Inclusive Origins of Rapid Industrialization: the Persistent Effects of the Colonial Bank Networks on Taiwan's Economic Miracle

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Abstract: This study examines how an inclusive banking institution established in prewar Taiwan under Japanese colonial rule (1895-1945) boosted the Chinese Nationalist government's capacity for financing postwar industrialization by nationalizing the banking sector. The decentralized banking system in colonial Taiwan allowed local elites to establish commercial banks to service farmers and entrepreneurs, and resulted in extensive bank networks. These banks, even being nationalized, continued to operate and expand new branches around the colonial bank networks. We demonstrate that townships with more nearby prewar bank branches tended to persistently have more bank branches and grow faster during the postwar rapid industrialization period.

keywords: Colonialism, Bank Branch, Elite, State Capacity, Institutions, Industrialization

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1 Introduction

What explains the East Asian miracle? Many studies argue that a key to the East Asian economies' success lies in strong state capacities for promoting economic development, and most of the existing works attribute such strong capacities mainly to the centralized governments and professional bureaucracy in East Asia.[1] Some further argue that the East Asian industrial revolutions were hardly different from "the Soviet Union in the 1950s," which grew through "a mobilization of resources that would have done Stalin proud" (Krugman, 1994). Although many studies have demonstrated that "inclusive economic institutions," or institutions broadly encouraging participants in an economy to produce and make investments, play a fundamental role in economic development (e.g. Acemoglu, Johnson, and Robinson, 2001; Acemoglu and Robinson, 2012), the institutional nature of East Asian industrialization is relatively unknown.[2]

To which degree, and how, do inclusive economic institutions affect the rapid industrialization in East Asian economies? Taiwan is an ideal case to examine those questions because the economic miracle in postwar Taiwan was led by the Chinese Nationalist government, the same government which was considered to be weak and corrupt and failed to industrialize prewar mainland China in the 1930s.[3] How did this weak government suddenly turn to have great capacities for making an economic miracle as it came to Taiwan? We propose that inclusive economic institutions established historically in Taiwan during the Japanese colonial period (1895-1945) have played a crucial role in boosting the postwar government's capacity to promote rapid industrialization.

Specifically, we examine these questions in the context of a "big-push" policy for financing industrialization in the spirit of Gerschenkron (1962): the nationalization of the banking sector to promote development. Gerschenkron (1962) proposed that developing countries could step into the banking sector for directing savings into manufacturing sectors to push industrialization. Yet, La Porta, Lopez-de-Silanes, and Shleifer (2002) have found that this approach generally failed to promote development. The Chinese Nationalist government, in both prewar China and postwar Taiwan, sought to finance industrialization by nationalizing the banking sector and imposing selective credit policies to favor certain manufacturing industries. Whereas the banking industry in prewar China "failed lamentably to carry out the function of credit creation for the development of the economy as a whole" (Feuerwerker, 1983, p.111), the banking sector in postwar Taiwan played a far-reaching role in industrial development.[4]

[1] For instance, Amsden (1992), Evans (1995), Rodrik (1995), Amsden and Chu (2003), and Wade (2004).

[2] A wave of earlier studies of economic history has suggested that institutions played a key role in the Industrial Revolution in Western Europe. For example, see North (1990), Greif (2006), Mokyr (2008) and De la Croix, Doepke, and Mokyr (2018).

[3] Instead, the Chinese Nationalist government caused a plenty of economic disasters in mainland China, for example, hyperinflation, intolerable corruptions, monopoly of businesses by the ruling members in the government. For massive political and economic turmoils related to the Chinese Nationalist government in mainland China, see Eastman (1984) and Eastman, Ch'en, Pepper, and Van Slyke (1991).

[4] Bank loans accounted for the majority of external funds in manufacturing sectors in postwar Taiwan

Our hypothesis to explain these opposite outcomes of the same ruling government is that the government could successfully finance industrial development in postwar Taiwan because an inclusive banking institution had been established during the prewar Japanese colonial period. The decentralized, bottom-up banking system in colonial Taiwan allowed local elites to establish commercial banks to service local farmers and merchants to facilitate investments. As a result, several commercial banks were established and competed with each other by expanding bank branches for collecting private savings and letting branch officers to make loan decisions. The competition resulted in extensive commercial bank networks which penetrated many rural areas in colonial Taiwan.

This study examines how this decentralized bank system established in colonial Taiwan amplified the postwar government's capacity for promoting the big-push policy. As the Chinese Nationalist government nationalized these commercial banks, not only the colonial commercial bank networks survived, but also each bank still competed with each other and allowed branch officers to make loans at the local level. We hypothesize that, because of economies of density, these banks tended to expand branch networks around their existing bank networks established during the colonial era, reinforcing the decentralized pattern of the bank expansion.[5] The decentralized nature of the Taiwanese banking system— the extensive bank networks as well as the fact that loan decisions were made by local branch officers— persistently reduced entrepreneurs' spatial frictions to search for external funds in the postwar period. Such frictions were pronounced for small and medium firms in any developing economy.

Because of the aforementioned decentralization nature, our empirical strategy uses the bank networks' geographic variation across townships to evaluate the impacts of this inclusive banking system.[6] In particular, we derive two testable implications: those areas "treated" by the colonial bank branches should persistently (1) have more bank branches and (2) have more industrial activities, such as a higher number of manufacturing establishments or a larger volume of manufacturing output.

To test our hypothesis, this study utilizes industrial censuses which cover all non-agricultural establishments in Taiwan from 1976 to 2001. The empirical analysis begins with cross-sectional regressions at the township level. Because the number of branches in the colonial period may be correlated with omitted variables influencing postwar devel-

during the rapid industrialization. For small and medium businesses in Taiwan, among difference sources of loans, bank loans account for 65% from 1964 to 1986, approximately approximately 75%-80% in the 1980s, and 55% in the early 1990s. See Huang (1988) and Yang, Chen, Chen, and Du (1997, Chapter 2 and 6).

[5] Huang (forthcoming) empirically analyzes the competition among banks in postwar Taiwan from 1969 to 2017, and finds that while these banks were highly regulated, each bank tends to open a new branch nearby owned branches, suggesting the existence of economies of density. Since most colonial commercial bank branches continued to operate in the postwar era, those historical branches naturally became the "initial locations" for postwar expansion of bank networks.

[6] The current administrative hierarchy from top to bottom in Taiwan is: 22 cities/counties (for example, Taipei city), 368 townships, and roughly 7,800 villages. In the postwar era, there have been a few changes of the number of townships over time. To make a consistent crosswalk, our data have 365 townships in the analysis. See appendix B.1 for more details.

opment, we perform robustness checks by implementing empirical exercises suggested by Kelly (2020), from controlling continuous spatial trends to dropping outliers. Our baseline OLS estimates are robust to these checks.

