Specialization investments and market power in the underwriting market for municipal bonds.

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Abstract

I find that municipal bond underwriters tend to specialize either in competitive sales or in negotiated sales. In a sample of 69,347 school district deals, on average, the market shares of competitive deals of the three main underwriters of negotiated deals in the state are 85% smaller than their shares of negotiated deals. Similarly, the top three competitive underwriters in the state have market shares of negotiated deals 94% smaller than their shares of competitive deals. I also find that competitive and negotiated sales require different types of specialization investments. The former requires investments in dealer networks, while the latter requires building relationships with investors and issuers. Local underwriters have a cost advantage in the specialization investments required for negotiated sales, and often dominate this market. However, this cost advantage disappears quickly crossing state borders. On the other hand, underwriters who invest in dealer networks can amortize their investment in multiple states. Compared to negotiated underwriters, I find that prime competitive underwriters in one state are more likely to become dominant competitive underwriters in a second state. Therefore, banks with pre-established networks have a cost advantage for competitive sales, and these markets are often dominated by national banks headquartered in New York. These cost dynamics also explain the higher industry concentration observed in negotiated sales markets.

Keywords: Market power, concentration, Herfindahl Index, book building, auctions, municipal bonds.

Classification: H3, H7, G1.

1. Introduction

The municipal bond market is the financial backbone of America's infrastructure. It is also one of the largest financial markets in the country, with almost $500 billion of new issues per year and around $4 trillion in market capitalization. It is not only economically relevant, it is also an important laboratory for questions in market microstructure and financial intermediation because it is regulated by particular federal laws, by heterogeneous state laws, and by its own and separate rule-setting authority—the Municipal Securities Rulemaking Board (MSRB). The market is undergoing rapid transformation with the constant introduction of new rules and a transition from an arcane and decentralized broker-dealer market to one in which trading platforms quickly gain market shares. The unique characteristics of this market, its swift development, and its national impact on the provision of public services, have stimulated a growing flow of scholarly research on municipal bonds in recent decades.

Municipal bond underwriters play a key part in a market characterized by its opacity and asymmetric information. However, little attention has been paid to their role in this market, and when they were studied, it involved pay-to-play situations (Butler 2008, Butler et al. 2009, Cestau et al. 2013). I extend the literature relating to municipal bond underwriters by analyzing how underwriters compete, what are the entry barriers they face, and what are sources of market power in this market.[1]

Surprisingly, I find that underwriters specialize either in public sales or in negotiated sales. Public and negotiated sales are the two most common mechanisms that muni issuers use to price new bond issues. In a public sale, the issuer conducts a public auction where underwriters bid for the entire issue. In a negotiated sale, the issuer negotiates a price with one underwriter after an ad-hoc selection process, as in book building. It is not rare for a firm to specialize in one service or product, but what it is unusual here is that, from the underwriter's perspective, the service is essentially the

[1] Green, Hollifield & Schürhoff (2007*a*), Green, Hollifield & Schürhoff (2007*b*), Green (2007), Hollifield, Neklyudov & Spatt (2017), and Li & Schürhoff (2019) show evidence of that broker-dealers have substantial market power in the secondary market. In this paper I focus on the primary market.

same; to determine a price, to buy at that price, and place the bond issue. What changes is the way they sell the service; Either they negotiate a price or they participate in a public auction.

This result has immediate implications. The concentration of the underwriting services industry is correctly measured when it is calculated by state and bid type. Cestau (2019) finds that concentration has to be calculated by state, because the industry is segmented along state borders. This paper goes a step further; The industry is also fragmented by bid type. Thus, a state with two underwriters with the same market shares, where one specializes in negotiated sales and one in competitive sales, has a fully concentrated industry.[2]. More importantly, the fact that they specialize raises some questions. Why are the underwriters willing to negotiate a price unwilling to submit a firm offer? And even more puzzling, why are the underwriters willing to submit a firm offer unwilling to negotiate one (and probably under better terms)? It is also a question if it is a matter of will.

I characterize the industry leaders in negotiated sales and the industry leaders in public sales as a starting point to answer the above questions. I find one clearly distinctive feature between them; industry leaders in the former case tend to be local, headquartered in the same state where they are leaders. Industry leaders in the latter case tend to be national banks based in New York City. The implications of this result are multiple. While a restriction on negotiated sales decreases the offering yields of plain-vanilla bonds by around 13 basis points (Cestau et al. 2019), it also hurts local firms, rendering it an unpopular policy. While it is puzzling that most issuers prefer negotiated sales when competitive sales lead to significantly lower yields (Cestau et al. 2019), the above result shows that by doing so they increase the business of local firms. While public sales favor competition among underwriters, it also increases systemic risk in the banking sector, as the market is dominated by national banks which, at the same time, are less numerous.

I carry on by theorizing why local underwriters have an advantage over out-of-state underwriters in the negotiated sales segment of the industry, and why New york-based

[2]Underlying this statement is the fact that issuers stick to the same sales method Cestau, Green, Hollifield & Schürhoff (2019)

national underwriters dominate the competitive sales segment. The answer to the first question is perhaps intuitive; Being local provides a cost advantage for building relationships with issuers and local investors alike, and relationships are a major entry barrier in this segment of the industry. The novel result presented in the paper is that this cost advantage quickly vanishes when underwriters cross state lines. Regarding the second question, I show evidence that broker-dealer relationships, which can be used to offload large bond inventories, are a prime entry barrier in the competitive sales segment, and thus, pre-established relationships give a competitive edge in this market. Both theories have also important implications.[3] Theoretical papers that compare negotiates sales vis-à-vis competitive sales often assume that, in both cases, the underwriter faces the same clientele and the same asymmetries of information (Benveniste & Spindt 1989, Benveniste & Wilhelm 1990, Spatt & Srivastava 1991, Biais & Faugeron-Crouzet 2002, Biais et al. 2002). However, I argue this assumption is not correct. This papers generally conclude that negotiated sales implement the optimal mechanism, but this conclusion might change with the right assumptions.

Finally, a valuable feature of this paper lies in its unique sample of bonds. There is evidence that the municipal bond market is fragmented (Schultz 2012, Babina et al. 2019), but to what extent it is not fully understood. Underwriters and issuers may behave differently in each market fragment, so to avoid confounding results I use a sample of bonds issued by solely independent school districts with taxing power. The goal is not to study the school bond market itself or school outcomes. I use this sample because it has very convenient characteristics from a technical point of view. The objective is to use a sample that is not populated by special cases that lend themselves to ad-hoc justifications of one sales method over the other. A sample that serves as a benchmark and that achieves the highest degree of simplicity and homogeneity, while maintaining a large size and universality. I argue that my sample fits well these objectives. Independent school districts are one of the most simple, common, and homogenous issuers in the market. They have straightforward fund structures and few and very similar sources of income. They are issuers of plain vanilla bonds. Issuance is also sizeable; between

[3]Possibly, it also predicts M&A activity in the industry.

1990 and 2014 they accounted for 32% of all bond issues and 17% of the total notional amount. In addition, I use novel data on bond characteristics, including hand-collected data on the statutory security of the bonds based on the security classification described in Cestau, Hollifield, Li & Schürhoff (2018).

2. Data and sample construction

I obtained data on 423,424 muni deals issued between 1966 and 2014 from Thompson Financial's SDC Platinum database. The data include issuer characteristics, deal characteristics, and bond characteristics. The database covers almost all bond issues since 1990, but only a fraction of the issues between 1964 and 1989.

Independent school districts: From the original sample, I was able to identify 97,591 deals issued by independent school districts from 48 states; I used the government identifier in the SDC database to identify 129,148 districts, and a set of 88 originally created *regular expressions* to separate school district bonds from the bonds issued by other types of governments, such as special purpose districts, community colleges, library districts, and several other.

Enabling laws: I hand-collected the enabling laws for each deal in the sample. The enabling laws are the set of state laws that authorize a school district to issue a bond with certain characteristics. I mainly obtained the enabling laws from the official statements attached to every new bond issue, which are available at the EMMA (MSRB) repository. Sometimes, however, the information provided in the official statements is incomplete. Either they do not list the full set of enabling laws or they simply indicate broad divisions of the codified laws of the state where the enabling laws are located. Or even worse, the enabling laws have been repealed and erased from the codes after the bond was issued. Therefore, it was often necessary to extensively survey the laws of the state or the amendments thereof, and seek the help of a bond lawyer; over 150 bond lawyers throughout the country have helped me with this database. I could not assign the enabling laws for 758 deals, including all Tennessee's observations—64—, where the

enabling laws are private laws.

Broad bond types: Bonds with different characteristics are issued under different enabling laws, and state laws generally provide for a number of different types of bonds. We can broadly divide the enabling laws into three distinct groups based on the characteristics of the bonds they authorize: temporary borrowings, certificates of participation (COPs), and long-term bonded obligations (bonds). Temporary borrowings include Tax and Revenue anticipation notes (TRANs) and Bond Anticipation Notes (BANs). They are short-term secured obligations, very safe, and often not rated. COPs include all issues relating to long-term lease financings, which usually involve a conduit issuer. The bond category includes all other types of securities such as bonds, notes, and debentures. Both underwriters and issuers may behave differently for each category, but there is no literature comparing these groups. We know these bonds are systematically different, but we do not know if they belong to different classes or if they operate in segmented markets. To avoid confounding results, I take the arbitrary decision to exclude temporary borrowings from the analysis. Therefore, I drop 20,645 temporary borrowings from the sample and keep the 7241 COPs and 68,947 bond deals.

