shanghai-Hong Kong Stock Connect (SHHKConnect) which was launched in November 17th, 2014. Previously, foreign investors who wished to invest in Chinese mainland stocks were restricted to the B share market, QFII (Qualified Foreign Institutional Investor) or RQFII (RMB Qualified Foreign Institutional Investor) schemes or as strategic investors. Only certain stocks listed on the SZSE are eligible for trading via the SZHKConnect, namely those listed on the SZSE Component Index and SZSE Small/Mid-Cap Innovation Index with a market capitalization of at least RMB6 billion. In total, there are about 880 eligible stocks in the SZSE. Trades by investors with accounts in Hong Kong in eligible Chinese mainland stocks are known as northbound trading.

This paper uses the introduction of the SZHKConnect to study the impact that an increased presence in institutional trading has on stock liquidity. This relies on the fact that a much larger portion of investors in the SEHK are institutional investors, and as such, northbound trading implies a larger presence of institutional investor trading in the SZSE. I use a two-pronged approach. First, I follow Aitken, Ji, Mollica and Wang (2016) and utilize a difference-in-difference approach to examine the changes in stock liquidity one month before and after the introduction of the SZHKConnect. Here I find some evidence that an exogenous increase in institutional trading improves liquidity. While on average, the introduction of the SZHKConnect increased quoted spreads, proportional quoted spreads and decreased quoted depth, stocks eligible for northbound trading experienced both smaller increases in spreads and smaller decreases in quoted depth when compared to non-eligible stocks. Specifically, eligible stocks saw a RMB0.0003 (around 1.76%) smaller increase in quoted spreads, a 0.0015% smaller increase in proportional spreads and a

RMB45,084 smaller decrease in quoted depth. The estimates for the spreads just miss the 5% significance level, while the estimate for the quoted depth is not significant. Second, I utilize more granular data, namely the specific RMB amount of northbound trading for each individual stock, to study whether changes in liquidity are more pronounced for stocks that experience a larger increase in institutional trading. I find that after controlling for stock fixed effects, there is very little evidence that increases in institutional trading affect liquidity. The ratio of northbound trading to total trading volume is only marginally significant in explaining quoted spreads, while not being statistically significant for proportional quoted spreads and quoted depth. Taking a two-pronged approach is due to the limitations in data: while trading data for individual Chinese mainland stocks (either listed on the SSE or the SZSE) are available for the entire sample period, SZHKConnect trading data is only available beginning March 17th, 2017.

Any study of market liquidity needs to start with focusing on a particular dimension (dimensions) of the concept. Kyle (1985) highlights three transactional properties of a liquid market: "...'tightness'(the cost of turning around a position over a short period of time), 'depth'(the size of an order flow innovation required to change prices a given amount), and 'resiliency'(the speed with which prices recover from a random, uninformative shock)." Traditional measures of tightness include (proportional) quoted spreads and (proportional) effective spreads. Depth on the other hand, can be measured as the average of the best bid or ask depth measured with respect to shares or dollar value. (Chung et al. 1999, Chordia, Roll, and Subrahmanyam 2000, Goldstein and Kavajecz 2000)

There is a reasonable amount of research that focuses on the introduction of the Connect program, whether it is the SHHKConnect or the SZHKConnect. Aitken et al. (2016) examines the impact that SHHKConnect had on market liquidity and price convergence for eligible stocks in

the Shanghai and Hong Kong markets. They find that liquidity in mainland China markets improve while liquidity decreases in Hong Kong markets. The main difference between my paper and Aitken et al. (2016) is I utilize more granular data, namely the amount of trading that is conducted through the SZHKConnect at the individual stock level.

The rest of the existing studies are mainly asset-pricing papers that focus on examining the linkages between returns and volatility across the two markets. These studies generally make use of market index data rather than stock level data. Huo and Ahmed (2017) use 1 minute interval data on market indexes to examine the dynamic relationship between the Shanghai and Hong Kong stock markets. They find that the SHHKConnect generates a long-term cointegration relationship between the markets and increases conditional volatility to both markets. Bai and Chow (2017) employ an event study approach and use market index data to study the short-term and medium-term impacts of the SHSC. They find that it increases liquidity, measured as daily price high and daily price low for the index. Other papers include Burdekin and Siklos (2018).

