Private Activity Bonds as Investment Subsidy: Evidence from the 1986 Cap on Bond Volumes

Lisa Knauer[a]

[a] *Technical University of Munich, Chair of Financial Management and Capital Markets*

Abstract

I examine how corporate investment responds to the supply of private activity bonds (PAB), which are tax-exempt municipal bonds issued on behalf of private sector firms. Exploiting a change in the state-level cap for PABs as mandated by the 1986 Tax Reform Act, I compare the real effects of firms located in bordering regions with varying per capita PAB supply. Consistent with a stimulating effect of PAB financing, I find that corporate investment of eligible firms relatively increases in regions with higher PAB availability. Furthermore, I document a positive impact on employment, suggesting that the investment subsidy does not lead to an input factor substitution. I leverage results from a bond allocation lottery to rule out that states' project selection drives the results.

Keywords: Municipal bond market, private activity bonds, tax subsidies, firm investment, real effects

JEL: G32, G38, H25, H74

⋆I thank Daniel Bias, Igor Cunha, Christoph Kaserer, Norman Schürhoff, Stefano Rossi, as well as participants of the NextGenEconomics Session at the 7th Lindau Nobel Laureate Meeting on Economic Sciences for helpful comments. Please send correspondence to lisa.knauer@tum.de

July 12, 2023

1. Introduction

U.S. state and local governments can issue tax-exempt private activity bonds (PABs) to foster capital investment and job creation or retention in the private sector. PABs are only secured by the corporate entity, and the governmental entity solely acts as the conduit issuer.[1] As the yield on PABs usually is considerably lower than on corporate bonds (see, e.g., Congressional Research Service, 2022), these bonds represent a cost-attractive source of financing for companies. From a political perspective, there have been intense debates on whether PABs should be tax-subsidized, mainly driven by concerns over the loss of tax revenues.[2] In 2017, Congress most recently decided to keep the tax exemption for qualified PABs, after the House of Representatives initially provided a provision to eliminate it (Reuters, 2017). Despite the political attention, surprisingly little is known about the corporate effects of PAB financing.

In this paper, I analyze how corporate investment and employment respond to the supply of PAB financing. Providing low-cost financing to private sector projects might stimulate firm investment directly if PABs lead to the realization of projects which would not be carried out without the tax subsidy (Zimmerman, 1989). Such a direct investment effect through PAB financing could also spur investment of local non-recipients (see, e.g., Dougal, Parsons and Titman, 2015). For employment, stimulating investment through PAB financing could spark two opposing effects (Moore and Squires, 1988): On the one hand, an increase in firm investment could induce a rise in firm employment due to a "scale effect". On the other hand, lowering capital costs through PABs might lead to a substitution effect and therefore reduce employment. Thus, the employment effect of PAB supply is an empirical question.

To identify the real effects of PAB supply, I draw on new state-level volume caps for PABs introduced as part of the 1986 Tax Reform Act. In the decade before the 1986 Tax Reform Act, PAB issuance volumes saw a substantial increase, so that PABs accounted for more than half of total issuance in the tax-exempt bond market in 1982 (Zimmerman, 1989). The 1986 Tax Reform Act imposed a limit to a state's total PAB issuance: For 1988 to 2000, each state was allowed to issue the greater of i) $150 million in baseline PAB volume and ii) $50 multiplied by the

[1] PABs are also referred to as conduit bonds. I use the term private activity bonds throughout this paper. Further, taxable PABs exist. In this project, I only look at qualified PABs which are tax-exempt.

[2] The New York Times (2013) exemplarily provides insights on such a debate on PABs.

state's population figure (H.R.3838 - Tax Reform Act of 1986, 1986). The 1986 Tax Reform Act may not be considered an exogenous event per se and came along with economic implications for firms in general (see Auerbach and Slemrod, 1997, for a comprehensive overview). However, the newly enacted PAB allocation schedule offers a distinctive and plausibly exogenous feature to study differences in PAB supply: Due to the allocation formula, less populous states can supply relatively higher per capita volumes of PABs to firms, while larger states with a population of 3 million and above can only distribute $50 per person.

Using a difference-in-differences framework, I first show that higher state-level PAB supply is associated with relatively higher PAB issuance for counties within the respective states after the 1986 Tax Reform Act. A one-standard-deviation increase in the per cap PAB supply limit of the state corresponds to a relative increase in PAB issuance at the county level by about 17.9%. I further document a relative increase in PAB volume at the bond-deal level for deals on behalf of firms located in states with higher per cap PAB supply.

To examine the corporate real effects of PAB supply, I then compare firms headquartered in bordering counties with relatively higher and lower per cap PAB supply due to the respective state's population. By focusing on the border sample, I can control for common economic trends and common investment opportunities in bordering regions before and after the 1986 Tax Reform Act and thus mitigate concerns that these trends drive my results (see, e.g., Gustafson and Kotter, 2023). To derive insights on the corporate real effects of PABs, I employ two samples: First, to account for the endogenous demand of firms for PAB financing, I adapt the idea of Bonfim, Custódio and Raposo (2023) and compare firms eligible for PAB financing, and second, I use a sample of PAB beneficiary firms.

The type of bonds that qualify for tax-exempt PAB financing are determined by the Internal Revenue Code (IRC) Section 141 and 146. I map eligibility to five broad industry groups: manufacturing, transportation and utilities, mining and construction, real estate, and higher education. Analyzing real effects for firms in the same set of eligible industries but located in areas with different per cap PAB supply also mitigates concerns that general differences in industry trends due to other provisions of the 1986 Tax Reform affect my findings. Employing the state-border difference-in-differences framework for the sample of PAB-eligible firms, I find a statistically significant and positive effect on firm investment when firms are located in states with higher per cap PAB supply. A one-standard-deviation increase

in the disposable per cap PAB volume is associated with an increase of the capex-to-assets ratio by about 9.76%. The positive effect on firm investment starts in 1987, the year after the reform, and increases over time. In a series of robustness tests, I show that the positive investment effect does not dependent on the investment measure or the sample of PAB-issuing counties employed in the analyses. Further, the effect is robust to an alternative specification of the per cap PAB supply measure based on the 1987 allocation schedule.

Next, I explore how higher per cap PAB supply impacts employment for firms eligible for PAB financing. Again making use of the state-border framework, I find that a one-standard-deviation increase in the per cap PAB supply leads to an increase in firm employment of about 4.56%. This finding suggests that subsidizing capital relative to labor through PABs is not associated with an input factor substitution.

In the second step, I turn to a sample of firms that receive a PAB allocation post-reform to derive insights on the direct effect of PAB financing. I show that PAB beneficiary firms in states with higher and lower per cap PAB supply are largely comparable in terms of their financial characteristics prior to the 1986 Tax Reform Act. Nevertheless, requesting PAB funding is not random, and there are likely differences in unobservable characteristics between PAB beneficiaries in states with higher and lower per cap PAB supply. All results should thus be carefully interpreted. Due to the small sample size, I refrain from using state bordering regions only and use all beneficiaries irrespective of their location. Despite these limitations, I find a positive and statistically significant effect of per cap PAB supply on firm investment, as well for firm employment.

A further potential concern in my analyses is that allocation committees of states systematically pick projects with better or worse investment and employment prospects in states with higher and lower per cap PAB supply. To rule out that states' project selection is the main driver of my results, I utilize PAB program data from the state of Texas, which employs a lottery system to allocate its PAB ceiling among PAB funding applicants. The Texas PAB allocation program is also interesting due to its economic size, as the state had the second largest PAB ceiling among all U.S. states (Texas Bond Review Board, 1997) during the lottery period that I analyze.

I leverage a sample of PAB applicant firms for the program years 1996 to 2001, of which a subset received PAB funding by lot. I find a large, positive, and statistically significant effect on firm investment for the lottery-winning firms relative to PAB

applicants which did not obtain PAB funding. This finding supports the notion that PAB financing directly stimulates corporate investment. For firm employment, I do not find a statistically significant relative increase in employment for lottery-winning firms, even though all point estimates are positive. The results are nevertheless not consistent with an input factor substitution taking place when PAB financing is obtained.

I provide novel insights on how PABs as a form of government-subsidized debt can stimulate private-sector investment. To the best of my knowledge, this study is the first to comprehensive analyze the corporate reaction to PAB financing. With my findings, I contribute to at least three strands of the literature. First, I add to the broader literature stream on municipal financing and its real effects. Adelino, Cunha and Ferreira (2017), Dagostino (2022), and Agrawal and Kim (2022), amongst others, provide insights on real effects related to conventional municipal bonds. Looking at a sample of hospitals, Rossi and Yun (2023) show that following the introduction of Chapter 9 bankruptcy, their capital expenditures increase when they use conduit financing. I add to this literature by providing insights on the capital expenditure and employment effects of PAB financing for PAB-eligible industries.

Second, I contribute to the literature that studies the effects of governmental incentives for private-sector investment. Hebous and Zimmermann (2021) examine the impact of federal procurement as a stimulus, while Kim and Nguyen (2020) analyze how private investment changes with respect to the allocation of federal funds around Census population count revisions. Chava, Malakar and Singh (2023) explore the effect of corporate subsidies on municipal financing costs, and document an increase in bond yields for subsidy-providing counties. While I also look at a stimulus on the local level as Chava, Malakar and Singh (2023) do, I focus on the private sector perspective and document a positive impact of PABs as a subsidy. Lastly, my findings add to the policy debate on private activity bonds (e.g., Zimmerman, 1990; Osterberg, 1991; Congressional Budget Office, 2010). As this debate primarily focuses on federal revenue losses and thus takes on a public sector perspective, I present novel insights from a private sector perspective by directly investigating corporate real effects.

The remainder of the paper is structured as follows. Section 2 provides background information on state-level PAB caps and states' PAB allocation. Section 3 describes the data. Section 4 presents results for the effect of PAB supply on PAB issuance volumes. Section 5 presents empirical results on the real effects of PAB

supply for eligible firms after the 1986 Tax Reform Act. Section 6 examines the real effects of PAB supply for PAB beneficiary firms. In Section 7, I examine the corporate real effects of the Texas PAB lottery program. Section 8 concludes.

2. State-level caps for private activity bond issuance

2.1. Background on state-level caps for PABs

The 1984 Deficit Reduction Act introduced the first state-level caps for PABs to address the booming issuance of these bonds in the years beforehand (see, e.g., Congressional Research Service, 2022). These first caps were set to the greater of i) \$150 multiplied by the state population, and ii) \$200 million baseline volume. However, as for instance noted by The Bond Buyer (1984), these initial volume caps did not impose a major restriction for states regarding their PAB issuance capability. With the passage of the 1986 Tax Reform Act, new, more restrictive state ceilings for issuing tax-exempt PABs were introduced. Contrary to the caps imposed in 1984, these new caps were reported as a strong cut to the PAB volume that states can allocate (see, e.g., Kawecki, 2002). Taking the state of California as an example, the newly introduced cap constituted a reduction by 50% relative to the 1985 limit (Business Wire, 1986). Figure 1, Subfigure (a) provides an overview of the cap over time.

— Figure 1 about here —

For 1987 as a transition year, each state was allowed to issue the greater of i) \$250 million in baseline PAB volume and ii) \$75 multiplied by the state's population figure. After that, from 1988 to 2000, the PAB cap remained constant, and each state could supply the greater of i) \$150 million in baseline PAB volume and ii) \$50 multiplied by the state's population figure [3].

$$PAB\ volume_{s,1988} = max \begin{cases} \$150m \\ \$50 \cdot\ population_s \end{cases} \tag{1}$$

As a consequence of this design of the allocation schedule, states with lower population figures possess relatively larger per cap tax-exempt PAB volumes. I illustrate this property in Subfigure (b) of Figure 1. In particular, for the year 1988

[3] See https://www.congress.gov/bill/99th-congress/house-bill/3838/text for details on the Tax Reform Act.

onwards states with population figures below 3 million had relatively higher per cap volumes, with values ranging up to about $322 for the least populated states. On the contrary, states with a population of 3 million could only distribute $50 in PAB volume per person:

$$Per\ cap\ PAB\ supply_{s,1988} = \begin{cases} \$150m \div population_s\ , if\ population_s < 3m \\ \$50\ , if\ population_s \geq 3m \end{cases} \tag{2}$$

I exploit the state-level variation in the per cap PAB supply limit in a difference-in-differences framework. I thereby compare the real effects of firms eligible for PAB financing in bordering regions with relatively higher and lower PAB supply after the 1986 Tax Reform Act. I use the per cap supply denoted by the more restrictive 1988 allocation schedule as treatment measure, which is also binding for the majority of the post-event period of interest, and even thereafter. To address concerns that the 1988 schedule underestimates the actual 1987 PAB limit, the properties of the 1987 transition year are analyzed in a robustness test later.[4]

2.2. Allocation of PAB volumes within states

As put forward in the IRC Section 146, states have the power to set up their own allocation scheme for PABs within their volume limits (see also Internal Revenue Service, 2019), or they can make use of the proposed scheme as described in the respective Section. The latter denotes that 50% of a state's ceiling should be allocated to state issuers, and the remaining 50% to local issuers based on relative local population figures. Zimmerman (1990) provides a comprehensive overview of both the state agencies responsible for the cap allocation and on allocation priorities within states as of 1989. Allocation priorities vary in terms of the distribution among state and local governments as conduit issuers, and with respect to industry and project types.