Statutory security of the bonds: If there is one thing we learned from Detroit's bankruptcy, it is that not all GO bonds are created equal. The city's three types of GO bonds outstanding at the time of the default had very different recovery rates, 73%, 42%, and 12%, respectively. The different types of municipal bond securities that we see today were not forged by market forces but rather dictated by the legislators of each State. Moreover, state and local courts cannot confiscate school property to pay bondholders, and neither federal nor state law determines the procedures and creditor priorities in case of a bankruptcy. Nor is it realistic to believe that credit ratings can capture fully the underlying security of a bond, when defaults of rated bonds are rare and, until recently, there was no unified and universal classification of the statutory security of a bond. For all these reasons, the diverse body of legal provisions relating to the security of the bonds becomes an essential element for assessing the security of a municipal bond. Therefore, I used the classification described in Cestau, Hollifield, Li &

Schürhoff (2018) to hand-classify the statutory security of each deal in the sample. The information was obtained from the enabling laws and the official statements. I was able to identify 66,749 deals of 34 different types of general obligations and 9439 deals of 13 different types of non-general obligations.

Lead underwriter data: The SDC database provides the name of the lead underwriter for each deal. I applied a series of filters to correct or augment the quality of these data. As a result, 20% of the names changed. The Appendix B describes these filters in detail.

Headquarters data. I obtained headquarters data from multiple sources. From the MSRB, I obtained a list with HQ data for all broker-dealers and bank dealers registered with the MSRB as of 10/29/2015. However, most of the data were collected from national and local newspapers. Most underwriters in the sample that are not included in the MSRB list have disappeared after a merger or an acquisition. By identifying potential counterparts and time of the M&A in the data, I could search for news that indicated the headquarters of the merged banks. Other sources of data were FINRA's broker check and Bloomberg, among others.

State-periods: The unit of analysis is the underwriter in a state-period. A state-period is a division of the observed deals in a state based on the year of issue: 1990-94 (period 1), 1995-99 (period 2), 2000-04 (period 3), 2005-09 (period 4), 2010-14 (period 5). The length of the period was selected based on the following trade-off. A too-short observational period leads to noisy measures of market shares. A too-long observational period leads to an underestimation of the market shares of firms that exited or entered the market during that period. M&A activity is high in the banking industry, and was especially driven in the '80s and '90s by the enactment of several banking laws. Given the number of deals observed per state and the considerable dynamism of the industry, I argue that five years adequately captures this trade-off.

Final sample: I drop the bond deals that were issued before 1990 because the data are rather incomplete before that date (6,486 observations). I also drop observations from Connecticut, Massachusetts, and Maine (355 observations). The few school districts that actually issue bonds in these states are systematically different from the other school

districts in the sample. The final sample contains 69,347 deals from 39 states. Except for those mentioned in this section, schools in the states not represented in this sample are either not independent or not authorized to issue debt.

3. Specialization investments

In this section, I show that the market for underwriting services is segmented by bid type. Underwriters tend to specialize either in competitive sales or negotiated sales. To show that the market is substantially segmented, for each underwriter I measure the difference between the market shares of negotiated sales and competitive sales in each state-period. I consistently find that top negotiated underwriters fail to be top competitive underwriters, and vice-versa.

The municipal market is highly concentrated. Often, few underwriters carry out most of the underwritings in the state-period, and a sizeable number of less active underwriters carry out a small fraction of total sales. I will measure specialization on the former group because it is the most relevant, and probably it yields less noisy measures. Panel A of Table 1 shows the median market shares across state-periods of the six underwriters with the largest shares of negotiated sales—top negotiated—, in order of size, and the six underwriters with the largest shares of competitive sales—top competitive— in each state-period. When two or more underwriters in a state-period have the same ranking, I use the average share. Ties also explain why the number of observations decreases with lower rankings. If two underwriters are No. 1, next is No. 3, leaving No. 2 empty. The median share of the top negotiated underwriter is 40% (45%) in terms of deals (notional amount), almost twice as large as the median share of the top competitive underwriter. The median share of the second largest negotiated underwriter is just half the top one, but still substantially larger than the median share of the second largest competitive underwriter. The third largest negotiated and competitive underwriters have market shares around 10%, and beyond that point, competitive underwriters tend to have, albeit small, larger market shares than their negotiated counterparts.

Evidently, negotiated sales are far more concentrated than competitive sales, and this fact is clearly documented in Cestau (2019). In fact, the median number of underwriters necessary to reach a combined market share of more than 70% of the state-period negotiated deals (notional amount) is just three (three), and this number rises to six (five) when it comes to the competitive deals (notional amount), as shown in Table A.1 of Appendix A.[4] Moreover, the market shares of smaller size underwriters quickly fall below 5%. Therefore, in most of the paper, I only analyze the top three negotiated underwriters and the top six competitive underwriters in each state-period.

The top three negotiated underwriters in every state-period tend to have relatively minuscule market shares of competitive sales. At the same time, the top six competitive underwriters in every state-period tend to have relatively minuscule market shares of negotiated sales. They all tend to specialize in one sales method in each state-period. For each top three negotiated underwriter in each state-period, I compute its share of negotiated sales and its share of competitive sales, and I calculate their difference as a fraction of the negotiated share, $(competitive\ share(i) - negotiated\ share(i))/negotiated\ share(i)$. I proceed analogously with each top six competitive underwriter in each state-period, although I calculate the opposite difference as a fraction of the competitive share, $(negotiated\ share(j) - competitive\ share(j))/competitive\ share(j)$. Throughout the paper, I refer to these ratios as the drops in the market share. In panel B of Table 1, I report the median[5] drop in the market share by ranking and bid type. Both types of underwriters, negotiated or competitive, lose market shares irrespective of their ranking. Note that since negotiated sales are more concentrated, it is natural that the top two negotiated underwriters have a smaller shares of competitive sales. However, top two competitive underwriters do not win market shares, they also lose, clearly indicating that top competitive underwriters are not at the same time top negotiated; they specialize.

Not only do they all lose market shares, they lose them almost completely. We see that the median drops in the market share, in terms of share of deals, for the top three state-

[4]Table A.1 in the Appendix A shows the median number of underwriters that are required to accumulate 70%, 80%, and 90% of the state-period deals for each sales method, and the median number of underwriters with market shares above 5%, 3%, and 1%, respectively, in each state-period.

[5]Across state-periods

period negotiated underwriters and the top six competitive underwriters are around 71% and 76%, respectively. The drops are also quite uniform across rankings. In terms of notional amount, the drops in the market share are even larger and more extreme; around 85% and 97%, respectively. These large or extreme drops mean that there is specialization and segmentation in the market for underwriting services at the state-period level. In Section 6, I discuss why specialization is higher in terms of notional amount, what characteristics drive to specialization in each sales method, and I present evidence that specialization is partly due to specialization investments with heterogeneous costs across underwriters.

The above results are robust to a myriad of sample filters that match negotiated sales to competitive sales of similar bond types. In fact, the more homogenous the sample, the stronger evidence of specialization we obtain. The baseline sample consists of a very homogenous set of issuers composed by the most standard form of school districts throughout the country. In the following analyses, I increase the homogeneity of the sample by additionally matching similar bond types. The objective of these sample filters is to determine whether underwriters purposely specialize in one sales method or whether specialization is spurious. For example, suppose that two different bond types require different and incompatible specialization investments by underwriters, and that these investments are not related to the sales method. Let us also assume that, for exogenous reasons, one bond type is more suitable for negotiated sales and the other type is more suitable for competitive sales. As a result, underwriters will unintentionally specialize in one sales method despite not making any special investment in that regard. By measuring specialization in homogenous samples of bonds we can test the hypothesis of spurious specialization.

Evidence of specialization is even stronger in the samples of new money bonds, refunding bonds, *unlimited* bonds, "plain vanilla" bonds, and in the samples combining any of the just mentioned filters, which means that underwriters purposely specialize in one sales method. I measure specialization in these samples because, first, all of them relate to most of what are widely accepted as the fundamental attributes of a new issue.

These attributes could create such differences between bonds that they could require special investments by underwriters or specialization. Second, it is also a fact that all of the above are strongly correlated with the method of sale Cestau, Green, Hollifield & Schürhoff (2019). Combined both arguments and we have the potential for spurious specialization in the sales method.

