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The implications of faster lending: loan processing time and corporate cash holdings*

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Abstract

A unique natural experiment in China – the city-level staggered introduction of administrative approval centers (AAC) – reduces bank loan processing times by substantially speeding up the process of registering collateral without affecting credit decisions. Following the establishment of an AAC, firms significantly reduce their cash holdings. State-owned enterprises are less affected. Cash flow sensitivity of cash holdings decreases, as does the cash flow sensitivity of investment. The share of short-term debt increases, while inventory holdings and reliance on trade credit decrease. Defaults also decrease. These results suggest that timely access to credit has important implications for firms' financial management.

JEL classification: D25, G21, G28, G32

Keywords: banking, efficiency, precautionary cash holdings, capital management, corporate loans

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Non-technical summary

Focus

This paper examines whether the speed at which firms can obtain bank loans matters for their financial decisions, even when overall access to credit is unchanged. While existing research shows that access to finance is crucial for firms, much less is known about how delays and uncertainty in loan processing affect corporate behavior. The study focuses on a large institutional reform in China: the staggered introduction of Administrative Approval Centers (AACs), which substantially reduced the time required to register collateral for bank loans. Importantly, this reform streamlined administrative procedures without altering banks' credit decisions. The central research question is therefore whether faster and more predictable access to bank credit influences firms' liquidity management, financing choices, and operational outcomes.

Contribution

The paper contributes to the literature on financial frictions and corporate finance by isolating the role of timeliness of credit, rather than credit availability itself. Using a natural experiment across Chinese cities and a long panel of listed firms from 1991 to 2017, the authors show how administrative efficiency in lending affects firm behavior. The study combines hand-collected data on collateral registration times with firm-level financial data, allowing for a clean identification of changes in loan processing speed. By focusing on a process-driven reform rather than technological innovation, the paper adds a novel institutional perspective to research on banking efficiency, precautionary cash holdings, capital structure, and trade credit.

Findings

The results show that firms significantly reduce their cash holdings after AACs are introduced in their cities, consistent with a lower need for precautionary liquidity when credit can be accessed quickly. These effects are stronger for non-state-owned enterprises, smaller firms, and firms with more collateralizable assets. Faster lending also reduces firms' dependence on internal cash flows: both cash holdings and investment become less sensitive to cash flow. While overall leverage changes little, firms shift toward greater use of short-term debt, reflecting lower refinancing risk. Inventory holdings and reliance on trade credit decline, and loan defaults become less likely. Overall, the findings suggest that reducing bureaucratic delays in lending can materially improve firms' financial flexibility, with important implications for financial regulation and institutional reform.

1 Introduction

Several studies show that access to credit is important to firms.[1] Yet even for firms that are able to get credit, the process of obtaining loans can be slow and cumbersome. For example, loans provided by the U.S. Small Business Administration (SBA) through banks, a popular financing option for U.S. SMEs, typically take 30-90 days to approve and fund.[2] In the 2023 Small Business Credit Survey, 22% of large bank customers and 18% of small bank customers reported long wait for credit decision or funding as a key challenge.[3] Consistent with the survey evidence, studies show that long payment times can impose financial constraints on small business suppliers.[4] Innovations in technology can help provide more efficient financial services and expand credit access, possibly mitigating such constraints.[5] However, the main challenge of studying the effects of efficiency gains from technological innovations is that they are typically associated with many other changes, not merely more efficient processing.

In this paper, we study how a reduction in bureaucratic delays in bank lending affects firms. We use a unique natural experiment in China – the staggered introduction of administrative approval centers (AAC) – which reduces bank loan processing times by substantially speeding up the process of registering collateral. Unlike most innovations in banking technology, this reform is plausibly exogenous to bank- and firm-level credit decisions (which take place before collateral registration) and simply makes it faster for firms to obtain bank loans when they need them. Importantly, the process of registering collateral is completely separate from the actual credit decision by the bank, providing a clean shock to lending process efficiency. It therefore allows us to isolate the effect of the *timeliness* of access to finance from actual access to finance, as well as from other factors.

To study the effects of the reduction in loan processing times, we manually collect information about the staggered establishment of AACs in 333 cities across China. Starting in the 1990s, China established AAC, first in Shenzhen and then in other cities across the country. This required administrative departments to centralize their offices and provide a "one-stop" approval process for collateral registration. The time to register collateral was shortened from several months to as little as one to five working days, and administrative fees were reduced significantly with many local governments abolishing them altogether. To analyze firm-level outcomes around this reform, we construct a panel dataset of all publicly

[1] See, e.g., Ayyagari et al. (2021), Hau et al. (2022), Chen et al. (2022), Rajan and Zingales (1998), Beck et al. (2004).

[2] Process time estimate provided by various financial websites. See, for example: https://www.bankrate.com/loans/small-business/sba-loan-approval/

[3] See Federal Reserve Banks (2024).

[4] See, e.g., Barrot and Nanda (2020), Murfin and Njoroge (2015), Barrot (2015).

[5] See, e.g., Lin et al. (2021), Xue et al. (2011), Tang (2019), D'Acunto et al. (2019).

listed firms in the Chinese stock market between 1991 and 2017.

To verify that the establishment in AACs reduces bureaucratic delays, we manually collect data on collateral processing times from local newspapers. These data confirm that there is a substantial decrease in approval times for registering collateral following the establishment of AACs. Using World Bank survey data, we confirm that firms in cities that have established an AAC report spending significantly less time on dealing the bureaucracy. In addition, the reported likelihood of informal payments to obtain loans is significantly lower in these cities.

We then study firm-level outcomes, focusing on the dynamics of cash holdings. An important motive for companies to hold cash is uncertainty. Firms with riskier cash flows hold larger amounts of cash (e.g., Opler et al. (1999), Han and Qiu (2007), Bates et al. (2009), Faulkender et al. (2019), Acharya et al. (2012), Hoberg et al. (2014)), as do those with more restricted access to capital markets (e.g., Harford et al. (2014), McLean (2011)). Given that longer processing times for bank loans expose firms to more cash flow risk by lengthening the time to access debt financing, we would expect a reduction in processing times to result in lower precautionary cash holdings. Our empirical results are consistent with this prediction. Following the establishment of an AAC in a city, firms hold significantly lower cash balances. Furthermore, the reduction in cash balances is larger when the city-level reduction in collateral approval times is greater.

Next, we explore cross-sectional differences in the reduction in cash holdings following the establishment of an AAC. First, we would expect that any problems with the administrative approval of collateral are less severe for state-owned enterprises (SOEs), given the government's direct interest in them. Our results are consistent with this prediction. The estimated reduction in cash holdings is clearly larger for non-SOEs than for SOEs. For non-SOEs, we find that the cash reduction is larger for smaller firms and firms in industries with higher levels of property, plant, and equipment, a proxy for the potential collateral amount to be registered, as well as firms in industries with higher leverage.

More timely access to credit should allow firms to access cash when they need it and smooth their investment according to their needs instead of internal cash flows. To explore this, we study the cash flow sensitivity of cash (e.g., Almeida et al. (2004), Khurana et al. (2006)) as well as the cash flow sensitivity of investment (e.g., Fazzari et al. (1988), Kaplan and Zingales (1997), Fazzari et al. (2000)). We find that both cash holdings and capital investment become less sensitive to the firm's cash flows following an AAC introduction.

It is not clear ex-ante whether and how more timely access to debt financing should affect the amount of leverage firms have. To explore this, we perform an analysis of leverage levels around the establishment of an AAC. Our estimates suggest that leverage somewhat increases, but this result is not statistically significant in the OLS regression results. The

composition of leverage changes significantly. Following an AAC introduction, firms use significantly more short-term debt as a share of their total debt. This suggests that reducing the uncertainty of ability to refinance in a timely fashion allows firms to rely on shorter-term debt. We find no significant change in the effective interest rate that firms pay on their debt.

In addition, we then study the implications on the working capital of firms and their reliance on trade credit. We find that an introduction of an AAC is followed by significant reductions in inventory levels. This is consistent with more timely access to financing reducing the uncertainty of being able to purchase additional inventory as needed. There is no significant change in accounts receivable – which is as might be predicted, given that this is trade credit extended to customers by the firm itself. Importantly, we find that firms' reliance on trade credit decreases significantly following an AAC introduction. This is consistent with, e.g., Fisman and Love (2003), who find that financial development is associated with firms being less reliant on implicit borrowing in the form of trade credit.

Given a reduction in loan processing times reduces the uncertainty of accessing finance when needed, we might expect it also to reduce the likelihood of default, as firms are better able to access liquidity when loans are due. To test this prediction, we perform an analysis of loan defaults. We find that the likelihood of default significantly decreases following an AAC introduction.

Our study contributes to the large literature on (often technology-focused) the efficiency of financial services (e.g., Lin et al. (2021), Xue et al. (2011), Tang (2019), D'Acunto et al. (2019)), using a unique setting in China – the staggered establishment of administrative approval centers (AAC) that reduce bureaucratic delays in loan processing – to gain insight into the connection between the timeliness of credit provision and firm outcomes. There are a number of papers that study the role of technology in facilitating a move from branches to digital banking (Kwan et al. (2023), Core and De Marco (2023), Branzoli et al. (2021)) or show that technology can generally contribute to bank performance (e.g., Pierri and Timmer (2022), Berger (2003), Beccalli (2007), Koetter and Noth (2013)). In our case, the shock to bank efficiency is not technology- but process-driven, representing an important addition to this literature. The establishment of AACs also represents an important institutional change that facilitates more efficient functioning of the banking sector without directly affecting banks' credit decisions. Hence, it also provides possibly important policy lessons for regulators.

We also contribute to the corporate finance literature on precautionary cash holdings by firms (e.g., Opler et al. (1999), Han and Qiu (2007), Bates et al. (2009), Faulkender et al. (2019), Acharya et al. (2012), Hoberg et al. (2014), Boyle and Guthrie (2003), Favara et al. (2021)) and firms' motivations to hold cash more generally (e.g., Foley et al. (2007),

Graham and Leary (2018), Frésard (2010)). Our setting allows us to isolate the role of the time it takes to access credit and timing uncertainty rather than the ability to obtain credit. Our study is also related to the large literature on the dynamics or firms' investment and its dependence on firm cash flows (e.g., Fazzari et al. (1988), Kaplan and Zingales (1997), Fazzari et al. (2000)), as well as the sensitivity of cash holdings to cash flows (e.g., Almeida et al. (2004), Khurana et al. (2006)) and the literature on firms' capital structure adjustment (e.g., Byoun (2008), Leary and Roberts (2005), Öztekin and Flannery (2012)).

A related study by Barrot and Nanda (2020) shows that faster payments to U.S. government contracts had important implications to small business contractors. This is consistent with other evidence that longer payment times impose financial constraints on small frms (Murfin and Njoroge (2015), Barrot (2015)). Lieberman et al. (2025) also find that payment times contain information about firm risk and bargaining position in the supply chain. Our findings are consistent with these prior studies on payment times, but instead of supplier payments, we provide evidence on the importance of the timeliness of bank credit.

We further contribute to the literature on the importance of trade credit (e.g., Fisman and Love (2003), Levine et al. (2018)). Finally, our study also adds to the literature focusing on Chinese financial institutions and their role in economic development (e.g., Allen et al. (2005), Bailey et al. (2011), Cull et al. (2015), Gao et al. (2022)) as well as the role of economic reforms in firm performance (e.g., Li (1997), Gan et al. (2018), Jiang and Kim (2020)). Our paper is also related to the literature on the role of banks and institutions in economic growth (e.g., Demirgüç-Kunt and Maksimovic (1998), La Porta et al. (1998), Boot and Thakor (1997)).

2 Institutional background

2.1 Bank loans in China

The banking sector has been a significant contributor to China's economic growth (e.g., Allen et al. (2005)). Bank loans in China primarily fall into three categories: credit loans, guaranteed loans, and collateral (pledged) loans (Chen et al. (2013)). Credit loans, which do not require guarantees or collateral, are usually restricted to firms with high credit quality. Guaranteed loans involve a third-party guarantor, offering security to the lender. Collateral loans, the largest of the three categories, require firms to transfer control of collateralized assets to the lending bank. Common types of collateral include land, buildings, machinery, vehicles, and equity stakes in the firm or affiliated firms (Yang and Qian (2008)). As of 2016, collateral loans accounted for nearly 45% of loans issued to domestic firms.

2.2 Procedure for obtaining collateral loans in China

Despite their importance as a source of external financing, the process of obtaining collateral loans in China remains complex, involving not only the lender but also relevant government departments. The loan approval process can be broken down into three stages:

1. **Application for collateral loan.** Firms submit a loan application and the necessary documents to the bank. The bank's credit department then assesses the loan by commissioning a third-party appraisal agency to evaluate the collateral, with the associated costs borne by the borrower. Once the appraisal report is complete, the bank's credit management team reviews it, and if approved, a loan contract is signed with the firm.
2. **Collateral registration.** Before disbursing funds, the borrowing firm must register its collateral with the appropriate government authorities, presenting the loan contract and proof of ownership of the collateral. This process can be slow and is often complicated by the involvement of multiple administrative departments.[6] The borrowing firm is responsible for paying all administrative fees and associated taxes, and the bank's claim is legally protected only upon completion of the collateral registration process.[7] In China, different types of fixed and mobile property are supervised and managed by various government departments, which can significantly slow down the administrative process for collateral registration. For instance, land-based collateral is typically registered with local land departments, while forestry-based collateral falls under the jurisdiction of local forestry departments. Equipment and other movable property are registered with local industrial and commercial departments, and share pledges are handled by securities registration authorities. The involvement of multiple government departments in this process adds complexity and can cause delays in obtaining necessary approvals.[8]

[6]More detailed information is provided in Internet Appendix Section IA.2.