To further address endogeneity concerns, we adopt an instrumental variables approach based on "elite distance"— each township's distance to the nearest residence of the local elites who established the commercial banks during the colonial era. The exclusion restriction for this empirical strategy relies on two premises. First, the elite distance should influence key economic outcomes only *after* the establishment of the commercial banks. Using village-level censuses in the early colonial period, we provide evidence that the instrument is uncorrelated with predetermined variables like village-level populations, agricultural output, and agricultural labor productivity before the establishment of these commercial banks. Second, in Taiwan's context, local elites might make local investments in their birthplaces, so these bank founders' own investments could potentially invalidate the instrument. Therefore, we also perform IV estimation using the subsample which excludes the counties of these bank founders' residences.

Estimating results from various empirical specifications confirm our hypothesis by demonstrating that, with more nearby bank branches at the end of the colonial era, a township tended to experience stronger bank branch expansion and have more industrial activities in the postwar period. Moreover, we find that both the path-dependence of bank expansion and its industrial effects tended to be more pronounced over time, especially after the deregulation of the banking industry in the 1990s.

Additionally, we use firm-level data to examine the channels of the financial institution in promoting economic development.[7] Our firm-level empirical results suggest two major channels. The first channel is that postwar banks facilitated capital formation of firms. External funds allowed firms to expand output by acquiring more capital inputs. Consequently, the labor productivity of these firms became higher. The second channel is that firms with higher total factor productivity tended to be selected to get loans, which has far-reaching implications for aggregated total productivity growths as Buera and Shin (2013) demonstrates. Intuitively, the tendency of financial intermediates to select productive firms to get loans will reduce the misallocation of credit by allowing more productive entrepreneurs to enter and survive. Our empirical results demonstrate that firms with higher total factor productivity tended to be selected to get loans. In addition to such two channels, we also examine whether accessing external funds directly improved total productivity. Although we find that getting loans might improve total factor productivity of non-manufacturing firms, we do not find robust evidence that external funds induced manufacturers to improve total factor productivity.[8]

[7] "Firm" and "establishment" are used exchangeably in this study, because most Taiwanese firms do not have multiple establishments. We only use data from single-establishment firms to investigate the channels in our firm-level analysis to avoid identifying the decision-making location in multiple-establishment firms.

[8] This finding is consistent with Gregg (2020): institutional arrangements which encourage private investments, in her case, incorporation law in Imperial Russia, may improve firm performance through

As a major contribution, this paper broadens our understanding of the institutional nature of rapid industrialization.[9] East Asian countries are often mentioned as successful stories of how state capacity causes growths (e.g. Amsden and Chu, 2003; Amsden, 1992; Evans, 1995; Rodrik, 1995; Wade, 2004).[10] This paper illuminates the role of existing institutions in shaping developmental impacts of state intervention. One important policy implication is that the efficacy of state-led financial policies for industrialization in particular, and other industrial policies to advance development in general, is crucially conditional on institutions. In other words, there may be a strong complementarity between a policy and institutions. For example, Gerschenkron (1962) argues that in a backward economy, the government can overcome the institutional failure by replacing the original economic institutions. However, this study demonstrates that the efficacy of governmental participation in the financial sector crucially depends on original institutions. In other words, inclusive institutions may facilitate "infrastructural power" (Mann, 1984) of states to push industrial revolutions.

Secondly, our study contributes to the literature of financial deepening (e.g. King and Levine, 1993; McKinnon, 1973; Rajan and Zingales, 1998; Schumpeter, 1934; Shaw, 1973). Our emphasis on bank branch networks draws insights from the literature particularly emphasizing financial intermediates, or bank-growth nexus, like Jayaratne and Strahan (1996), Burgess and Pande (2005), and Nguyen (2019). A recent wave of studies also found that banking access played a crucial role in the industrial revolution in Europe (e.g. Heblich and Trew, 2019; Lehmann-Hasemeyer and Wahl, 2021). We show that even in a developing economy, the well-established decentralized bank network and its spatial configuration play a far-reaching role in industrialization.[11]

Our study shares the same interest as empirical studies on entry patterns of retail chains which have founded that economies of density have strong impacts on retail chains' entry decisions (e.g. Holmes, 2011; Igami, 2011; Jia, 2008; Nishida, 2015; Seim, 2006).[12] In this study, the mechanism of persistence is through the path-dependence of postwar bank expansion. On top of that, we exploit the historical entry pattern of bank branches to construct the elite distance instrument. The dual nature of local elites, simultaneously

capital formation rather than improving total factor productivity.

[9] More broadly, this paper also links to the empirical literature on what causes industrialization. Some notice the importance of corporate laws, like Gregg (2020). Some find that transportation infrastructure are crucial, fro example, Hornbeck and Rotemberg (2019) on railroad expansion in USA. A study that is close to our findings is Bau and Matray (2020) which illustrates that, in India, liberalization of capital market increases manufacturing productivity and reducing capital misallocation there.

[10] Recent studies on East Asian states and its economic impacts include Chen, Igami, Sawada, and Xiao (forthcoming) on China's strategy of privatizing state-owned enterprises, and Lane (2019) on South Korea's industrial policy to promote infant industries. Many empirical studies on state capacity also raise East Asian countries as a typical model. See Dell, Lane, and Querubin (2018) and Acemoglu, Garcia-Jimeno, and Robinson (2015).

[11] Interestingly, Huang (2012) also points out that financial liberalization of rural credit institutions played a fundamental role in China's take-off of rapid growth in the 1980s.

[12] To enjoy cost advantages as a result of economies of density, retail chains, either big-box format (Walmart) or small-store format (like 7-11), tend to expand store close to its headquarter or distribution centers and open a new store near old ones in a region.

as the modern businessmen and traditional political elites, provides the source of relevance and exclusion restriction. We believe that a similar instrument could be adopted in other setting of an industrializing society.

Finally, this paper also connects to a broad literature on history and development (e.g. Jia, 2014; Nunn, 2008; Nunn and Wantchekon, 2011; Voigtländer and Voth, 2012). Specifically, our work is closely related to studies on persistent effects of institutions (e.g. Acemoglu, Johnson, and Robinson, 2001, 2002; Banerjee and Iyer, 2005; Chen, Kung, and Ma, 2020), especially the ones that stress the role of local elites in local development (e.g. Dell, 2010; Dell and Olken, 2020). Recently, researchers emphasize that understanding of historical factors is essential for policy-making (Nunn, 2020; Voth, 2021). We illustrate that even in a rapidly changing economy like postwar Taiwan, the backstop of a successful policy in the postwar era has been established historically. Our study suggests that as developing countries search for economic policies to promote development, they should seriously consider policies that can harness the potential of their own historical conditions. In our case, the Chinese Nationalist government's big-push policy only worked in Taiwan because the Taiwanese banking sector had been well-established during the colonial era. In contrast, it was too early for the Chinese Nationalist government to implement this policy in prewar China as it still lacked efficacious banking institutions.

In the following, Section 2 provides background knowledge and Section 3 introduces data. Section 4 presents the township-level cross-sectional empirical results which confirm our hypothesis. Section 5 explores how the colonial bank networks influenced dynamic pattern of industrialization. Section 6 turns to examine how these persistent effects passed through to firm performance. Section 7 concludes.