Panels C of Table 1 shows that the median drops in the market share by bid type and ranking are slightly larger in the sample of new money bonds. The drops in terms of deals (notional amount) are around 77% (89%) for the top three negotiated underwriters and around 81% (99%) for the top six competitive underwriters. Likewise, the drops are larger in the sample of refunding bonds (panel D), around 77% (94%) and 75% (98%) for the top negotiated and the top competitive underwriters respectively. Panel E shows median drops that are also around 5% (1%) larger in terms of deals (notional amount) for the bonds backed by unlimited ad-valorem property taxes, the most common school bond type. Panel F shows the drops in the market share for the sample plain vanilla bonds. Plain vanilla bonds do not include zero-coupon, taxable, and deal sizes under 1.5 million dollars. Zero-coupon and taxable are rare, have different clientele, and require more sales efforts by underwriters. Small size deals tend to be underwritten by smaller underwriters, and they are also attractive to different clientele. Taxable and zero-coupon bonds are often sold in negotiated sales, and although there is not a preferred method of sale for small size deals across states, within states, the preferred method is often different from that of larger deals. In addition, state laws that require competitive sales often make exceptions based on these three attributes. Once we exclude taxable, zero-coupon, and small deals from the sample, again we find median drops in the market share by ranking and bid type that are around 5% (1%) larger in terms of deals (notional amount) compared to the the baseline sample.

The drops are notoriously larger in samples that combined the aforementioned filters, as shown in Table A.2 of Appendix A. For example, the drops in the market shares of the top three negotiated underwriters of new-money unlimited vanilla bonds are around 84% in terms of deals, and 95% in terms of notional amount. Likewise, the drops in the

market shares of the top six competitive underwriters in this sample are around 88% and 100% in terms of deals and notional amount respectively. Note that in terms of notional amount, and a little bit less in terms of deals, the median top underwriter, irrespective of its ranking and bid type specialization, loses all or almost all its market share. All the above results indicate that not only underwriters specialize within state-period, but that they purposely do it. Also note that the sample size varies greatly across subsamples, and yet the results that point to specialization are very consistent, regardless of how we divide the sample.

In the following sections of the paper, I will put the emphasis on new-money bonds and leave the results for the full sample for the Appendix. Most refunding bonds are sold by negotiation, and most competitive sales involve new-money bonds. Thus, when we compare competitive sales against negotiated sales in the full sample, we are mostly comparing new-money bonds against refunding bonds. Since new-money bonds and refunding bonds are arguably different kinds of bonds, I focus on the sub-sample of new-money bonds to avoid potential biases, and study the interactions between the markets for underwriting services for refunding bonds and new-money bonds in Section 4.

We know from Cestau (2019) that smaller states—in terms of school bond issues—have higher market concentration than larger states. Yet, state size does not have a significant effect on specialization. Panels A and B of Table 2 show the median drops in market shares for the samples of state-periods below and above the median number of deals (notional amount) in a state period. The drops are similar to those found in the baseline. More importantly, the drops are very similar between samples, both in terms of deals and amounts, and for both bid types. The difference between the average drop in panels A and B is just 1% point. This indicates that specialization is an optimal strategy regardless of scale.

Specialization is also not affected by market concentration itself. Panels C and D show the drops in market shares for the samples of state-periods with low market concentration and high market concentration respectively. The N columns of panels C and D of Table 2 show the median drops for state-periods where negotiated sales have a Herfind-

	Deals			Amount			Deals			Amount		
Ran-	N	C	Sample	N	C	Sample	N	C	Sample	N	C	Sample
king	(%)	(%)	Size	(%)	(%)	Size	(%)	(%)	Size	(%)	(%)	Size
	A: Median market shares						B: Proportional drop in market shares					
No. 1	40	23	150/150	45	25	150/150	-76	-61	150/150	-93	-92	150/150
No. 2	21	14	141/128	21	16	150/150	-73	-69	141/128	-80	-97	150/150
No. 3	10	10	132/124	11	11	149/150	-65	-76	132/124	-82	-94	149/150
No. 4	6	8	106/103	7	8	146/149	.	-81	. /103	.	-100	./149
No. 5	4	6	93/90	5	7	137/149	.	-87	. /90	.	-100	./149
No. 6	3	5	78/89	2	5	129/144	.	-84	. /89	.	-100	./144
	C: New money						D: Refunding					
No. 1	-81	-76	100/100	-95	-92	100/100	-82	-84	67/67	-92	-89	67/67
No. 2	-78	-80	93/84	-85	-100	100/100	-82	-81	62/61	-90	-98	67/67
No. 3	-74	-69	80/82	-86	-100	99/100	-67	-66	62/43	-100	-100	66/67
No. 4	.	-90	./69	.	-100	./100	.	-48	./34	.	-100	./66
No. 5	.	-77	./61	.	-100	./98	.	-92	./28	.	-100	./66
No. 6	.	-97	./51	.	-100	./96	.	-78	./26	.	-99	./64
	E: Unlimited						F: Plain Vanilla					
No. 1	-79	-63	128/128	-91	-95	128/128	-78	-78	130/130	-90	-92	130/130
No. 2	-73	-77	118/107	-81	-96	128/128	-78	-67	121/108	-81	-99	130/130
No. 3	-75	-87	116/103	-78	-100	127/128	-68	-80	111/100	-85	-100	128/130
No. 4	.	-85	./85	.	-100	./127	.	-90	./80	.	-100	./129
No. 5	.	-86	./81	.	-100	./128	.	-99	./76	.	-98	./128
No. 6	.	-92	./71	.	-100	./124	.	-86	./70	.	-100	./122
	G: Small state-periods						H: Large state-periods					
No. 1	-79	-64	75/75	-94	-98	75/75	-73	-62	75/75	-93	-89	75/75
No. 2	-82	-68	70/61	-83	-100	75/75	-69	-74	71/68	-79	-93	75/75
No. 3	-78	-74	62/57	-93	-100	74/75	-68	-75	69/66	-70	-92	75/75

Table 1: Median market share by ranking and bid type.

ahl Index (HI) below and above 0.25 respectively. The *C* columns show the median drops for state-periods where competitive sales have a HI below and above 0.15 respectively. HI=0.15 and HI=0.25 are the thresholds between low concentration and moderate concentration, and between moderate concentration and high concentration, respectively, according to the 2010 guidelines for horizontal mergers of the Department of Justice of the US. The drops are very similar in both samples, especially those registered by top negotiated underwriters. On average, the drops in market shares of top competitive and negotiated underwriters in highly concentrated state-periods are just 3% points higher than the drops observed in low concentrated state-periods. Specialization is not driven by the degree of competition among underwriters, which is an important result if we want to model how they compete.

Specialization is sensitive to the proportion of competitive sales, however. When the proportion of competitive sales is the highest, the drop in market shares of top competitive and negotiated underwriters is more moderate, but still very large. Panels E, F, and G of Table 2 show the drops in market shares in state-periods with a proportion of competitive sales under one-third of total sales, between one-third and two-thirds, and above two-thirds, respectively. We observe similar values in panels E and F. The differences in drops are not larger than 2% points on average. In state-periods with a proportion of competitive sales above two-thirds, top negotiated and top competitive underwriters lose around 60% of their market shares in terms of deals, and around 72% and 93% in terms of notional amount, respectively. The drops are still high but significantly lower than those in panels E and F. The lower drops are due to underwriters that are both top negotiated and top competitive in the same state-periods. These underwriters tend to have their headquarters in low competitive states and have expanded to contiguous high competitive states with low or null number of local underwriters. I provide a more detailed explanation in Section 6.

	Deals			Amount			Deals			Amount		
Ran-king	N (%)	C (%)	Sample Size	N (%)	C (%)	Sample Size	N (%)	C (%)	Sample Size	N (%)	C (%)	Sample Size
	A: Small state-periods						B: Large state-periods					
No. 1	-84	-69	51/51	-96	-97	50/50	-81	-77	49/49	-94	-83	50/50
No. 2	-77	-82	48/39	-92	-100	50/50	-80	-83	46/46	-79	-99	50/50
No. 3	-70	-74	36/40	-69	-100	50/50	-78	-69	44/44	-95	-99	49/50
	C: Low concentration						D: High concentration					
No. 1	-76	-76	48/67	-96	-82	39/56	-87	-79	52/33	-95	-97	61/44
No. 2	-76	-85	43/59	-84	-99	39/56	-78	-70	51/26	-85	-100	61/44
No. 3	-82	-60	37/56	-85	-93	39/56	-67	-84	43/28	-84	-100	60/44
	E: Low competitive ratio						F: Medium competitive ratio					
No. 1	-100	-82	37/37	-100	-100	35/35	-87	-88	22/22	-100	-99	21/21
No. 2	-84	-92	37/26	-94	-100	35/35	-80	-100	22/19	-94	-100	21/21
No. 3	-76	-60	37/27	-93	-94	35/35	-76	-82	19/19	-100	-100	21/21
	G: High competitive ratio											
No. 1	-71	-49	41/41	-87	-80	44/44						
No. 2	-71	-43	35/40	-68	-100	44/44						
No. 3	-38	-83	24/38	-60	-100	43/44						

Table 2: Median market shares by subsample.

3.1. Sorting

An alternative, and perhaps better, way of measuring specialization is to analyze the positions held by top negotiated underwriters in the top competitive rankings. This way we can directly address the question of whether top negotiated underwriters are also top competitive underwriters. Note that, since the concentration in the competitive markets is lower, top negotiated underwriters could see their market shares reduced, but still be at the very top of the competitive rankings. The premise is that, if underwriters specialize, top negotiated should not be top competitive at the same time, and vice-versa, regardless of their market shares.