II. DATA AND METHODOLOGY

Data for this paper is obtained from two sources. Trading statistics for individual stocks originate from the Shenzhen Stock Exchange, and are collected and provided by Jinshuyuan, an on-line financial data provider. The statistics include the five highest (lowest) bid (ask) prices and the amount of shares quoted at those prices. Investors can only use limit orders to execute their trades, and as such, trades are always executed at the bid/ask price. The frequency of the data is 3 seconds, which is problematic for two reasons: firstly, it could be presenting different bid/ask prices than what actually transpired in the market and would be exceedingly inaccurate when markets are highly volatile. (e.g. the misrepresentation of bid/ask prices are small when prices are

relatively stable, but when a stock is soaring or plummeting, the 3 second frequency becomes an issue); secondly, it severely limits the measures of liquidity applicable, as at the 3 second frequency, trades and quotes are not necessarily correctly matched. As such, I focus on three measures of liquidity: time-weighted quoted spreads (henceforth written as quoted spreads), time-weighted proportional quoted spreads (henceforth written as proportional spreads), and quoted depth in RMB (henceforth written as quoted depth).

Specifically, the time-weighted quoted spread for each individual stock is obtained from:

$$(1) \quad TW\ Spread_{s,d} = \sum_{t=1}^{T} Spread_{s,t,d} \times TW_{s,t,d}$$

Where s is the stock, t is the specific time in the trading day, and d is the trading day.

The time-weighted proportional quoted spread for each individual stock is obtained from:

$$(2) \quad TW\ Prop\ Spread_{s,d} = \sum_{t=1}^{T} \frac{Spread_{s,t,d}}{Price_{s,t,d}} \times TW_{s,t,d}$$

Where s is the stock, t is the specific time in the trading day, and d is the trading day.

The quoted depth in RMB value for each individual stock is obtained from:

$$(3) \quad Depth_{s,d} = \frac{1}{2} \times \left(\sum_{t=1}^{T} Bid\ Price_{s,t,d} \times Bid\ Volume_{s,t,d} \times TW_{s,t,d} + \sum_{t=1}^{T} Ask\ Price_{s,t,d} \times Ask\ Volume_{s,t,d} \times TW_{s,t,d}\right)$$

Where s is the stock, t is the specific time in the trading day, and d is the trading day.

The second part of my data is northbound trading through the SZHKConnect. The data originates from the Stock Exchange of Hong Kong and is provided by Dabawang, an on-line financial data provider. I use northbound trading activity (where investors with Stock Exchange of

Hong Kong accounts trade eligible Shenzhen stocks) to proxy for an increase in institutional trading. Whereas I cannot identify if northbound trading activity is conducted by institutional or retail traders, there is an overall belief that the portion of northbound trades conducted by institutional investors far exceeds that in the Shenzhen Stock Exchange. In further work, I regress northbound trading on China ETF trading, and use the residuals as a proxy for northbound institutional trading. The intuition being that retail investor trading on China ETFs are correlated with northbound retail investor trading. This allows me to observe the amount of northbound trading at the individual stock level. This is crucial, as it allows me to not only examine the average impact that SZHKConnect had on eligible Shenzhen Stock Exchange stocks, but also the differential impacts of different degrees of northbound trading. The relative trading volume of institutional investors through SZHKConnect is the ratio of daily northbound trading over the total daily trading volume of the stock. In essence, this is a measure of the portion of trades in which a northbound trader was on at least one side of the transaction.

$$(4) \quad Prop\ Northbound\ Vol_{s,d} = \frac{Northbound\ Vol_{s,d}}{Total\ Vol_{s,d}} \times 100\%$$

I apply a two-pronged approach in examining the effect that increased institutional trading has on liquidity. First, I apply a difference-in-difference approach with an event window spanning 1 month before (Nov 7th 2016) and after (January 7th 2017) the launch of the SZHKConnect. The treatment group are stocks listed on the Shenzhen Stock Exchange that became eligible for investors with accounts in the Stock Exchange of Hong Kong (SEHK) to invest in, while the control group are stocks listed on the Shenzhen Stock Exchange that did not become eligible.[3] The second approach is to apply the more granular data on northbound trading on individual stocks.