2 Background

2.1 Bank Institutions in Colonial Taiwan and Prewar China

Many inclusive institutions had been established in colonial Taiwan, such as a land registration system which promoted landowners to make investments in land (Koo, 2011) as well as the Western legal system which unbiasedly protected private property in general (Wang, 2015). Among these fundamental institutions, an institution was promoted to reduce financial frictions: the decentralized commercial bank system which had already thrived in mainland Japan. There were multiple private commercial banks established by local elites for lending funds to Taiwanese farmers and entrepreneurs, and these commercial banks were encouraged to compete with each other.[13] As a result, bank

[13] Among the five commercial banks built by Taiwanese elites, four of them were established by *local* elites: First Commercial and Industrial Bank, Chang Hwa Bank, Chiayi Bank, Nitaka Bank. The other one, Hua Nan Bank, was built by a Taiwanese elite far beyond the local level, and and its branch network mainly concentrated on southern China and southeastern Asian rather than Taiwan during the colonial era. For details, see section 2.2.2.

branches extended deeply and widely in colonial Taiwan, and branch officers endeavored to collect private savings and lend money to promising local enterprises. After the 1920s, most Taiwanese farmers and businessmen could get formal loans from these banks branches.(Olds, 2018).

In contrast, prewar China lacked inclusive economic institutions. In the 1930s, the Nationalist government captured the ownership of many private banks through nationalization and regulations. Chinese farmers and businessmen in many regions could not borrow money from the state-controlled banks, partly due to the fact that too few bank branches had been established (except in treaty ports) (Feuerwerker, 1983, p.111), partly because of state-capture of bank loans,[14] and partly because big firms with political connections were more likely to get loans (Xu, 1958). During this period, the mass of Chinese farmers in rural areas failed to access external funds.[15]

2.2 Evolution of Commercial Bank System in Colonial Taiwan

2.2.1 The Changing Role of Local Elites

In Taiwan, local elites had played a crucial political role in villages since the Qing era (1683-1895). The weak local governments of the Qing empire failed to provide many public services at the village level, so the provision of public goods were often in private hands. For instance, villagers often needed to supply local defense and irrigation facilities by themselves.[16] In many villages, some local elites emerged to coordinate those public affairs. As Taiwan was taken over by the Japanese government as a colony in 1895, many rebellions prevailed in rural areas, often led by these local elites. To seek their support, in October 1896, the colonial government publicly recognized the social status of local elites by issuing *Shenzhang* (meaning literally gentry medals) to them.[17] Local elites were also encouraged to build modern businesses, for example, commercial banks.

2.2.2 Commercial Banks in Colonial Taiwan

The Japanese colonial government promoted the decentralized commercial bank system that had been well-established in mainland Japan after the Meiji Restoration. This system allowed privately-owned, profit-oriented commercial banks to expand their branches to

[14] About 20% of the public revenue of Nationalist government from 1928 to 1937 was derived through bank credit or issuing government bonds to be purchased by domestic banks. See Eastman (1986, p.140). For precise component of public revenue and expenditure during the time, see Tabel 20 in Feuerwerker (1983). State-capture of bank funds prevailed. By 1937, the government controlled nearly 70% of the total banking assets (Eastman, 1986, pp.139-140).

[15] Some semi-official publications admitted that farmers and private entrepreneurs in rural areas, who accounted for most economic activities during that time, could not have access to bank credit (Chu, 1937).

[16] See Jheng, Koo, and Wu (2020) for such phenomenon and its implication on land transactions in Qing Taiwan.

[17] In 1915, Ando Teibi (安東貞美), the Governor-General of Taiwan initiated a project to record names, addresses, and social contributions to villagers of those elites receiving *Shenzhang*. Such biographies of 1020 local elites are published by the colonial government in 1916. See Takatori (1916).

compete for market shares of local lending market. Most commercial banks in colonial Taiwan were established by local elites. Specifically, five commercial banks were established and operated by the Taiwanese: First Commercial and Industrial Bank (第一商工, henceforth First Bank), Chang Hwa Bank (彰化銀行), Chiayi Bank (嘉義銀行), Nitaka Bank (新高銀行), Hua Nan Bank (華南銀行).[18]

We present detailed biographies of these five commercial banks and their founders in appendix A.1. To summarize the biographies, the key features to these banks and their founders are the following: (1) except Hua Nan Bank, these banks were founded by local political elites to service Taiwanese farmers and entrepreneurs in colonial Taiwan, (2) First Bank became the largest commercial banks in the 1920s by acquiring Chiayi Bank and Nitaka Bank; (3) several of these banks, in order to meet new business opportunities in bigger cities, had moved their headquarters away from where the bank founders lived. Yet, many of their new branches were still established near their founders' residences. We will utilize these observations in our empirical section.

As a result of this decentralized system, there were 143 domestic bank branches in Taiwan at the end of the colonial period, including 89 branches of these commercial banks established by Taiwanese elites.[19]

To compare the accessibility of formal banking among Taiwan, China, and Japan in the prewar period, we use the densities of domestic bank branches as a rough index of the accessibility of formal banking. In 1940, there were 3,658 bank branch number and about 73 million people in mainland Japan.[20] Although the density of domestic bank branches in colonial Taiwan was lower than that in prewar Japan, it was far higher than that in prewar mainland China. In 1945, there were 143 domestic bank branches and 6.2 million people living in Taiwan. In contrast, In 1937, there were 1,627 domestic bank branches and 460 million people in mainland China.[21] To make a comparison, the density is about 5.01 branches per 100,000 population in mainland Japan in 1940, about 2.31 branches per 100,000 population in Taiwan, and about 0.35 branches per 100,000 population in China in 1937.

2.2.3 Geographical Distribution of Colonial Commercial Bank Networks

Figure 1 graphically presents the locations of all domestic bank branches at the end of the colonial period. We also mark the location of two major cities in Taiwan (Taipei city and Kaohsiung city) at the end of the colonial era. Further, we also shade the "abo-

[18] Another two banks, Taiwan Commercial Bank and Taiwan Agricultural and Industrial Bank, established by the Taiwanese in the early 1900s, were soon liquidated just after they were established.

[19] Chang Hwa Bank had 36 branches. Hua Nan Bank had 11 branches. First Bank had 42 branches, including the branches originally established by Chiayi Bank and Nitaka Bank. In addition to these three commercial banks, four banks were founded by Japanese people or extended from mainland Japan. Bank of Taiwan (the quasi central bank set up by the colonial government) had 15 branches. Japan Kangyu Bank (headquartered in Tokyo) and Sanwa Bank (headquartered in Osaka) had five and three branches, respectively. Taiwan Saving Bank had 31 branches.

[20] The number of bank branch in Japan is drawn from Hoffmann, Okazaki, and Okubo (2019).

[21] The number of bank branch in prewar China is drawn from Bank of China (1937).

riginal areas" which were ruled differently by the colonial government and the postwar government.