I test this premise in the following way. I take the top three underwriters in each state-period—top three negotiated— and the top three competitive underwriters that are not also top three negotiated—top three competitive—. I rank them from one to six according to their market shares of negotiated sales in the state-period—the negotiated ranking—, such that the largest underwriter is assigned the No. 1 ranking, and the

smallest underwriter the No. 6 ranking. I also rank them from one to six according to their market shares of competitive sales—the competitive ranking—, and I regress the competitive ranking on the negotiated ranking—the ranking regression—.

Note that the ranking regression violates several of the assumptions necessary to obtain unbiased estimates in a linear regression, in particular the independence assumption[6], so it is not suitable for studying what variables affect the competitive ranking. However, the ranking regression is perfect for studying whether there is *ranking reversion* or *ranking preservation* between the negotiated and the competitive rankings, as long as we do not include any controls in addition to a constant. In a ranking regression, such as the one described above, the coefficient on the negotiated ranking, b, is bounded between one and negative one. If $b = 1$, there is perfect *sorting* or perfect ranking preservation; The largest negative underwriter is the largest competitive underwriter, the second largest negotiated underwriter is also the second largest competitive underwriter, and so on. If $b = -1$, there is perfect inverse sorting or perfect ranking reversion; The negotiated and the competitive rankings are inverted. The constant, k, and b have a deterministic relationship, $k = \sum R_{is}^N * (1 - b) / \sum N_s$, where i indexes underwriters, s indexes state-periods, R_{is}^N denotes the negotiated ranking of underwriter i in state-period s, and N_s is the number of underwriters in s. In our case, we always have six underwriters per state-period, so $k = 3.5 * (1 - b)$. Thus, we can determine whether there is ranking reservation or reversion either from b or k.

The linear prediction, $\hat{R^C} = k + b * R_{is}^N$, where R^C denotes the competitive ranking, crosses the 45° line, in the R^NxR^C plane, exactly at $R^N = \sum R_{is}^N / \sum N_s$. In our case, where we have six underwriters per state-period, the linear prediction will cross the 45° line at $R^N = 3.5$ —the pivot point— regardless of b. Therefore, by construction, the pivot point exactly separates the top three negative underwriters to the left, ant the top three competitive underwriters to the right, in each state-period.[7] If the observations to the left

[6]For example, if there are only two underwriters per state-period, the negotiated and competitive rankings of one underwriter exactly determines both rankings of the second underwriter. Thus, the error of one underwriter exactly determines the error of the second underwriter. Moreover, the errors have different distributions in the first place.

[7]In a regression using market shares instead of rankings, the pivot point would be exactly at $100\%/N_s$.

of the pivot point tend to have competitive rankings under 3.5, b will be greater than 0. On the contrary, if the observations to the left of the pivot point tend to have competitive rankings above 3.5, b will be less than 0. In other words, $b > 0$ if top negotiated tend to be also top competitive, $b < 0$ if top negotiated do not tend to be also top competitive, or $b > 0$ if there is no specialization, and $b < 0$ if there is specialization. Of course, if there is no ranking preservation and no ranking reversion, $b = 0$. Thus, the ranking regression is suitable for studying whether underwriters specialize in a sales method.

I include exactly three top negotiated underwriters and three top competitive underwriters per state-period for the following reasons. First, it is important to include as many top negotiated underwriters as top competitive underwriters, so the pivot point separates top negotiated from top competitive and b can be correctly interpreted. For example, if we only included top negotiated underwriters, regardless of the sign of b, we would not be able to conclude whether underwriters specialize. Second, underwriters with rankings greater than three tend to be very small. If they are small due to lack of financial backing, they would be at the bottom of the rankings regardless of their specialization choice. I assume that top three negotiated underwriters have enough financial backing to be top three competitive, and vice-versa. In addition, the top three underwriters cover a significant proportion of all state-period sales. They provide a good balance between being large and representative enough. Third, we can also select a different number of underwriters for each state-period and include state-period fixed effects to correct the pivot point in each case. However, state-periods with a greater number of underwriters would have more weight in the estimate of b. By including the same number of underwriters per state-period, every state-period has the same weight.[8] In fact, $b = mean(b_s)$, where b_s are the coefficients of separate ranking regressions by state-period.

Although $b \in [-1, 1]$, the effective bounds can be much narrower. In the most ex-

The number of observations to the left and to the right of the pivot point would depend on the market concentration of the negotiated sales in the state-period. It would not exactly separate top negotiated from top competitive.

[8] In a regression using market shares instead of rankings, the weight of each state-period in the regression would highly depend on the market concentration of negotiated sales. More concentration increases the weight of the state-period for the same number of underwriters

treme case of specialization, the three top negotiated underwriters would have no market shares of competitive sales, and the three top competitive underwriters would have no market shares of negotiated sales. Therefore, top negotiated would be tied in the competitive ranking, and top competitive would be tied in the negotiated ranking, which yields a $b = -0.87$. In fact, whenever we observe ties in rankings, the effective bounds get narrower. When there is specialization, but there is also ranking preservation among underwriters with the same specialization, $b = -0.54$. In other words, if top negotiated underwriters are never the top competitive, but larger negotiated underwriters have larger shares of competitive sales than lower-ranked top negotiated underwriters, the b will be much closer to 0. Finally, if there is specialization, but rankings are random in the sales method in which underwriters do not specialize, $b = -0.80$. Given that ties are very common in the sample, including ties with zero market shares, and that in the next section I show that there is substantial ranking preservation within specialization, any b close to either -.50 indicates extreme specialization.

The ranking regressions also reveal that underwriters specialize in one sales method. Table 3 shows the slopes of the ranking regressions for the samples of new-money bonds, refunding bonds, and their sub-samples of unlimited bonds, plain-vanilla bonds, and unlimited plain-vanilla bonds.[9] The table does not show the estimated constant values of the ranking regressions because they have a deterministic relationship with the slopes, so they are superfluous, and it does not show standard errors and R-squared values because they are meaningless and incorrect. The slopes are just descriptive statistics of the samples. The estimated slope for new-money bonds is between -.33 and -0.42 in terms of deals and between -0.44 and -0.56 in terms of notional amount. Similarly, the estimated slope for refunding bonds is between -.39 and -0.45 in terms of deals and between -0.43 and -0.52 in terms of notional amount. Based on the above analysis of the effective boundaries, we can conclude that the underwriters of municipal bonds show near to extreme specialization in one sales method. The slopes of the ranking regressions are also consistent with our previous results. The level of specialization is similar in the

[9] I drop state-periods that do not have at least three top negotiated underwriters with positive shares of negotiated sales, and at least three top competitive underwriters with positive shares of competitive sales that are not also top negotiated.

samples of new-money bonds and refunding bonds. Specialization increases with the homogeneity of the sample. And specialization is higher in terms of notional amount than in terms of deals.

The estimated slopes for the sample and sub-samples of new-money bonds are much steeper when there is a low to medium proportion of competitive sales in the state-period. On the contrary, the slopes are more steeper in state-periods with a high proportion of competitive sales for the sample and sub-samples of refunding bonds. The coefficient on the negotiated ranking for new-money bonds in low and medium competitive state-periods is between -0.35 and -0.61 in terms of deals, and between -0.53 and -0.73 in terms of notional amount. On the other hand, the estimated coefficient in high competitive state-periods is between -0.07 and -0.24 in terms of deals, and between -0.22 and -0.24 in terms of notional amount. Instead, for refunding bonds, while in the former case the slope is between -0.25 and -0.43 in terms of deals and between -0.40 and -0.52 in terms of notional amount, in the latter case it is between -0.49 and -0.64 and between -0.43 and -0.56 respectively; Several points higher. Although the sample of state-periods with a high proportion of competitive sales is much smaller for refunding bonds than for new-money bonds, these opposite results may suggest that there is not a causal relationship between specialization and the proportion of competitive sales. I analyze the case of new-money bonds more deeply in Section 6.