[7]According to the Security Law of the People's Republic of China (1995) (the "Security Law"), property collateral must be registered with the appropriate administrative department. Failure to do so renders the collateral-holder's rights over the property vulnerable to claims from third parties. Specifically, Article Nos. 41 and 43 stipulate that any property listed under Article No. 42 must be registered for the collateral loan contract to take legal effect. If the collateralized (pledged) property is not properly registered, the collateral-holder's interests may be subject to third-party claims, making the protection of the lender's rights dependent on this registration process.

[8]Article No. 42 of the Security Law of the People's Republic of China outlines the administrative authorities responsible for the registration of various types of collateral property: (1) where land use rights pertaining to land with no attachments are collateralized, registration shall be administered by the land administration departments responsible for verification and issuing of land use right certificates; (2) where urban real estate or buildings of township and village enterprises are collateralized, registration shall be administered by departments designated by local governments at county level and above; (3) where forestry

3. **Granting of loan.** Upon the completion of the collateral registration process, the lending bank releases the funds to the borrower.

2.3 Staggered setup of administrative approval centers (AAC)

The administrative approval system in China represents a government intervention designed to align market operations with certain characteristics of the country's historical planned economy. Under this system, firms are required to obtain approval from various government departments for their investment and financing activities. To address inefficiencies in this process, the Chinese government has, in recent years, implemented reforms, including the creation of Administrative Approval Centers (AACs). These centers are intended to streamline bureaucratic procedures and improve economic efficiency by centralizing the approval process for firms, reducing delays, and simplifying administrative tasks.

AACs require government departments to centralize their operations, offering a "one-stop" approval process for projects. This approach was first piloted in the 1990s in cities such as Shenzhen. Starting in 2001, with strong support from the central government, the reform quickly expanded across China. By the end of 2016, 324 of the 333 prefecture-level cities in China had established AACs, as shown in Figure 1. The establishment of AACs significantly simplified the administrative approval process for collateral registration, reducing the number of procedural steps and cutting down on delays. The guidelines introduced by the AACs mandate that the registration process for land collateral must be completed within ten working days, housing collateral within five days, and movable property mortgages within three days. Additionally, the administrative fees associated with collateral registration were drastically reduced as a result of the AAC reform, further improving the efficiency of the process.

For instance, an AAC was established in Shaoyang City, Hunan Province, in 2003, centralizing various municipal departments such as the Bureaus of Municipal Finance, Taxation, Industry and Commerce, Public Security, Economics and Information, Housing and Urban-Rural Development, and Land Resources, along with 37 other departments that hold approval authority. The AAC integrated these departments into a unified system, connect-

trees are collateralized, the registration shall be administered by the forestry administration departments at county level and above; (4) where aircraft, ships and vehicles are collateralized, the registration shall be administered by departments in charge of the registration of means of transport; (5) where equipment and other movable property is mortgaged, the registration shall be administered by the local industrial and commercial administration departments. Additionally, Article No. 78 specifies that, for legally transferable share certificates, a written pledge contract must be signed by the pledger and the pledgee, and the pledge must be registered with the securities registration authorities. Article No. 79 extends this requirement to legally transferable trademarks, patents, or copyright privileges, where a written pledge contract must be registered with the relevant administrative authorities.

ing entities such as the Property Rights Supervision Office and the Real Estate Transaction Center, as well as property and land appraisal agencies, accounting firms, auditing firms, and notary offices, to create a streamlined, one-stop collateral loan registration "window".

This system was designed to facilitate "centralized acceptance, centralized charges, centralized surveys, and completion within the required timescale". An in-depth analysis, presented in the Internet Appendix Section IA.2, illustrates how AAC implementation relates to the credit process, focusing on commonly used land and housing collateral.The case study shows that after the establishment of AACs, firms only need to visit the "one-stop" collateral registration window twice: once for signing the loan contract and once for finalizing the loan. This centralized process greatly simplifies the procedure and significantly reduces loan processing times.

Additionally, the administrative approval fees for collateral registration were significantly reduced after the establishment of AACs. Prior to these reforms, the collateral registration process involved multiple government departments with overlapping or unclear responsibilities, resulting in numerous inexplicable fees and repeated charges. This not only increased the bureaucratic burden on firms but also delayed the timely processing of collateral loans(Liu (1997)). The introduction of the "one-stop" window under the AAC system centralized all administrative, institutional, and service fees, reducing the potential for other units to charge additional unauthorized fees.

A notable example of the AAC reform can be seen in the Second Tractor Factory in Zhengzhou City. In 1997, the factory, facing a product backlog and declining economic efficiency, sought a bank loan using 160,000 square meters of land and buildings as collateral. The Land Bureau assessed the land at 48.08 million RMB, leading to a total appraisal fee of 144,000 RMB (charged at 0.3% of the land's value), a collateral registration fee of 96,000 RMB (charged at 0.2%), and a notary fee of 48,000 RMB (charged at 0.1%). The total fees for the land alone amounted to 288,000 RMB, with additional fees incurred for the buildings on the land, further increasing the cost. After the AAC reform, most cities introduced standardized fees for collateral registration, charging a flat rate per "case" regardless of the collateral's value. The standardized fees in each city now typically range from 100 to 2,000 RMB per collateral registration, significantly reducing costs for businesses and improving the efficiency of the registration process.

3 Data and methodology

3.1 Sample selection

Our sample covers all of the firms listed on the Shanghai and Shenzhen Stock Exchanges between 1991 and 2017. We begin in 1991 because this is when China began to establish its stock market. Since many AACs were set up between 2001 and 2005, we end our sample in 2017 to have a roughly balanced period of pre- and post-treatment observations. We manually collect information on the establishment of AACs in 333 cities across China. Figure 1 presents the distribution of AACs by year.

We construct a panel dataset of all publicly listed firms in the Chinese stock market for our sample period. We obtain firm-level financial and accounting information from the CSMAR database, and city-level data, including GDP, from the National Bureau of Statistics of China. We filter the sample to exclude: (1) firms located in Jiangmen, Anshun, Bayan Nur, Ulanqab, Jiyuan, Haidong, Sansha, and Puer, which were not formally established as prefecture-level cities prior to the establishment of AAC; (2) financial firms; (3) special treatment (ST) firms; (4) firms founded after the establishment of a city's AAC; (5) observations with missing variables. This leaves us with a sample of 31,274 firm-year observations with 2,542 unique firms.

Table 1 presents summary statistics for our firm-year sample. The mean of *Cash/sales* for all sample firms is 0.374, while the sample average debt level is equals to 20% of total assets. Nearly 68% of the debt is short-term. The average effective interest is 9%. The average firm holds inventory equivalent to 42% of its annual sales, while the average amount of trade credit used is 24% of the annual cost of goods sold.

3.2 AAC and bureaucratic delays

To verify that the establishment of AACs reduces bureaucratic delays, we manually collect information from news reports in local newspapers. We identify local newspapers for each city using the database available at CNKI.com.[9] For example, "Beijing Daily" is recognized as the local newspaper for Beijing. We then search for relevant news reports in these newspapers using specific keywords associated with AACs. These keywords include "administrative approval center", "governmental affairs center", "governmental affairs service center", "ad-

[9]CNKI (China National Knowledge Infrastructure) is a comprehensive Chinese database providing access to a wide range of digital resources across disciplines. The platform provides access to a wide collection of Chinese newspapers covering various topics such as current events, politics, economics, culture, and more. This allows users to access articles, reports, and editorials from national and regional newspapers, making CNKI a valuable resource for contemporary issues or historical news articles from China.

ministrative service center", "public service center", "citizen's home", and "citizen's center". Once the relevant news reports are identified, we extract information related to reductions of approval times and improvement in administrative efficiency. Using these data, we construct a city-year level dataset for the variable *Approval time* measuring the average number of days it takes to register collateral for a loan.

Figure 2 presents the distribution of loan approval times across cities before and after the establishment of an AAC. In the pre-AAC period, the distribution is wider and more dispersed, indicating a significant variation in the time required to process loan approvals. The approval time extends up to 80 days, with a noticeable concentration around 40 to 60 days. In the post-AAC period, this distribution is more concentrated and shifts towards shorter approval times. Most approval times fall between 0 to 20 days, reflecting a substantial reduction in bureaucratic delays. This figure quantitatively illustrates how AACs are associated with shorter and more predictable loan approval times, indicating improved efficiency in firms' access to credit.

To confirm that the introduction of an AAC reduces collateral processing times, we perform an analysis using hand-collected newspaper report data. Table 2 presents a city-level regression analysis of approval times for registering collateral before and after the establishment of an AAC. The sample includes two observations for each city, before and after the introduction of an AAC. This analysis uses both the actual approval time and its natural logarithm as dependent variables. *Approval time* is the average number of days it takes to register collateral for a loan, based on our hand-collected press reports. The regressions account for various city-level economic and demographic characteristics. *GDP per capita* is the GDP per capita for the city. *GDP pc. growth* is the growth of GDP per capita for the city. *Ind. tertiary* is the share of tertiary industry in the GDP of the city. *Population density* is the natural logarithm of the city's population density. *ln(Ind. enterprises)* is the natural logarithm of the number of industrial enterprises in the city. *ln(Average wage)* is the natural logarithm of the average wage of the city. *Foreign-invested GDP* is the proportion of foreign investment in the city, measured by GDP created by foreign-invested enterprises divided by total GDP.

Across all models in Table 2, we find the establishment of an AAC is associated with a substantial reduction in the time required to register collateral. This reduction is both statistically significant and economically meaningful. For example, in column (1), on average, approval times fall by about 26 days after an AAC is established, holding other factors constant. Given that pre-reform collateral registration often took around one to two months, this is a reduction of roughly 60–70% in processing time, effectively transforming a bureaucratic process from a multi-month delay into something closer to a few days or weeks. Column (2)

produces a similar effect size when additional controls are included, confirming the robustness of the finding. When the dependent variable is expressed in logs, columns (3) and (4) show declines of about 2.15 log points, which translate to a reduction of approximately 88% in approval time relative to the baseline. This magnitude underscores that the AAC reform is not a marginal procedural improvement but a fundamental streamlining of credit-related bureaucracy.

In Internet Appendix Section IA.3.1, we also verify how AACs are associated with changes in efficiency using data from the World Bank (World Bank (2006)). The results show that in cities with an AAC, firms spend significantly less time dealing with bureaucracy and report a significantly lower likelihood of informal payments to obtain loans.

4 Firm-level outcomes

4.1 Cash holdings

An important motive for companies to hold cash is uncertainty. Firms with riskier cash flows hold larger amounts of cash (e.g., Opler et al. (1999), Han and Qiu (2007), Bates et al. (2009), Faulkender et al. (2019), Acharya et al. (2012), Hoberg et al. (2014)), as do firms with less access to capital markets (e.g., Harford et al. (2014), McLean (2011)). Longer and more uncertain processing times for bank loans expose firms to more cash flow risk by lengthening the time it takes to access debt financing, so we would expect a reduction in processing times to lead to lower precautionary cash holdings.

4.1.1 Treatment based on corporate headquarter city

To test this conjecture, we perform a regression analysis of the following form:

$$Cash/sales_{i,t} = \alpha_i + \theta_{j,t} + \tau_{p,t} + \beta Post \times AAC + \gamma X + \epsilon_{i,t}, \tag{1}$$

where i, j, p, and t denote the firm, industry, province, year, respectively. The dependent variable is *Cash/sales*. The interaction variable $Post \times AAC$ indicates whether the city where the firm is headquartered has established an AAC. X is a vector of controls, including *ln(Total assets)* and *Leverage*, calculated as total debt divided by total assets. The control variables are lagged by one year. We include firm and year fixed effects, or alternative sets of fixed effects such as both industry-year joint fixed effects and province-year joint fixed effects for robustness.

There are well-documented problems with using standard OLS estimates with two-

way fixed effects in staggered difference-in-differences settings (e.g., de Chaisemartin and D'Haultfœuille (2020), Goodman-Bacon (2021), Sun and Abraham (2021), Baker et al. (2022)). To address these, we perform our regression analyses using both standard OLS as well as the estimator of Borusyak et al. (2024) (titled "BJS" in the tables).

The results are shown in Panel A of Table 3. The coefficients of $Post \times AAC$ are negative and statistically significant across all model specifications, showing that firms hold significantly lower cash balances following the establishment of an AAC in their city. This relationship is economically meaningful. Based on the most saturated OLS model in column (3), the introduction of an AAC is associated with a 4.22 percentage-point reduction in cash holdings relative to sales, or 11% reduction relative to the sample average *Cash/sales*. The corresponding BJS estimate indicates a larger reduction of 7.45 percentage points, or 20% relative to the sample average.

Figure 3 reports yearly coefficients relative to the establishment year of an AAC, using the same specification as in column (3) of Table 3. Panel A shows OLS estimates, and panel B shows the BJS estimates. With either methodology, the treatment and control groups show no significant differences in the pre-treatment period, but there is a clear decline in cash holdings following an AAC introduction.