Two patterns are observed in Figure 1. On the one hand, we can observe the decentralized pattern of bank branch networks. Rather than clustering around the two major cities, the commercial banks established by Taiwanese elites extended widely and deeply in colonial Taiwan. For local farmers and entrepreneurs in rural villages, the commercial banks branches naturally became the major source of formal banking. On the other hand, "other banks" established by Japanese people concentrated in major cites during the colonial period, so the dots representing "other banks" in the figure tend to overlap each other in a small number of places. These patterns motivate us to focus on the colonial commercial banks in this study.

The residences of the four bank founders are also marked in Figure 1.[22] We observe geographic variation in the branch locations across these banks. A bank generally had more branches in regions near its founder's residence. After First Bank acquired Nitaka bank and Chiayi bank in 1923, the distribution of First bank' branches in 1945 were still influenced by the residences of those two banks' founders.

Related to the elite distance instrument, the first pattern is that regions geographically close to these residences tended to have more branches at the end of the colonial period. This is consistent with our argument the elite distance influenced historical bank expansion. Moreover, except Nitaka bank's founder, three bank founders lived in rural areas. Coincidently, many bank branches entered rustic areas rather than the two major cities. These patterns combined evince that "the elite distance" played an important role in the formation of the colonial commercial bank networks. In section 4.2, We not only formally test the first-stage relationship between the elite distance and the bank networks at the end colonial period, but also conduct falsification exercises to examine whether predetermined economic variables are correlated with the instrument.

[Figure 1 is about here]

2.3 Commercial Banks in Postwar Taiwan

2.3.1 An Overview

In this subsection, we briefly overview the postwar history of the banking industry in Taiwan. The following subsections provide more details.

After 1945, Taiwan turned to be ruled by the Chinese Nationalist government. The new government soon controlled the Taiwanese banking industry by partially nationalizing the commercial banks. Initially, the Nationalist government sought to abolish the decentralized commercial bank system by merging all commercial banks into one big state-owned bank. Yet, due to the Taiwanese elites' resistance, the three commercial

[22] For more information of these bank founders, please see section A.1. The founder of Hua Nan Bank, Lin Hsiung-cheng (林熊徵)'s residence was not included because the Lin family moved from Taiwan to China in 1895 (Hsu, 2012). He itinerantly lived in mainland China, Taiwan, and Japan.

banks established in colonial Taiwan survived. Although the operation of bank businesses was highly regulated in postwar Taiwan, the competitive nature of the colonial bank system remained. Not only the original bank branch networks persisted to work, but also bank branch officers, as they did during the colonial era, were allowed to make loan decisions at the local level.

When the Nationalist government in postwar Taiwan initiated large-scale market reforms in the 1960s, it did not give up its control of the banking industry. Instead, the postwar government tried to direct the banking industry to finance manufacturers by further imposing selective credit policy.[23] In the early episode of the market reforms, the restriction of credit supply still prevented many private manufacturers from getting bank credit. The Taiwan Provincial Council, as the most recognized democratic legislature during that time, urged the government to further relax regulations on banks' lending businesses. In the late episode of the market reforms, the government maintained the selective credit policy but allowed the domestic banks to expand credit supply.

2.3.2 Inheritance of the Commercial Bank Institution and the Political Influence of Taiwanese Bankers

Taiwan shifted to the hand of the Chinese Nationalist government in 1945, and the new government soon reorganized the colonial financial institutions. For the banks established by Japanese people, the government took over the Bank of Taiwan and merged it with the Taiwan Saving Bank and branches of the Sanwa Bank. The branches of the Japan Kangyo Bank were taken by Land Bank of Taiwan.[24]

For the commercial banks established by Taiwanese elites during the colonial era, some historical documents indicated that the postwar government originally planned to keep only one commercial bank and shut down others. The Taiwanese bankers sought to resist this centralizing plan. Once learning this news, they began to make political efforts in changing their fates. For example, the founder of Hua Nan Bank, Lin Hsiung-cheng, went to mainland China in 1946 to meet the president and the premier of the Nationalist government: Chiang Kai-shek and Soong Tse-ven.[25] After the meeting, the three commercial banks, First Bank, Chang Hwa Bank, and Hua Nan Bank were permitted to continue operating, although the government partially nationalized these banks by taking the Japanese-owned shares of these banks.[26]

By partial nationalization, the new government extended its political control over

[23] Shea and Yang (1994) notes that the postwar government imposed selective credit policies that encouraged banks to allocate credits to export industries (instead of specific corporations). For example, in the 1970s, the exporting firms could have lower loan raters. Since the 1980s the government further required domestic banks to expand loans to exporting manufacturers, or any manufacturer in "the strategic industries."

[24] See Bank of Taiwan (1991) and Yeh (2002).

[25] The manager who accompanied Lin Hsiung-cheng in this meeting provides a first-hand account of the negotiation process. See Hua Nan Bank (1987).

[26] Separately, Lin Hsien-tang (林獻堂), who took charge of Chang Hwa Bank during that time, also lobbied the officials of the Nationalist government. See Lin and Ho (2014).

these commercial banks which had been privately-owned in colonial Taiwan. Some bureaucrats of the new government or members of the Kuomintang (Chinese Nationalist Party) were elected as new chairpersons of these banks, but most managers and employees remained, and each branch continued operating in a way similar to that in the colonial period.[27]

2.3.3 Reforms in the late 1950s and the early 1960s

In the early postwar period, banks were under the state's control and permitted to supply credit to private enterprises. However, credit supply of banks was restrictive because the Nationalist government, in fear of hyperinflation, maintained a credit-contraction policy. To further enforce this policy, Economic Stabilization Board (經濟安定委員會),[28] established a special group, Bank Loan Supervision Team (銀行放款督導小組) in 1956, to supervise each bank's supply of credit.[29]

In the late 1950s, Yin Chung-jung (尹仲容), as the main economic planner, led the postwar government to initiate a series of reforms. Firstly he pushed the deregulation of foreign exchange to encourage exports in 1958. To respond to the recommendations of economic reforms from the United States in 1958, the Nationalist government announced "Nineteen-point Reform Program" (十九點財經改革方案措施) in 1959, a reform agenda aiming to facilitate private investments, either domestic or foreign. As a result, in 1960, the government legislated "Statute for the Encouragement of Investment" (獎勵投資條例).[30]

Urged by the Taiwan Provincial Council, the government further initiated a financial reform and finally ceased the credit-contraction policy.[31] Prior to the reforms, the Bank of Taiwan mainly provided credit to public businesses, and the officials in the headquarter determined which private firm, like textile capitalists, could have access to its loans. The loans to private businesses of the Bank of Taiwan started to increase since the reforms, and it even allowed each branch manager to decide who to get loans in 1963. In 1965, its credit supply to the private sector converged to the level of the public sector.

[27] See Hua Nan Bank (1987), Chang Hwa Bank (1967) and First Bank (1969) for the operation of these commercial banks during the early postwar period.

[28] Economic Stabilization Board was a special administrative commission to coordinate economic policies from 1953 to 1958.

[29] See Hua Nan Bank (1987, pp.372-373) for the role of Bank Loan Supervision Team during this period.