Figure 1 plots the pair of negotiated ranking-competitive ranking, in terms of deals and notional amount, for each top underwriter in the samples of new-money bonds and refunding bonds. The size of the blue dots represents the number of underwriters with the given ranking pair. In all cases, we clearly see that underwriters concentrate in the upper-left region and in the bottom-right region of the plots, indicating that the most common ranking combinations are: high negotiated ranking-low competitive ranking, and low negotiated ranking-high competitive ranking. The plots also show the 45° line and the estimated linear predictions, which always cross at the 3.5-3.5 ranking pair. Ties among underwriters lead to non-integer rankings, and they are more frequent in the

Extra Filter	Prop comp	New-Money			Refunding		
		Deal	Amnt	N	Deal	Amnt	N
None	All	-0.33	-0.44	588	-0.39	-0.43	396
Vanilla	All	-0.42	-0.50	390	-0.39	-0.45	354*
Ultd	All	-0.35	-0.47	492	-0.41	-0.46	342
Utd+van	All	-0.41	-0.56	324	-0.45	-0.52	306*
None	Low	-0.51	-0.63	216/210	-0.36	-0.41	264/264
	Med	-0.47	-0.55	132/120	-0.38	-0.44	60/30
	High	-0.07	-0.24	240/258	-0.51	-0.47	72/102
Vanilla	Low	-0.61	-0.70	168/162	-0.40	-0.46	228/222
	Med	-0.35	-0.53	90/102	-0.25	-0.46	66/42
	High	-0.21	-0.22	132/126	-0.49	-0.43	60/84
Ultd	Low	-0.47	-0.64	210/204	-0.38	-0.44	240/246
	Med	-0.50	-0.57	108/102	-0.41	-0.44	54/30
	High	-0.09	-0.24	174/186	-0.58	-0.55	48/66
Ultd-Vanilla	Low	-0.51	-0.73	156/144	-0.43	-0.52	192/210
	Med	-0.39	-0.56	78/102	-0.42	-0.40	78/36
	High	-0.24	-0.23	90/78	-0.64	-0.56	36/54
Free-Vanilla	Low	-0.61	-0.70	168/162	-0.40	-0.52	228/222
	Med	-0.42	-0.56	78/96	-0.23	-0.46	60/42
	High	-0.46	-0.23	78/66	-0.67	-0.57	42/60

Table 3: Ranking regression slopes by subsample.

lower rankings due to ties at zero market shares.[10]

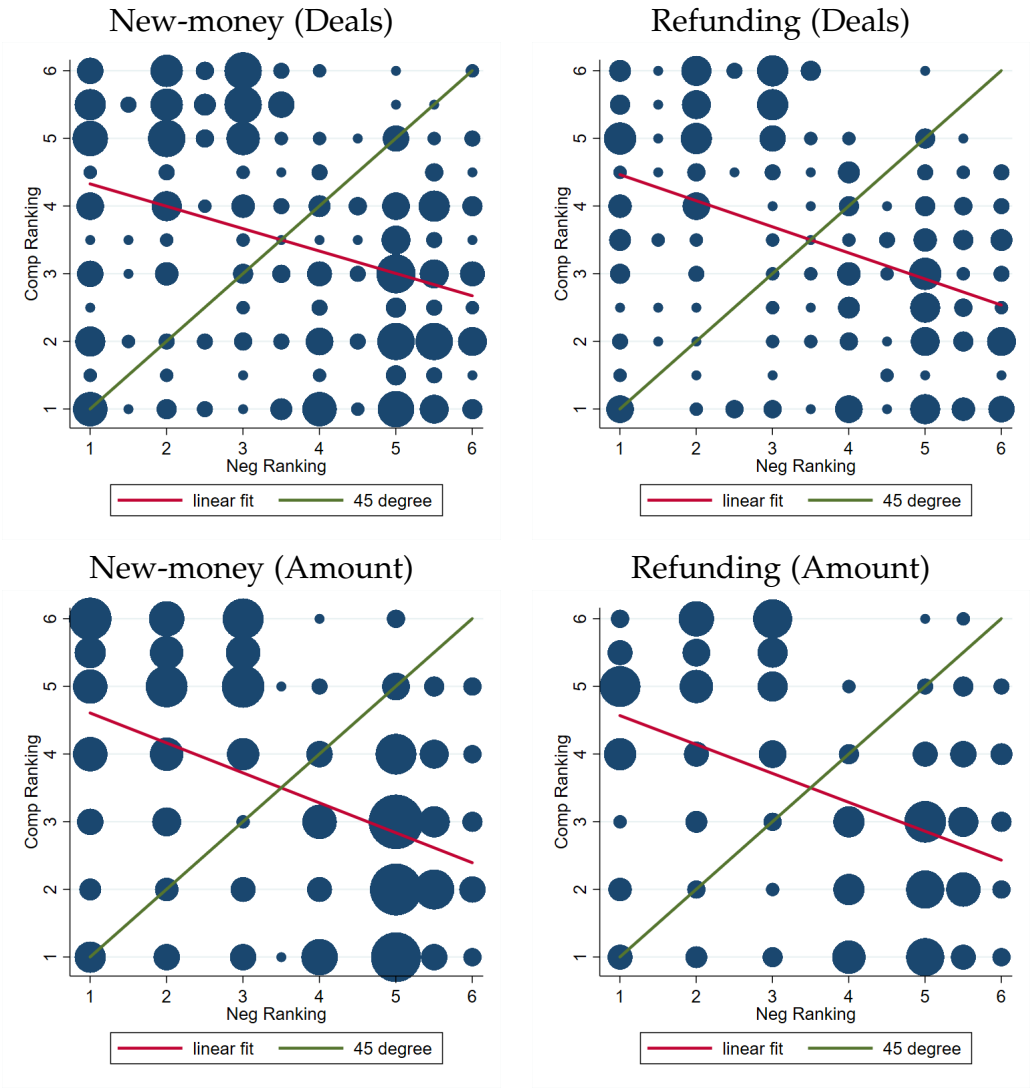

Figure 1: Scatter plots - negotiated and competitive rankings.

3.2. Sorting within specialization

Although top negotiated underwriters are seldom top competitive, larger negotiated underwriters have larger shares of competitive sales than top negotiated underwriters with

[10]In the ranking regressions, ties are corrected differently from the previous section to keep the pivot point exactly at 3.5 in each state-period. When two or more underwriters have the same market share in a given type of sales, I rank them randomly and assign them the average ranking. For example, if two underwriters are tied with zero market shares, they get a 5.5 ranking each.

	New-money					Refunding				
# top neg	2	3	4	5	6	2	3	4	5	6
Deals	0.30	0.28	0.20	0.24	0.30	0.31	0.24	0.21	0.23	0.27
Amount	-0.06	0.03	0.09	0.17	0.21	0.21	0.24	0.12	0.14	0.16
N	200	297	368	410	432	134	198	256	305	330
# top comp	2	3	4	5	6	2	3	4	5	6
Deals	0.23	0.24	0.34	0.36	0.38	0.40	0.32	0.37	0.41	0.45
Amount	0.21	0.09	0.22	0.23	0.23	0.15	0.16	0.15	0.25	0.20
N	200	300	400	490	576	134	201	264	330	390

Table 4: Ranking preservation within specialization.

lower rankings. Analogously, this statement also holds for top competitive underwriters. Table 4 shows the slopes of the estimated ranking regressions in samples of only top negotiated underwriters and only top competitive underwriters. The top row of the table indicates the number, from two to six, of top negotiated underwriters included from each state-period in each regression. The average slope reported for top negotiated underwriters is 0.20, which indicates moderate[11] ranking preservation among top negotiated underwriters. The fifth row of the table indicates the number of top competitive underwriters included from each state-period in each regression. The average slope for top competitive underwriters is 0.27; Ranking preservation is a bit higher among top competitive underwriters. The results presented in this section provide evidence that underwriters are not randomized across the negotiated and competitive rankings. It is reassuring to find that underwriters preserve their ranking relative to other underwriters with the same specialization given that bonds sold in competitive and negotiated sales are otherwise similar within state-periods. Therefore, it is also likely that the results presented in previous sections are not by chance.

[11]The effective boundaries of the slope may be narrower than in previous cases. For example, in the case of extreme specialization, all top negotiated underwriters would have zero market shares of competitive sales, and therefore the same competitive ranking. In this case, the coefficient on the negotiated ranking would be zero.

4. Specialization by refunding type

In the previous sections, I show that underwriters purposely specialize in one sales method, but it is still undetermined whether specialization is due to ex-ante differences among underwriters. In this section, I test the ex-ante heterogeneity hypothesis in some way. It is reasonable to assume that if some characteristics give the underwriter an advantage for specializing in the competitive sale of new-money bonds, they should not give an advantage for specializing in the negotiated sale of refunding bonds. Therefore, if competitive new-money underwriters are, at the same time, top negotiated underwriters of refunding bonds, or vice-versa, we can probably reject the hypothesis of ex-ante heterogeneity.

If they are not, we do not prove the hypothesis, however. Other causes may lead to this result. For example, if the markets for underwriting services for new-money bonds and refunding bonds are segmented, regardless of the method of sale, or if there is a "dominant" equilibrium where ex-ante homogenous underwriters specialize in one sales method, regardless of the refunding type of the bonds—new money or refunding—. Thus, in this section I also to study whether underwriters specialize in one refunding type, and in Section 6, I show that ex-ante differences might explain specialization.