[3] Stocks listed on the ChiNext, which are primary small growth stocks are excluded from both subsamples

The data for this exercise is from March 17th, 2017 to April 12th, 2017. With this data, I regress the quoted spreads, proportional spreads, and quoted depth on the portion of trading in which northbound traders were involved.

Table 1 and Table 2 presents the summary statistics for the two subsamples. All variables are winsorized at the 5% and 95% cutoffs. For the first subsample from November 7th, 2016 to January 7th, 2017, there are 18 trading days before the launch of the SZHKConnect on December 5th, 2016 and 23 trading days after. Stocks with less than 37 effective trading days are dropped from the subsample, leaving a total of 1,092 stocks, of which 616 are eligible for Northbound trading and 476 are non-eligible. For the second subsample from March 20th, 2017 to April 12th, 2017, there are 16 trading days in the sample. Stocks with less than 15 effective trading days are dropped from the subsample, leaving a total of 669 eligible stocks.

$$(5) \quad spread_{s,d} = \alpha + \frac{Northbound\ Vol_{s,d}}{Total\ Vol_{s,d}} + FE_s$$

Insert tables 1-2 here

III. RESULTS

III.A Subsample 1

I start with the difference-in-difference approach for the first subsample. As seen in figures 1 to 3, the trends for the eligible stocks and the non-eligible stocks are quite similar before and after the SZHKConnect. As expected, the eligible stocks are more liquid compared to their non-eligible counterparts on all three measures: quoted spread, proportional quoted spread, and quoted depth. The quoted spread and proportional quoted spreads are smaller for eligible stocks and the quoted depth measured in RMB is higher.

Insert figures 1 to 3 here

There is no significant trend in liquidity before and after the SZHKConnect, and thus it is difficult to eyeball whether the SZHKConnect had an impact on liquidity on either stock group, not to mention if it had an impact on the eligible stocks compared to the non-eligible stocks. To examine this, I turn to the regression:

$$(6) \quad Liquidity\ Measure_{s,d} = \alpha + \beta Eligible_s + \delta Connect_d + \sigma Eligible_s \times Connect_d + \epsilon_{s,d}$$

$Eligible_s$ takes 1 if the stock is eligible for Northbound trading, and 0 otherwise. $Connect_d$ takes 1 if the trading day is on or after Dec 5th 2016, when the SZHKConnect was established. Quoted Spread and Depth are in RMB, while Proportional Spread is in percentage points. The results are summarized in Table 3.

Insert Table 3 here

The coefficient on $Eligible_s$ are the same as in figures 1-3. On average eligible stocks have spreads which are RMB0.0036 lower than non-eligible stocks, given that average quoted spreads over the subsample are RMB0.017, this corresponds to eligible stocks having quoted spreads 21% lower than non-eligible stocks. Similarly, on average eligible stocks have proportional spreads which are -0.0065% lower than non-eligible stocks. On average, eligible stocks have quoted depths which are RMB73,236 larger than non-eligible stocks.

Interestingly, the launch of the SZHKConnect lead to overall worsening in the liquidity of the overall market. Quoted spreads increase by RMB0.0011 after the SZHKConnect was launched, which corresponds to a 6% increase in quoted spreads while proportional quoted spreads increase by 0.01%. Average quoted depth decreases by RMB177,592, which corresponds to a large 62% decrease.