4.1.2 Treatment based on corporate geographic footprint

The analysis above assigns AAC treatment status to firms based on the location of their headquarters. However, firms may hold collateral that can be registered in cities other than their headquarters, meaning they could also be affected by the introduction of AACs in those locations, depending on the geographic footprint of their subsidiaries. To capture this broader exposure, we construct a continuous, firm-level treatment measure, *Avg (Post* $\times$ *AAC)*, and run the analysis as the following form:

$$Cash/sales_{i,t} = \alpha_i + \theta_{j,t} + \tau_{p,t} + \beta Avg(Post \times AAC) + \gamma X + \epsilon_{i,t}, \tag{2}$$

This variable *Avg (Post* $\times$ *AAC)* represents the average of $Post \times AAC$ across all the geographic locations of a firm's subsidiaries, not just the headquarters. By incorporating this broader geographic consideration, the firm-level treatment variable *Avg (Post* $\times$ *AAC)* captures the exposure of firms to AAC reforms across all the cities where they have operations, rather than limiting the analysis to headquarters. This adjustment allows for a more comprehensive evaluation of the reform's effects, as many firms may benefit from the AACs introduced in locations where their collateral is registered, even if those locations are not the firm's primary base of operations. Moreover, by including city-year fixed effects based on the

firm's headquarters, we account for time-variant factors that could affect cities differently.

The results in Panel B of Table 3 are qualitatively consistent with those found in Panel A but exhibit larger economic magnitudes. This suggests that firms with broader geographic presence experience greater changes following the reform, likely because having AACs across multiple cities facilitates more efficient credit access from diverse locations, reducing the need for precautionary cash holdings and improving financial management.

4.1.3 City-level treatment heterogeneity

We further explore the AAC reforms by dividing the sample based on the magnitude of reductions in collateral approval times across different cities. To do this, we use the sample median of the reduction in collateral processing times for cities where data is available from the hand-collected newspaper data. This allows us to distinguish between cities with large reductions in processing time and those with smaller reductions.

The results in Panel C of Table 3 demonstrate that firms located in cities with larger reductions in collateral approval times experience a substantially greater reduction in cash holdings following the introduction of an AAC. This suggests that the more significant the decrease in bureaucratic delays, the more pronounced the reduction on cash holdings. In contrast, firms in cities with smaller reductions in processing times still reduce their cash holdings, but the reduction is both statistically and economically less pronounced.

Overall, the results clearly indicate that firms significantly reduce their cash holdings immediately after the introduction of an AAC. This pattern supports the hypothesis that timeliness of access to credit plays a crucial role in shaping firms' financial management. Specifically, when firms can access credit more quickly and with fewer delays, they no longer need to maintain high levels of precautionary cash holdings to safeguard against the uncertainty of financing.

4.2 Cross-sectional differences in cash holding dynamics

4.2.1 SOE v.s. Non-SOEs

In this section, we delve deeper into the cross-sectional differences in the reduction of cash holdings following the introduction of AACs, using the distinction between SOEs and non-SOEs. SOEs provide a useful setting to examine how improvements in banking efficiency associated with AAC reforms are reflected in firms' liquidity management practices. Given the government's direct involvement in SOEs, these firms typically enjoy more favorable access to credit and administrative processes, with fewer financing constraints than non-SOEs. Several studies have highlighted that SOEs tend to face significantly lower credit

constraints due to their closer ties to the government and preferential treatment by state-owned banks (e.g., Allen et al. (2005), Cull et al. (2009), Cull et al. (2015), Huang et al. (2020)).

Given these characteristics, SOEs represent a natural control group in this setting. If AAC reforms primarily reduce the bureaucratic frictions that disproportionately affect more credit-constrained firms, we would expect changes for SOEs to be smaller compared with non-SOEs, as the latter group faces more significant financing constraints. Consistent with this, In Table 4, our cross-sectional results show that the reduction in cash holdings is significantly larger for non-SOEs, supporting the notion that non-SOEs derive more substantial benefits from the improved administrative efficiency introduced by AACs. In contrast, the relatively smaller reduction in cash holdings for SOEs aligns with the idea that they are less constrained by the pre-existing bureaucratic inefficiencies that AAC reforms seek to address.

4.2.2 Within non-SOEs

Given this differential effect for SOEs and non-SOEs, in Table 5, we then perform a cross-sectional analysis of the non-SOE part of the sample.[10] These analyses allow us to better understand how the introduction of AACs affects different types of non-SOE firms and to explore further heterogeneity within this group.

The results suggest that the reduction in cash holdings is larger for smaller firms, which are typically more financially constrained and reliant on external financing. Smaller firms generally face greater barriers to accessing credit, and therefore, improvements in the timeliness of credit access—such as those brought about by AACs—tend to be more pronounced in their liquidity management.This aligns with existing literature, which shows that smaller firms tend to hold more precautionary cash due to their limited access to capital markets and bank financing (e.g., Almeida et al. (2004)).

Furthermore, firms operating in industries with higher levels of property, plant, and equipment (PPE), scaled by total assets, also exhibit a greater reduction in cash holdings. PPE serves as a proxy for the amount of collateral that a firm can pledge when applying for a loan. Firms in industries with more tangible assets benefit more from AAC reforms, as these assets can be more easily registered and leveraged to secure financing. The efficiency gains in collateral registration directly reduce the friction in obtaining loans, allowing these firms to lower their precautionary cash reserves.

Additionally, firms in industries with higher leverage experience a larger reduction in cash holdings. Higher leverage indicates a greater reliance on debt financing, making access

[10]For completeness, in Internet Appendix Section IA.3.5, we show the same analyses for the full sample including SOEs.

to timely credit crucial for meeting obligations and sustaining operations. As AAC reforms streamline the process of securing loans, firms with higher leverage can rely more on external credit and less on internal liquidity buffers, leading to a larger reduction in their cash holdings.

These findings suggest that AACs matter more for non-SOEs that are smaller, have more collateralizable assets, and operate with higher leverage. These firms are likely to experience the most significant benefits from improvements in administrative efficiency, as they are more dependent on external financing and more affected by delays in the loan approval process. The introduction of AACs alleviates these constraints, enabling them to reduce their reliance on cash as a precautionary measure and to better manage their liquidity needs.

4.3 Cash flow sensitivity of cash and investment

More timely access to credit should allow firms to access cash when they need it and to smooth their investment according to their investment needs instead of internal cash flows. This should also reduce the need to save from current cash flows. To explore this, we first study the cash flow sensitivity of cash holdings following the establishment of an AAC. Following Almeida et al. (2004) and Khurana et al. (2006), the baseline model to measure cash flow sensitivity of cash is specified as:

$$\begin{aligned} \Delta Cash_{i,t}/total\ assets_{i,t-1} =& \alpha + \beta_1 CF_{i,t}/Total\ assets_{i,t-1} \times Post \times AAC \\ &+ \beta_2 CF_{i,t}/Total\ assets_{i,t-1} \times AAC \\ &+ \beta_3 CF_{i,t}/Total\ assets_{i,t-1} + \gamma X_{i,t-1} + \epsilon_{i,t}, \end{aligned} \tag{3}$$

where the dependent variable is Δ *Cash/Total assets*, the change in cash during the year scaled by total assets at the beginning of the year. AAC is a dummy that equals one if the city established an AAC within the sample period, and zero otherwise. $Post \times AAC$ is a dummy that equals one if the city has established an AAC. *CF* is the earnings before extraordinary items and depreciation. X is a vector of controls including Q, the market value divided by the book value of assets, and *ln(Total assets)*. We include firm fixed effects, year fixed effects, and city fixed effects. The coefficient for *CF/Total assets* captures the cash flow sensitivity of cash, and a higher coefficient indicates that firms have a higher propensity to save cash out of cash flows. In general, constrained firms should have a positive cash flow sensitivity of cash, while unconstrained firms' cash savings should not be systematically related to cash flows (Almeida et al. (2004)).

The results are shown in Panel A of Table 6. Following an AAC introduction, the sensitivity of cash holdings to cash flow decreases significantly. This suggests that more

timely access to credit reduces the need to save cash from operating cash flows.

We then study the cash flow sensitivity of investment (e.g., Fazzari et al. (1988), Kaplan and Zingales (1997), Fazzari et al. (2000)), using a similar baseline specification:

$$\begin{aligned} Capex_{i,t}/K_{i,t-1} =& \alpha + \beta_1 CF_{i,t}/K_{i,t-1} \times Post \times AAC \\ &+ \beta_2 CF_{i,t}/K_{i,t-1} \times AAC \\ &+ \beta_3 CF_{i,t}/K_{i,t-1} + \gamma X_{i,t-1} + \epsilon_{i,t}, \end{aligned} \tag{4}$$

where *Capex* is the capital expenditure during the year and K is the net property, plant, and equipment on the balance sheet. X is a vector of controls including Q, the market value divided by the book value of assets, and *ln(K)*. We include firm fixed effects, year fixed effects, and city fixed effects. The coefficient for *CF/K* captures the cash flow sensitivity of investment.

The results are shown in Panel B of Table 6. Similar to the cash flow sensitivity of cash, following an AAC introduction, the sensitivity of investment to cash flow decreases significantly. This suggests that more timely access to credit reduces firms' dependence on operating cash flows to fund capital investment and therefore allows better matching of investments with investment needs instead of with availability of funds.

4.4 Debt structure

Next, we examine the amount and composition of leverage that firms hold. It is not ex-ante clear whether and how more timely access to debt financing should affect the overall leverage ratio. Since the establishment of an AAC does not alter banks' credit decisions, it should not directly change firms' overall access to credit. However, by making the process of obtaining loans faster, the reform could influence the composition of debt. When the time to access credit is long and unpredictable, the refinancing risk associated with short-term borrowing is more severe. Greater certainty in timely access to credit should make short-term debt relatively more attractive.

To explore these questions, we perform an analysis of leverage levels and composition around the establishment of an AAC. The specification is similar to Table 3, simply replacing the dependent variable. The results are shown in Table 7. There is a slight increase in leverage following the establishment of an AAC. This increase is not statistically significant with standard OLS estimates, but it is somewhat larger and statistically significant based on the BJS estimator. The composition of leverage changes more substantially. Following an AAC introduction, firms use significantly more short-term debt as a share of their total debt. This suggests that reducing the uncertainty of ability to refinance in a timely fashion

allows firms to rely on shorter-term debt.

We also observe an increase in the proportion of collateralized loans with the OLS estimate while the BJS estimate is smaller and not statistically significant. This suggests that easier and faster collateral registration may encourage greater use of collateralized borrowing, though the strength of the effect depends on the estimation method. We find no significant change in the effective interest that firms pay on their debt, indicating that these shifts in debt composition and collateral use occur without an associated increase in borrowing costs.

4.5 Inventory and trade credit

For a firm, an obvious substitute for bank lending is trade credit. Firms with more limited access to bank credit are likely to use more trade credit in general (e.g., Petersen and Rajan (1997), Wilner (2000), Casey and O'Toole (2014)), while firms with better access to credit may use trade credit to channel financing to weaker firms (e.g., Love et al. (2007), Cull et al. (2009)). Several studies focus on the nature of the underlying product to explain the use of trade credit (Fabbri and Menichini (2010), Giannetti et al. (2011)). Dass et al. (2015) emphasize the role of trade credit as a commitment device for making relationship-specific investments. Our setting allows us to explore how the timeliness of access to bank credit influences a firm's reliance on trade credit. As bank financing becomes more dependable, we might expect the reliance on trade credit to decrease.

Similarly, we can study how firms' inventory holdings depend on the timeliness of access to credit. Financing constraints can limit a firm's investment in inventory (e.g., Carpenter et al. (1998), Brown and Haegler (2004), Dasgupta et al. (2019)). Hence, delays or uncertainty about the timing of access to bank financing might prompt firms to hold larger inventories to avoid losing sales for lack of inventory. While this stockout-avoidance motive is widely recognized in the literature (e.g., Kahn (1987), Kahn (1992), Wen (2011)), the financing channel in our setting is novel to this literature.

Given these predictions, we perform an analysis of firms' inventory levels and their reliance on trade credit. This analysis is shown in Table 8. We find that the introduction of an AAC is followed by significant decreases in inventory levels. This result is consistent with more timely access to financing reducing the need to hold large precautionary inventories, as firms can purchase additional stock when required with less concern about financing delays. Accounts receivable show no significant change, which is not surprising, since receivables reflect trade credit extended to customers and are not directly tied to the firm's own access to external financing. In contrast, accounts payable decline significantly, indicating that firms reduce their reliance on trade credit from suppliers when bank financing becomes faster and

more predictable.

4.6 Likelihood of default

Since a reduction in loan processing times reduces the uncertainty of accessing finance when needed, we might expect it also to reduce the likelihood of default as firms are better able to access liquidity when loans are due. To test that, we perform an analysis of loan defaults, using a specification is similar to that in Table 3, simply replacing the dependent variable.

The results are shown in Table 9. The dependent variable is *Default*, a dummy taking the value of one if the firm defaults on its loans during the year. The default is estimated to take place if short-term bank loans in the previous year (including shot-term loans and long-term loans due within one year) is larger than the repayment of bank loans recorded in the current year. For both OLS and BJS estimations, the coefficients of $Post \times AAC$ are negative and statistically significant, suggesting that the likelihood of default significantly decreases following an AAC introduction.

5 Further analysis

In the Internet Appendix, we perform a number of additional analyses. These are briefly summarized below:

(i) *Additional evidence on bureaucratic delays.* In Section IA.3.1, we examine how AACs are associated with changes in efficiency using data from the World Bank (World Bank (2006)). We perfom a city-level regression analysis of the average time spent dealing with bureaucracy by a firm as well as the likelihood of informal payments to obtain loans, depending on whether the city has established an AAC. The results show that in cities with an AAC, firms spend significantly less time dealing with bureaucracy and report a significantly lower likelihood of informal payments to obtain loans.

(ii) *Firm performance.* In Section IA.3.2, we study whether faster access to credit translates into differences in firm performance. There is no consistent evidence of a change in sales growth. We find that EBIT margins decrease across both estimators. This suggests that costs in firms' income statements increase following an AAC introduction.