We know from the previous sections, that both markets, the new-money bond (NB) market and the refunding bond (RB) market, are segmented by bid type. Thus, instead of directly comparing new-money bonds against refunding bonds, I compare every pair of bid type and refunding type combinations; I compare negotiated new-money to negotiated refunding (neg-neg), negotiated new-money to competitive refunding (neg-comp), competitive new-money to negotiated refunding (comp-neg), and competitive new-money to competitive refunding (comp-comp sample). In panel A of Table 5 I report median market shares by ranking and refunding type for each subsample in terms of deals, top three rows, and notional amount, bottom three. In panel B, I report the median proportional drop in market shares by ranking and refunding type for each subsample in terms of deals, top three rows, and notional amount, bottom three. The pro-

	Neg - Neg			Neg - Comp			Comp - Neg			Comp - Comp		
Ranking	NB (%)	RB (%)	N	NB (%)	RB (%)	N	NB (%)	RB (%)	N	NB (%)	RB (%)	N
A:	Median market shares											
No. 1	41	42	115/115	38	25	63/63	22	43	112/112	21	25	87/87
No. 2	19	20	110/108	17	13	58/55	14	20	94/104	14	14	81/74
No. 3	11	11	95/101	11	10	50/41	10	11	91/100	10	10	74/56
No. 1	45	45	115/115	40	30	63/63	26	46	112/112	24	31	87/87
No. 2	21	21	114/115	18	16	63/63	16	20	112/112	15	17	87/87
No. 3	11	12	113/112	10	11	62/63	11	12	112/108	11	11	87/87
B:	Proportional drop in market shares											
No. 1	-12	-23	115/115	-87	-79	63/63	-66	-85	112/112	-27	-34	87/87
No. 2	-15	-5	110/108	-74	-86	58/55	-87	-75	94/104	-17	-36	81/74
No. 3	-15	-15	95/101	-90	-83	50/41	-68	-60	91/100	-15	-30	74/56
No. 1	-24	-20	115/115	-93	-94	63/63	-90	-95	112/112	-31	-52	87/87
No. 2	-9	-25	114/115	-93	-100	63/63	-100	-89	112/112	-44	-52	87/87
No. 3	-23	-47	113/112	-91	-100	62/63	-100	-78	112/108	-56	-37	87/87

Table 5: Specialization by refunding type.

portional drop for top new-money underwriters is the ratio $(refunding\ share(s,i) - new\text{-}money\ share(s,i))/new\text{-}money\ share(s,i)$, and for top refunding underwriters is the ratio $(new\text{-}money\ share(s,i) - refunding\ share(s,i))/refunding\ share(s,i)$, where (s,i) denotes underwriter i in state-period s.

The new-money bond market and the refunding bond market have almost the same market concentration in the neg-neg sample. They also have very similar concentrations in the comp-comp sample. New-money bonds are much more concentrated than refunding bonds in the neg-comp sample, and on the contrary, new-money bonds are much less concentrated than refunding bonds in the comp-neg sample. The median market share of the largest new-money underwriter is almost half the market share of the largest refunding underwriter in the latter case. Negotiated new-money bonds have very similar market concentrations in the neg-neg and the neg-comp samples, despite the large difference in sample sizes.[12] The same can be said about the other bid type and refunding type combinations. Thus, the reported median shares are very robust to the

[12]Sample size differences arise because I require at least seven NB observations and seven RB observation per state-period. In some state-periods there may be at least seven NB or RB of one bid type but not the other.

number of state-periods included in the samples. Not surprisingly, as reported in Cestau (2019), negotiated sales are much more concentrated than competitive sales regardless of the refunding type of the bonds.

Top new-money underwriters largely maintain their market shares in the refunding bond market in the neg-neg and the comp-comp samples. The average median drop in market shares for the top three new-money underwriters and the top three refunding underwriters in the neg-neg sample is just 14% in terms of deals and 25% in terms of notional amount. The fact that all top three underwriters lose market shares does not mean that the muni-market is fragmented by refunding type. Top underwriters can only lose shares or stay the same, because they are already at the top, so the average median change will be negative. To put in perspective, if there was perfect ranking preservation across refunding types, the average median drop would be 0%. And if there was neither ranking preservation nor reversion, and top three new-money and refunding underwriters had 45%, 33%, and 22% market shares respectively, the average median drop would be 64%. Thus, the average median drop of top underwriters in the neg-neg sample is very small. The average median drop in the comp-comp sample is larger but still relatively small; 27% in terms of deals and 45% in terms of notional amount. This also reflect that issuer-underwriter relationships are more ephemeral in the competitive market. All in all, the evidence does not indicate that there is market fragmentation by refunding type.

On the other hand, top new-money underwriters almost lose all their market shares in the refunding bond market in the neg-comp and the comp-neg samples, and vice-versa. The average median drop in market shares for the top new-money and refunding underwriters in the neg-comp sample is 83% in terms of deals and 95% in terms of notional amount. In the comp-neg sample, the average median drop is 74% in terms of deals and 92% in terms of notional amount.[13] Thus, there is no evidence to reject the ex-ante heterogeneity hypothesis; Top negotiated underwriters in new-money bonds

[13]The slightly lower drop in the comp-neg sample may reflect the relationship advantage that top competitive new-money underwriters have in the negotiated refunding market. This advantage might be significant given that relationships matter and that the large majority of issuers that prefer competitive sales for new-money bonds prefer negotiated sales for refunding bonds.

	Neg - Neg			Neg - Comp			Comp - Neg			Comp - Comp		
Filter	D	A	N	D	A	N	D	A	N	D	A	N
None	0.43	0.33	516*	-0.47	-0.49	366	-0.41	-0.45	576/600	0.14	0.07	510
Vanilla	0.49	0.33	420*	-0.47	-0.50	252	-0.40	-0.44	510	0.18	0.06	468*
Ultd	0.49	0.38	420	-0.47	-0.53	282*	-0.44	-0.46	534/564	0.09	0.00	420*
Ultd+van	0.51	0.36	348*	-0.46	-0.53	204	-0.43	-0.47	462/474	0.15	0.04	360

Table 6: Ranking regressions by refunding type and specialization.

tend not to be top competitive in the refunding market, and vice-versa.

4.1. Ranking regressions

In this section, I use ranking regressions to directly measure whether top new-money underwriters are also top refunding underwriters, regardless of their market shares. I proceed analogously to the previous sections, where instead of comparing negotiated and competitive markets, new-money bonds replace negotiated bonds, and refunding bonds replace competitive bonds. Table 6 shows the coefficient on the new-money ranking for the above for samples and their sub-samples of plain-vanilla bonds, unlimited bonds, and unlimited plain-vanilla bonds. The table neither reports the estimated constant values, for they are superfluous, nor the standard errors and R-squared values, because they lack meaning. The slopes are just descriptive statistics of the samples.

Top new-money underwriters largely preserve their rankings in the neg-neg sample. The estimated slope is between 0.43 and 0.51 in terms of deals and between 0.33 and 0.38 in terms of notional amount. The coefficients are very robust to different sample sizes and homogeneity. There is less ranking preservation in the comp-comp sample, but it is still positive. The average estimated coefficient is 0.14 in terms of deals and 0.04 in terms of notional amount. The coefficients are also very robust to different sizes and homogeneity of the samples. The lower coefficients probably reflect the more ephemeral issuer-underwriter relationships in the competitive market. The large positive and the non-negative coefficients in the neg-neg and the comp-com samples indicate that the muni market is not fragmented by refunding type. The absence of ranking reversion

does not mean that the new-money and the refunding markets do not require special investments, however. They may exist and may not be incompatible, for example, if they complement each other or if ex-ante differences among underwriters do not create comparative advantages in any particular refunding type.

However, top new-money underwriters experience very large drops in rankings in the neg-comp and comp-neg samples. The estimated slope is between -0.46 and -0.47 in terms of deals and between -0.49 and -0.53 in terms of notional amount in the neg-comp sample, and between -0.46 and -0.47 in terms of deals and between -0.49 and -0.53 in terms of notional amount in the comp-neg sample. Top competitive underwriters in the new-money market seldom are top negotiated in the refunding market, and vice-versa. Thus, we cannot reject the ex-ante heterogeneity hypothesis and not because the new-money and the refunding markets are fragmented.

5. Specialization by deal size

We can also test the ex-ante heterogeneity hypothesis by analyzing whether top negotiated underwriters of large new-money deals tend to be also top competitive underwriters of small new-money deals. In the next section, I show that top negotiated underwriters tend to be local and top competitive national. It is possible that local top negotiated underwriters do not participate in competitive sales because they can not compete against large national underwriters, in which case the specialization in negotiated sales would be spurious. However, they might compete for small competitive sales and win, since national underwriters do not tend to underwrite small deals. In addition to testing this hypothesis, it is also interesting to study whether the market is segmented by issue size.

To test the hypothesis, I classify all tax-exempt and fixed-coupon new-money deals as *large* if they are over two million dollars, and as *small* if they are under this amount[14],

[14]The average state-period median is around nine million, but most small amount exceptions in several bond laws use a 1.5 or 1 million threshold. We also start seeing oddities around two million and under, such as no official statement, no CUSIP, or different sales method preferences.

	Lneg-Lcomp		Sneg-Scomp		Lneg-Scomp		Sneg-Lcomp		Lneg-Sneg		Lcomp-Scomp	
	D	A	D	A	D	A	D	A	D	A	D	A
b	-0.42	-0.52	-0.23	-0.31	-0.43	-0.47	-0.42	-0.50	0.14	0.12	-0.02	-0.20
N	384	378	240	240	198	198	366	366	288	294	480	492

Table 7: Ranking regressions by size and specialization.

and use the same ranking regressions I use in Section 3.1 to study ranking preservation in each pair of samples of deals of a given bid type and size; I analyze ranking preservation in the samples of large negotiated deals and large competitive deals (Lneg-Lcomp), small negotiated deals and small competitive deals (Sneg-Scomp), large negotiated deals and small competitive deals (Lneg-Scomp), small negotiated deals and large competitive deals (Sneg-Lcomp), large negotiated deals and small negotiated deals (Lneg-Sneg), and finally, large competitive deals and small competitive deals (Lcomp-Scomp). Table 7 shows the estimated slope for each of the above-mentioned samples. The table neither reports constant values nor standard errors and R-squared values.