For the state of Texas, the Texas Bond Review Board (BRB) administers the private activity bond allocation program since 1992 (Texas Bond Review Board, 2023b). Chapter 1372 of the Texas Government Code is the relevant legal basis. The state volume is allocated to several subceilings for an initial period of about

[4] As shown and further discussed in section 5.2, using the 1987 per cap PAB supply produces very similar results.

8 months. The focus of my analyses is on the impact of PABs on corporate beneficiaries from the Compustat universe. Therefore, the relevant sub-ceilings are the one for qualified small issue bonds (formerly industrial development bonds, IDB) and empowerment zone bonds, and the subceiling for any other issues, under which exempt facility bonds fall (Texas Bond Review Board, 1996). The reserved percentage share for the subsceilings varies over time. For 1996, the category on any other issues received 42% of the total volume, and small issue bonds received 7.5%(Texas Bond Review Board, 1996). Under the current version of Chapter 1372, the ceiling for any other issues comprises 29.5%, and small issues get a reservation amount of 2%.[5]

Within any of the subceilings, the priority of PAB projects is generally determined based on a lottery. Applicants, therefore, must submit an allocation request before the respective lottery application deadline, which currently is on October 20 before the respective PAB program year starts (see Texas Bond Review Board, 2023a, for a detailed timeline of the lottery program and further details on the distribution mechanism).

The Texas PAB lottery results provide information on the status of the application request, the conduit issuer, and the project, amongst others. Due to common oversubscription of the program, I can leverage the data from the Texas PAB lottery to compare investment among a set of firms that applied for PAB allocation, but not all attempts received an allocation.

2.3. Characteristics of PAB beneficiary firms

My analyses either compare real effects for a sample of PAB eligible or a sample of PAB beneficiary firms across states with different per cap PAB supply limits. To provide a comprehensive background for the assessment of both potential direct and indirect effects of PAB supply in these analyses, I compare firm characteristics of PAB beneficiary firms relative to their industry peers, which are PAB eligible firms which do not receive a PAB allocation. For data availability reasons, I focus on Compustat-matched PAB deals and therefore PAB beneficiary firms starting from 1981 on until 1990, which marks the end of the sample period in later analyses. Manufacturing firms (about 49% of deals) and firms in the transportation and public utility industry (38%) are the industry groups that receive the highest shares of PAB

[5] As noted by the Texas Bond Review Board (1997), the 29.5% subceiling limit for the "all other issues" category has been introduced with the calendar year 1998.

bonds matchable to Compustat firms.

In Figure 2, I display the mean values and 90% confidence intervals for the difference between PAB beneficiary firms and their industry peers. PAB recipients are significantly larger as measured by the logarithm of employment.[6] Further, PAB beneficiaries are more profitable as measured by a higher return on assets. While PABs themselves constitute a source of debt funding, PAB beneficiary firms are also more highly levered in general. The group of PAB beneficiary firms shows higher firm investments as measured by the natural logarithm of capex divided by assets, which is in line with the fact that PAB bond volumes need to be used for capital investments. However, the PAB firms have lower average PPE growth ratios compared to industry peers, as well as relatively lower market-to-book values. Finally, PAB beneficiary firms have significantly higher payout ratios than their peers, which suggests that they are less financially constrained.

— Figure 2 about here —

Overall, PAB bond recipients seem to be larger, more profitable firms, with lower financial constraints relative to their industry peers. Several states impose concrete requirements in terms of job creation related to the PAB issuance, which might only be fulfillable for more robust and thriving companies. Further, as denoted by IRC Section 147, PABs can only use 2 percent of the bond proceeds for issuance costs. United States Government Accountability Office (2008) show that issuance costs generally vary with bond size and are usually smaller for larger issuance sizes. The issuance cost limit might also be a reason why larger and more profitable firms select into PAB issuance.

3. Data and descriptive statistics

3.1. Data sources

I make use of data from multiple sources. To calculate the actual disposable per cap PAB volume for the states, I collect data on the allocation schedule from the Internal Revenue Service's (IRS) statistics of income bulletin, complemented with legal text information from the IRC Section 146. The Statistics of Income Bulletin regularly reports on the aggregate usage of private activity tax-exempt bonds, and

[6] PAB recipients are also larger in terms of total assets, which for displayability reasons is not captured in the figure above.

thereby also provides background information on volume caps. State and county population data is obtained from the U.S. Bureau of the Census Population and Housing Unit Estimates series.

Company financial data and headquarter locations are from the Compustat database. All continuous financial variables are winsorized at the 1st and 99th percentiles. Firms in bordering regions are identified using the U.S. Bureau of the Census' County Adjacency File. Based on companies' historic SIC code in Compustat, I map firms to broad PAB eligibility categories. If therefore use the historic SIC code from 1987 if available. Otherwise, I use the current SIC code.

The type of bonds that qualify for tax-exempt PAB issues and fall under the PAB volume cap are determined by IRC Sections 141 and 146. As noted by Whitaker (2011), this limits the use of PABs to projects from five categories: "industrial development, utilities, mortgage revenue bonds, multifamily housing bonds, and student loan bonds". I map these use cases to SIC industry groups. In a second step, I validate the SIC code assignment using actual PAB deal data.[7] In particular, the following industries are initially defined as eligible for PAB financing: manufacturing (SIC2 20-39), transportation and utilities (SIC2 40-49), mining and construction (SIC2 10-17), real estate (SIC2 65), and higher education industry (SIC2 82).[8]

To construct a sample of PAB-issuing counties, I use data on PAB issuance by local governments from the U.S. Bureau of the Census' Annual Survey of State and Local Government Finances. I aggregate this data on the county level to identify counties with any PAB issuance in the 10-year period before the 1986 Tax Reform Act. I also use the PAB issuance data for county-level tests on the PAB issue trends.

To identify PAB beneficiary firms, I employ data from SDC Platinum. Within SDC, the Municipal New Issues Database captures municipal bond deals with corporate beneficiaries. 1977 is the first year for which a limited set of PAB deals is covered. More comprehensive coverage starts from 1980 onward.[9] I restrict the sample to new money PAB deals, as current refunding deals are exempt from the PAB caps (see IRC Section 146). Deal data is organized from the perspective of the conduit issuer. Therefore, I need to hand-match PAB beneficiary names to

[7] I use PAB deal data from SDC Platinum and hand-match the beneficiaries to Compustat firms, which allows me to observe the (historic) beneficiary SIC codes.

[8] The vast majority of PAB deals in SDC which can be matched to Compustat are from the manufacturing and the transportation and utilities industry groups. Without further adjustments, the industry composition of firms in the bordering county sample aligns well with this property.

[9] See Appendix B for an overview of data coverage.

Compustat firms using (historic) company names. I extract additional PAB deal characteristics from SDC. In particular, I obtain information if the deal is rated, if it is credit enhanced, and the deal's maturity.

Data for the Texas PAB lottery comes from the Texas Bond Review Board (BRB). The BRB annually provides information on lottery participation and outcomes. Data from 2001 onward is available via the BRB's website. Data from 1996 to 2000 was directly obtained from the BRB. I keep two types of lottery attempts: i) those which have been allocated an amount, and ii) those which are in line for funding, i.e., did not receive an allocation in the lottery. I exclude withdrawn and denied lottery attempts. I hand-match project beneficiary names to Compustat, and aggregate lottery attempts on the firm-lottery-year level. Appendix A provides a detailed description of all variables included in the analyses.

3.2. Descriptive statistics

Table 1 shows summary statistics for PAB issuance at the county and the deal level, as well as for the three firm-level data samples employed in the empirical analyses. Panel A presents summary statistics for PAB issuance of 906 counties, as well as PAB deal characteristics. Average PAB issuance at the county level is about USD 11m, and the average PAB deal has a deal volume of USD 15.39m.[10]

In Panel B, I present summary statistics for the PAB-eligible firms headquartered in bordering counties. Overall, the sample comprises 682 firms, of which 126 are located in states with relatively higher per cap PAB supply. The firms are located in 38 states, of which 14 can supply a per cap amount of PAB larger then 50 USD based on the the 1988 allocation schedule. The average (median) capex-to-assets ratio in this sample is 9% (6%).

— Table 1 about here —

Panel C displays descriptive statistics for firms that benefit from any PAB issuance during the four years after the 1986 Tax Reform Act. This sample consists of 116 firms, of which 13 are located in a state which can supply more than 50 USD in PABs per cap. Panel C shows descriptive statistics for firms that requested a PAB allocation through the Texas PAB lottery between 1996 and 2001. 29 firm-lottery

[10] As noted by the U.S. Bureau of the Census (2006), the item public debt for private purposes was historically subject to some reporting difficulties. Hence, the displayed volumes might rather represent a lower bound of the actual county-level issuance.

attempts are included in the sample, of which 14 applicants received some PAB allocation, i.e., *Lottery win dummy* takes a value equal to one.

In Table 2, I present pre-event summary statistics for firms in the treatment and control groups. Panel A and B cover the years 1983 to 1986, i.e., the period before new PAB volume caps have been introduced. When comparing firms in states with higher and lower per cap PAB supply, both the sample of bordering firms and the sample of PAB beneficiaries exhibit broadly similar financial characteristics, with the exception of the logarithm of capex divided by assets for the border firm sample. I therefore calculate an adjusted difference in means, which controls for industry-year fixed effects. This adjusted mean difference for the logarithm of capex divided by assets is close to zero, and statistically not significant.

While firms in bordering counties are broadly similar in terms of their financial characteristics, bordering counties in states with higher per cap PAB supply are smaller in terms of county population. If investment opportunities are however positively correlated with county size and are better in states with lower per cap PAB supply, the distribution of county population should rather bias me against finding an effect.

— Table 2 about here —

In Panel D, I compare the financial characteristics of Compustat-linked lottery winners and losers of the Texas PAB lottery. I thereby focus on the pre-lottery year. Except for leverage, both firm groups show statistically similar financial characteristics.

4. State-level per cap PAB supply limit and its impact on PAB issuance

I first examine the effect of the state-level per cap PAB supply limits on PAB issuance after the 1986 Tax Reform Act. While the aggregate deal volume in the PAB market declined Post-1986 (see Appendix B), states with higher per cap PAB supply limits should be less affected by the new volume caps, and thus should show relatively higher PAB issuance after the Tax Reform Act.

To analyze the effect on PAB issuance, I make use of county-level PAB issuance data from the Census of State and Local Government Finance, as well as PAB deal data from SDC Platinum. I analyze a window of plus/minus four years around the introduction of new PAB volume caps. I run the following difference-in-differences

regression at the county level:

$$\begin{aligned} PAB\ issuance\ volume_{c,t} = \alpha + \beta Post-1986_t \cdot Per\ cap\ PAB\ supply_s \\ +\gamma Post-1986_t + \delta Per\ cap\ PAB\ supply_s + \phi_c + \xi_t + \epsilon_{i,t} \end{aligned} \tag{3}$$

whereby c denotes a county, t a fiscal year, and s a state. ϕ_c are county fixed effects, ξ_t corresponds to year fixed effects. $Post-1986$ equals one in the four years after the introduction of new volume caps for PABs, i.e., for the years 1987 to 1990. *Per cap PAB supply* is the limit to the per capita amount of private activity bonds in USD that a state may distribute for calendar years according to the allocation schedule valid for 1988 to 2000. The sample period is from 1983 to 1990. I include the county-level House price index as a control variable in all regressions. Data are obtained from the Federal Housing Finance Agency, and imputed with state-level values if missing. Further, I add county size-decile-year fixed effects in some specifications. The variable of interest is the coefficient on the interaction term between the Post-dummy and the per cap supply limit of PABs ($Post-1986_t \cdot Per\ cap\ PAB\ supply_s$). Standard errors are clustered at the state level. In the empirical estimation, the $Post-1986_t$ and the $Per\ cap\ PAB\ supply_s$ variables are absorbed by year and county fixed effects, respectively.