(iii) *Capital investment.* In Section IA.3.3, we study firms' capital investment dynamics following an AAC introduction, including capital investment and return on invested capital. Overall, following the introduction of AACs, both firms' capital expenditures relative to sales and their return on invested capital decrease. Together with the findings on firm profitability, these results would be consistent on reduced investment in

fixed assets (captured by capital expenditure) and increased investment in intangibles that would be recorded as a cost in a firm's income statement.

(iv) *Innovation activity.* In Section IA.3.4, we study firms' innovation activities following an AAC introduction, focusing on the number of patents and R&D investments relative to sales. Following the establishment of AACs, firms appear to increase the number of patent applications. The increase in R&D investment relative to sales is less clear, with the statistical significance of the estimates depending on the estimation method used. The sample where we have R&D data available is also very limited, making these results somewhat anecdotal. Nevertheless, these results are consistent with the establishment of an AAC being followed by an increase in innovation activity.

(v) *Bank performance.* In Section IA.3.6, we examine whether AAC coverage in a bank's branch network translates into differences in bank outcomes. Using matched branch–year data and bank financial statements, we find no significant association between AAC exposure and banks' ROA, ROE, loan growth, total loan balances, or mortgage loan shares. This suggests that at least in the short run, AAC introduction does not affect bank-level profitability or lending structure.

(vi) *Aggregate city-level lending.* In Section IA.3.7, we analyze whether AACs influence overall credit supply at the city level, using city-level loan statistics from CSMAR. The results show no significant differences in loan balances or their growth rates following the introduction of AACs. By contrast, local economic fundamentals such as GDP per capita and the number of industrial enterprises are strongly related to city-level loan activity.

6 Conclusion

In this study, we use a unique natural experiment in China – the staggered introduction of administrative approval centers (AAC) – to study the implications on firms of more timely of access to credit. AAC reforms, aimed at streamlining and reducing bureaucratic delays in the loan approval process, provide an ideal setting to investigate how the timeliness of credit access influences firms' liquidity management, capital structure, and operational decisions.

Our findings demonstrate that firms significantly reduce their precautionary cash holdings following the introduction of an AAC in their city, indicating that improved access to external credit diminishes the need for large internal liquidity buffers. This reduction in cash holdings is particularly pronounced in non-SOEs, smaller firms, firms with more tangible assets (such as property, plant, and equipment), and firms in industries with higher leverage. These firms, which are typically more financially constrained and dependent on external financing,

benefit the most from the administrative efficiency gains that AACs deliver.

Our findings suggest by reducing bureaucratic delays in collateral registration and loan approvals, AACs enhance the financial flexibility of firms, allowing them to lower their precautionary cash balances and reallocate resources toward more productive uses, such as investment and expansion. This, in turn, promotes economic growth by fostering a more efficient allocation of capital. Institutions reducing bureaucracy and making it faster for firms to access financing when needed may hence be an important component in the ability of the financial sector to support real businesses.

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Figure 1: AAC establishment over time

This figure presents the temporal distribution of the establishment of AACs across prefecture-level cities in China. The grey bars indicate the number of new AACs established each year, while the black dotted line shows the cumulative number of AACs established from the beginning of the program.

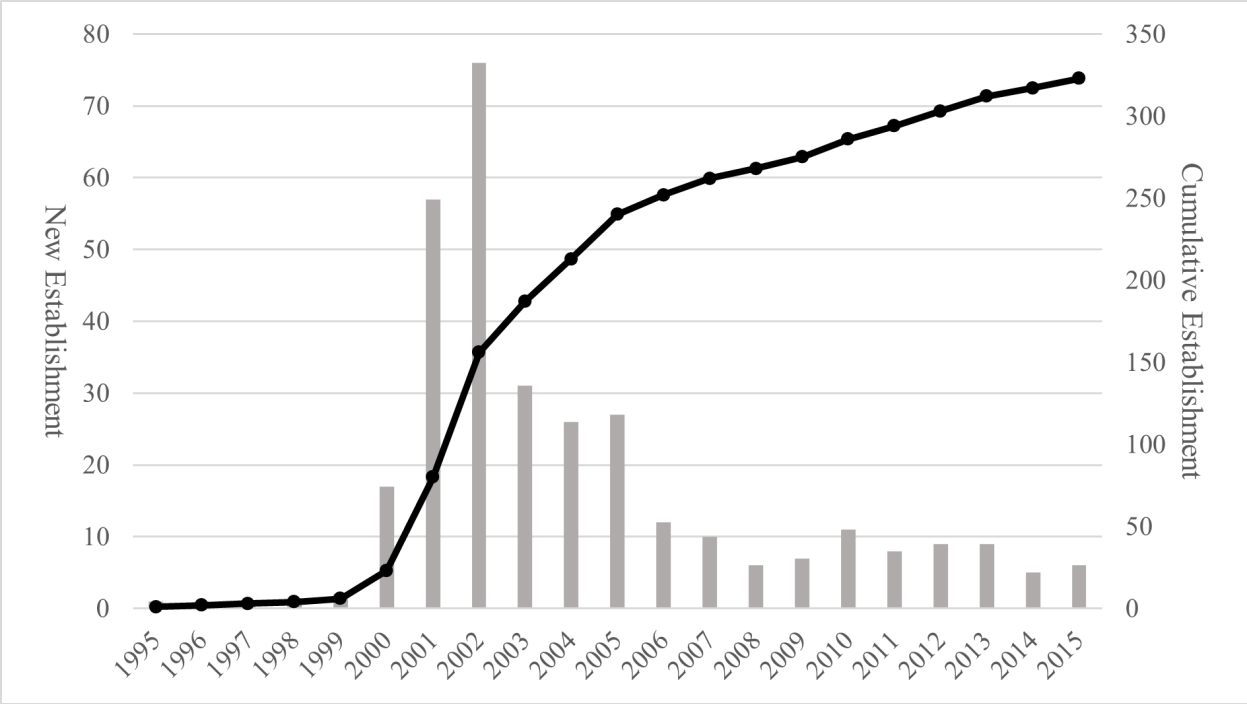


Figure 2: Approval time distribution by city

This figure displays the distribution of loan approval times before and after the establishment of AACs across various cities. The x-axis represents the approval time in days, while the y-axis represents the density of occurrences. The pre-AAC period is indicated by the solid grey bars. The post-AAC period is indicated by the black dashed line.

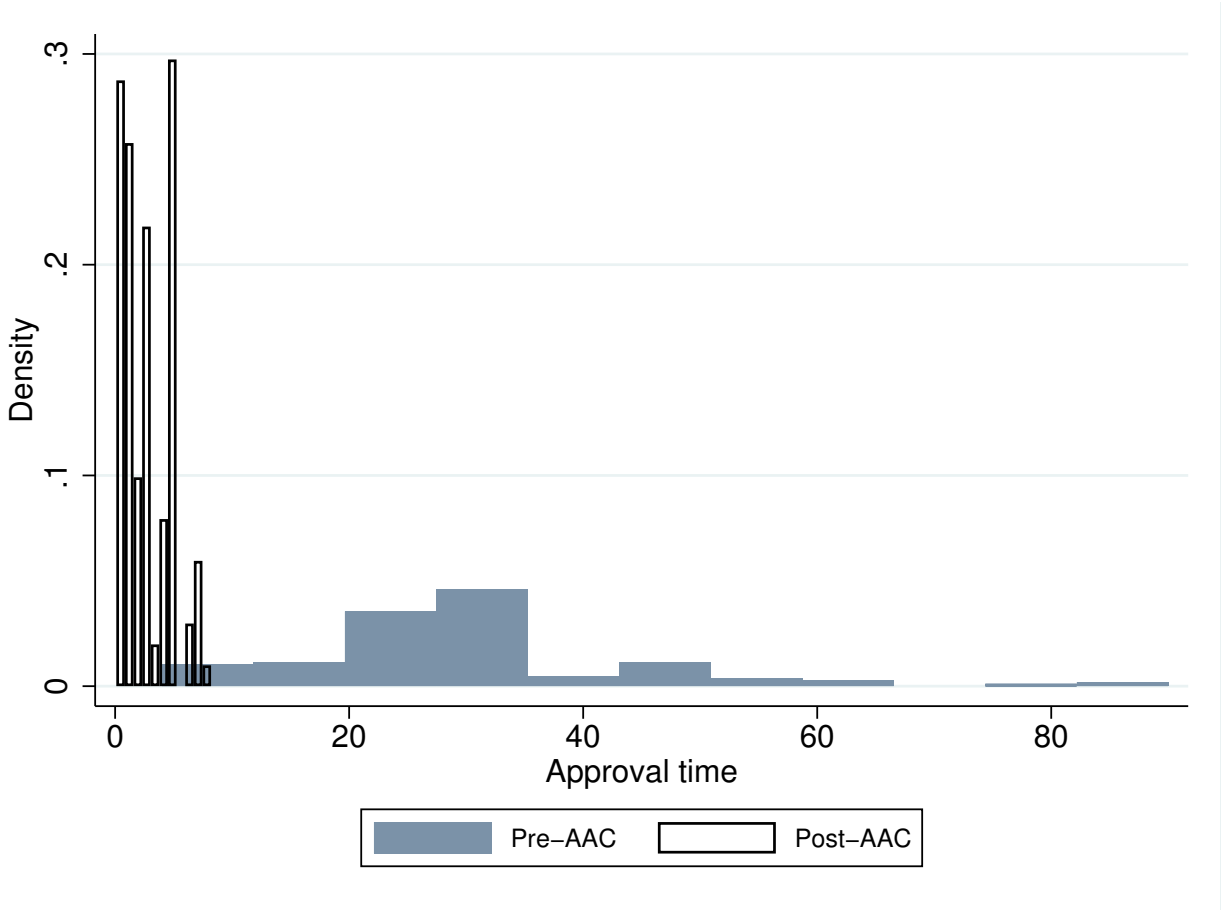


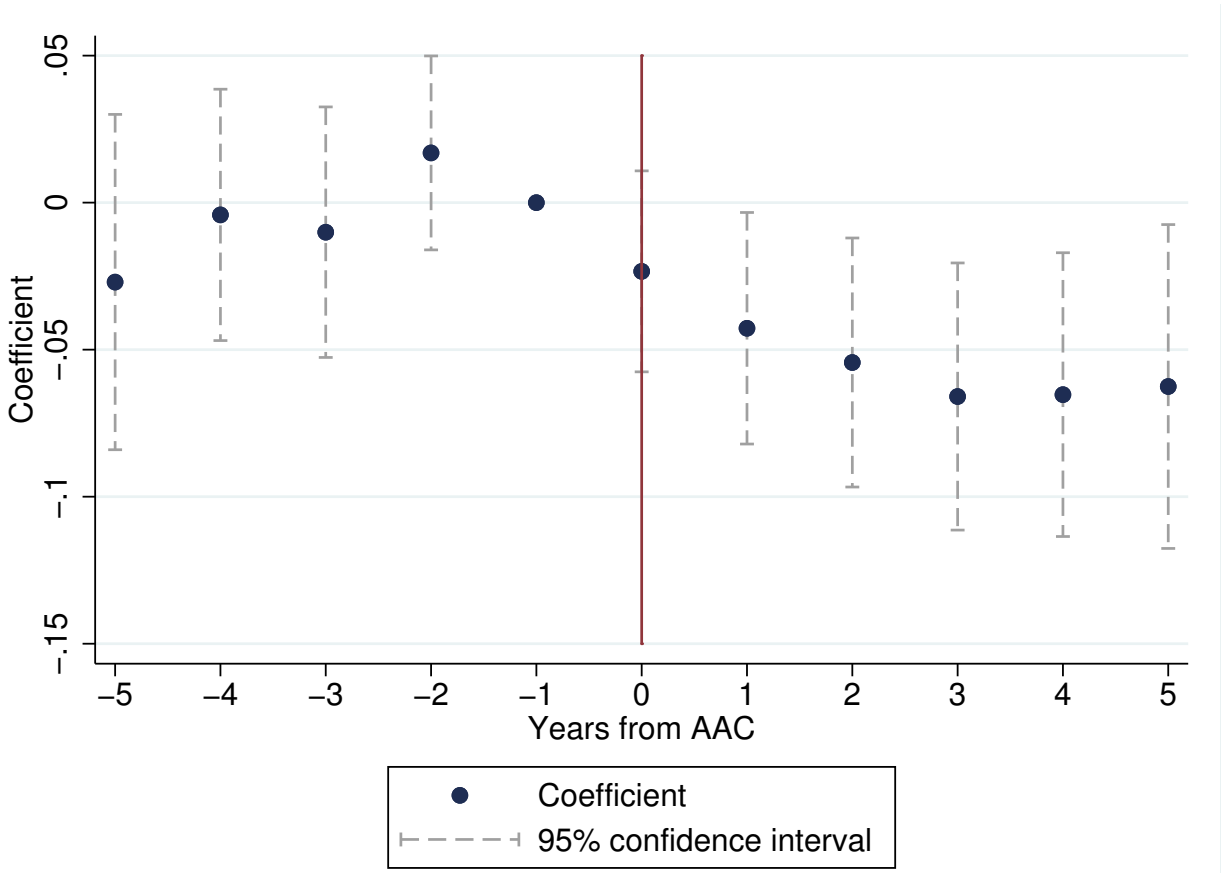
Figure 3: Cash holdings relative to AAC introduction

This figure reports yearly coefficients for firms' cash holdings around an AAC introduction. The regression specification is the same as in column (3) of Table 3:

$$Cash/sales_{i,t} = \alpha_i + \theta_{j,t} + \tau_{p,t} + \beta Post \times AAC + \gamma X + \epsilon_{i,t}$$

where the the vector of controls, X, includes *ln(Total assets)* and *Leverage*. Panel A shows OLS estimates, while panel B shows estimates using the Borusyak et al. (2024) (BJS) estimator. The ranges indicate 95% confidence intervals based on heteroscedasticity-consistent standard errors, clustered by firm.