The main interest of the regressions is the coefficient on $Eligible_s \times Connect_d$, this measures how much liquidity changed for eligible stocks after the SZHKConnect compared to non-eligible stocks. Even though on average, liquidity for stocks in the subsample worsened after the SZHKConnect, eligible stocks experienced a smaller increase in spreads after the SZHKConnect when compared to non-eligible stocks. Using the quoted spread measure, eligible stocks experienced a RMB0.0003 smaller increase in spreads. Statistically, it just misses the 5% significance level. In terms of economic significance, the RMB0.0003 difference in quoted spread changes is a 1.8% decrease when compared against the subsample average spread of RMB0.017. For the proportional spread measure, eligible stocks saw a 0.0015% smaller increase in proportional spreads when compared to non-eligible stocks, again just missing the 5% level in statistical significance. For liquidity measured by quoted depth, eligible stocks experienced a smaller decrease compared to their counterparts. Even though quoted depth decreased on average by a staggering 62% after the SZHKConnect, eligible stocks had a RMB45,084 (or a 16%) smaller decrease in best bid/ask quotes.

In summary, the preliminary results here tell us that an increase in institutional trading through the SZHKConnect program is associated with an increase in liquidity measured through quoted spreads, proportional spreads, and quoted depth. However, the economic significance and statistical significance is relatively weak. This could be partially due to the fact that northbound trading via the SZHKConnect is limited at the launch of the program.

III.B Subsample 2

To further investigate the impact of institutional trading on stock liquidity, I utilize slightly more granular data: northbound trading data at the individual stock level. As mentioned in the data

section of this paper, since individual northbound position data is only available starting from March 17th, 2017, I focus on a subsample of eligible stocks from March 17th, 2017 to April 12th, 2017. In total, the sample has 644 stocks and 16 trading days.

I include stock fixed effects since the characteristics of different stocks could potentially impact both the liquidity of stocks and the willingness of institutional investors (through SZHKConnect) to trade on them. Specifically, the regression I use is:

$$(7) \quad Liquidity\ Measure_{s,d} = \gamma + \theta Prop\ Northbound\ Vol_{s,d} + \omega_s + e_{s,d}$$

The results are summarized in Table 4.

Insert Table 4 here

Table 4 shows that controlling for stock fixed effects, there is little evidence that institutional trading on stocks through the SZHKConnect have an impact on liquidity. Proportional northbound trading volume is only marginally statistically important at the 10% level in explaining the time-series variation in quoted spreads. Economically speaking, a 1% increase of northbound trading/trading volume ratio decreases quoted spreads by a tiny RMB0.00003. Northbound trading does not have a statistically significant correlation with liquidity measured by proportional spreads or quoted depth. The signs are also in contradicting directions. Coefficients on the quoted spread and proportional spread suggest a positive correlation between northbound trading and liquidity, while coefficients on quoted depth suggest a negative relationship.

This suggests that we cannot reject the hypothesis that an increase in institutional trading through the SZHKConnect has no impact on stock liquidity. There are a few obvious reasons for why I am not able to reject the hypothesis. First of all, my measure of additional institutional trading through the SZHKConnect may not be an accurate measure of northbound trading. Starting from holding position data, I am only able to measure the overall change in net positions for

northbound traders across trading days. This underestimates the amount of northbound trading. In the extreme scenario where some northbound traders sell their entire position of a stock to another northbound trader, my measurement of northbound trading activity would be zero even though there was intense trading. Another reason could be the limitation of the subsample size. Ideally, the subsample here could be extended from March 17th, 2017 to August 2018. An argument against extending the sample is that as we move further away from the exogenous shock (the launch of the SZHKConnect program), northbound institutional trading intensity for stocks could be more sensitive to endogeneity problems.

IV. CONCLUSION

I find that there is limited evidence that increased institutional trading via the launch of the SZHKConnect had an impact on liquidity measured as quoted spreads, proportional quoted spreads, and quoted depth. Over the first subsample, the difference-in-difference approach which focuses on the differential change in liquidity for eligible stocks compared to non-eligible stocks finds that the launch of the SZHKConnect (and more institutional investor trading) led to improved liquidity: lower quoted spreads, proportional spreads, and higher quoted depth. However, there is only statistical significance at the 10% level for quoted spreads and proportional spreads, and no statistical significance when the outcome variable is quoted depth. Over the second subsample, after controlling for stock fixed effects, a higher ratio of northbound trading is negatively correlated with quoted spreads, but only marginally at the 10% level, while the ratio of northbound trading is not significantly correlated with proportional spreads or quoted depth.