Panel A of Table 3 shows results for the effect of different limits in the per cap PAB supply on actual PAB issuance. The dependent variable is the natural logarithm of the county-level sum of PAB issuance volume over all local governments in the respective county. In columns 1 and 2, the sample consists of counties that supplied any PAB in the ten years before the tax reform. The coefficient on the interaction term *Per cap PAB supply x Post-1986* is positive and statistically significant and indicates that a one-standard-deviation increase in the per cap PAB supply (39.81 USD) is associated with a relative increase in PAB issuance at the county-level by about 19.1% or 17.9%, respectively. In columns 3 and 4, I limit the sample to border counties and include state-border pair-year fixed effects in the regressions. The point estimates indicate that moving from the 50th to the 90th percentile in terms of per cap PAB supply, equivalent to an increase of 16.03 USD, relatively increases PAB issuance by 19.2% or 22.0%.

— Table 3 about here —

I illustrate the time dynamics of the effect of per cap PAB supply on PAB issuance in Subfigure (a) of Figure 3. The figure shows the coefficient estimates and

the 90% confidence interval on the Per cap PAB supply measure interacted with year dummies over the event period. The regression specification follows the one displayed in Panel A, column (4) of Table 3. Until 1986, I do not observe statistically significant differences in the development of PAB issuance for counties depending on the respective per cap PAB supply limit. Starting with 1987, relatively higher per cap PAB supply positively impacts PAB issuance at the county-level. The effect reaches its maximum in 1989, and slightly declines thereafter.

— Figure 3 about here —

I then examine the effect of per cap PAB supply on new-money PAB deal volumes. In Subfigure (b) and (c), I display point estimates and 90% confidence intervals for regressions of the indicated PAB deal characteristics on the per cap PAB supply measure for the pre- and post-period separately. Before the 1986 Tax Reform Act, PAB deals were on average smaller in states with later on higher per cap PAB supply, i.e., in less populous states, even though the difference is statistically not significant. After the 1986 Tax Reform Act, PAB deal volumes in states with higher per cap PAB supply are relatively larger. I analyze the effect of per cap PAB supply on the natural logarithm of PAB deal volumes in a set of regressions. Results are presented in Panel B of Table 3. All regressions include state and year fixed effects. Additional controls for PAB characteristics are added in further steps. Across all specifications, per cap PAB supply has a positive and statistically significant effect on PAB deal volumes after the 1986 Tax Reform Act. Focusing on column (3), a one-standard-deviation increase in per cap PAB supply, equivalent to 24.21 USD for this sub-sample, corresponds to a relative increase in the PAB deal volume of 6.54%. This corresponds to a relative increase in the PAB deal volume by about USD 1 million for the average PAB deal in the sample.

Overall, the results suggest that higher limits to the per cap PAB supply on the state-level seem to be reflected in actual higher issuance at the county-level, as well as higher PAB deal volumes.

5. Real effects of state-level per cap PAB supply after the 1986 Tax Reform Act

5.1. State-level per cap PAB supply and firm investment

I analyze how state-level differences in the supply of per cap PAB financing after the 1986 Tax Reform Act impact investment of firms eligible for this type

of financing. I therefore employ a sample of firms located in bordering regions, which allows me to control for the overall local economic trend as well as general development of investment opportunities in these regions. Further, broadly following the approach of Adelino, Cunha and Ferreira (2017), my sample comprises firms located in counties with any PAB issuance in the ten years before the 1986 Tax reform.

The main dependent variable of interest, firm investment, is calculated as the natural logarithm of capital expenditures divided by the beginning of period total assets. My treatment measure *Per cap PAB supply* is the per person Dollar amount of PABs that a state can supply according to the 1988 allocation schedule. Due to the kink in the per cap PAB allocation schedule (illustrated in Subfigure (b) of Figure 1), this per cap PAB supply is larger than 50 USD for state with a population figure below 3 million, and 50 USD for states with a population of 3 million and larger.

I run the following difference-in-differences regression at state borders:

$$\begin{aligned} Investment_{i,t} = \alpha + \beta Post-1986_t \cdot Per\ cap\ PAB\ supply_s + \gamma Post-1986_t \\ +\delta Per\ cap\ PAB\ supply_s + \phi_i + \xi_t + \chi_{b,p} + \epsilon_{i,t} \end{aligned} \tag{4}$$

whereby i denotes a firm eligible for PAB financing, t a fiscal year, and s a state. ϕ_i are firm fixed effects, ξ_t corresponds to year fixed effects, and $\chi_{b,p}$ are bordering region-by-post-dummy fixed effects. $Post-1986$ equals one in the four years after the new volume caps have been introduced, i.e., for the years 1987 to 1990. *Per cap PAB supply* is the limit to the per capita amount of private activity bonds in USD that a state may distribute for calendar years according to the allocation schedule valid for 1988 to 2000. The sample period is from 1983 to 1990. I include lagged firm size measured as the natural logarithm of total assets as control variable in all regressions. The variable of interest is the coefficient on the interaction term between the Post-dummy and the per cap supply limit of PABs ($Post-1986_t \cdot Per\ cap\ PAB\ supply_s$). Standard errors are clustered at the state level. In the empirical estimation, the $Post-1986_t$ and the $Per\ cap\ PAB\ supply_s$ variables are absorbed by year and firm fixed effects, respectively.

Table 4 presents results for the effect of PAB supply on firm investment. As I include firm fixed effects in all regressions, the point estimates correspond to within-firm changes in firm investment for firms located in states with higher per cap PAB supply relative to firms in states with lower supply. State border pair-post fixed effects control for general economic development in bordering regions before and

after the 1986 Tax Reform Act. Besides the set of fixed effects as introduced in Equation 4, column (1) additionally controls for lagged firm size. Column (2) also includes the lag of return on assets as control. Finally, to capture potential different investment trends of industries over time, I add industry-year fixed effects in column (3). The point estimate for the interaction term *Per cap PAB supply x Post-1986* ranges from 0.0018 to 0.0021 and is statistically significant across all specifications. This indicates that after the introduction of new PAB volume caps, a one-standard-deviation increase in per cap PAB supply, equivalent to an increase by 46.48 USD, leads to an increase in the capex-to-assets ratio of eligible firms of about 8.36% to 9.76%. This corresponds to a relative increase in the capex-to-asset ratio of 0.75 to 0.88 percentage points for the average firm in the sample. As the regression captures firms eligible for PAB financing, the effect may be carefully considered a difference in the intention-to-treat effect for firms located in states with different per cap PAB supply. It may capture both direct effects for firms actually receiving PAB financing, and any potential spillover effects.

— Table 4 about here —

Time dynamics of the effect of per cap PAB supply on firm investment are illustrated in Figure 4. Subfigure (a) shows the development of average investment for firms in states with baseline per cap PAB supply of 50 USD, as well as for firms located in states with higher per cap PAB supply. Until 1986 when the new PAB volume caps were signed into law, both firm groups display a similar investment trend. For 1987, the first year when new volume caps became binding, firms in states with a per cap PAB supply larger then 50 show an slight increase in firm investment, while firms in states with the baseline per cap PAB supply of 50 USD continue the downward investment trend. In the mean plot, the investment gap increases until 1988 and remains constant thereafter.

— Figure 4 about here —

Subfigure (b) show the coefficient estimates and the 90% confidence interval on the Per cap PAB supply measure interacted with year dummies over the event period. The regression specification follows Equation 4, and includes the full set of control variables as noted in column (3) of Table 4. I do not observe statistically significant differences in the development of firm investment for firms located in states with higher and lower per cap PAB supply until 1986. The positive effect

of higher per cap PAB supply on firm investments starts in the first year after the 1986 Tax Reform Act, even though it is not statistically significant for 1987. The positive investment effect of PAB supply continues to rise over the remainder of the post-period.

Overall, the results indicate that a relatively higher supply of PAB financing positively affects firm investment for eligible firms.

5.2. Robustness tests

I conduct a range of robustness tests to lend support my finding that higher per cap PAB supply positively impacts firm investment. In the first set of these tests, I employ alternative measures for firm investment, as several common measures exist for Compustat firms (see Bai et al., 2022, for an overview). Results are presented in Table 5. I use three alternative measures for firm investment: the natural logarithm of capital expenditures (column 1), capex divided by the beginning of period total assets (column 2), and the growth rate for net property, plant, and equipment (column 3). Consistent with the baseline results, I find a positive effect of per cap PAB supply on firm investment when using the alternative investment measures, which is statistically significant for the logarithm of capex and the capex-to-assets ratio, but not for PPE growth.

— Table 5 about here —

Next, I address concerns that the calculation of the per cap PAB supply limit as being based on the allocation schedule valid for 1988 to 2000 might distort the findings. The allocation schedule for the transition year 1987 allows for a higher per cap PAB supply across all states for the respective year only. The relative decrease between the per cap supply of 1987 and 1988 is not the same for all states due to (i) a downward shift in the population cutoff point relevant for a state being able to possess higher per cap PAB volumes, from about 3.3 to 3 million, as well as (ii) because of (minor) changes in the state population. The additional relative cut for 1988 lies in a range from about 33% to about 43%, and is most pronounced for the least populous states, so that the additional decrease relatively diminishes per cap supply differences between states. Using the 1988 per cap PAB supply compared to the 1987 PAB supply should rather slightly bias me against finding an effect. For robustness, I employ the Per cap PAB supply limit for 1987 as alternative treatment measure, and present results in Panel A of Table 6. Across all specifications, the point estimate is positive and statistically significant. For

column (3), a one-standard deviation increase in PAB supply, which equals 81.41 USD, denotes a relative increase in the capex-to-assets ratio of about 9.77%, which is highly similar to the baseline estimate.

— Table 6 about here —

Finally, I address concerns that the definition of the sample of PAB issuing counties might drive my results, and present robustness tests for the sample definition in Panel B of Table 6. In the baseline specification, I limit the sample of firms to those located in counties with any PAB issuance in the ten years before the 1986 Tax Reform Act, i.e., between 1976 and 1985. Column (1) shows results for a sample of counties with any PAB issuance in the pre-event period from 1983 and 1986, and column (2) for counties with any PAB issuance in the pre- and the post period, which is from 1987 to 1990. I obtain positive and statistically significant point estimates for the interaction term *Per cap PAB supply x Post-1986* in both specifications, which denotes that a one standard deviation increase in per cap PAB supply is associated to a relative increase in the capex-to-asset ratio for eligible firms of about 10.2% and 12.5%, respectively. Finally, I show results for the contrary sample of counties without PAB issuance in column (3). If indeed the availability of PAB funding positively boosts investment, I should not find a differential effect of per cap PAB supply on firm investment for non-issuer counties. In line with this, the point estimate is statistically not significant.

Overall, the robustness tests further support the finding that the availability of PAB financing positively affects firm investment.

5.3. State-level per cap PAB supply and firm employment

PAB financing may be regarded as a capital subsidy. As noted by Moore and Squires (1988) in the context of Industrial Revenue Bonds, it is ex-ante not clear how subsidizing capital relative to labor as an input factor impacts employment outcomes. On the one hand, the authors note that due to an increase in investment associated with PABs, employment could rise due to a "scale effect" being at play. On the other hand, lowering the cost of investment through tax-subsidization might lead to a substitution effect. Anecdotally, the Washington State Department of Commerce (2018) reports that its PAB allocation for small issue bonds as well as exempt facility bonds created 191 new jobs and retained 150 jobs during 2016 and 2017. Further, some states explicitly require job creation or retention for beneficiaries. The state of Pennsylvania for instance demands the net creation of at least one

job, or retention of one full-time job, for each 50,000 USD in PAB volume allocated (see 12 Pa. Code Chapter 61.3).