Not surprisingly, the slope in the Lneg-Lcomp sample is largely negative, consistent with our previous findings. More importantly, the estimated slope is also largely negative in the Sneg-Scomp, the Lneg-Scomp, and in the Sneg-Lcomp samples, which means that neither top negotiated underwriters of large deals nor top negotiated underwriters of small deals are top competitive underwriters of small deals. Thus, we cannot reject the ex-ante heterogeneity hypothesis. Note that consistent with our presumption, the slope in the Lcomp-Scomp sample is slightly negative in terms of deals and moderately negative in terms of notional amount, which indicates that there is some segmentation by size in the market of competitive new-money bonds. This segmentation is caused by large national competitive underwriters, who largely dominate the competitive market, but abstain from underwriting small deals. And still, top negotiated underwriters do not participate in such market. Finally, the slope in the Lneg-Snneg sample is positive but small, which indicates low ranking preservation. However, we cannot claim that the negotiated market is segmented by size.

6. Characterizing the specialization investments

In the previous sections, I show extensive evidence that underwriters purposely specialize in one method of sale. The question is what characteristics lead a bank or brokerage firm to specialize in competitive or negotiated sales in a state. This question is also related to the decision to enter a state and the entry barriers they face. It is undeniable that underwriters must undertake state-specific investments or fixed costs to become important in a state; PNC and BNY Mellon are very large banks, with banking activity and branches in many states, but as underwriters of municipal bonds, they are only big in Pennsylvania. Fixed costs are clearly important in negotiates sales; The cost of building relationships. Fixed costs might also be important in competitive sales; The cost of building a broker-dealer network in the state. In this section, we explore the roles of the headquarters location and networks in the specialization decision.

I classify each top three negotiated and competitive underwriter in each state-period as local, regional or national according to the state where its headquarters are located. Top underwriters in the state of their headquarters are classified as *local*. There are two types of local: Those underwriters that have expanded and became top underwriters out-of-state, either in negotiated sales or in competitive sales, are classified as local-X, and those who have not, are classified as local-N. Top underwriters in contiguous states to the state of their headquarters are classified as *regional-1*, and top underwriters in states separated by only one state from the state of their headquarters are classified as *regional-2*. Underwriters that have more than one state separation from their headquarters are classified as *national*; around 90% of the top underwriters classified as national are based in New York. Note that the classification is by state-period and firm, so an underwriting firm may be classified in more than one group depending on the state-period. For example, Robert W. Baird & Co. is classified as local-X, regional-1, regional-2, and national depending on the state-period.

I make some exceptions to account for situations where an out-of-state firm merges or acquires a top local firm. I assume that the merged firm continues to be local in the

Panel A	Underwriter type distribution									
	Deals					Amount				
Top3	Nat	Reg-2	Reg-1	Loc-X	Loc-N	Nat	Reg-2	Reg-1	Loc-X	Loc-N
Neg	17%	13%	21%	19%	30%	22%	12%	20%	19%	27%
Comp	36%	7%	24%	15%	17%	55%	5%	17%	15%	8%
C/N	2.06	0.54	1.13	0.78	0.54	2.51	0.43	0.85	0.78	0.28
Panel B	Median Deal Size by underwriter type and bid type									
Neg	13.3	9.1	10.5	8.9	10.8	12.4	8.4	7.8	8.9	10.8
Comp	14.1	14.1	9.6	10.8	9.7	14.0	12.7	8.2	10.8	9.7
N	35	11	28	23	24	54	9	21	23	12
Panel C	Ratio of top-top by underwriter type									
top-top	0.06	0.11	0.18	0.22	0.07	0.03	0.14	0.17	0.21	0.04

Table 8: Underwriter characteristics by specialization.

state as long as it keeps the name of the acquired firm, at least partially, regardless of the length and word order of the merged firm's name. I also assume that the merged firm continues to be local in the state as long as the acquired local firm operates as a division or as a separated entity in the state. I drop the exception the moment the merged firm drops the name of the acquired local firm or discontinues the division or separate entity.[15] The rationale behind these exceptions is that I am interested in studying what type of underwriters become top of the state in what sales method. The presumption is that market shares are sticky even if the firm is acquired. I assume that market shares will be more sticky in the above cases because issuers can literally associate the new firm with the locally acquired one. However, it is debatable whether to include or not an exception if the name of the acquired top local firm disappears. The drawback of this approach is that I do not observe which local firms were large before 1990. However, inter-state M&A were less common before the 90s due to several federal laws that restricted them.

In Table 8 I report how top three underwriters of new-money vanilla bonds are distributed among the five groups by bid specialization. In the last row, I report the ratio between the number of top competitive underwriters and the number of top negotiated

[15]The results in this section remain qualitatively the same and quantitatively similar if I drop these exceptions altogether or if I extend them one period after the name of the acquired firm is dropped or the separate entity or division is discontinued.

underwriters in each group. Top negotiated underwriters are largely local. They account for 50% of all top three negotiated underwriters in terms of deals and 52% in terms of notional amount. These numbers probably underestimate the real contribution of local underwriters because I do not observe acquisitions of local top negotiated underwriters before 1990, and because many of the most frequent national and regional-2 top negotiated underwriters, such as Dain Rauscher and Piper Jaffray from Minnesota, and A.G. Edwards and Stifel from Missouri, have become nationally large by buying local top negotiated underwriters, and in many cases, such acquisitions do not qualify for the exceptions. Regional-1 and local underwriters accumulate around 70% of all negotiated, and around 80% if we also include regional-2 underwriters. On the other hand, local underwriters only account for 32% of all top competitive underwriters in terms of deals and just 23% in terms of notional amount. Top competitive underwriters are largely national and based in New York; 55% in terms of notional amount. Comparatively, while it is 3.5 times more likely to observe a local-N negotiated underwriter than a local-N competitive underwriter, it is 2.5 times more likely to observe a top competitive national underwriter than a top negotiated national underwriter.

Thus, the number of state borders between a state and the state where the headquarters are located plays a fundamental role in the specialization decision in that state. Local underwriters have an edge in the negotiated market with respect to out-of-state underwriters. The question is how fast the advantage disappears with the number of state borders. Top competitive underwriters seem to be as common as top negotiated in the regional-1 group, so it seems that the advantage diminishes when underwriters cross their state border. On the other hand, we find more top negotiated underwriters than top competitive underwriters in the regional-2 group, so it seems that the edge remains for at least two state borders. However, most top negotiated underwriters in the regional-2 group have become top by buying local top negotiated underwriters. Therefore, it is undetermined how fast the edge disappears.

The relation between local underwriters and the specialization in negotiated sales makes perfect sense. Negotiated sales are based on relationships, and relationships are

less costly to build when the underwriter has a strong and continuing presence in the state. It is less intuitive to explain however, the relationship between being a national underwriter and specializing in competitive sales. One commonality among national underwrites is that they have pre-established broker-dealer relationships in many states. And if they do not, they can better amortize the cost of building them since they meet more often than local banks with other local banks outside the state. This might suggest that broker-dealer relationships are more important in the competitive markets than in the negotiated markets, and that the cost of building these networks might explain the edge that national underwriters have in the competitive markets.

The fact that national underwriters dominate the competitive markets bring us back to the spurious specialization hypothesis. National underwriters probably specialize in larger amounts, and if larger amounts tend to be competitive, it will seem that national underwriters specialize in competitive sales. I test this hypothesis in Panel B of Table 8; For each underwriter type, I compare the median size of competitive and negotiated sales in state-periods where we observe at least one top three competitive underwriter of the given type. For example, the sample size for local-N top competitive underwriters in terms of deals is 24. It means that in 24 state-periods there is at least one local-N top three competitive underwriter. The differences between the median sizes of competitive sales and negotiated sales are relatively very small in every sample, except perhaps, in the regional-2 samples, where sample sizes are small anyway. While it is true that national underwriters tend to be active in states with larger deals, it is not true that one sales method is more suitable for larger deals. In particular, in state-periods where we observe at least one national top three competitive underwriter, the median size of competitive deals is very similar to the median size of negotiated deals. Thus, there is no reason for national underwriters to specialize in competitive sales if they are looking for large deals. Therefore, we can reject the spurious specialization hypothesis, again.

In panel C, for each underwriter type, I report the ratio between the number of underwriters of that type that are both top negotiated and top competitive in the same state period and the number of underwriters of that type that are either top competitive

or top negotiated in some state-period. For example, for local-N top underwriters in terms of deals, this ratio is 0.07. It means that only 7% of all local-N top underwriters, either in competitive sales or negotiated sales, are top in both sales methods —top-top—.