There are several reasons for why this paper only finds weak evidence, the relative low frequency of the data being the most prominent. Obtaining data at a higher frequency, extending

the sample period, and improving the measurement of the intensity of northbound trading would be first steps in achieving more convincing results.

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Table 1: Summary Statistics on First Subsample

	N	Mean	Median	Sd	Min	Max
Quoted Spread	44,590	0.017	0.013	0.009	0.010	0.044
Proportional Quoted Spread	44,590	0.109	0.102	0.040	0.051	0.200
Quoted Depth in RMB	44,590	284,739	204,587	220,069	90,254	946,897

Summary statistics are from the subsample spanning Nov 7th, 2016 to Jan 7th, 2017. Variables are winsorized at the 5% and 95% cutoffs. There are 1,092 stocks in the sample, of which 476 are non-eligible for Northbound trading, and 616 are eligible. There are 18 trading days before the event and 23 trading days after the event. Stocks with less than 37 effective trading days during the subsample are dropped.

Table 2: Summary Statistics on Second Subsample

	N	Mean	Median	Sd	Min	Max
Quoted Spread	10,259	0.015	0.012	0.006	0.010	0.033
Proportional Quoted Spread (%)	10,259	0.106	0.097	0.041	0.048	0.204
Quoted Depth in RMB	10,259	371,841	256,826	308,184	109,962	1,308,890
Proportional Northbound Trading	10,259	0.007	0.003	0.010	0	0.040

Summary statistics are from the subsample spanning March 20th, 2017 to April 20th, 2017. Variables are winsorized at the 5% and 95% cutoffs. There are 669 stocks in the sample. There are 16 trading days. Stocks with less than 15 effective trading days during the subsample are dropped.

Table 3: Impact of Connect on Liquidity

	Spread	Proportional Spread	Depth
Eligible	-0.0036	-0.0065	73,236
	(-29.11)	(-12.07)	(1.54)
Connect	0.0011	0.0104	-177,592
	(8.46)	(18.45)	(-3.55)
Eligible × Connect	-0.0003	-0.0015	45,084
	(-1.95)	(-1.94)	(0.68)
N	44,590	44,590	44,590
Adjusted R^2	4.33%	2.27%	0.07%

Regression results of liquidity measures (Spread, Proportional Spread and Depth) on launch of SZHKConnect. Eligible takes 1 if the stock is eligible for northbound trading, and 0 otherwise. Connect takes 1 if the trading day is on or after Dec 5th, 2016, when the SZHKConnect was established. Spread and Depth are in RMB, while Proportional Spread is in percentage points. The subsample period is from Nov 7th, 2016 to Jan 7th, 2017. Variables are winsorized at the 5% and 95% cutoffs. There are 644 stocks in the subsample and a total of 16 trading days. Stocks with less than 37 effective trading days during the subsample are dropped. t-statistics in parenthesis.

Table 4: Impact of Northbound Trading on Liquidity

	Spread	Proportional Spread	Depth
Northbound Trading	-0.0030	-0.0057	-5,123
	(-1.70)	(-0.47)	(-0.06)
N	10,259	10,259	10,259
Adjusted R^2	75.59%	74.58%	79.71%

Regression results of liquidity measures (Spread, Proportional Spread and Depth) on northbound trading. Spread and Depth are in RMB, while Proportional Spread is in percentage points. The subsample period is from Mar 17th, 2017 to Apr 12th, 2017. Variables are winsorized at the 5% and 95% cutoffs. There are 644 stocks in the sample with 16 trading days. Stocks with less than 15 effective trading days during the subsample are dropped. t-statistics in parenthesis.