A. OLS estimates



B. BJS estimates

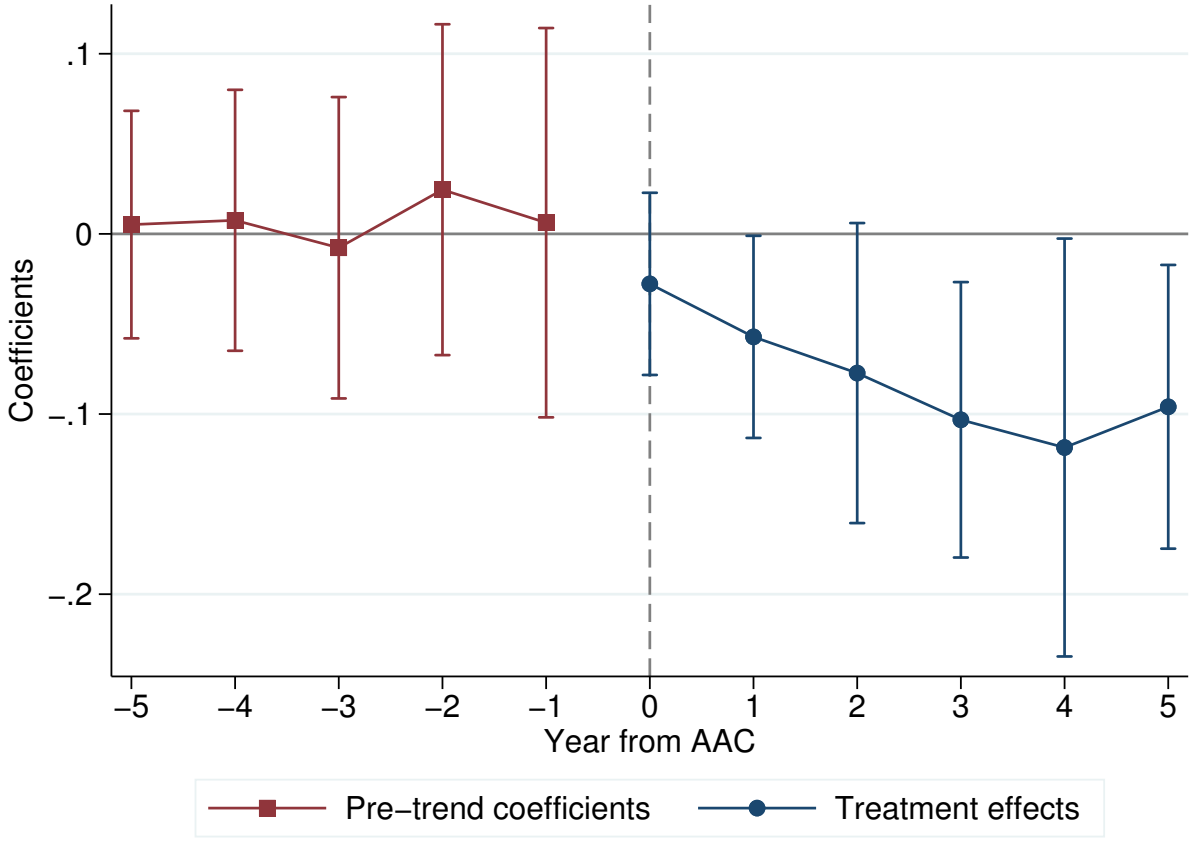


Table 1
Summary statistics

This table presents descriptive statistics for the main variables used in our analysis. All variables are defined in Appendix A. All continuous variables are winsorized at the 1% level.

	Mean	Std	p25	p50	p75
Cash and leverage					
Cash/Sales	0.374	0.485	0.094	0.213	0.452
Leverage	0.200	0.157	0.061	0.185	0.311
% ST debt	0.676	0.325	0.444	0.767	0.996
% Collateral loan	0.225	0.298	0.000	0.077	0.365
Effective interest	0.090	0.086	0.051	0.067	0.092
Default	0.140	0.347	0.000	0.000	0.000
Cash flow sensitivity					
Δ Cash/Total assets	-0.008	0.087	-0.044	-0.002	0.028
CF/Total assets	0.033	0.063	0.001	0.029	0.063
Capex/K	0.417	0.765	0.073	0.190	0.427
CF/K	0.653	1.837	0.110	0.240	0.524
Working capital					
Inventory/Sales	0.417	0.715	0.107	0.204	0.385
AR/Sales	0.290	0.353	0.069	0.179	0.371
AP/COGS	0.238	0.220	0.100	0.178	0.297
AAC introduction					
Post $\times$ AAC (HQ)	0.552	0.497	0.000	1.000	1.000
Avg(Post $\times$ AAC)	0.648	0.366	0.333	0.786	1.000
AAC (HQ)	0.737	0.440	0.000	1.000	1.000
Controls					
ln(Total assets) (t-1)	21.579	1.267	20.685	21.421	22.283
Leverage (t-1)	0.201	0.155	0.064	0.188	0.312
N	31,274				

Table 2
Approval time of collateral

This table shows a city-level regression analysis of the approval time of collateral. The sample includes two observations for each city, one before and one after the introduction of an AAC. The dependent variable is shown above each column. *Approval time* is the average number of days it takes to register collateral for a loan, based on hand-collected press reports. *GDP per capita* is the GDP per capita for the city. *GDP pc. growth* is the growth of GDP per capita for the city. *Ind. tertiary* is the proportion of the tertiary industry, measured as the tertiary industry GDP divided by the total GDP of the city. *Population density* is the natural logarithm of the city's population density. *ln(Ind. enterprises)* is the natural logarithm of the number of industrial enterprises in the city. *ln(Average wage)* is the natural logarithm of the average wage of the city. *Foreign-invested GDP* is the proportion of foreign investment in the city, measured by GDP created by foreign-invested enterprises divided by total GDP. *Post* × *AAC* is a dummy that equals one if the city has established the AAC in the year. All continuous variables are winsorized at the 1% level. Heteroscedasticity-consistent standard errors are shown in parentheses. Significance levels: * 0.1, ** 0.05, *** 0.01.

	Approval time		ln(Approval time)	
	(1)	(2)	(3)	(4)
Post × AAC	-26.2626***	-23.2815***	-2.1496***	-2.1579***
	(1.2562)	(1.6160)	(0.0636)	(0.0925)
GDP per capita		-0.8590**		-0.0228
		(0.3667)		(0.0173)
GDP pc. growth		-0.0067		0.0061
		(0.1181)		(0.0059)
ln(Ind. enterprises)		-2.5986		0.3375
		(5.7561)		(0.2477)
City FE	Yes	Yes	Yes	Yes
N	274	234	274	234
R^2	0.811	0.813	0.908	0.907

Table 3
Cash holdings

This table shows a regression analysis of the level of cash holdings by firms. The dependent variable is *Cash/sales*, the ratio of cash to sales. *Post* × *AAC* is a dummy that equals one if the city has established the AAC in the year. Panel A reports the results for treatment based on corporate headquarter city. Panel B reports the results for treatment based on corporate geographic footprint. *Avg(Post* × *AAC)* is the average of *Post* × *AAC* across all the geographic locations of a firm's subsidiaries. Panel C splits the sample into cities with large versus small reduction in collateral approval time, based on the same data as used in Table 2. All variables are defined in Appendix A. All continuous variables are winsorized at the 1% level. *BJS* indicates estimates using the Borusyak et al. (2024) estimator. Heteroscedasticity-consistent standard errors, clustered by firm, are shown in parentheses. Significance levels: * 0.1, ** 0.05, *** 0.01.

Panel A: Treatment based on corporate headquarter city

	OLS			BJS		
	(1)	(2)	(3)	(4)	(5)	(6)
Post × AAC	-0.0629***	-0.0547***	-0.0422**	-0.1233***	-0.0993***	-0.0745**
	(0.0159)	(0.0160)	(0.0177)	(0.0208)	(0.0202)	(0.0362)
ln(Total assets) (t-1)		-0.0337***	-0.0402***		-0.0574***	-0.0700***
		(0.0090)	(0.0090)		(0.0168)	(0.0159)
Leverage (t-1)		-0.3296***	-0.3400***		-0.2390***	-0.2510***
		(0.0397)	(0.0392)		(0.0729)	(0.0716)
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	No	Yes	Yes	No
Province-Year FE	No	No	Yes	No	No	Yes
Industry-Year FE	No	No	Yes	No	No	Yes
N	31,196	28,590	28,542	24,808	22,100	16,708
R^2	0.449	0.456	0.507			

Panel B: Treatment based on corporate geographic footprint

	(1)	(2)	(3)	(4)
Avg(Post × AAC)	-0.0916***	-0.0774***	-0.1078***	-0.1028***
	(0.0219)	(0.0217)	(0.0308)	(0.0303)
ln(Total assets) (t-1)		-0.0391***	-0.0471***	-0.0505***
		(0.0099)	(0.0107)	(0.0109)
Leverage (t-1)		-0.3329***	-0.3048***	-0.3040***
		(0.0434)	(0.0478)	(0.0482)
Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	No	No
City-Year FE	No	No	Yes	Yes
Industry-Year FE	No	No	No	Yes
N	24,474	23,141	21,702	21,697
R^2	0.471	0.482	0.549	0.569

Panel C: Large vs. small reduction in approval time

	Large reduction		Small reduction	
	(1) OLS	(2) BJS	(3) OLS	(4) BJS
Post × AAC	-0.1037***	-0.0652*	-0.0247	-0.0584
	(0.0268)	(0.0379)	(0.0426)	(0.0449)
ln(Total assets) (t-1)	-0.0039	0.0065	-0.0454**	-0.0390
	(0.0166)	(0.0410)	(0.0205)	(0.0454)
Leverage (t-1)	-0.3306***	-0.2105	-0.5334***	-0.2372**
	(0.0759)	(0.1606)	(0.1216)	(0.1052)
Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
N	5,343	2,552	3,902	2,474
R^2	0.521		0.440	

Table 4
Cash holdings – state-owned vs. non-state-owned enterprises

This table shows a regression analysis of the level of cash holdings by firms. The dependent variable is *Cash/sales*, the ratio of cash to sales. *Post* × *AAC* is a dummy that equals one if the city has established the AAC in the year. All variables are defined in Appendix A. All continuous variables are winsorized at the 1% level. *BJS* indicates estimates using the Borusyak et al. (2024) estimator. Heteroscedasticity-consistent standard errors, clustered by firm, are shown in parentheses. Significance levels: * 0.1, ** 0.05, *** 0.01.

	SOE			Non-SOE		
	(1) OLS	(2) BJS	(3) OLS	(4) OLS	(5) BJS	(6) OLS
Post × AAC	-0.0341**	-0.0647***		-0.0823**	-0.0955**	
	(0.0169)	(0.0215)		(0.0327)	(0.0443)	
Avg(Post × AAC)			-0.0401			-0.1980***
			(0.0352)			(0.0539)
ln(Total assets) (t-1)	-0.0143	-0.0244	-0.0226	-0.0592***	-0.1013***	-0.0465**
	(0.0110)	(0.0189)	(0.0145)	(0.0172)	(0.0343)	(0.0187)
Leverage (t-1)	-0.2918***	-0.2222***	-0.3059***	-0.3603***	-0.2617	-0.2956***
	(0.0461)	(0.0713)	(0.0615)	(0.0781)	(0.1944)	(0.0843)
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	No	Yes	Yes	No
City-Year FE	No	No	Yes	No	No	Yes
N	17,472	15,037	11,398	10,884	5,602	9,123
R^2	0.463		0.579	0.503		0.602

Table 5
Cash holdings – subsample analysis excluding SOEs

This table shows a regression analysis of the level of cash holdings by firms. The dependent variable is *Cash/sales*, the ratio of cash to sales. *Post* × *AAC* is a dummy that equals one if the city has established the AAC in the year. All variables are defined in Appendix A. All continuous variables are winsorized at the 1% level. *BJS* indicates estimates using the Borusyak et al. (2024) estimator. Heteroscedasticity-consistent standard errors, clustered by firm, are shown in parentheses. Significance levels: * 0.1, ** 0.05, *** 0.01.