The employment effect of PAB financing is ultimately an empirical question. I explore the effect of relatively higher per cap PAB supply on firm employment using the difference-in-differences framework at state borders as introduced in Section 5.1. Results are presented in Table 7. The dependent variable in all regressions is the natural logarithm of firm employment. To clean for potential data errors, I exclude firms that report an employment figure of zero at any time during the event period. The point estimate on the interaction term *Per cap PAB supply x Post-1986* is positive and statistically significant across all specifications (t-statistics between 6.252 and 9.806). Focusing on column (3), the point estimate indicates that a one-standard-deviation increase in the per cap PAB supply, equivalent to 46.48 USD, leads to an increase in firm employment of about 4.56%. Again, this effect may be carefully considered as a difference in the intention-to-treat effect and may stem from a direct effect of the per cap PAB supply on firm employment, and/or from local spillover effects to other firms.

— Table 7 about here —

I illustrate the time dynamics of the effect of per cap PAB supply on firm employment in Figure 5. I follow the specification as displayed in column (3) of Table 7, but use an interaction of Per cap PAB supply with year dummies instead of the post-dummy. The coefficient plot shows no statistically significant differences in employment for different levels of per cap PAB supply until 1986. Starting in 1987, the year following the introduction of new PAB volume caps, firm employment relatively rises with higher per cap PAB supply, but the effect only becomes statistically significant as of 1988. For 1989, the effect remains constant relative to the pre-year, before it further rises for 1990.

— Figure 5 about here —

Overall, my results suggest that besides the stimulating effect on firm investment, a higher supply of PABs also has a positive effect on firm employment. Hence, I do not find evidence consistent with an input factor substitution effect of PAB financing after the 1986 Tax Reform Act.

6. PAB beneficiary firms and the 1986 cap on PAB volumes

Besides the analyses for eligible firms, I also investigate corporate responses for the actual funding recipients of PABs after the 1986 Tax Reform Act. To do so, I link data on PAB deals from SDC Platinum to Compustat firms to construct a sample of PAB beneficiary firms. Appendix B provides an overview of the matching between SDC and Compustat over time. After the 1986 Tax Reform, Compustat firms only account for about 25% of the PAB deals, but they account for an aggregate bond volume share of about 50%.

Looking at PAB beneficiary firms allows me provide insights on the direct response of firms to PAB financing. However, as I cannot observe why firms select to demand PAB issuance in the first place, all estimations should be considered rather an upper bound of the actual direct effect of PAB issuance. Further, due to the small sample size relative to the sample of eligible firms, I use PAB beneficiary firms irrespective of their location within the state and do not condition on a border firm sample. In the regressions, I therefore cannot control for the common economic development of bordering regions before and after the 1986 Tax Reform Act, and point estimates might be distorted due to this limitation. To avoid singleton observations, I use industry-post fixed effects instead of industry-year fixed effects as in previous regressions.

For my analyses, I use a sample of Compustat firms that are the ultimate beneficiaries of any new money PAB deal in the four years after the 1986 Tax Reform. I thus compare firms that all demanded a PAB issuance after the reform, but are headquartered in states with different per cap PAB supply due to the new caps for PABs on the state level. Panel B of Table 2 compares pre-reform firm characteristics for PAB beneficiaries in states with a per cap PAB limit larger than 50 USD and those in states which are restricted to the baseline per cap PAB supply of 50 USD. These firm groups are statistically similar across a range of firm characteristics, even though PAB beneficiary firms in less-restricted states appear somewhat smaller in terms of employment. Overall, firms with largely similar observable characteristics seem to demand PAB funding across states with different population figures.

Table 8 presents results for the investment and employment effect of PAB supply for PAB beneficiary firms. The firm sample for columns (1) and (2) consists of firms that receive any PAB in the four years after the 1986 Tax Reform. The sample in columns (3) and (4) comprises firms which besides receiving any issuance after the Tax Reform also received any PAB issuance in the pre-period (1983 to

1986). Panel A presents results for firm investment as the dependent variable. For the sample of post-beneficiaries, I obtain a positive and statistically significant point estimates of 0.0021 for the interaction term *Per cap PAB supply x Post-1986*. When including industry-post fixed effects, the estimate remains positive but is not statistically significant anymore. For the sample of pre- and post-reform PAB beneficiaries, the point estimates in column (3) and (4) are statistically significant and more pronounced compared to the previous specifications. In particular, using the estimate from column (4), moving from the 50th to the 90th percentile in per cap PAB supply—equivalent to an increase of 4.72 USD— relatively increases the capex-to-assets ratio by about 2.6% in the four-year window after the tax reform. For the average firm in the PAB beneficiary sample, this corresponds to an increase in the capex-to-assets ratio by 0.234 percentage points.

— Table 8 about here —

Time dynamics for the specification as in column (4) are presented in Figure 6. Before the 1986 Tax Reform Act, I do not observe a difference in firm investment depending on the per cap supply of PABs. For 1988, relatively higher per cap PAB supply has a strong positive impact on firm investment. For 1989 and 1990, the relative difference in firm investment diminishes, however.

— Figure 6 about here —

In Panel B of Table 8, I present results for the effect of per cap PAB supply on firm employment. The point estimate is positive across all specifications, and statistically significant for three of the four regressions. For column (4), the estimate implies that moving from the 50th to the 90th percentile of the Per cap PAB supply distribution (4.72 USD) is associated with a relative increase in firm employment by 0.8%.

Overall, these findings suggest that a relatively higher per cap PAB supply also seems to stimulate firm investment in the sample of PAB beneficiaries, and seems to rather have scale effects in terms of the employment outcome.

7. Real effects of the Texas PAB lottery

So far, I have disregarded that states have discretion in allocating their volume caps to PAB projects. If states with higher per cap PAB supply limits systematically select projects with higher investment and employment potential than states with

lower supply, this would distort my findings. However, as demand for PABs should exceed state-level supply by far more in the group of Low PAB states, it is more likely that Low PAB states have the chance to select relatively better projects, which would rather bias me against finding an effect.

To strengthen my identification, I use PAB program data from the state of Texas, which employs a lottery system to allocate PAB volume to program applicants (see Section 2.2 for more details). This allows me to compare real effects for firms that all applied for PAB allocation, but only a random set of firms as determined by lot actually received PAB funding through the program.

Data from the PAB lottery is on the project level and is available from 1996 to 2022. As I am interested in corporate real effects, I aggregate the data at the firm-year level. Further, I can only include lottery program years for which I both observe Compustat firms with any PAB allocation ("Lottery winning firms"), and firms whose PAB attempts all are in-line, i.e., they did not receive any allocation ("Lottery losing firms"). This condition reduces the time span for my analyses to 1996 to 2001. To reduce bias stemming from the staggered nature of the lottery data, I only consider lottery-winning firms in their earliest year with a successful lottery attempt. Lottery-losing firms never received an allocation over the entire 1996 to 2001 time span, and are covered in the sample in all years in which they requested an allocation.

I compare financial characteristics for the remaining lottery-winning and losing firms in the year before their respective lottery attempts. Panel C of Table 2 provides an overview. Winning and losing firms have similar size, return on assets, and PPE growth before the lottery attempt, and they also do not differ in the level of the outcome variables. Winning firms seem to be less levered than losing firms pre-lottery.

I estimate the impact of receiving PAB funding through the lottery on firm investment and employment based on the following regression specification:

$$\Delta Outcome_{i,t} = \alpha + \beta Lottery\ win\ dummy_i + \xi_{lottery\ year} + \epsilon_{i,t} \tag{5}$$

$\Delta Outcome_{i,t}$ is the change in firm investment or employment between year t and the pre-lottery year. $Lottery\ win\ dummy_i$ is a dummy variable equal to one if a lottery-participating firm wins any lottery (project) attempt in the respective calendar year, and zero otherwise. I use the natural logarithm of the lottery-allocated bond volume as an alternative treatment measure. $\xi_{lottery\ year}$ are lottery-year fixed

effects. I control for the firm size measured in the pre-lottery year in all regressions.

Table 9 presents results for the effect of receiving PAB allocation in the lottery on firm investment. For Panel A, I use the Lottery win dummy as the treatment measure. The preferred specification is reported in columns (4) to (6) and compares lottery winning and losing firms that submit allocation attempts in the same lottery year. When looking at the change in firm investment between the lottery year ("year 1") and the pre-year as the outcome variable, the coefficient for the lottery win dummy is positive, but statistically not significant (column (4), t-stat: 1.051). I observe a statistically significant relative increase in firm investment for Lottery winning firms one year after the lottery relative to pre-lottery (Year 2 -0), with the effect slightly increasing for Year 3 relative to the pre-lottery year. The magnitude of the effect denotes an increase in the capex-to-assets ratio for lottery winning firms relative to losing firms of 34.5% over two years or 39.1% over three years, respectively.

— Table 9 about here —

In Panel B of Table 9, I use the natural logarithm of the lottery-allocated bond volume plus one as the treatment measure. Consistent with the dummy analysis, lottery-winning firms show a relative increase in firm investment in Year 2 and Year 3 over the pre-lottery year. These results strengthen the view that PAB financing stimulates firm investment.

In Table 10, I show results for the effect of PAB allocation through the lottery on firm employment. The dependent variable in all regressions is the natural logarithm of the number of employees. I do not obtain any statistically significant point estimate in these regressions. However, the coefficient for the Lottery win dummy and for the logarithm of the lottery-allocated bond volume is positive in all specifications. The time pattern also shows an increase in the coefficient size over the three-year window post-lottery. For the preferred specification with lottery-year fixed effects and looking at the Lottery win dummy as the treatment measure, I obtain a t-statistic equal to 1.464.

— Table 10 about here —

To summarize, the results from analyzing the Texas PAB lottery lend strong support to the previous finding that PAB financing positively impacts firm investment, and that state's project selection does not drive this relation. While the employment

results for lottery-winning firms do not show a statistically significant increase, in any case, they do not show a negative employment trend for winning firms, and thus rather speak against an input factor substitution taking place.

8. Conclusion

Private activity bonds account for a significant share of the municipal bond market. For the calendar year 2019, the Internal Revenue Service (2019)'s Statistics of Income Division reports about 2,500 PAB issuances, with an aggregate volume of about $127 billion. This PAB volume accounts for about 25% of the municipal bond market volume. Thus, municipal bond issuance for private projects may be considered a relevant regional investment factor besides conventional municipal bonds. However, little is known about the actual impact of PAB financing on firms and their investment behavior.

I analyze how state-level differences in the per cap supply of PAB financing affect firm investment and employment. I therefore exploit a change in the allocation schedule for PABs resulting from the 1986 Tax Reform Act, which imposes different limits on the per cap supply of PABs depending on a state's population figure. Comparing the investment behavior of PAB-eligible firms in bordering counties, I document that higher per cap PAB supply after the Tax Reform is positively associated with firm investment. The positive effect on firm investment is also observed when comparing PAB beneficiaries after the volume cap reform. To address the potential concern state's discretionary allocation of PAB resources to projects drives my results, I leverage data from the Texas PAB lottery, the PAB distribution mechanism in Texas. Comparing firms that won and lost their requests for PAB allocation in the lottery, I also show a positive impact of PAB funding allocation on firm investment.

Finally, I investigate how the limit on per cap PAB supply impacts firm employment. I find that after the 1986 Tax Reform Act, a relatively higher per cap PAB supply is positively associated with employment. These findings suggest that PAB funding is not linked to an input factor substitution, despite the relative subsidy for capital compared to labor.

Overall, I provide novel evidence on the actual firm response to PAB financing. By demonstrating a positive effect on capital investment, I highlight the stimulating role of government-subsidized financing within PAB-eligible industries.

References

Adelino, M., Cunha, I., Ferreira, M. A., 2017. The economic effects of public financing: Evidence from municipal bond ratings recalibration. The Review of Financial Studies 30, 3223–3268.

Agrawal, A., Kim, D., 2022. Municipal bond insurance and public infrastructure: Evidence from drinking water. Unpublished working paper.

Auerbach, A. J., Slemrod, J., June 1997. The economic effects of the Tax Reform Act of 1986. Journal of Economic Literature 35 (2), 589–632.

Bai, H., Li, E. X. N., Xue, C., Zhang, L., 2022. Asymmetric investment rates. Unpublished working paper.

Bonfim, D., Custódio, C., Raposo, C., March 2023. Supporting small firms through recessions and recoveries. Journal of Financial Economics 147 (3), 658–688.

Business Wire, 1986. CA-State-treasurer; Treasurer announces first allocation of 1986 private activity bonds (October 30, 1986).