Figure 1: Quoted Spreads around SZHKConnect Launch

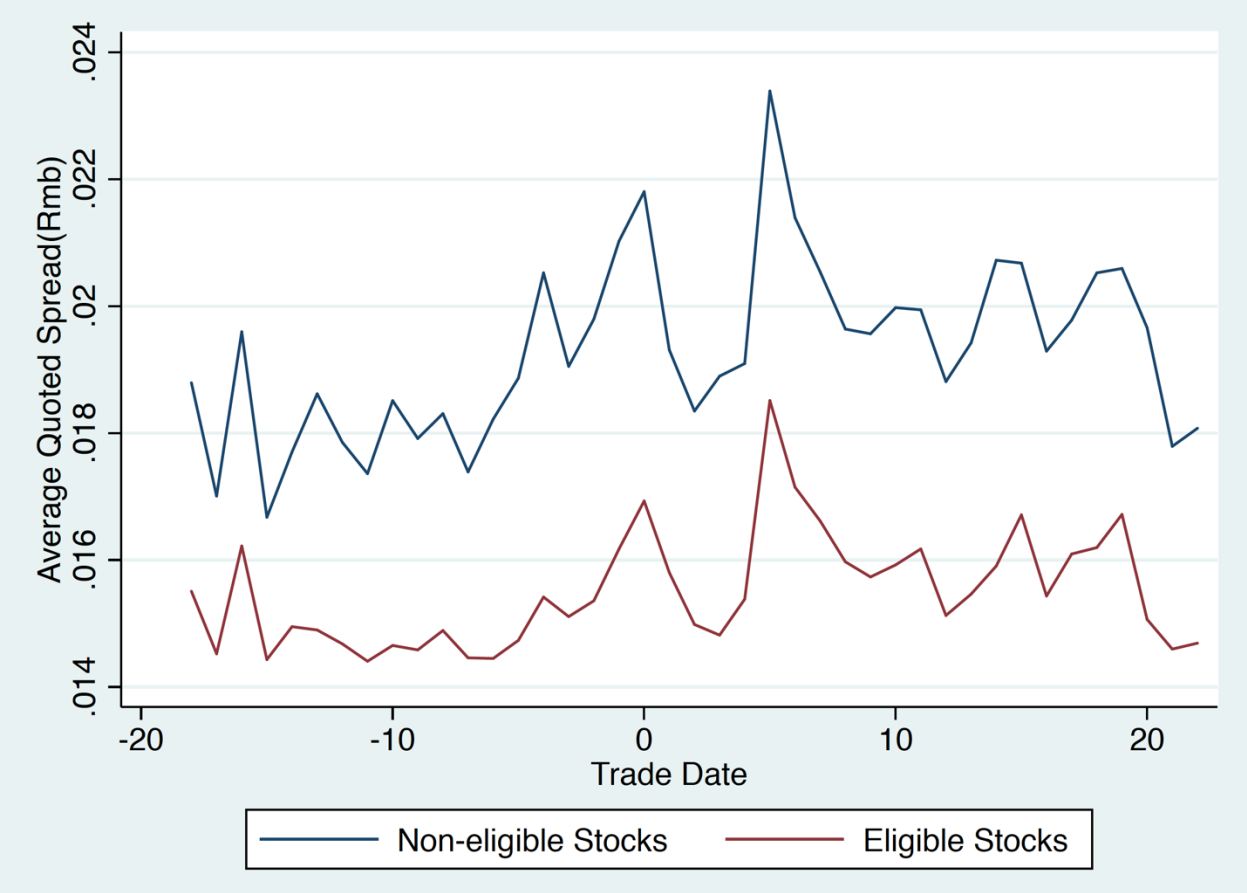

Figure 1 plots the average quoted spread measured in RMB for both eligible stocks and non-eligible stocks for northbound trading following the establishment of the SZHKConnect program. The time-weighted quoted spread for each individual stock is obtained from: $TW\ Spread_{s,d} = \sum_{t=1}^{T} Spread_{s,t,d} \times TW_{s,t,d}$, where s is the stock, t is the specific time in the trading day, and d is the trading day.