Panel A: Large vs. small firms (excluding SOEs)

	Large		Small	
	(1) OLS	(2) BJS	(3) OLS	(4) BJS
Post × AAC	-0.0371	-0.0668	-0.1390***	-0.1319**
	(0.0465)	(0.0679)	(0.0482)	(0.0539)
ln(Total assets) (t-1)	-0.0171	-0.1103**	-0.2138***	-0.3761***
	(0.0264)	(0.0537)	(0.0366)	(0.0635)
Leverage (t-1)	-0.2159**	0.0464	-0.5455***	-0.6783***
	(0.0976)	(0.2563)	(0.1178)	(0.2566)
Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
N	5,385	2,553	5,287	2,655
R^2	0.576		0.531	

Panel B: Industry average level of PPE (excluding SOEs)

	High PPE		Low PPE	
	(1) OLS	(2) BJS	(3) OLS	(4) BJS
Post × AAC	-0.1283***	-0.1091*	-0.0343	-0.0557
	(0.0484)	(0.0611)	(0.0445)	(0.0575)
ln(Total assets) (t-1)	-0.0364*	-0.0668*	-0.0789***	-0.1204**
	(0.0207)	(0.0400)	(0.0266)	(0.0473)
Leverage (t-1)	-0.2976***	-0.3110	-0.4330***	-0.2598
	(0.0936)	(0.2401)	(0.1267)	(0.2754)
Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
N	5,273	2,375	5,604	3,194
R^2	0.501		0.504	

Panel C: Industry average leverage (excluding SOEs)

	High leverage		Low leverage	
	(1) OLS	(2) BJS	(3) OLS	(4) BJS
Post × AAC	-0.0863*	-0.1597***	-0.0727	-0.0162
	(0.0449)	(0.0619)	(0.0471)	(0.0560)
ln(Total assets) (t-1)	-0.0694***	-0.1537***	-0.0314	-0.0579
	(0.0268)	(0.0515)	(0.0219)	(0.0368)
Leverage (t-1)	-0.3463***	-0.2425	-0.4424***	-0.3670*
	(0.1175)	(0.2769)	(0.0982)	(0.2214)
Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
N	5,262	2,696	5,610	2,787
R^2	0.465		0.561	

Table 6
Cash flow sensitivity of cash and investment

This table shows a regression analysis of the cash flow sensitivity of cash and cash flow sensitivity of investment. In Panel A, the dependent variable is Δ *Cash/Total assets*. Following Almeida et al. (2004) and Khurana et al. (2006), Δ *Cash/Total assets* is the change of cash holdings, calculated as the ratio of holdings of cash to total assets from the year t-1 to year t. *CF* as the sum of earnings before extraordinary items and depreciation. *Q* is the Tobin's Q, equals the market value divided by the book value of assets. In Panel B, the dependent variable is *Capex/K*. Following Fazzari et al. (1988) and Kaplan and Zingales (1997), *Capex* is measured by the funds used by a company to acquire, upgrade, and maintain physical assets such as property, plants, buildings, technology, or equipment. *K* is measured as net property, plant, and equipment. *AAC* is a dummy that equlas one if the city established AAC within the sample period. *Post* × *AAC* is a dummy that equals one if the city has established the AAC in the year. All variables are defined in Appendix A. All continuous variables are winsorized at the 1% level. Heteroscedasticity-consistent standard errors, clustered by firm, are shown in parentheses. Significance levels: * 0.1, ** 0.05, *** 0.01.

Panel A: Cash flow sensitivity of cash

	Δ Cash / Total assets			
	(1)	(2)	(3)	(4)
CF/Total assets × Post × AAC			-0.0482*	-0.0519**
			(0.0260)	(0.0261)
CF/Total assets × AAC			0.0768**	0.0792**
			(0.0337)	(0.0337)
Post × AAC			0.0066***	0.0068***
			(0.0019)	(0.0019)
CF/Total assets	0.0881***	0.0893***	0.0575**	0.0593**
	(0.0113)	(0.0114)	(0.0254)	(0.0254)
Q (t-1)	0.0054***	0.0058***	0.0054***	0.0058***
	(0.0008)	(0.0009)	(0.0008)	(0.0009)
ln(Total assets) (t-1)		0.0013		0.0016
		(0.0011)		(0.0011)
Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
N	26,322	26,322	26,322	26,322
R^2	0.147	0.147	0.147	0.147

Panel B: Cash flow sensitivity of investment

	Capex/K			
	(1)	(2)	(3)	(4)
CF/K × Post × AAC			-0.0665*	-0.0622*
			(0.0357)	(0.0332)
CF/K × AAC			0.0784**	0.0653*
			(0.0382)	(0.0353)
Post × AAC			-0.0237	-0.0053
			(0.0232)	(0.0228)
CF/K	0.1663***	0.1045***	0.1554***	0.0985***
	(0.0114)	(0.0114)	(0.0146)	(0.0145)
Q (t-1)	0.0399***	-0.0288***	0.0393***	-0.0290***
	(0.0085)	(0.0082)	(0.0085)	(0.0082)
ln(K (t-1))		-0.2482***		-0.2472***
		(0.0140)		(0.0140)
Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
N	27,577	27,576	27,577	27,576
R^2	0.391	0.445	0.392	0.446

Table 7
Debt structure

This table shows a regression analysis of leverage, debt maturity, and cost of debt. The dependent variable is shown above each column. *Leverage* equals the sum of long-term debt and short-term debt divided by total assets. *% ST debt* is short-term debt divided by the sum of long-term debt and short-term debt. *% Collateral loan* is the amount of collateral loan divided by the total loan in the firm. *Effective interest* is the sum of cash paid to interest during the year and interest payable at end of year minus interest payable at the beginning of the year divided by the average of debt at the beginning and the end of year. *AAC* is a dummy that equals one if the city established AAC within the sample period. *Post* × *AAC* is a dummy that equals one if the city has established the ACC in the year. All variables are defined in Appendix A. All continuous variables are winsorized at the 1% level. *BJS* indicates estimates using the Borusyak et al. (2024) estimator. Heteroscedasticity-consistent standard errors, clustered by firm, are shown in parentheses. Significance levels: * 0.1, ** 0.05, *** 0.01.

	Leverage		% ST debt		% Collateral loan		Effective interest	
	(1) OLS	(2) BJS	(3) OLS	(4) BJS	(5) OLS	(6) BJS	(7) OLS	(8) BJS
Post × AAC	0.0064	0.0242***	0.0232**	0.0366**	0.0206*	0.0149	0.0027	-0.0002
	(0.0051)	(0.0065)	(0.0116)	(0.0150)	(0.0118)	(0.0126)	(0.0032)	(0.0038)
ln(Total assets) (t-1)	0.0590***	0.0613***	-0.0393***	-0.0529***	-0.0389***	-0.0210**	0.0043***	0.0046
	(0.0029)	(0.0045)	(0.0066)	(0.0093)	(0.0059)	(0.0095)	(0.0015)	(0.0034)
Leverage (t-1)			-0.1567***	-0.2194***	0.0612**	-0.0072	-0.1512***	-0.1686***
			(0.0282)	(0.0440)	(0.0276)	(0.0473)	(0.0087)	(0.0184)
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	28,595	22,105	25,770	20,013	17,202	7,453	21,117	10,764
R^2	0.618		0.489		0.627		0.436	

Table 8
Inventory and trade credit

This table shows a regression analysis of inventory level and trade credit at firms. The dependent variable is shown above each column. *Inventory/sales* is calculated by the level of inventory divided by total sales. *AR/sales* is calculated as the accounts receivable divided by total sales. *AP/COGS* is calculated as the accounts payable divided by cost of goods sold. *Post* × *AAC* is a dummy that equals one if the city has established the AAC in the year. All variables are defined in Appendix A. All continuous variables are winsorized at the 1% level. *BJS* indicates estimates using the Borusyak et al. (2024) estimator. Heteroscedasticity-consistent standard errors, clustered by firm, are shown in parentheses. Significance levels: * 0.1, ** 0.05, *** 0.01.

	Inventory/sales		AR/sales		AP/COGS	
	(1) OLS	(2) BJS	(3) OLS	(4) BJS	(5) OLS	(6) BJS
Post × AAC	-0.0587**	-0.0826**	-0.0198	-0.0131	-0.0153*	-0.0278***
	(0.0293)	(0.0370)	(0.0130)	(0.0171)	(0.0079)	(0.0102)
ln(Total assets) (t-1)	0.0900***	0.1139***	0.0407***	0.0423***	0.0186***	0.0230***
	(0.0184)	(0.0262)	(0.0072)	(0.0103)	(0.0046)	(0.0069)
Leverage (t-1)	0.2283***	0.1823*	0.1118***	0.1861***	0.0155	0.0580*
	(0.0684)	(0.1047)	(0.0296)	(0.0492)	(0.0197)	(0.0308)
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
N	28,509	22,029	28,590	22,100	28,488	22,001
R^2	0.591		0.560		0.491	

Table 9
Likelihood of default

This table shows a regression analysis of the likelihood of default by firms. The dependent variable is *Default*, a dummy taking the value of one if the firm defaults on its loans in the year. A default is deemed if the short-term bank loans of the previous year (including shot-term loans and long-term loans due within one year) is bigger than repayment of bank loans recorded in the current year. *Post* × *AAC* is a dummy that equals one if the city has established the AAC in the year. All variables are defined in Appendix A. All continuous variables are winsorized at the 1% level. *BJS* indicates estimates using the Borusyak et al. (2024) estimator. Heteroscedasticity-consistent standard errors, clustered by firm, are shown in parentheses. Significance levels: * 0.1, ** 0.05, *** 0.01.

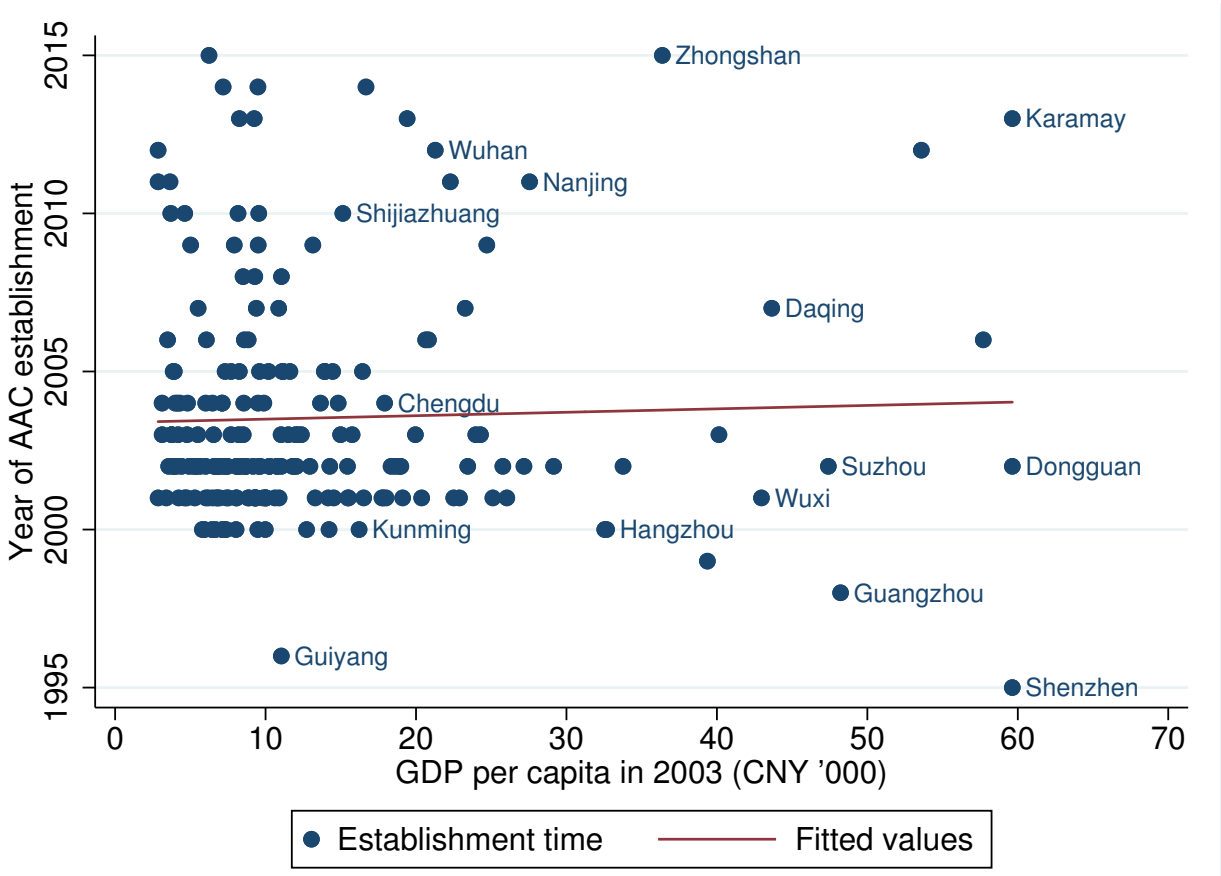
	OLS		BJS	
	(1)	(2)	(3)	(4)
Post × AAC	-0.0325***	-0.0329***	-0.0367**	-0.0450***
	(0.0116)	(0.0116)	(0.0163)	(0.0161)
ln(Total assets) (t-1)		0.0058		0.0075
		(0.0061)		(0.0104)
Leverage (t-1)		0.2831***		0.3160***
		(0.0299)		(0.0544)
Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
N	27,264	27,264	20,225	20,225
R^2	0.280	0.287		

Internet appendix

IA.1 Timing of AAC establishment

Figure IA.1: GDP per capita in 2003 and the timing of AAC establishment

This figure presents the GDP per capita in 2003 (x-axis) and in the year of AAC establishment relative to 1995 (y-axis) for each city; 1995 is when Shenzhen established China's first AAC.



IA.2 Example: Bank loan process using land and housing as collateral

This appendix illustrates the impact of AACs on the credit process, using the common example of a firm using housing and land as collateral for a bank loan [11].