Chava, S., Malakar, B., Singh, M., 2023. Impact of corporate subsidies on borrowing costs of local governments: Evidence from municipal bonds. Review of Finance, forthcoming.

Congressional Budget Office, 2010. Subsidizing infrastructure investment with tax-preferred bonds. Congressional Budget Office. Joint Committee on Taxation, 83–138.

Congressional Research Service, 2022. Private activity bonds: An introduction. CRS Report (RL31457).

Dagostino, R., 2022. The impact of bank financing on municipalities' bond issuance and the real economy. Unpublished working paper.

Dougal, C., Parsons, C. A., Titman, S., February 2015. Urban vibrancy and corporate growth. The Journal of Finance 70 (1).

Gustafson, M. T., Kotter, J. D., 2023. Higher minimum wages reduce capital expenditures. Management Science 69 (5), 2933–2953.

Hebous, S., Zimmermann, T., 2021. Can government demand stimulate private investment? Evidence from U.S. federal procurement. Journal of Monetary Economics 118, 178–194.

H.R.3838 - Tax Reform Act of 1986, 1986. https://www.congress.gov/bill/99th-congress/house-bill/3838, 99th Congress (1985-1986), Conference report filed in House (09/18/1986).

Internal Revenue Service, 2019. Municipal bonds, Calendar Year 2019.

Kawecki, L., 2002. An historical perspective on small issue bonds. URL https://www.irs.gov/pub/irs-tege/part1b02.pdf

Kim, T., Nguyen, Q. H., 2020. The effect of public spending on private investment. Review of Finance 24, 415–451.

Moore, T. S., Squires, G. D., 1988. Industrial revenue bonds: The social costs and private benefits of a public subsidy. Public Administration Quarterly 12 (2), 151–168.

Osterberg, W. P., 1991. Public subsidies for private purposes. Economic commentary. Federal Reserve Bank of Cleveland.

Reuters, 2017. U.S. muni market faces challenges, not 'crisis' with tax changes. URL https://www.reuters.com/article/us-usa-tax-municipals-idINKBN1EF02S

Rossi, S., Yun, H., 2023. Financial reform and public good provision: Municipal bankruptcy law and the financing of hospitals. Management Science, forthcoming.

Texas Bond Review Board, 1996. Annual Report 1996, Chapter 7. Texas private activity bond allocation program.

Texas Bond Review Board, 1997. Annual Report 1997, Chapter 7. Texas private activity bond allocation program.

Texas Bond Review Board, 2023a. Private activity bond allocation program 2023 program year. https://www.brb.texas.gov/2023-program-year/.

Texas Bond Review Board, 2023b. Private activity bond allocation program overview. https://www.brb.texas.gov/pab-program-overview/.

The Bond Buyer, 1984. Most states find 1984 idb limits easy going but scurry for reserves.

The New York Times, 2013. A stealth tax subsidy for business faces new scrutiny. URL https://www.nytimes.com/2013/03/05/business/qualified-private-activity-bonds-come-under-new-scrutiny.html

United States Government Accountability Office, 2008. Tax-exempt status of certain bonds merits reconsideration, and apparent noncompliance with issuance cost limitations should be addressed. Report to the Committee on Finance, U.S. Senate (GAO-08-364).

U.S. Bureau of the Census, 2006. Government Finance and Employment Classification Manual. U.S. Bureau of the Census.

Washington State Department of Commerce, 2018. Bond cap allocation program. the 2018 biennial policy report and activity summary. https://www.commerce.wa.gov/wp-content/uploads/2013/01/12-18-2018-bond-cap-report-FINAL.pdf.

Whitaker, S., 2011. Prioritization in private-activity-bond volume cap allocation. Federal Reserve Bank of Cleveland Working Paper 11-10.

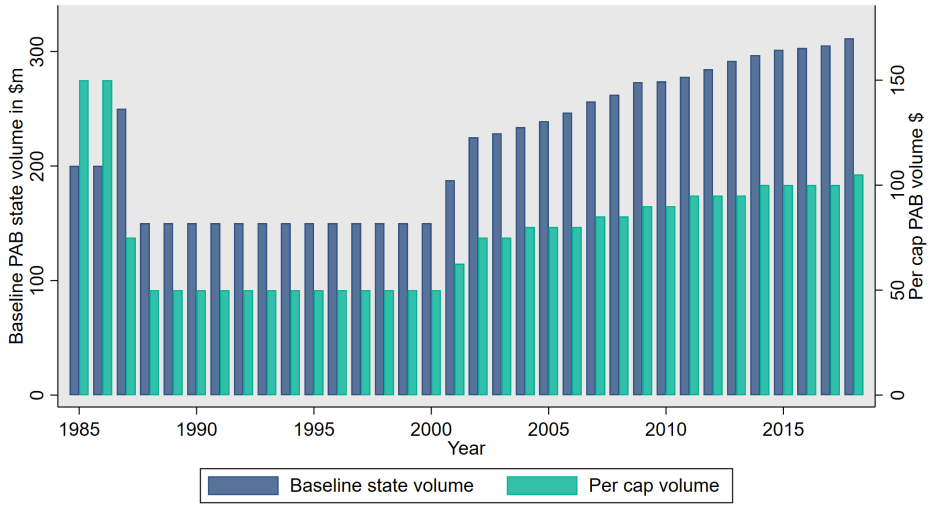
Zimmerman, D., 1989. Tax-exempt bonds: A sacred cow that gave (some) milk. National Tax Journal 42 (3), 283–292.

Zimmerman, D., 1990. The volume cap for tax-exempt private activity bonds: State and local experience in 1989. Advisory Commission on Intergovernmental Relations.

Figure 1
The 1986 Tax Reform Act and state-level PAB volume caps

This figure illustrates properties of the state-level cap on PABs, which is set as the higher value between a baseline PAB state volume, and a per cap volume multiplied by the state's population. Subfigure (a) shows the development of the baseline PAB state volume (■) as well as the allocation schedule's per cap volume (■) over the period from 1985 to 2018. Data come from the Internal Revenue Service's (IRS) statistics of income bulletin, complemented with legal text information from the Internal Revenue Code Section 146. Subfigure (b) illustrates the limit on per cap PAB supply for the period 1988 to 2000 depending on a state's population figure (▬), calculated as a state's total PAB volume divided by the respective state's population figure. States with a population below 3 million can supply comparatively higher per cap PAB volumes.

(a) PAB volume caps over time



(b) State population and limit on per cap PAB supply for 1988 to 2000

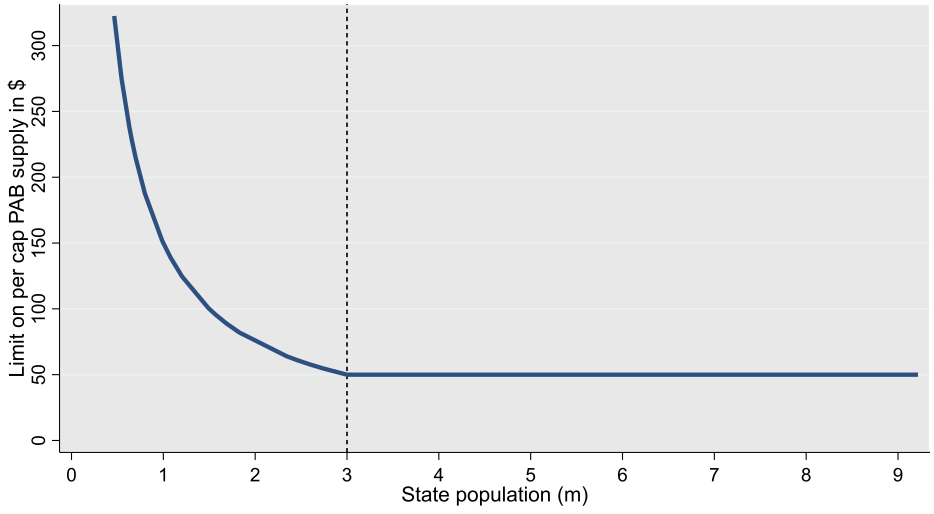


Figure 2
Characteristics of PAB beneficiary firms

This figure illustrates the difference in means of firm characteristics for firms which received any PAB deal between 1981 and 1990, relative to their industry-peers without PAB deal according to SDC Platinum data. The bars mark the 90% confidence intervals. The comparison period is from 1981 to 1990. Appendix A provides a detailed description of all variables.

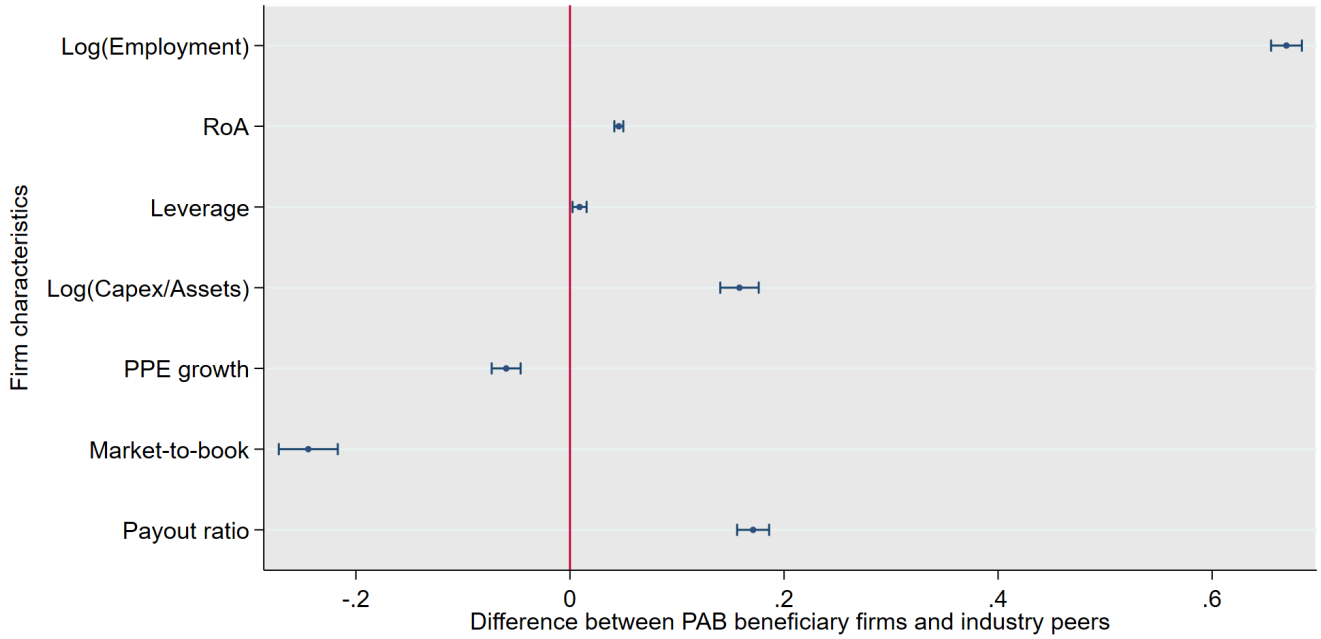
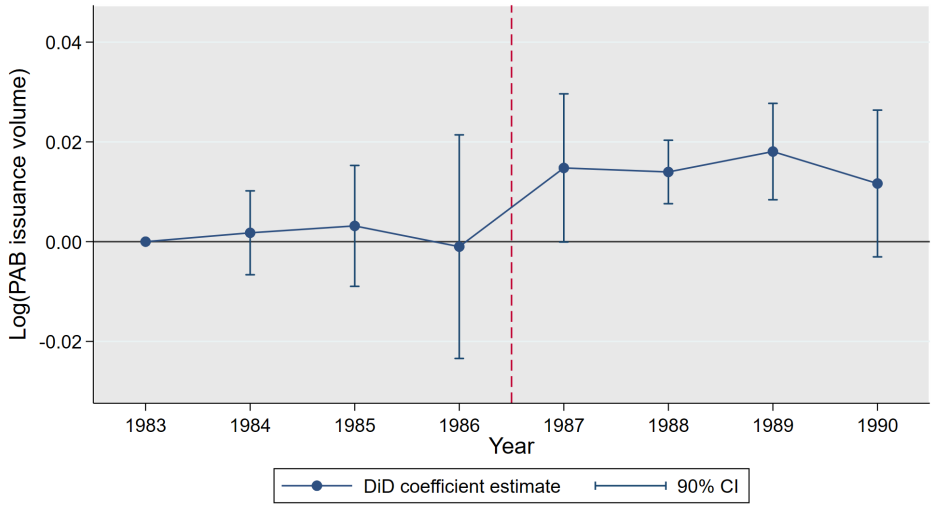


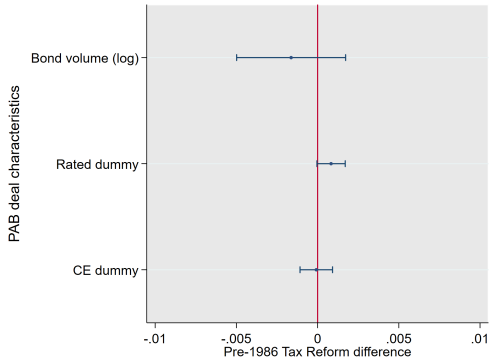
Figure 3
State-level per cap PAB supply limit and PAB issuance after the 1986 Tax Reform Act

This figure illustrates PAB issuance trends around the 1986 Tax Reform Act. In Subfigure (a), the dependent variable is the natural logarithm of the aggregate PAB issuance volume at the county level. The figure shows the coefficient estimates and 90% confidence interval on Per cap PAB supply interacted with year dummies. Per cap PAB supply is the limit to the per capita amount of private activity bonds in USD that a state may distribute for calendar years 1988 to 1990. The regression specification follows column (4) in Table 3. The general start of new binding caps on PAB volume is depicted in red (— —). The sample for Subfigure (b) and (c) consists of new-money PAB deals from SDC Platinum in the pre-period (1983 to 1986) or the post-period (1987 to 1990) of the 1986 Tax Reform, respectively. These figures show point estimates and 90% confidence intervals for regressions of the indicated PAB deal characteristics on the Per cap PAB supply measure. Standard errors are clustered at the state-level. Appendix A provides a detailed description of all variables.