If we analyze the ratios shown in Panel C, we can conclude that know-how does not play an important role in the specialization decision. On the one hand, top-top underwriters are several times more common within local-X underwriters than within local-N underwriters. We also observe that some top local-X underwriters are skilled in the alternative sales method outside their states. Thus, in theory, know-how could explain the difference between local-N and local-X underwriters. On the other hand, the ratio decreases rapidly for the other types of underwriters, especially for national underwriters, which present even lower ratios than local-N underwriters. Almost all top national and regional-2 underwriters, whether in terms of deals or notional amount, are familiar with both sales methods. Therefore, if know-how played a significant role, we would observe higher and not lower ratios for these two types of underwriters.

Instead, I argue that pre-established regional broker-dealer networks may explain the higher ratios of top-top underwriters in the local-X sample. Most regional-1 and local-X top competitive underwriters in the sample are concentrated in midwest states, in the roughly square area that has vertices in Minnesota, Missouri, Tennessee, and Michigan. This means that, if a bank becomes a top competitive underwriter in a neighbor state, it will likely meet its network of local-X and regional-1 banks in its own state, since they all expand locally. Thus, the bank will have a pre-established network in its own state, and consequently, an edge in the competitive market. This advantage in the competitive market coupled with its locality advantage in the negotiated market could explain the higher ratios of top-top underwriters we observe in the local-X sample.

I also show that reputation does not play a significant role in the specialization decision either. On the one side, reputation is not a determining factor in the winner of the auction. In general, school districts are allowed to reject bids coming from non-"responsible" bidders.[16]. However, all relatively active bidders qualify as responsible,

[16]"Responsible bidders" is a legal term that is frequently used in the legal provisions relating to the sale

so schools are unlikely to reject winning bids based on reputation. On the other side, reputation might play a more profound role in negotiated sales, since they might help to build relationships. Top competitive underwriters in state-periods with a high proportion of auctions are likely to enjoy a high reputation, and this could help them also become a top negotiated underwriter in those state-periods. Under such hypothesis, the percentage of underwriters located in states with a high proportion of auctions should be larger in the sample of top-top underwriters than in the sample of top competitive underwriters.

To test this hypothesis, first, I classify each state-period as low competitive, medium competitive, or high competitive depending on whether the proportion of auctions in the state-period is between 0 and 1/3, 1/3 and 2/3, and 2/3 and 1, respectively. Second, for each underwriter type, I compare how underwriters are distributed among the three types of state-periods in the sample of top competitive underwriters and in the sample of top-top underwriters. I find that, both in terms of deals and notional amount, the distribution of top-top underwriters is relatively more tilted towards high competitive state-periods in all samples except in the local-X sample, which is the one that accounts for most top-top underwriters. Thus, evidence of an effect of reputation on specialization is mixed at best.

Still, we observe more top-top underwriters in high competitive state-periods than in low and medium competitive state-periods. Moreover, in Section 3.1 we find less ranking reversion in the sample of high-competitive state-periods. These facts could be explained by the same laws that prohibit the negotiated sales of tax-exempt new-money bonds in some high-competitive state. Most of these laws establish that in cases where the issuer rejects all bids, it may sell the bonds by negotiation to one of the bidders. If such situations account for most of the negotiated sales that we observe in these states, by law, only top competitive underwriters may become top negotiated underwriters. In the last three rows of Table 3, I show that, when I drop the restricted deals from the sample, the

of bonds and in the notices of bond sale. It means it is a well-established firm. In addition, most state laws provide that the school may reject any bid, and all state laws allow them to reject all bids. In general, they do not specify under what circumstances they may reject a bid or bids

slope of the ranking regression does not vary much with the proportion of competitive sales when market shares are measured in terms of deals, but differences remain when market shares are measured in terms of notional amount. Thus, the statutory restrictions on negotiated sales can not fully explain the lower ranking reversion in high-competitive states.

7. Conclusion

Underwriting firms with pre-established broker-dealer relationships have an advantage in competitive sales and therefore specialize in this market segment. On the other hand, local firms specialize in negotiated sales because they can provide more non-yield benefits than outside firms, giving them an advantage in negotiated sales because the underwriter selection is not solely determined by yields.

A firm should be more likely to enter the competitive segment of another state if it has an ongoing relationship with incumbent firms in that state, or if these firms are likely to expand to states where the firm is already active. However, to enter the negotiated segment of another state is important to acquire a local firm with headquarters in the state.

The results of this paper also explain why fifteen states have lifted or relaxed the bans of on negotiated sales over the last thirty years despite saving hundreds of million of dollars annually in taxpayer money. These law amendments favor the growth of local firms, but also, local firms can lobby state legislators more effectively than outside firms.

Median number of underwriters with:							
	Comb. share above			Share above			Weights/
	70%	80%	90%	5%	3%	1%	N
Neg	3	4	5.5	4	6	7	Deals
Comp	6	8	12	6	8	14.5	150
Neg	3	3	4	4	5	7	Amount
Comp	5	7	10	6	8	13	150

Table A.1: Concentration ratios and large size underwriters. The left panels show the median number of underwriters that takes to reach a combined market share of state-period sales above the value indicated in the top row of the table. The right panels show the median of the number of underwriters by state-period that have a market share above the value indicated in the top row. The top panels measure market shares in terms of number of deals, and the bottom panel in terms of notional amount.

	Deals			Amount			Deals			Amount		
Ran-	N	C	Sample	N	C	Sample	N	C	Sample	N	C	Sample
king	(%)	(%)	Size	(%)	(%)	Size	(%)	(%)	Size	(%)	(%)	Size
	A: NB-ultd						B: RB-ultd					
1	-86	-79	84/84	-96	-98	84/84	-83	-85	59/59	-92	-94	59/59
2	-77	-87	79/69	-85	-100	84/84	-84	-75	58/50	-93	-99	59/59
3	-73	-72	68/65	-86	-100	83/84	-71	-88	55/38	-100	-100	58/59
4	.	-89	./57	.	-100	./84	.	-60	./30	.	-100	./58
5	.	-88	./53	.	-100	./82	.	-86	./20	.	-100	./58
6	.	-100	./35	.	-100	./80	.	-75	./22	.	-100	./53
	C: NB-vanilla						D: RB-vanilla					
1	-91	-85	69/69	-97	-94	69/69	-85	-87	60/60	-92	-91	60/60
2	-82	-81	61/55	-93	-100	68/69	-74	-76	57/52	-89	-100	60/60
3	-78	-89	56/53	-83	-100	67/69	-82	-59	54/35	-100	-100	59/60
4	.	-92	./43	.	-100	./69	.	-84	./25	.	-100	./59
5	.	-93	./33	.	-100	./67	.	-77	./28	.	-100	./58
6	.	-94	./36	.	-100	./65	.	-71	./23	.	-99	./54
	E: NB-ultd-vanilla						F: RB-ultd-vanilla					
1	-95	-84	58/58	-98	-97	58/58	-87	-88	53/53	-92	-95	53/53
2	-80	-80	53/44	-97	-100	57/58	-78	-78	50/47	-94	-100	53/53
3	-77	-89	51/43	-89	-100	56/58	-100	-61	45/30	-95	-99	51/53
4	.	-79	./33	.	-100	./58	.	-81	./21	.	-100	./52
5	.	-100	./27	.	-100	./56	.	-62	./23	.	-100	./52
6	.	-94	./27	.	-100	./54	.	-78	./17	.	-100	./49
	G: Small state-periods						H: Large state-periods					
1	-84	-69	51/51	-96	-97	50/50	-81	-77	49/49	-94	-83	50/50
2	-77	-82	48/39	-92	-100	50/50	-80	-83	46/46	-79	-99	50/50
3	-70	-74	36/40	-69	-100	50/50	-78	-69	44/44	-95	-99	49/50

Table A.2: Median market shares by subsample - combined filters.

A. Market concentration

B. Lead underwriter names

I used the following filters to correct the lead manager names provided in the SDC database. The SDC provides a short name of the lead manager, but it is not consistent in the abbreviation and quite often uses different abbreviations for the same bank. At the same time, sometimes it uses the same abbreviation for different banks. This often happens when different banks share the same or a very similar name. They usually include names such as commercial, citizens, farmers, union, national, or a common city name. I used the lead manager names in the official statements to correct the SDC variable. I also used bank logos, also printed on the official statements, to distinguish between different banks with the same name, or same banks with slightly different names; banks often make small name changes, such as going from "bank" to "banc", or from "corporation" to "corp".

I also changed the names of the bank subsidiaries to those of their parent companies when the parent was also an active underwriter. Parent companies are dynamic, they change with M&A activity. Thus, I had to build the complete history of mergers and acquisitions for all relevant underwriters in the sample.[17]. When two banks merge, and the name of the new bank differs from the names of both merged banks, I retroactively replaced the name of one of the merged banks with the name of the new bank. Finally, after a merger, the SDC tends to continue to use both the old and new names at the same time for a while. For example, although UBS purchased Paine Webber in 2000 and dropped the name entirely by 2003, the SDC kept using the name until 2009. I corrected this.

[17]In the analysis, I only use the main underwriters from each state, so it is not necessary to get these data for all lead managers in the sample

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