[30] See Kuo (2015) for this historical episode. Also see Irwin (2021) for the role of Yin Chung-jung in the reforms.

[31] The process of credit expansion was more "bottom-up"than the previous reforms: In the 1960, the Provincial Council organized a conference (工商金融座談會) for private entrepreneurs and bankers. Due to the credit-contraction policy in the 1950s, many private businesses suffered from a shortage of credit, even for the "star" industry–the textile industry which was dominated by mainland Chinese capitalists. Those mainland Chinese capitalists, together with prominent Kuomintang members in the Provincial Council, urged the government to relax credit restrictions. Yin Chung-jung who also took charge of the Bank of Taiwan at the time, attended the conference and promised the expansion of credit. See Yin (1963) for Yin Chung-jung's speech in this conference and his reply to textile capitalists and Provincial councilors.

[32] As for the three commercial banks, the government stopped scrutinizing their credit supply. Compared to 1960, the credit supply of the three commercial banks doubled in 1965, and continued growing.[33]

In short, the reforms in this period ceased the suffocation of credit markets in the 1950s. Since then, managers of bank branches had more power to decide whom and how much to loan, and the extensive bank branches, in turn, played a crucial role in reducing spatial frictions of Taiwanese manufacturers to search funds.

2.3.4 Regulation and Deregulation on Branch Expansion

The postwar banking industry in Taiwan was highly regulated. Most banks were owned by the local, provincial, or the central government until 1990. As the government started to deregulate the entry restrictions of new banks in 1990, 16 new private commercial banks entered from 1991 to 1993. In addition, other types of financial companies were allowed to transform into commercial banks. The number of banks increased from 25 in 1990 to 54 in 2000.

Although few new banks entered before 1991, incumbent banks were allowed to expand branch networks under many regulations. Originally, each domestic bank could at most opened two or three branches a year in the 1980s. After 1993, they could open at most five branches a year. It is noteworthy that when bank entry was deregulated in the 1990s, most bank branches belonged to those banks established during the colonial era.[34] In fact, the aforesaid three commercial banks established and survived in the colonial period had the largest branch numbers.[35]

3 Data

3.1 Township-level Geographical Information

The main analysis of this study is at the township level. The geographical information of each township is drawn from a project of government open data in Taiwan.[36] To calculate each township's centroid, the boundary of townships is provided by National Land Surveying and Mapping Center.

[32] See Bank of Taiwan (1991).

[33] See Hua Nan Bank (1987, p.392), and Chang Hwa Bank (1967, p.288-289). First Bank (1969).

[34] See Huang (forthcoming).

[35] Between 1945 and 1990, some new commercial banks were established. the Bank of Overseas Chinese, the Shanghai Commercial and Savings Bank, the United World Chinese Commercial Bank. However, these banks only opened a small number of branches in major cities in Taiwan. In 1980, both Bank of Overseas Chinese and the Shanghai Commercial and Savings Bank established branches only in the two largest cities: Taipei and Kaohsiung. The United World Chinese Commercial Bank opened branches in the five major cities: Taipei, Kaohsiung, Tainan, Taichung, and Keelung. In the same year, the three commercial banks established in colonial Taiwan had 285 branches in total, while the three new commercial banks had only 16 branches in total. This spatial pattern implies that all branches of commercial banks in rural areas in Taiwan before 1990 were established by such three colonial commercial banks.

[36] See //data.gov.tw/ dataset/7441.

3.2 Bank Branch Data

The data of postwar locations of bank branches rely on what is manually collected by Huang (forthcoming), mainly based on "Organizational Change of Financial Institutes" (金融機構組織動態) published by the Central Bank of Taiwan monthly on the journal *Reference Materials of Financial Business* (金融業務參考資料). The monthly documents record status changes of all financial institutions in Taiwan after 1969. Huang (forthcoming) also utilizes many additional sources to address missing records of the publication, including annual financial statements of banks listed in Taiwan Stock Exchange, *Financial Institutions Business Operations Annual Reports*, several anniversary books on bank history, and information from the website of Bank Bureau of Financial Supervisory Commission.

The locations of prewar bank branches are collected from anniversary books of bank history, including Hua Nan Bank (1987), Chang Hwa Bank (1967), and First Bank (1999). In the postwar era, the three commercial banks established in colonial Taiwan generally published anniversary books of own history for every 10 years. Those books provide chronicles listing branch expansion. We construct a list of prewar bank branches by identifying those branches opened before October 1945.

3.3 Firm Data

Our township-level and firm-level dataset is based on Industrial and Commercial Census (henceforth, Industrial Census) collected by Directorate General of Budget, Accounting and Statistics in 1976, 1981, 1986, 1991, 1996, and 2001. The census was conducted every five years since 1961. However, the earliest establishment-level data available for academic use is from 1976. We obtained the data from Survey Research Data Archive (SRDA) at Academia Sinica.

The advantage of Industrial Censuses lies in its wide scope. The censuses not only have covered most industries, except the agriculture, forestry, fishery, and animal husbandry,[37] but also recorded basically all business units, either private or public, with fixed business premises and operation equipments. Its wide scope implies that many enterprises that may be considered "informal" are also included in the census data, and our analysis of industrialization can take into account those small and informal firms that are important for a rapid developing economy.

The censuses record each establishment's input and output information for the census year: employment, wage bills revenue, book value of the capital stock, and expenditures on several types of intermediate inputs. For each industrial census, we can identify a firm's location at the township level, which industry it belongs to, its age, whether it pays the interest on loans, whether it is private or public, whether it registers itself as a company, and so on.[38] We utilize these establishment-level variables to construct our

[37] The census data for such industries are available in Census of Agriculture, Forestry, Fishery and Animal Husbandry, which are also taken by Statistical Bureau of Executive Yuan in Taiwan.

[38] Census of 1976 does not contain age.

township-level dataset.

For our firm-level analysis, unfortunately due to confidential restrictions, we cannot constructed firm-level panel data as we cannot match the same firm across censuses. Thus, we construct a repeated cross-sectional firm-level dataset from each cross-sectional datasets from Industry Census in 1976, 1981, 1986, 1991, 1996, and 2001.[39] Because most Taiwanese firms do not have multiple establishments, in the firm-level analysis, we only use data from single-establishment firms to avoid identifying the decision-making location in multiple-establishment firms.

3.4 Township-Level Key Variables

To measure the number of bank branches, we use township as a geographical unit. The distance between centroids of two adjacent townships is approximately 5 kilometers. For the following, BN_{jt} denotes the number of contemporary bank branches in a township j for each year t.

To measure the "exposure" of the colonial bank network, we define CB_j as the number of branches within a 10-km radius of a township in 1945.[40] Township-level populations, Pop_{jt}, are measured as registered populations. Registered population in 1955 are reported in Household Registration Statics of Taiwan (臺灣省戶籍統計要覽).[41] Registered population data in 1976 are recorded in Taiwan-Fukien Demographic Fact Book Republic of China (中華民國臺閩地區人口統計), while populations after 1980 are provided in Monthly Bulletin of Interior Statistics (內政部統計月報).