(a) County level



(b) PAB deal characteristics pre-1986



(c) PAB deal characteristics post-1986

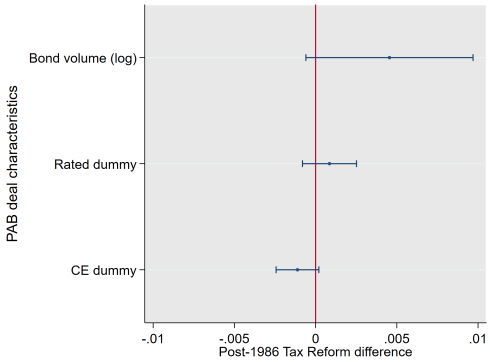
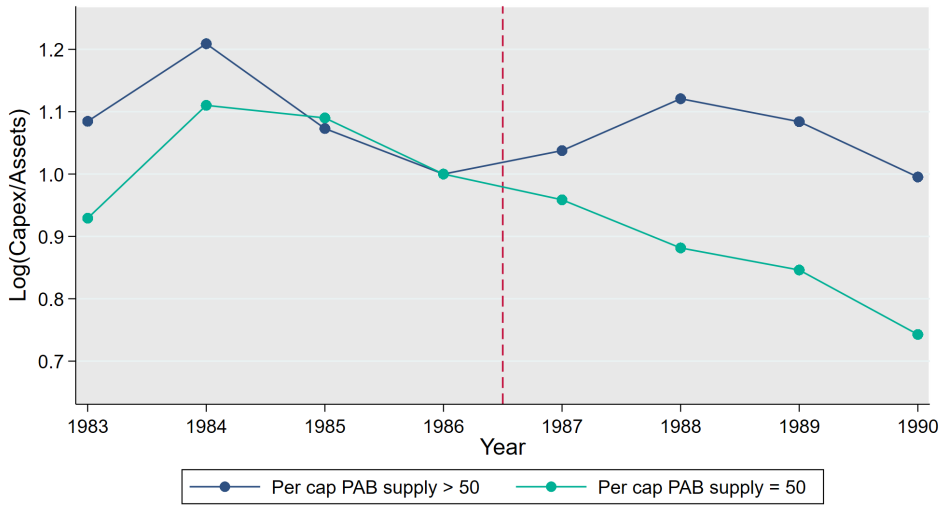


Figure 4
State-level per cap PAB supply limit and firm investment after the 1986 Tax Reform Act

This figure illustrates the development of firm investment for border-county firms around the 1986 Tax Reform Act. Per cap PAB supply is the limit to the per capita amount of private activity bonds in USD that a state may distribute for calendar years 1988 to 1990. Subfigure (a) shows the development of average firm investment in states with more than 50 USD in per cap PAB supply (●) compared to firms in states restricted to the 50 USD per cap PAB supply limit (●) from 1983 to 1990. The general start of new binding caps on PAB volume is depicted in red (▬). For both firm groups, the level of firm investment is set to one in the fiscal year 1986. Firm investment is defined as the natural logarithm of capital expenditures divided by the beginning of period total assets. Subfigure (b) shows the coefficient estimates and the 90% confidence interval on the Per cap PAB supply measure interacted with year dummies over the event period. The regression specification follows column (3) in Table 4. Appendix A provides a detailed description of all variables.

(a) Mean values of firms' investment



(b) Difference in firms' investment

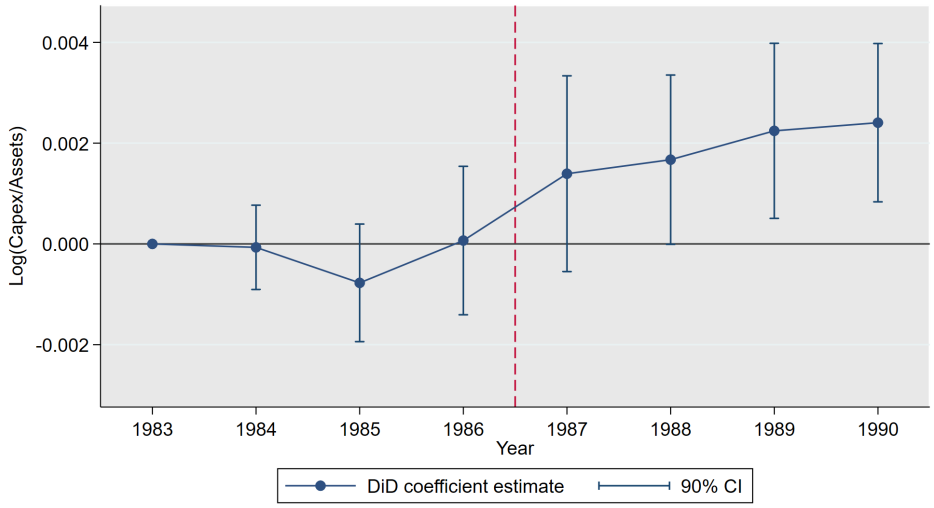


Figure 5

State-level per cap PAB supply limit and firm employment after the 1986 Tax Reform Act

This figure illustrates the development of firm employment, calculated as the natural logarithm of the number of employees, from 1983 to 1990. It shows coefficient estimates and the 90% confidence interval on the state's per cap PAB supply interacted with year dummies over the event period. The regression specification follows column (3) in Table 7. Per cap PAB supply is the limit to the per capita amount of private activity bonds in USD that a state may distribute for calendar years 1988 to 1990. The general start of new binding caps on PAB volume is depicted in red (▬ ▬). The sample consists of firms headquartered in bordering counties that supplied any PAB in the ten years before the tax reform. Appendix A provides a detailed description of all variables.

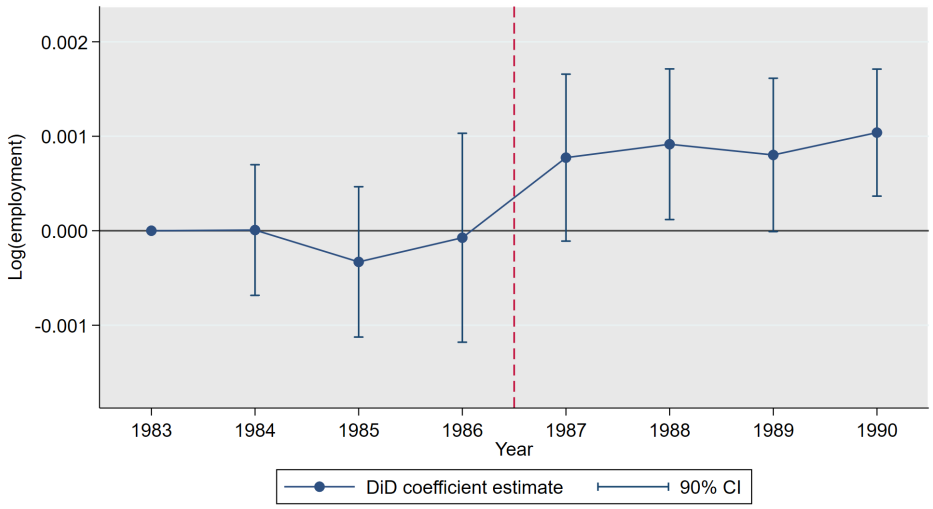


Figure 6

Per cap PAB supply limit and firm investment of PAB beneficiaries after the 1986 Tax Reform Act

This figure illustrates the development of firm investment, calculated as the natural logarithm of capital expenditures divided by the beginning of period total assets, for firms that benefit from any PAB issuance on their behalf during 1987 and 1990. It shows coefficient estimates and the 90% confidence interval on the Per cap PAB supply measure interacted with year dummies over the event period. Per cap PAB supply is the limit to the per capita amount of private activity bonds in USD that a state may distribute for calendar years 1988 to 1990. The regression specification follows column (2) in Panel A, Table 8. The general start of new binding caps on PAB volume is depicted in red (▬ ▬). Appendix A provides a detailed description of all variables.

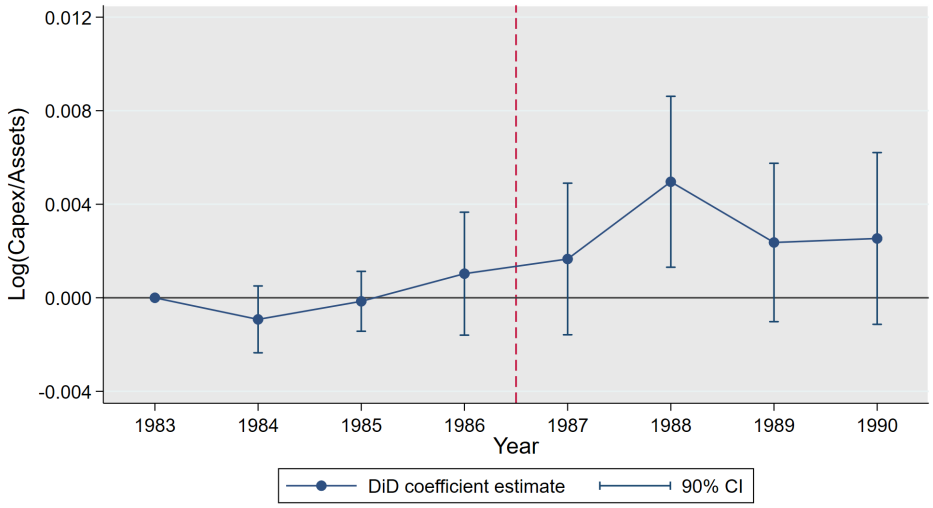


Table 1
Descriptive statistics

This table presents descriptive statistics for PAB issuance and the three firm samples employed in the analyses. Panel A shows descriptive statistics for 906 counties or 2876 PAB deals. Panel B shows descriptive statistics for the sample of PAB-eligible firms in bordering counties and consists of 682 firms located across 38 states. For Panel C, the sample comprises 116 firms in 34 states with any PAB issuance between 1987 and 1990. Panel D captures pre-lottery-year descriptives for 29 lottery-year-attempts between 1996 and 2001. Appendix A provides a detailed description of all variables.