Figure 2: Proportional Spreads around SZHKConnect Launch

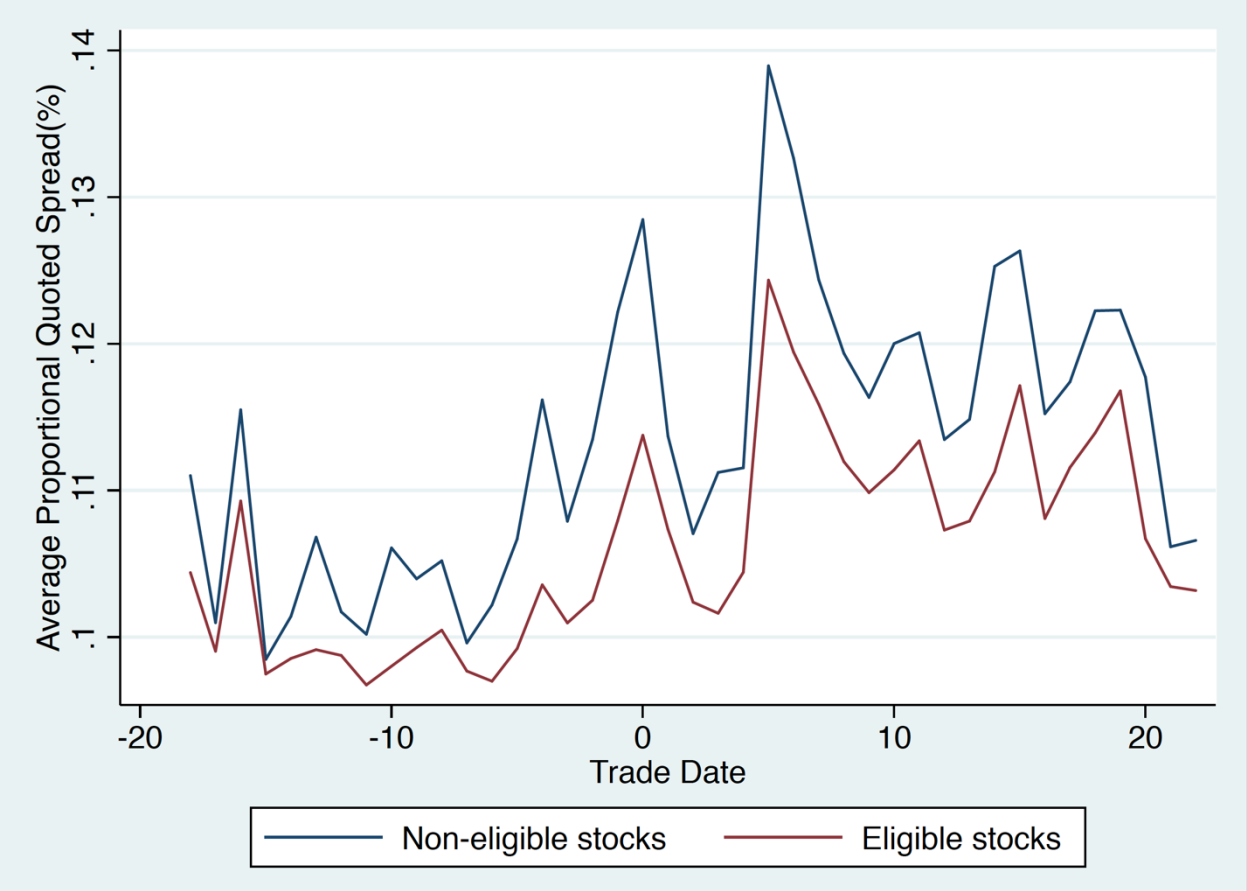

Figure 2 plots the average proportional quoted spread measured in % for both eligible stocks and non-eligible stocks for northbound trading following the establishment of the SZHKConnect program. The time-weighted proportional quoted spread for each individual stock is obtained from: $TW\ Prop\ Spread_{s,d} = \sum_{t=1}^{T} \frac{Spread_{s,t,d}}{Price_{s,t,d}} \times TW_{s,t,d}$, where s is the stock, t is the specific time in the trading day, and d is the trading day.