Other key variables used in the township-level analysis are the number of industrial establishments, N_{jt}^{ind}, the number of manufacturing establishments, N_{jt}^{manu}, the number of establishments having loans, N_{jt}^{loan}, industrial output, Y_{jt}^{ind}, and manufacturing output, Y_{jt}^{manu}. Those variables are directly summed up from establishment-level variables in the Industrial Censuses. Appendix B.2 presents the details on the construction of establishment-level variables from the census data.

3.5 Summary Statistics

Table 1 shows township-level summary statistics. Column 1 reports summary statistics in a pooled sample, while other columns report ones in each census year. In appendix, Tabel C1 presents establishment-level summary statistics in a pooled sample and in each census year, and Table C2 reports establishment-level summary statistics in manufacturing subsamples.

[39] Some important variables for our empirical analysis are available only in the public-use cross-sectional datasets but not in the panel dataset.

[40] Alternatively, we also tried 5-km radius or considering only the number of a township's own branches. We use 10-km radius as baseline specification not only for simplicity but also because 10-km radius of a township roughly covers itself and its neighboring townships, and a manufacturer in postwar Taiwan might visit nearby townships to search for external funds.

[41] The file is provided by Kelly Olds in 臺灣歷史統計, a website collecting historical statistical data of Taiwan. See http://140.112.36.98:10100/.

[Table 1 is about here]

3.6 Selective Credit Policy and the Historical Bank Networks

This subsection provides suggestive evidence for the existence of selective credit policy and, more importantly, the interactive role of the colonial bank networks on boosting the state capacity for directing funds into the manufacturing sector.

Figure 2 illustrates that the colonial bank networks have impacts on the selective credit policies favoring manufacturing firms. We divide townships into two groups based on whether there is at least one commercial bank branch within a 10-km radius in 1945. In both groups, the percentage of manufacturing firms getting loans is constantly higher than non-manufacturing firms, suggesting the existence of selective credit policies. In either group, those townships connected to the colonial bank networks have a higher percentage of firms with loans. More importantly, the percentage of firms getting loans in the townships connected to the colonial bank networks is the highest among all categories.

As we observe in the last row of Table 1, the mean of township percentage of firms getting loans was only 6% in 1976 and later 15% in 2001. Figure 2 provides a clearer picture. It reveals that in 1976, in townships without connections to the colonial bank networks, even the percentage of manufacturing firms which got loans was below 10%. In those townships connected to the colonial bank networks, in the same year, the percentage of manufacturing firms getting loans was up to 20%. After the relaxation of bank regulation in the 1990s, the township percentage of manufacturing firm with loans rose to around 25%-30% in 1996 and 2001. This suggests that the colonial bank networks played a crucial role in the credit selective policies to promote manufacturers.

[Figure 2 is about here]

4 Empirical Analysis of Township-Level Data

4.1 Baseline Regression

To test our hypothesis that the colonial bank networks caused postwar industrialization by creating a more inclusive financial environment, our aim is to exploit cross-sectional variation to capture the long-run effects of the colonial bank networks on economic outcomes across townships. We begin by estimating the following baseline specification:

$$y_j^{2001} = \beta CB_j + \gamma X_j + d_{County} + \epsilon_j \tag{1}$$

where j indexes townships, d_{County} denotes county fixed effects, and X_j denotes township-level control variables. The "treatment variable" of interest, CB_j is the number of commercial bank branches at the end of the Japanese colonial era within a 10-km radius (but not necessary in that township). The outcome variable of interest, y_j^{2001} represents the

economic variables in 2001. In addition to examining the economic effects on 2001, we are also interested in whether the areas connected to the colonial bank networks grew more rapidly from 1976 to 2001, so we estimate another specification as well:

$$\Delta y_j = y_j^{2001} - y_j^{1976} = \beta CB_j + \gamma X_j + d_{County} + \epsilon_j \quad (2)$$

where Δy_j represents the difference (in level) of economic variables between 1976 and 2001, or $y_j^{2001} - y_j^{1976}$.

Prior to running any regression, Figure 3 illustrates the main findings of this section. Each scatter plot demonstrates the unconditional relationship between the outcome variable in a township and the number of nearby commercial bank branches (within 10-km radius) in 1945. We can observe a positive pattern that townships with more nearby commercial banks in 1945 had more bank branches and were more industrialized in 2001, in terms with higher number of manufacturing establishments and larger manufacturing output. The regression results in this section further confirm the pattern which is clearly observed in the raw data.

[Figure 3 is about here]

Table 2 reports OLS estimates and robustness checks on the effects of colonial commercial bank network for a number of economic outcome variables using Specification (1). The baseline statistical inferences in Table 2 are based on robust standard errors reported in parentheses that do not account for spatial autocorrelation. Kelly (2020)'s replication works have demonstrated that persistency studies tend to underestimate standard errors for not properly correcting spatial dependence, which causes the "inflation" of t-values in these empirical studies. The mainstream approach to address this is to apply Conley (1999)'s method of computing standard errors which is adjusted for two-dimensional spatial dependence with an assumed cutoff distance. Kelly (2020) also finds that the inferences in the previous studies on persistency based on Conley (1999)'s method are sensitive to the choice of cutoff distances, especially when the assumed cutoff distance is too small.

To account for the potential inflation of t-values in our baseline inference, we firstly calculate Conley (1999)'s standard errors with a fairly large cutoff distance (1 degree of longitude and latitude). These are reported in square brackets in Table 2. Next, we utilize Kelly (2020)'s cutoff-free estimator based on a kernel with a highly flexible functional form to calculate standard errors adjusted for spatial autocorrelation. We report Kelly (2020)'s standard errors in curly brackets. Three kinds of standard errors are very close, and usually produce essentially identical levels of significance in Table 2, which implies the inflation of t-values caused by spatial autocorrelation does not serve as a major concern in our study.[42]

[42] An interesting pattern is that while Kelly(2020)'s standard errors are generally largest among these three kinds of standard errors, Conley (1999)'s standard errors with a fairly large cutoff distance are still sometimes lower than the baseline robust standard errors which ignore spatial autocorrelation.

Column 1 of Table 2 presents OLS estimates of the colonial commercial bank networks with county fixed effects in Specification (1). Panel A documents a significantly positive effect on the branch number in 2001. This positive correlation supports the existence of path-dependence of bank expansion: the postwar banks tended to establish branches in townships with more nearby colonial commercial bank branches. Panel B and C demonstrate the significantly positive effects on the number of the manufacturing establishments and the the manufacturing output, which further supports our hypothesis that the areas connected to the colonial bank networks were more industrialized in 2001. Figure C1 further visualizes the correlations presented in Panel A, B, and C by binned scatter plots. Furthermore, Panel D, E and F show the same positive pattern when we use other township outcomes to measure local development, such as the number of (non-agricultural) industrial establishments, (non-agricultural) industrial output and the number of population.