	N	Mean	SD	10^{th}	50^{th}	90^{th}
Panel A: PAB issuance characteristics						
PAB issuance $\text{volume}_{\text{county}}$ ($m)	7150	11.02	48.53	0.00	0.00	20.00
Log (PAB issuance $\text{volume}_{\text{county}}$)	7150	2.88	4.28	0.00	0.00	9.90
Per cap PAB supply	7150	61.38	39.81	50.00	50.00	64.03
PAB deal volume ($m)	2876	15.39	32.73	1.30	5.50	40.20
Log (PAB deal volume)	2876	2.02	1.06	0.83	1.87	3.72
Maturity (years)	2109	21.13	8.62	10.00	20.00	30.00
Rated dummy	2876	0.44	0.50	0.00	0.00	1.00
Credit enhancement dummy	2876	0.43	0.50	0.00	0.00	1.00
Panel B: PAB eligible firms in bordering counties						
Per cap PAB supply	4097	66.68	46.48	50.00	50.00	139.53
Per cap PAB supply_{1987}	4097	105.47	81.41	75.00	75.00	244.29
Capex/Assets	4097	0.09	0.11	0.02	0.06	0.18
Log (Capex/Assets)	4097	-2.86	1.04	-4.17	-2.76	-1.72
Employment (k)	3948	6.16	14.23	0.05	1.06	16.05
Log (Employment)	3946	1.10	1.12	0.05	0.72	2.84
Lag of Size	4097	4.48	2.35	1.35	4.51	7.59
Lag of RoA	4079	0.00	0.23	-0.12	0.05	0.12
Panel C: PAB beneficiary firms post-1986						
Per cap PAB supply	844	56.90	26.28	50.00	50.00	54.72
Capex/Assets	844	0.09	0.06	0.03	0.08	0.16
Log (Capex/Assets)	844	-2.56	0.64	-3.36	-2.52	-1.82
Employment (k)	832	17.36	51.07	0.44	3.50	30.10
Log (Employment)	832	1.78	1.24	0.36	1.51	3.44
Lag of Size	844	6.51	2.07	3.75	6.72	9.09
Lag of RoA	844	0.05	0.05	0.01	0.05	0.10
Panel D: Firms in Texas PAB lottery						
Lottery win dummy	29	0.55	0.51	0.00	1.00	1.00
Lottery-allocated bond volume ($m)	29	10.96	11.48	0.00	7.50	25.00
$\text{Capex/Assets}_{\text{Pre-lottery year}}$	29	0.08	0.06	0.02	0.07	0.12
$\text{Log(Capex/Assets)}_{\text{Pre-lottery year}}$	29	-2.75	0.65	-3.77	-2.68	-2.25
$\text{Employment (k)}_{\text{Pre-lottery year}}$	28	25.40	25.78	1.40	23.69	59.57
$\text{Log (Employment)}_{\text{Pre-lottery year}}$	28	2.73	1.20	0.88	3.21	4.10
$\text{Size}_{\text{Pre-lottery year}}$	29	8.71	1.73	6.40	9.16	10.53
$\text{RoA}_{\text{Pre-lottery year}}$	29	0.07	0.05	0.00	0.07	0.12

Table 2

Pre-event characteristics for firms in treatment and control groups

This table presents the mean pre-event characteristics as well as differences in the mean values for firms in the treatment and control groups as indicated in the respective Panel. For Panel A and B, the pre-event period is from 1983 to 1986. For Panel C, the mean values correspond to the pre-lottery year. Difference adjusted controls for industry-year fixed effects when calculating the mean difference. For the difference calculation in Panel A and B, standard errors are clustered at the state-level. ***, ** and * indicate significance at the 1%-, 5%- and 10%-levels, respectively. Appendix A provides a detailed description of all variables.

	N	Mean	N	Mean	Diff.	Diff. adj.
Panel A: Bordering firms	**Per cap PAB > 50**		**Per cap PAB = 50**			
Log (Capex/Assets)	379	-2.65	1625	-2.81	0.16**	0.01
Log (Employment)	358	1.11	1570	1.12	-0.01	-0.00
Lag of Size	379	4.65	1625	4.31	0.34	-0.02
Lag of RoA	377	-0.01	1623	0.01	-0.02	-0.02
Lag of Leverage	379	0.40	1624	0.37	0.03	-0.02
Lag of PPE growth	349	0.15	1507	0.22	-0.07	-0.04
County population (k)	379	386.04	1625	961.13	-575.09**	n/a
Panel B: PAB issuer	**Per cap PAB > 50**		**Per cap PAB = 50**			
Log (Capex/Assets)	43	-2.67	352	-2.51	-0.16	-0.20
Log (Employment)	43	1.47	346	1.85	-0.38	-0.65*
Lag of Size	43	6.43	352	6.51	-0.07	-0.74
Lag of RoA	43	0.05	352	0.05	0.00	0.00
Lag of Leverage	43	0.48	352	0.42	0.06	0.05
Lag of PPE growth	41	0.12	344	0.11	0.01	0.02
Panel C: Texas lottery	**Lottery winning firm**		**Lottery loosing firm**			
Log (Capex/Assets)	16	-2.8	13	-2.6	-0.21	n/a
Log (Employment)	15	2.76	13	2.7	0.06	n/a
Size	16	8.74	13	8.68	0.06	n/a
RoA	16	0.07	13	0.06	0.00	n/a
Leverage	16	0.41	13	0.51	-0.10**	n/a
PPE growth	16	0.08	13	0.02	0.06	n/a

Table 3
Per cap PAB supply limits and PAB issuance volumes after the 1986 Tax Reform Act

In Panel A, the dependent variable is the natural logarithm of the PAB issuance volume at the county-level, and the sample consists of counties that supplied any PAB in the ten years before the tax reform. In Panel B, the dependent variable is the natural logarithm of the PAB deal volume, and the sample comprises new-money PAB deals from SDC Platinum with sale date during the the sample period from 1983 to 1990. Per cap PAB supply is the limit to the per capita amount of private activity bonds in USD that a state may distribute for calendar years 1988 to 1990. Post is a dummy that equals one from 1987 to 1990, and zero otherwise. T-statistics based on Huber/White robust standard errors clustered by state are presented in parentheses. ***, ** and * indicate significance at the 1%-, 5%- and 10%-levels, respectively. Appendix A provides a detailed description of all variables.

	(1)	(2)	(3)	(4)
Panel A: County-level				
	PAB issuing counties		PAB issuing border counties	
Per cap PAB supply x Post-1986	0.0048*	0.0045*	0.0120***	0.0137***
	(1.811)	(1.895)	(3.039)	(3.534)
House price index control	Yes	Yes	Yes	Yes
County FE	Yes	Yes	Yes	Yes
Year FE	Yes	No	Yes	No
County size decile-Year FE	No	Yes	No	Yes
State border pair-Year FE	No	No	Yes	Yes
Number of observations	7150	7142	2295	2295
Adjusted R^2	0.376	0.376	0.375	0.373
Panel B: PAB deal-level				
Per cap PAB supply x Post-1986	0.0029**	0.0032***	0.0027**	0.0021*
	(2.376)	(2.815)	(2.591)	(1.737)
Rated dummy		0.7799***	0.3951***	0.3734***
		(11.057)	(7.386)	(7.337)
Credit enhancement dummy		-0.0153	0.1752***	0.0879**
		(-0.295)	(4.277)	(2.347)
State FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Usage type FE	No	No	Yes	Yes
Beneficiary FE	No	No	No	Yes
Number of observations	2876	2876	2876	2033
Adjusted R^2	0.159	0.270	0.448	0.606

Table 4

State-level per cap PAB supply and firm investment after the 1986 Tax Reform Act

The dependent variable is the natural logarithm of capital expenditures divided by the beginning of period total assets. Per cap PAB supply is the limit to the per capita amount of private activity bonds in USD that a state may distribute for calendar years 1988 to 1990. Post is a dummy that equals one from 1987 to 1990, and zero otherwise. The sample consists of firms headquartered in bordering counties that supplied any PAB in the ten years before the tax reform. The sample period is from 1983 to 1990. T-statistics based on Huber/White robust standard errors clustered by state are presented in parentheses. ***, ** and * indicate significance at the 1%-, 5%- and 10%-levels, respectively. Appendix A provides a detailed description of all variables.

	(1)	(2)	(3)
Per cap PAB supply x Post-1986	0.0018***	0.0017***	0.0021***
	(5.089)	(4.977)	(3.359)
Lag of Size	-0.4144***	-0.4788***	-0.4808***
	(-6.299)	(-7.621)	(-9.973)
Lag of RoA		1.1047***	1.0546***
		(7.294)	(7.291)
Firm FE	Yes	Yes	Yes
Year FE	Yes	Yes	No
Stateborder-Pair-Post FE	Yes	Yes	Yes
Industry-Year FE	No	No	Yes
Number of observations	4094	4073	4059
Adjusted R2	0.488	0.507	0.525

Table 5

Robustness tests: Alternative firm investment measures

The dependent variable is indicated in each column and represents an alternative firm investment measure. Per cap PAB supply is the limit to the per capita amount of private activity bonds in USD that a state may distribute for calendar years 1988 to 1990. Post is a dummy that equals one from 1987 to 1990, and zero otherwise. The sample consists of firms headquartered in bordering counties that supplied any PAB in the ten years before the tax reform. Firm controls are lag of size and lag of return on assets. The sample period is from 1983 to 1990. T-statistics based on Huber/White robust standard errors clustered by state are presented in parentheses. ***, ** and * indicate significance at the 1%-, 5%- and 10%-levels, respectively. Appendix A provides a detailed description of all variables.

	(1) Log (Capex)	(2) Capex/Assets	(3) PPE growth
Per cap PAB supply x Post-1986	0.0024***	0.0002**	0.0004
	(4.837)	(2.246)	(1.014)
Firm controls	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes
Stateborder-Pair-Post FE	Yes	Yes	Yes
Industry-Year FE	Yes	Yes	Yes
Number of observations	4157	4157	4211
Adjusted R^2	0.954	0.380	0.107

Table 6

Robustness tests: PAB supply measure and PAB issuing county sample

The dependent variable is the natural logarithm of capital expenditures divided by the beginning of period total assets. Post is a dummy that equals one from 1987 to 1990, and zero otherwise. In Panel A, the setup is as in Table 4, but Per cap PAB supply$_{1987}$ is the limit to the per capita amount of private activity bonds in USD that a state may distribute for transition year 1987. In Panel B, the setup is as in Table 4, but alternative definitions for the sample of PAB issuing counties are used. Firm controls are lag of size and lag of return on assets. The sample period is from 1983 to 1990. T-statistics based on Huber/White robust standard errors clustered by state are presented in parentheses. ***, ** and * indicate significance at the 1%-, 5%- and 10%-levels, respectively. Appendix A provides a detailed description of all variables.

	(1)	(2)	(3)
Panel A: PAB supply for transition year 1987			
Per cap PAB supply$_{1987}$ x Post-1986	0.0011***	0.0010***	0.0012***
	(4.883)	(4.773)	(3.300)
Lag of Size	-0.4144***	-0.4788***	-0.4807***
	(-6.297)	(-7.619)	(-9.972)
Lag of RoA		1.1046***	1.0545***
		(7.294)	(7.291)
Firm FE	Yes	Yes	Yes
Year FE	Yes	Yes	No
Stateborder-Pair-Post FE	Yes	Yes	Yes
Industry-Year FE	No	No	Yes
Number of observations	4094	4073	4059
Adjusted R^2	0.488	0.507	0.525
Panel B: PAB issuing county definition			
	Pre-period issuer	Pre- and post-period issuer	Non-issuer 1976-1985
Per cap PAB supply x Post-1986	0.0022***	0.0027***	0.0047
	(3.640)	(4.490)	(0.415)
Firm controls	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes
Stateborder-Pair-Post FE	Yes	Yes	Yes
Industry-Year FE	Yes	Yes	Yes
Number of observations	3487	2766	2590
Adjusted R^2	0.521	0.518	0.483

Table 7

State-level per cap PAB supply and firm employment after the 1986 Tax Reform Act

The dependent variable is the natural logarithm of firm employment. Per cap PAB supply is the limit to the per capita amount of private activity bonds in USD that a state may distribute for calendar years 1988 to 1990. Post is a dummy that equals one from 1987 to 1990, and zero otherwise. The sample consists of firms headquartered in bordering counties that supplied any PAB in the ten years before the tax reform. The sample period is from 1983 to 1990. T-statistics based on Huber/White robust standard errors clustered by state are presented in parentheses. ***, ** and * indicate significance at the 1%-, 5%- and 10%-levels, respectively. Appendix A provides a detailed description of all variables.