As illustrated in Figure IA.2, prior to the establishment of AACs the specific process for a firm to obtain a bank loan using collateral involved:

1. *Signing the loan contract and the collateral contract.*
2. *Registering the collateral.* This involves dealing with different government departments and is complicated and tedious, as follows:
   (a) *Verifying the file at the information inquiry windows of the Housing Administrative Bureau (HAB hereafter) and the Land Administrative Bureau (LAB hereafter).* The firm will receive the verification certificates of housing and land rights status, respectively, once verification has been completed.
   (b) *Filing the collateral contract at the transaction filing windows of the HAB and LAB.* Again, the firm will receive the collateral contract filing certificates of housing and land rights status, respectively, once filing has been completed.
   (c) *Registering the collateral at the collateral registration windows of the HAB and LAB.* This is the most critical step and requires documentation including collateral registration application forms for housing and land, a letter of attorney (if necessary), financial and business licenses of the bank, assessment reports on housing and land, list of collateral, certificates/copies for housing and land, ID card/copies for mortgagee and bank manager, a collateral contract, and a loan contract. In addition, as mortgagee, the firm is required to provide appropriate resolutions at a shareholders' meeting and the board of directors. It needs to show its business license, its articles of incorporation, an authorization letter from the firm, ID cards of the legal executive and the manager, and certificate of the legal executive. After submission to the relevant windows, each window completes four steps of acceptance, review, registration, and certification, as follows:
      i. *Acceptance.* The windows check the identity of the firm and bank, whether they are handled by this registry, whether the relevant materials are complete, and ask for information related to collateral registration. This step also involves cross-agency information inquiries; specifically, checking the identity

[11] Land use rights and ownership of the buildings on the land are usually collateralized at the same time, as required by Article 31 of the Urban Real Estate Management Law of the People's Republic of China (1994) (http://gtghj.wuhan.gov.cn/hs/pc-246-818.html).

information of firms and banks requires input from the public security department, checking the business license of firms and banks requires input from the market supervision department, checking the financial license of banks requires input from the banking and insurance supervision department, and so on.

ii. *Review.* The windows check the registers of housing and land, whether there is any ban or seizure on the collateral being registered, and the specific information on the loan and collateral contracts. Checking the registers of housing and land needs the file information from the information inquiry window, and checking for bans or seizures on collateral needs the registration filing information from the transaction filing window.

iii. *Registration.* The collateral registration window registers the housing and land matters in the register according to the specific information in the loan and collateral contracts.

iv. *Certification.* The window makes and prints the collateral registration certificates for the housing and land, then notifies the firm to retrieve the real estate and land certificates, and provides the bank with the collateral registration certificates of housing and land.

(d) *Payment of fees.* Having received notice from the collateral registration office, the borrowing firm goes to the fee payment window to pay the collateral registration fee.

(e) *Receiving the certificate.* The firm retrieves the real estate and land certificates, and the bank gets the collateral registration certificates, with proof of the associated fee payments.

3. *Granting of loan by bank.*

The process described above shows that, prior to AAC establishment, multiple government departments were involved in granting administrative approval of a collateral-based loan to a firm before a bank could formally issue a loan. In particular, the collateral registration step requires a firm to go to multiple windows of the HAB and LAB, and repeatedly submit multiple materials. A total of seven steps are involved and, in areas where the relative responsibilities of the housing and land departments are unclear, it can consume even more time.

Following the establishment of the AACs, the specific process required for a firm to obtain a collateral-based bank loan, as illustrated in Figure IA.3, is as follows:

1. *Signing the loan contract and the collateral contract.*

2. *Registering the collateral.*
   (a) *Collateral registration at a "one-stop" window of AAC.* This only requires the borrowing firm and the bank to submit relevant materials at a "one-stop" window for collateral registration. The window will complete the four steps of acceptance, review, registration, and certificate production. The checks of acceptance, review, and so on are completed within the AAC, generally only taking three working days, after which firms and banks will be notified to retrieve the collateral registration certificate and other property certificates.
   (b) *Paying the fee and receiving the certificate.* Having received notice from the AAC, the firm goes to the "one-stop" service window for collateral registration to pay the fee and retrieve the real estate and land certificates, and the bank is provided with the collateral registration certificates.
3. *Granting of loan by bank.*

The process described above shows that, following the establishment of the AACs, a firm only needs to contact the government administrative service department twice to obtain a collateral-based loan; the process is much simplified, from seven to two steps, and the time is greatly reduced. The process for the government departments is also reduced (from four steps to three), and the approval departments collaborate with each other to improve the efficiency of the approval process and reduce the time involved.

Figure IA.2: Bank loan process using land and housing as collateral prior to AAC establishment

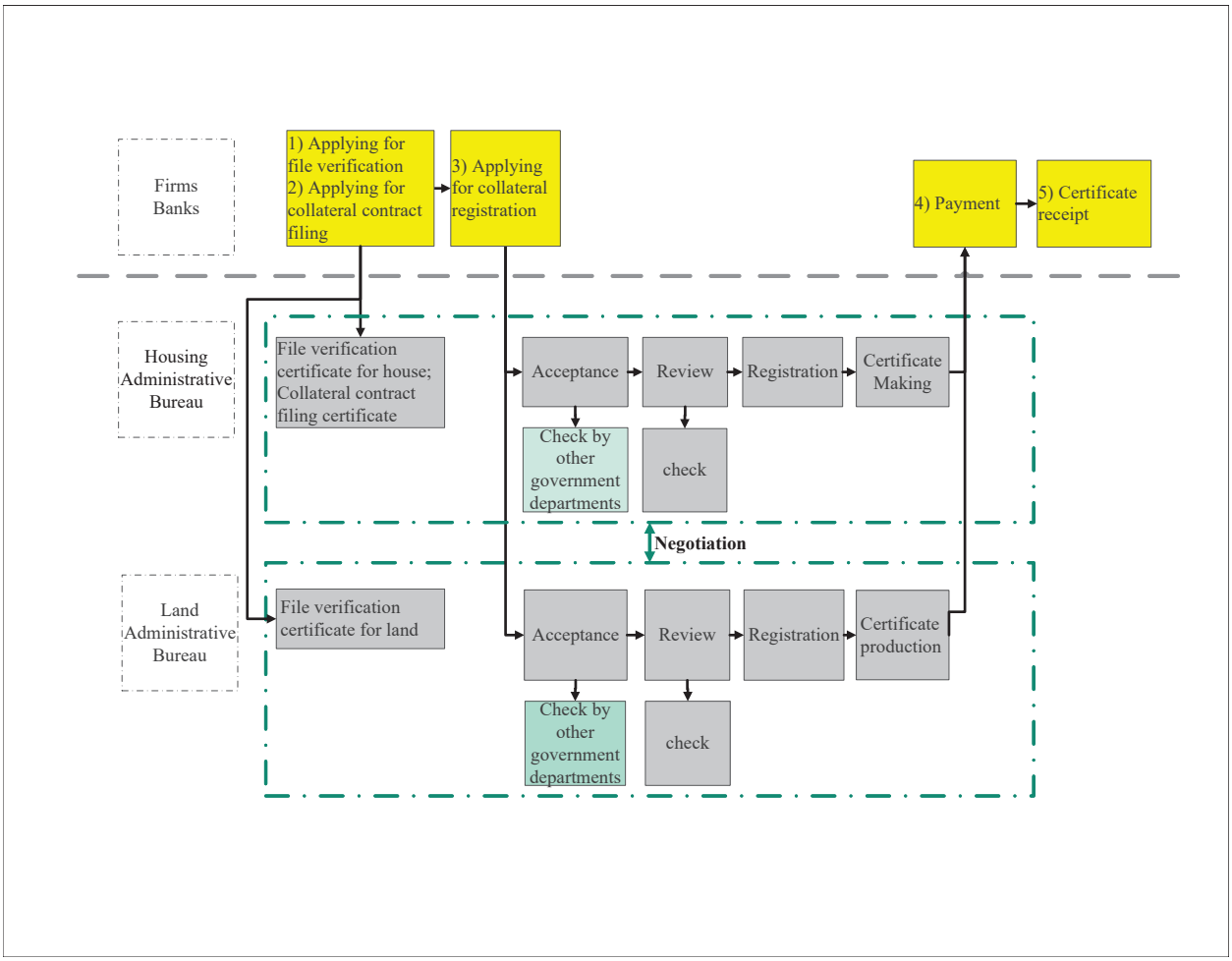
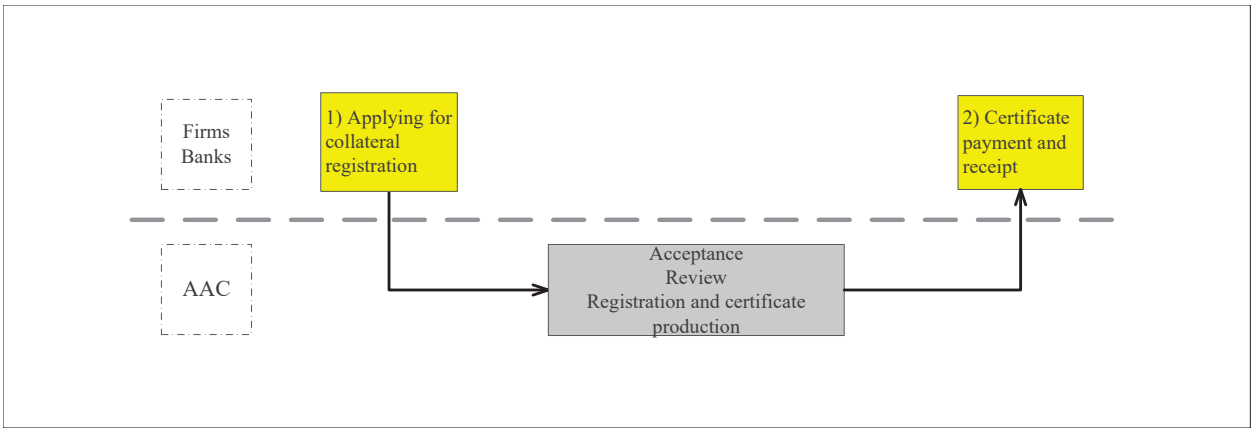


Figure IA.3: Bank loan process using land and housing as collateral after AAC establishment



IA.3 Additional analysis

IA.3.1 Time spent dealing with bureaucracy

As an alternative source to validate the reduction in bureaucratic delays following the establishment of AACs, we use a World Bank report from 2006 titled "China: Governance, Investment Climate, and Harmonious Society: Competitiveness Enhancements for 120 Cities in China". The report uses survey information collected through questionnaires and interviews targeting local businesses and government officials to assess the investment climate and competitiveness across 120 Chinese cities. It highlights significant variations in local government efficiency. These differences are reflected in various metrics, such as the average time that firms report spending annually on bureaucratic interactions and their expectation of the need for "informal payments" to obtain bank loans. While this dataset is only available for one year as the survey was conducted in 2005, it allows us to compare cities with AAC with those without one. Following this report, we construct two variables. *Bureaucratic interaction* is the average time per year that firms spend on bureaucratic interaction (in multiples of 100 days). *P(Informal payments)* is the expectation of the need for informal payments to obtain bank loans (in percentage).

Table IA.1 presents a city-level regression analysis of the average time spent dealing with bureaucracy by a firm as well as the likelihood of informal payments to obtain loans, depending on whether the city has established an AAC. The results show that in cities with an AAC, firms spend significantly less time dealing with bureaucracy and report a significantly lower likelihood of informal payments to obtain loans.

Table IA.1
Time spent dealing with bureaucracy

This table shows a city-level regression analysis of firms' time spent dealing with bureaucracy and the probability of informal payments. The dependent variables are *Bureaucratic interaction* and *P(Informal payments)*. *Bureaucratic interaction* is the average time firms spend on annual bureaucratic interaction (in the multiple of 100 days). *P(Informal payments)* is the expectation of need for informal payment to obtain bank loans (in percentage). *GDP per capita* is the GDP per capita for the city. *GDP pc. growth* is the growth of GDP per capita for the city. *Ind. tertiary* is the proportion of the tertiary industry, measured as the tertiary industry GDP divided by the total GDP of the city. *Population density* is the natural logarithm of the city's population density. *ln(Ind. enterprises)* is the natural logarithm of the number of industrial enterprises in the city. *ln(Average wage)* is the natural logarithm of the average wage of the city. *Foreign-invested GDP* is the proportion of foreign investment in the city, measured by GDP created by foreign-invested enterprises divided by total GDP. AAC is a dummy that equlas one if the city established AAC within the sample period, and zero otherwise. *Post* $\times$ AAC is a dummy that equals one if the city has established the AAC in the year, and zero otherwise. All continuous variables are winsorized at the 1% level. Heteroscedasticity-consistent standard errors are shown in parentheses. Significance levels: * 0.1, ** 0.05, *** 0.01.

	Gov't delay days / 100		P(Abnormal payments)	
	(1)	(2)	(3)	(4)
Post × AAC	-0.1152*	-0.1264**	-3.4645*	-3.7919**
	(0.0663)	(0.0623)	(1.9688)	(1.8374)
AAC	0.0216	-0.2544**	4.8022	-3.6600
	(0.1202)	(0.1039)	(4.6907)	(3.9886)
GDP per capita		0.0020		0.0392
		(0.0038)		(0.1129)
GDP pc. growth		0.0161**		0.4508**
		(0.0063)		(0.1827)
ln(Ind. enterprises)		-0.1567***		-4.8415***
		(0.0239)		(0.7261)
Constant	0.9987***	1.9950***	14.9286***	46.8580***
	(0.1045)	(0.2210)	(4.3392)	(6.9997)
N	212	212	212	212
R^2	0.015	0.202	0.016	0.231

IA.3.2 Firm performance

We then study whether the faster access to credit translates into differences in firm performance. As a number of studies suggest that finance is important for economic growth (e.g., Beck et al. (2005), Tadesse (2002)), Levine (1998), Levine (1999)), we investigate firms' sales growth and profitability.

The results are shown in Table IA.2. There is no consistent evidence of a change in sales growth. We also find that EBIT margins decrease across both estimators. This suggests that costs in firms' income statements increase following an AAC introduction.

Table IA.2
Firm performance

This table shows a regression analysis of firm performance. The dependent variable is shown above each column. *Sales growth* is calculated as the total sales in the current year minus the total sales in the previous year divided by the sales in the previous year. *EBIT margin* is he sum of net income, interest, and income taxes divided by total sales. *Post* × *AAC* is a dummy that equals one if the city has established the AAC in the year. All variables are defined in Appendix A. All continuous variables are winsorized at the 1% level. *BJS* indicates estimates using the Borusyak et al. (2024) estimator. Heteroscedasticity-consistent standard errors, clustered by firm, are shown in parentheses. Significance levels: * 0.1, ** 0.05, *** 0.01.