[Table 2 is about here]

Estimating Specification (1) by OLS may suffer from both positive and negative selection biases. On the one hand, OLS estimates are possibly biased upward as a result of commercial clusters which had been formed during the pre-colonial era. For example, Taipei has been much developed prior to the emergence of the commercial banks. As emphasized in section 2.3, most commercial banks in colonial Taiwan were privately-owned and thus profit-oriented, so they might have expanded toward regions with more commercial activities during the colonial era. Those regions as a historical lucrative market may be still lucrative in the postwar period, and consequently there were more postwar economic activities, which makes our OLS estimates biased upward.

On the other hand, less obviously, it is also possible that OLS estimates suffer from negative selection biases. For example, production of agricultural commodities like rice, tea, or sugar, played the major role in the economy of colonial Taiwan. Thus, firms in regions with more prewar bank branches were more likely to concentrate in the sector of agricultural commodities, so these firms probably had higher adjustment costs of transiting to new manufacturing industries in the postwar era.[43] Similarly, areas with more nearby bank branches during the colonial era were also developed earlier. Without reconstruction, deteriorated public infrastructures and crowded space may curb subsequent local development.[44]

Especially for empirical studies of persistency, accounting for these potential omitted factors is crucial for consistently estimating persistent effects of a particular institution. By replicating several famous persistent studies, Kelly (2020) found that the results

[43] For example, Hsinchu attracted branches of Nitaka Bank because of its tea industry, but the tea industry lost its importance during the postwar industrialization. Hsinchu did not industrialize in the early postwar period. Since 1980s, partly because of Hsinchu Science Park, Hsinchu shifted to be an high-tech cluster of semiconductor manufacturing and other manufacturing of computer technology.

[44] Reconstruction may benefit urban development by removing those barriers. See Hornbeck and Keniston (2017).

of persistency tend to be sensitive to (1)the inclusion of regional fixed effects or other historical control variables, (2) controlling for continuous spatial trends and (3) the exclusion of outliers. To conduct robustness checks for benchmark results in Column 1 of Table 2, we follow Kelly (2020)'s suggestions to address these concerns.

Since we have included county fixed effects in Column 1 of Table 2, we further include other control variables to address potential regional and historical omitted factors. Column 2 of Table 2 includes two additional historical controls: (1) a regional dummy variable indicating whether an township had been an "aboriginal area" since the colonial era, because the Japanese colonial government imposed "aborigine administration" which was highly restrictive in these areas, and (2) the number of manufacturing employment in 1938 to account for prewar manufacturing development in the colonial era.[45] Except the persistent effects on the (non-agricultural) industrial output in Panel E which becomes substantially lower, the size of the effects on other outcome variables in 2001 only moderately decreases. In general, the coefficients of the colonial bank networks remain positive and significant.

Next, we follow Kelly (2020)'s advice to include the flexible effects of township longitude and latitude, $f(\lambda_j^x, \lambda_j^y)$ with λ_j^x as longitude and λ_j^y as longitude. Columns 3 and 4 show that the estimates are very robust to the inclusion of either linear or quadric spatial trends. This implies that the positive persistent effects are not simply driven by unobserved spatial trends.

Finally, we turn to address the potential threats caused by outliers. As the western region of Taiwan had been obviously more industrialized than other regions and also had more commercial bank branches in 1945, these estimates may exaggerate the effect of the colonial commercial bank networks. Column 5 reports the subsample results as we only consider townships in western Taiwan. Further, the results in Column 5 may still be driven by some key industrial clusters. In Column 6, we further exclude Taipei city(as Taiwan's capital), Hsinchu city as well as Hsinchu county (for the Hsinchu Scientific Park) and Kaohsiung city (as the main export ports in colonial Taiwan and still the main cluster of heavy industries) and keep the remaining townships in western Taiwan in the regression. These subsample estimates are very close to the previous columns. In Column 7, as only 5% of townships had more than 6 commercial bank branches within 10-km radius in 1945, we directly drop these top 5% outliers. Compared to the previous estimates, the magnitude of the effects tends to drop in Column 7, but the coefficients remain positive and significant.

As we are also interested in whether the areas connected to the colonial bank networks grew more rapidly from 1976 to 2001, Table C3 reports the results of OLS estimates of Specification (2) where outcome variables turn to be differences of economic variables between 1976 and 2001. The OLS estimates remain positive and statistically signifiant

[45] We calculate the number of manufacturing employment in 1938 via the "Taiwan Businesspeople" dataset provided by Kelly Olds. See http://homepage.ntu.edu.tw/ olds/. Some townships are missing in the regressions with the historical controls because these townships cannot be matched to the dataset of "Taiwan Businesspeople."

with all kinds of robustness checks. This implies that these townships connected to the historical commercial bank branch networks tended to witness more rapid bank branch expansion and industrial development.

4.2 Elite-Distance Instrument

We have observed a general pattern that townships with more nearby commercial bank branches in the colonial period tended to experience stronger bank expansion and more rapid industrialization in the postwar era. However, unobserved factors ϵ_j in regression equation (1) may correlate with CB_j and bias the OLS estimates. To address the selection biases caused by unobservables, we proposes an instrumental variables approach based on each township's distance to bank founders' residences that had been determined before the colonial period.

The OLS estimates above share a similar endogeneity concern with the empirical literature on the entry decision of retail chains: firms tend to enter growing markets and exit declining ones. In our setting, even though historical bank entry happened in the colonial period, unobserved heterogeneity across geographical markets may persist through the postwar era.[46] To construct a plausible instrument, we rely on an insight drawn from previous empirical studies of retail entry such as Jia (2008) and Holmes (2011). They find that, for saving costs of management or distribution, a retail chain tends to expand more stores near its headquarter or open a new store near old ones. That is, distance matters.

To address our endogeneity concern, we need to find an instrument which is relevant to (historical) bank branch expansion, but orthogonal to unobserved factors influencing local demand for bank credit in the postwar era. A potential instrument is each township's distance to the nearest historical bank headquarters in the colonial era. It is easy to convince its relevance to bank branch numbers in 1945, because it would be less costly to supervise a branch close to the headquarter. However, the exclusion restriction of this instrument is not plausible. Historical documents suggest that some commercial banks moved their headquarters as a response to regional economic shocks during the colonial period.[47]

This study proposes a novel instrument: the nearest distance to the residences of bank founders, who had been local political elites since the pre-colonial period (the elite-distance instrument, henceforth). Specifically, we construct each township's nearest distance to the residence of a local elite who was one of the founders of the commercial banks established in colonial era.[48] Four local elites are considered when we construct

[46] See Igami and Yang (2016) which discusses this endogeneity issue in detail in the context of empirical dynamic entry game.

[47] For example, the headquarter of the First bank had been initially in Pingtung, but it soon shifted to Taipei as the First Bank merged the Taiwan Bank of Saving. Also, Chang Hwa Bank was established in Changhua, but its headquarter soon moved to Taichung to approach new sugar companies. The locations of the headquarters are hardly orthogonal to factors influencing local demand conditions.