Figure 3: Quoted Depth around SZHKConnect Launch

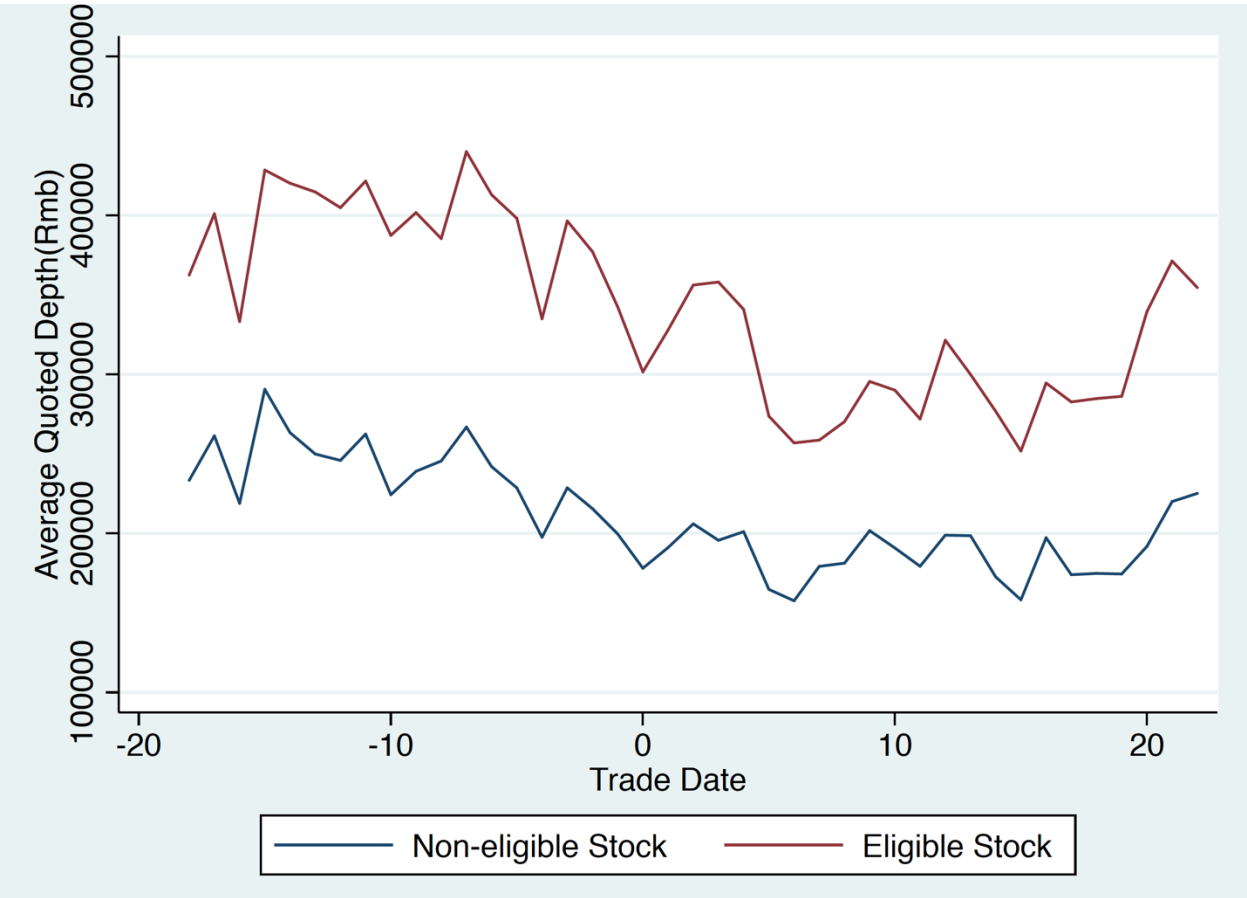

Figure 3 plots the average quoted depth measured in RMB for both eligible stocks and non-eligible stocks for northbound trading following the establishment of the SZHKConnect program. The quoted depth in RMB value for each individual stock is obtained from: $Depth_{s,d} = 1/2 \times (\sum_{t=1}^{T} Bid\ Price_{s,t,d} \times Bid\ Volume_{s,t,d} \times TW_{s,t,d} + \sum_{t=1}^{T} Ask\ Price_{s,t,d} \times Ask\ Volume_{s,t,d} \times TW_{s,t,d})$, where s is the stock, t is the specific time in the trading day, and d is the trading day.