	(1)	(2)	(3)
Per cap PAB supply x Post-1986	0.00104***	0.00103***	0.00098***
	(9.806)	(9.779)	(6.252)
Lag of Size	0.16262***	0.16609***	0.16914***
	(7.249)	(6.997)	(6.632)
Lag of RoA		0.01730	0.01950
		(0.657)	(0.696)
Firm FE	Yes	Yes	Yes
Year FE	Yes	Yes	No
Stateborder-Pair-Post FE	Yes	Yes	Yes
Industry-Year FE	No	Yes	Yes
Number of observations	4067	4051	4027
Adjusted R^2 (within)	0.157	0.161	0.169

Table 8
Per cap PAB supply and real effects for PAB beneficiary firms after the 1986 Tax Reform Act

In columns (1) and (2), the sample consists of firms that receive any PAB in the four years after the 1986 Tax Reform. columns (3) and (4) additionally require any PAB issuance in the 4 years before the reform. In Panel A, the dependent variable is the natural logarithm of capital expenditures divided by the beginning of period total assets. In Panel B, the dependent variable is the natural logarithm of firm employment. Per cap PAB supply is the limit to the per capita amount of private activity bonds in USD that a state may distribute for calendar years 1988 to 1990. Post is a dummy that equals one from 1987 to 1990, and zero otherwise. T-statistics based on Huber/White robust standard errors clustered by state are presented in parentheses. ***, ** and * indicate significance at the 1%-, 5%- and 10%-levels, respectively. Appendix A provides a detailed description of all variables.

	(1)	(2)	(3)	(4)
	Post-beneficiaries		Pre- and post-beneficiaries	
Panel A: Firm investment				
Per cap PAB supply x Post-1986	0.0021**	0.0029	0.0035**	0.0055***
	(2.221)	(1.400)	(2.113)	(3.030)
Firm controls	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes	No	Yes	No
Industry-Post FE	No	Yes	No	Yes
Number of observations	844	843	424	424
Adjusted R^2	0.474	0.488	0.530	0.566
Panel B: Firm employment				
Per cap PAB supply x Post-1986	0.0007	0.0011**	0.0011**	0.0017***
	(1.554)	(2.610)	(2.266)	(2.935)
Firm controls	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes	No	Yes	No
Industry-Post FE	No	Yes	No	Yes
Number of observations	841	840	428	428
Adjusted R^2 (within)	0.284	0.289	0.226	0.262

Table 9
The Texas PAB lottery and firm investment

The sample consists of firms that participated in the Texas PAB lottery between 1996 and 2001. Lottery win dummy is a dummy equal to one if the firm won any of its lottery attempts in the respective calendar year, and zero otherwise. Log(lottery-allocated bond volume) represents the natural logarithm of the total bond amount won in a lottery year in USD plus one, and is zero for non-winning firms. The dependent variable is the difference between the natural logarithm of capital expenditures divided by the beginning of period total assets in the specified year, and the same variable in the year before the lottery. Year 1 corresponds to the actual lottery year. T-statistics based on Huber/White robust standard errors are presented in parentheses. ***, ** and * indicate significance at the 1%-, 5%- and 10%-levels, respectively. Appendix A provides a detailed description of all variables.

	(1)	(2)	(3)	(4)	(5)	(6)
	$\Delta Year - Pre\ lottery\ year(0)$					
	$\Delta 1-0$	$\Delta 2-0$	$\Delta 3-0$	$\Delta 1-0$	$\Delta 2-0$	$\Delta 3-0$
Panel A: Lottery winning firms						
Lottery win dummy	0.138	0.336**	0.320*	0.165	0.345*	0.391*
	(1.137)	(2.226)	(1.933)	(1.051)	(1.756)	(2.019)
$\text{Size}_{\text{Pre-lottery year}}$	-0.193***	-0.201***	-0.158***	-0.201***	-0.209***	-0.179***
	(-4.102)	(-4.431)	(-4.215)	(-4.371)	(-4.093)	(-3.829)
Lottery year FE	No	No	No	Yes	Yes	Yes
Number of observations	29	25	24	29	25	24
Adjusted R^2	0.488	0.498	0.363	0.459	0.381	0.279
Panel B: Lottery-allocated bond amount						
Log(Lottery-allocated bond volume)	0.009	0.021**	0.020*	0.011	0.021*	0.024*
	(1.192)	(2.298)	(2.011)	(1.119)	(1.813)	(2.108)
$\text{Size}_{\text{Pre-lottery year}}$	-0.193***	-0.201***	-0.158***	-0.201***	-0.209***	-0.179***
	(-4.133)	(-4.492)	(-4.284)	(-4.449)	(-4.181)	(-3.935)
Lottery year FE	No	No	No	Yes	Yes	Yes
Number of observations	29	25	24	29	25	24
Adjusted R^2	0.491	0.504	0.372	0.465	0.389	0.294

Table 10
The Texas PAB lottery and firm employment

The sample consists of firms that participated in the Texas PAB lottery between 1996 and 2001. Lottery win dummy is a dummy equal to one if the firm won any of its lottery attempts in the respective calendar year, and zero otherwise. Log(lottery-allocated bond volume) represents the natural logarithm of the total bond amount won in a lottery year in USD plus one, and is zero for non-winning firms. The dependent variable is the difference between the natural logarithm of firm employment in the specified year, and the same variable in the year prior to the lottery. Year 1 corresponds to the actual lottery year. T-statistics based on Huber/White robust standard errors are presented in parentheses. ***, ** and * indicate significance at the 1%-, 5%- and 10%-levels, respectively. Appendix A provides a detailed description of all variables.

	(1)	(2)	(3)	(4)	(5)	(6)
	$\Delta Year - Pre\ lottery\ year(0)$					
	$\Delta 1-0$	$\Delta 2-0$	$\Delta 3-0$	$\Delta 1-0$	$\Delta 2-0$	$\Delta 3-0$
Panel A: Lottery winning firms						
Lottery win dummy	0.066	0.083	0.144	0.085	0.114	0.185
	(1.329)	(1.241)	(1.453)	(1.490)	(1.258)	(1.464)
$\text{Size}_{\text{Pre-lottery year}}$	-0.002	-0.019	-0.039	-0.007	-0.023	-0.042
	(-0.241)	(-0.953)	(-1.043)	(-0.581)	(-1.263)	(-1.212)
Lottery year FE	No	No	No	Yes	Yes	Yes
Number of observations	29	25	25	28	24	24
Adjusted R^2 (within)	-0.00164	0.0152	0.0530	0.0216	0.0477	0.0643
Panel B: Lottery-allocated bond amount						
Log(Lottery-allocated bond volume)	0.004	0.005	0.009	0.005	0.007	0.011
	(1.318)	(1.272)	(1.440)	(1.497)	(1.292)	(1.439)
$\text{Size}_{\text{Pre-lottery year}}$	-0.002	-0.019	-0.039	-0.007	-0.023	-0.042
	(-0.235)	(-0.936)	(-1.035)	(-0.583)	(-1.246)	(-1.202)
Lottery year FE	No	No	No	Yes	Yes	Yes
Number of observations	29	25	25	28	24	24
Adjusted R^2 (within)	-0.00143	0.0205	0.0524	0.0250	0.0576	0.0629

Appendix A
Definition of variables

Variable	Description
State-level caps for PABs	
Post-1986	Dummy which equals one in the three years following the 1986 Tax Reform Act, i.e., from 1987 to 1990. Source: Own calculation.
Per cap PAB supply	Per cap volume of PAB in USD on the state-level as mandated for 1988-1990. Source: Own calculation based on data from the IRS and U.S. Bureau of the Census.
PAB issuing county	State-bordering county with any PAB issuance by a local government during the period from 1976 to 1985. Source: Own calculation based on data from the U.S. Census Bureau's Annual Survey of State and Local Government Finance.
PAB beneficiary firm	Firm for which any PAB is issued during the period 1987 to 1990. Source: SDC Platinum.
PAB market characteristics	
Log (PAB issuance volume$_{\text{county}}$)	Natural logarithm of one plus the county-level sum of PAB issuance volumes by all local governments in the respective county. Source: Own calculation based on data from the U.S. Census Bureau's Annual Survey of State and Local Government Finance.
Log (PAB deal volume)	Natural logarithm of one plus the PAB's deal composite amount. Source: SDC Platinum.
Maturity	PAB deal maturity in years. Source: SDC Platinum.
Rated dummy	Dummy equal to one if PAB deal is rated, and zero otherwise. Source: SDC Platinum.
CE dummy	Dummy equal to one if PAB deal received any credit enhancement, and zero otherwise. Source: SDC Platinum.
House price index	County-level house price index. Missing data points are imputed with the state-level house price index. Source: Federal Housing Finance Agency.
Texas PAB lottery	
Lottery win dummy	Dummy equal to one if a lottery participating firm wins any of its lottery (project) attempts in the respective calendar year, and zero otherwise. Source: Own calculation based on data from the Texas Bond Review Board.
Log(Lottery-allocated bond volume)	Natural logarithm plus one of the total PAB volume allocated to a firm in the Texas PAB lottery in a calendar year. Source: Own calculation based on data from the Texas Bond Review Board.
Firm characteristics	
Log (Capex / Assets)	Natural logarithm of capex (item: capx) divided by beginning of period total assets (item: at). Source: Compustat.
Log (Employment)	Natural logarithm of one plus the number of employees (item: emp). Source: Compustat.
Lag of Size	Natural logarithm of one plus total assets (item: at), lagged by one period. Source: Compustat.

Continued on next page

Appendix A continued

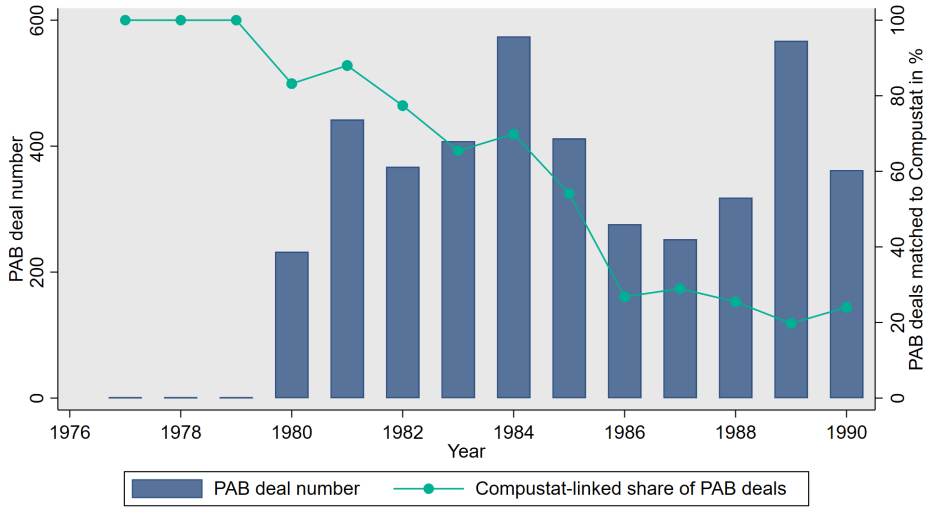
Variable	**Description**
Lag of RoA	Net income (item: ni) divided by total assets (item: at), lagged by one period. Source: Compustat.
Lag of Leverage	Long term debt (item: dltt) plus debt in current liabilites (item: dlc) divided by book value of common equity (item: ceq) plus long term debt and debt in current liabilites. Source. Compustat.
Log (Capex)	Natural logarithm of capex (item: capx). Source: Compustat.
Capex/Assets	Capex (item: capx) divided by beginning of peroid total assets (item: at). Source. Compustat.
PPE growth	Difference between Property, plant and equipment (item: ppent) of the current year and the pre-period, divided by pre-period value. Source: Compustat.
Market-to-book	Total assets (item: at) minus book value of common equity (item: ceq) plus market value of common equity (items: $prcc_f$ multiplied by csho), divided by total assets (item: at). Source: Compustat.
Payout ratio	Sum of dividends on preferred stock (item: dvp), dividends on common stock (item: dvc) and purchase of common and preferred stock (item: prstkc), divided by income before extraordinary items (item: ib) Source: Compustat.
Industry-Year FE	Historic SIC-level-2- Year Fixed Effect. Source: Compustat.

Appendix B

PAB beneficiary firms

This figure illustrates the proportion of new-money PABs obtained from SDC Platinum that can be linked to Compustat within the period from 1977 to 1990. Further, it demonstrates the extent to which SDC covers new-money PAB deals during this period. Subfigure (a) illustrates sample properties for the deal level, while Subfigure (b) captures deal volumes.

(a) PAB Deals and Compustat PAB beneficiaries



(b) PAB Deal Volume and Compustat PAB beneficiaries