	Sales growth		EBIT margin	
	(1) OLS	(2) BJS	(3) OLS	(4) BJS
Post × AAC	-0.0117	-0.0161	-0.0186***	-0.0160**
	(0.0160)	(0.0195)	(0.0060)	(0.0076)
ln(Total assets) (t-1)	-0.1441***	-0.1976***	0.0002	-0.0034
	(0.0089)	(0.0161)	(0.0031)	(0.0052)
Leverage (t-1)	0.1145***	0.2174***	-0.1257***	-0.1354***
	(0.0404)	(0.0797)	(0.0154)	(0.0288)
Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
N	28,580	22,090	28,527	22,038
R^2	0.116		0.341	

IA.3.3 Capital investment

We also study firms' capital investment dynamics following an AAC introduction, including firm's capital investment and return on invested capital. The results are shown in Table IA.3. Overall, following the introduction of AACs, both firms' capital expenditures relative to sales and their return on invested capital decrease. Together with the findings on firm profitability, these results would be consistent on reduced investment in fixed assets (captured by capital expenditure) and increased investment in intangibles that would be recorded as a cost in the income statement.

Table IA.3
Capital investment

This table shows a regression analysis of capital expenditure and return on invested capital. The dependent variable is shown above each column. *Capex/sales* is calculated as the funds used by a company to acquire, upgrade, and maintain physical assets such as property, plants, buildings, technology, or equipment divided by total sales. *ROIC* is the calculated by the EBIT divided by the sum of debt and equity. *Post* × *AAC* is a dummy that equals one if the city has established the AAC in the year. All variables are defined in Appendix A. All continuous variables are winsorized at the 1% level. *BJS* indicates estimates using the Borusyak et al. (2024) estimator. Heteroscedasticity-consistent standard errors, clustered by firm, are shown in parentheses. Significance levels: * 0.1, ** 0.05, *** 0.01.

	Capex/sales		ROIC	
	(1) OLS	(2) BJS	(3) OLS	(4) BJS
Post × AAC	-0.0154***	-0.0299***	-0.0059**	-0.0064**
	(0.0059)	(0.0073)	(0.0028)	(0.0031)
ln(Total assets) (t-1)	0.0062*	0.0004	-0.0034**	-0.0044**
	(0.0033)	(0.0046)	(0.0013)	(0.0021)
Leverage (t-1)	-0.0723***	-0.0218	-0.0996***	-0.0992***
	(0.0159)	(0.0248)	(0.0068)	(0.0110)
Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
N	28,590	22,100	28,530	22,041
R^2	0.387		0.346	

IA.3.4 Innovation activity

We also study firms' innovation activities following an AAC introduction, focusing on the number of patents and R&D investments relative to sales. The results are shown in Table IA.4. Following the establishment of AACs, firms appear to increase the number of patent applications. The increase in R&D investment relative to sales is less clear, with the statistical significance of the estimates depending on the estimation method used. The sample where we have R&D data available is also very limited, making these results somewhat anecdotal. Nevertheless, these results are consistent with the establishment of an AAC being followed by an increase in innovation activity.

Table IA.4
Innovation activity

This table shows a regression analysis of firms' innovation activity. The dependent variable is shown above each column. *Patents growth* is calculated as the number of patent applications in the current year minus the patent applications in the previous year divided by the patent applications in the previous year. *R&D /sales* is the ratio of R&D investment to total sales. *Post* × *AAC* is a dummy that equals one if the city has established the AAC in the year. All variables are defined in Appendix A. All continuous variables are winsorized at the 1% level. *BJS* indicates estimates using the Borusyak et al. (2024) estimator. Heteroscedasticity-consistent standard errors, clustered by firm, are shown in parentheses. Significance levels: * 0.1, ** 0.05, *** 0.01.

	Patents growth		R&D investment	
	(1) OLS	(2) BJS	(3) OLS	(4) BJS
Post × AAC	0.0822	0.3813***	0.4222	0.6104**
	(0.0860)	(0.1169)	(0.3094)	(0.2914)
ln(Total assets) (t-1)	-0.0693*	-0.1382**	-0.0780	-0.4984***
	(0.0366)	(0.0654)	(0.1104)	(0.1892)
Leverage (t-1)	-0.2816*	0.3369	-1.5876***	-0.5506
	(0.1637)	(0.3436)	(0.4066)	(0.8691)
Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
N	11,849	5,638	9,757	3,364
R^2	0.129		0.850	

IA.3.5 Subsample analysis including SOEs

Table IA.5
Cash holdings – subsample analysis (full sample)

This table shows a regression analysis of the level of cash holdings by firms. The dependent variable is *Cash/sales*, the ratio of cash to sales. *Post* × *AAC* is a dummy that equals one if the city has established the AAC in the year. All variables are defined in Appendix A. All continuous variables are winsorized at the 1% level. *BJS* indicates estimates using the Borusyak et al. (2024) estimator. Heteroscedasticity-consistent standard errors, clustered by firm, are shown in parentheses. Significance levels: * 0.1, ** 0.05, *** 0.01.

Panel B: Large vs. small firms (including SOEs)

	Large		Small	
	(1) OLS	(2) BJS	(3) OLS	(4) BJS
Post × AAC	-0.0348*	-0.0387	-0.0717***	-0.1251***
	(0.0183)	(0.0257)	(0.0252)	(0.0307)
ln(Total assets) (t-1)	-0.0114	-0.0460**	-0.1226***	-0.1734***
	(0.0124)	(0.0186)	(0.0203)	(0.0314)
Leverage (t-1)	-0.1765***	-0.1143	-0.4834***	-0.3415***
	(0.0459)	(0.0809)	(0.0628)	(0.1133)
Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
N	14,229	10,547	14,162	9,934
R^2	0.520		0.491	

Panel C: Industry average level of PPE (including SOEs)

	High PPE		Low PPE	
	(1) OLS	(2) BJS	(3) OLS	(4) BJS
Post × AAC	-0.0452**	-0.0569*	-0.0577**	-0.1201***
	(0.0217)	(0.0298)	(0.0230)	(0.0265)
ln(Total assets) (t-1)	-0.0226**	-0.0602***	-0.0448***	-0.0650***
	(0.0112)	(0.0204)	(0.0136)	(0.0228)
Leverage (t-1)	-0.3771***	-0.2788***	-0.2511***	-0.1718
	(0.0493)	(0.0838)	(0.0607)	(0.1050)
Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
N	13,427	10,141	15,144	11,853
R^2	0.452		0.460	

Panel D: Industry average leverage (including SOEs)

	High leverage		Low leverage	
	(1) OLS	(2) BJS	(3) OLS	(4) BJS
Post × AAC	-0.0557**	-0.1243***	-0.0502**	-0.0668***
	(0.0239)	(0.0316)	(0.0213)	(0.0257)
ln(Total assets) (t-1)	-0.0260*	-0.0577*	-0.0369***	-0.0546***
	(0.0152)	(0.0296)	(0.0111)	(0.0184)
Leverage (t-1)	-0.3735***	-0.3508***	-0.3196***	-0.1698*
	(0.0595)	(0.1252)	(0.0541)	(0.0887)
Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
N	13,762	10,204	14,807	11,021
R^2	0.435		0.513	

IA.3.6 The implications for bank performance

In addition to examining firm-level outcomes, we also investigate whether bank performance changes following AAC introduction. The rationale is that faster collateral registration and improved lending efficiency at the branch level could enhance banks' operational capacity, potentially increasing lending volumes, altering loan composition, and affecting profitability.

We adopt the same approach as in the firm-level geographic footprint analysis to define bank treatment, but here the exposure is determined by the geographic footprint of each bank's branches. The orignial bank branch data come from CNOpenData. First, based on the China Bank Branch Distribution Information Table, we construct a branch–year dataset. We then merge it with the China Bank Branch Exit Information Table and China Bank Branch Loss-of-Control Information Table, using institution codes and branch names to identify and remove all branch–year observations after a branch has exited or lost control. Second, using the geographic location information of each branch (province, city, etc.), we match the AAC data to the bank branch data. Third, because financial statement data for Chinese banks are available at the bank–year level and most banks have branches in multiple cities, we follow the Rules for the Compilation of Financial License Institution Codes (Trial) issued by the China Banking Regulatory Commission in 2007, under which the first five digits of the 15-digit institution code uniquely identify a bank. Using these first five digits as the bank identifier, we calculate the bank–year average AAC exposure (*Avg (Post* $\times$ *AAC)*) in the same manner as in Panel B of Table 3. Fourth, we manually match the bank codes in the financial statement data to the first five digits of the institution codes from the previous step (using historical names to match banks that have undergone name changes), and merge the resulting bank–year AAC averages into the bank financial statement and credit business datasets. Finally, we test how AAC introduction is related to bank-level ROE, ROA, total loans, loan growth, and the ratio of mortgage loans.

Table IA.6 shows that AAC exposure, measured by *Avg (Post* $\times$ *AAC)* across a bank's branch cities, is not significantly associated with ROA, ROE, total loan balances, loan growth, or the share of mortgage loans in total lending. These results suggest that, at least in the short run, greater AAC coverage in a bank's operating areas does not translate into measurable changes in profitability, lending scale, growth rates, or loan composition at the bank level.

Table IA.6
Bank performance

This table shows a regression analysis of bank peformance. The dependent variable is shown above each column. *Bank ROA* equals net income divided by the total assets at the bank level. *Bank ROE* equals net income divided by the total equity at the bank level at the bank level. *Ln(Total bank loan)* equals the natural logarithm of total loan lent out by the bank. *Bank loan growth* is calculated as the total loan lent out in the current year minus the total loan lent out in the previous year divided by the total loan lent out in the previous year. *Ratio of mortgage loan* is calculated as the amount of mortgage loan lent out divided the total loan lent out by the bank. *Avg(Post × AAC)* is the average of *Post × AAC* across all the geographic locations of a bank's subsidiaries. All variables are defined in Appendix A. All continuous variables are winsorized at the 1% level. Heteroscedasticity-consistent standard errors, clustered by firm, are shown in parentheses. Significance levels: * 0.1, ** 0.05, *** 0.01.

	Bank ROA		Bank ROE		Ln(Total bank loan)		Bank loan growth		Ratio of mortgage loan	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Avg(Post × AAC)	0.0005	0.0006	0.0084	0.0088	0.1904	0.0900	-0.1879	0.9604	0.0317	0.0333
	(0.0009)	(0.0009)	(0.0128)	(0.0127)	(0.1201)	(0.0727)	(0.2044)	(1.4944)	(0.0309)	(0.0311)
ln(Total assets)		-0.0004		0.0059		0.6143***		-8.3544		-0.0102
		(0.0007)		(0.0048)		(0.1438)		(8.3058)		(0.0155)
Leverage		-0.0063		0.3362***		0.6931		-85.5114		0.0971
		(0.0079)		(0.0715)		(0.5770)		(85.2029)		(0.1559)
Bank FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	4,019	4,009	4,019	4,008	3,601	3,554	2,988	2,971	2,295	2,284
R^2	0.652	0.654	0.618	0.636	0.983	0.991	0.338	0.351	0.851	0.851

IA.3.7 The implications for aggregate city-level lending activity

We also examine whether the introduction of AACs is associated with changes in aggregate city-level lending activity. While firm- or bank-level regressions capture effects on specific entities, city-level analysis allows us to assess whether AAC implementation coincides with broader shifts in the volume or growth of credit in the local financial system.

Table IA.7 reports results on the association between AAC introduction and city-level loan outcomes, using data from CSMAR. The city-level loan balance series is taken from the CSMAR "City-Level Financial Statistics". The dependent variables are the natural logarithm of the year-end loan balance in the city (*Ln(Loan balance)*) and the year-on-year loan balance growth rate (*Loan balance growth*).

The estimated coefficients on $Post \times AAC$ are small and statistically insignificant in all specifications. By contrast, GDP per capita, GDP per capita growth, and the number of industrial enterprises are positively and significantly related to loan levels or growth in several specifications. This analysis indicates no detectable change in either the total volume or growth rate of city-level loans following AAC introduction.

Table IA.7
City-level lending

This table shows a regression analysis of city-level lending. The dependent variable is shown above each column. *Ln(Loan balance)* is calculated as the natural logarithm of the year end balance of all loans lent out from financial institutions in the city. *Loan banlance growth* is calculated as the year end balance of all loans lent out from financial institutions in the current year minus the year end balance of all loans in the previous year divided by the year end balance of all loans in the previous year in the city. *Post* × *AAC* is a dummy that equals one if the city has established the AAC in the year. All variables are defined in Appendix A. All continuous variables are winsorized at the 1% level. Heteroscedasticity-consistent standard errors, clustered by firm, are shown in parentheses. Significance levels: * 0.1, ** 0.05, *** 0.01.

	Ln(Loan balance)		Loan balance growth	
	(1)	(2)	(3)	(4)
Post × AAC	0.0164	0.0295	0.0026	0.0030
	(0.0268)	(0.0266)	(0.0097)	(0.0095)
GDP per capita		0.0025***		-0.0002
		(0.0009)		(0.0003)
GDP pc. growth		0.0004		0.0017***
		(0.0006)		(0.0003)
ln(Ind. enterprises)		0.1235***		0.0213**
		(0.0258)		(0.0096)
City FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
N	4,033	3,987	3,737	3,705
R^2	0.982	0.983	0.439	0.451

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