[48] Addresses of their houses are recorded in Takatori (1916). Geocoding is possible because their houses

the elite-distance instrument: Wang Chao-wen(王朝文) for Chiayi Bank, Li Jing-sheng (李景盛) for Nitaka Bank, Wu Ru-xiang (吳汝祥) for Chang Hwa Bank, and Lan Gao-chuan (藍高川) for First Bank.[49]

Like the distance to a bank headquarter, the elite-distance instrument is a cost-shifter for expanding branch networks: it was less costly for a founder to supervise a branch close to his house, so banks tended to expand branches near its founders. Unlike the locations of bank headquarters which might change in response to demand shocks, the unique history of colonial Taiwan provides a basis for this instrument's exogeneity, because where these elites lived is predetermined in the early Qing dynasty, which is unlikely to correlate with regional economic shocks in postwar Taiwan. Moreover, historical documents show that those local elites tended to stay in their birthplaces, and rarely moved to a new thriving region in the colonial era (e.g. Taipei).[50] Those local elites in colonial Taiwan had strong political incentives to stay in their original residences for maintaining the cachet of elite status and associated political advantages.

The exclusion restriction for the identification strategy relies on two premises. The first premise is that the instrument should not affect key economic outcomes prior to the establishment of the commercial banks. Thus, we conduct a set of "falsification exercises" by using the first agricultural census in 1903 and the first population census in 1905 during the colonial period. Both village-level censuses were conducted by the Japanese colonial governments before any commercial bank's operation.[51] We examine the instrument's effects on several predetermined variables which may have long-run impacts on industrialization: populations, density of population, agricultural output, and agricultural labor productivity, and percent of irrigation in the early 1900s. We also examines whether villages near bank founder' residences once had plain aboriginal tribes in 1788. Villages with such tribes in the 18th century had been established much earlier than other villages, so they were possibly located in some pre-determinedly favorable places. Table 3 shows that conditional on county and district fixed effects, geographical controls, and spatial trends, the elite distance instrument is uncorrelated with these predetermined variables. This implies that the variation in the instrument does not reflect predetermined economic disparity across regions. Overall, the falsification exercises increase our confidence in the validity of our instrument.

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remain even today, and become famous cultural heritage.

[49] The founder of Hua Nan Bank, Lin Hsiung-cheng was not included because of the following reasons. First, strictly speaking, Lin Hsiung-cheng was not a local elite because the Lin family moved from Taiwan to China in 1895 (Hsu, 2012). Lin Hsiung-cheng was invited by the Japanese colonial government to make investments in Taiwan. As a result, he itinerantly lived in mainland China, Taiwan, and Japan. Second, Hua Nan Bank was not local incumbent bank established for serving local enterprises. Details of those banks and their founders are written in section 2.2.2.

[50] To illustrate, the founder of the First Bank insisted staying in Pingtung, while the headquarter of the First Bank moved to Taipei.

[51] The first population census was almost completed in early 1905 and unlikely to be affected by the establishment of Chiayi Bank and Chang Hwa Bank, because such two banks were built in the middle of 1905.

[Table 3 is about here]

The second premise is that a valid instrument requires that the effects of the elite distance on postwar development should be fully captured by bank expansion. In this respect, there are still at least two potential threats to the instrument's validity. The first threat is that the elite-distance instrument is correlated with other spatial trends influencing regional development. Thus, we also present the specification with the linear spatial trends as a robustness check. The second threat is less obvious. In Taiwan's context, it is possible that areas near the bank founders' residences had been more developed not only because of bank expansion, but also due to bank founders' direct investments around their birthplaces. Given that these bank founders did not move to other booming cities, they naturally had incentives to invest in profitable business projects in nearby towns, which may make the elite distance instrument violate exclusion restrictions.[52]

To deal with this concern, we utilize the local nature of these bank founders. As these elites' own investment in new businesses tended to concentrate around their birthplaces where they had political impact, faraway geographical markets for bank entry would not be the targets of their investments. In these distant townships, economies of density was the only plausible reason that distances to those banker's residences are relevant to bank expansion and modern industrial outcomes. Therefore, we present results based on the subsamples excluding townships where these bank founders lived, as they and their offspring tended to be the local politicians in these townships in both the colonial era and the postwar era. Additionally, we also conduct the analysis with a smaller subsample which further excludes the whole counties where these bank founders lived because there were county-level elections since the 1950s, and their offspring may extend investments to the whole counties they lived as they sought to win elections during the postwar period.

Formally, our IV strategy utilizes the following model for the two-stage least square estimator:

$$CB_j = \rho Z_j + \omega X_j + d_{County} + v_j \tag{3}$$

$$y_j = \beta CB_j + \gamma X_j + d_{County} + \epsilon_j \tag{4}$$

where in the first-stage regression Z_j denotes the elite-distance instrument and v_j denotes the disturbance term; X_j denotes the control variables; the second-stage regression is the same as Specification (1) or (2).

Table 4 reports first-stage results for the elite-distance instrument Z_j. In all specifications, the coefficient of the instrument is negative and strongly significant, which is consistent with our argument that the elite distance instrument is a cost shifter. Figure 4

[52] As there were thousands of local elites who established new businesses in colonial Taiwan, these investments of bank founders alone were unlikely to shape long-run regional development. Yet, we cannot rule out the possibility that such investments cause the elite-instrument to violate the exclusion restrictions.

presents the binned scatter plot for the first-stage estimate reported in Column 1 of Table 4.

[Table 4 is about here]

[Figure 4 is about here]

IV estimates for Specification (1) are reported in Table 5. Robust standard errors are reported in parentheses for making baseline statistical inferences, and Kelly (2020)'s cutoff-free standard errors adjusted for spatial autocorrelation are reported in curly brackets as well. In all columns we control for county fixed effects. We also include historical controls in Column 2 and linear spatial trends in Column 3. In case that these bank founders' own local investments caused the elite-distance instrument to violate the exclusion restriction, in Column 4 we drop those townships where the bank founders lived, and in Column 5 we drop all townships in the same counties where these founders lived.

Comparing with the OLS estimates in Table 2 , all estimates under IV regression in Table 5 are still positive. Nevertheless, some patterns emerge. Firstly, historical controls tend to substantially lower the size of the persistent effects. Secondly, the IV estimates are not sensitive to the inclusion of linear spatial trends. Thirdly, dropping townships under the bank founders' own political and economic influence slightly lowers the magnitude of the persistent effects. Lastly, the IV estimates reported by Table 5 are constantly more positive than the OLS estimates, which implies that there are *negative selections* in the OLS estimates.[53]

[Table 5 is about here]

In terms of economic impacts, we use the coefficients in Column 2 for illustration. Increasing one commercial bank branch in the 10-km radius of a township in 1945, all other things being equal, would cause the township in 2001 to have about 4.7 more branches (50% increase compared to the mean), 365 more manufacturing establishments (86% increase compared to the mean), and extra manufacturing output worth 13.7 billion NTDs (roughly 36% increase compared to the mean).[54]

In short, the IV estimates confirm our hypothesis that the colonial commercial bank networks cause the regional rapid industrialization in postwar Taiwan, through the path-dependence of bank expansion.

[53] We have argued OLS estimates may suffer from negative selections because some townships had been developed much earlier, and its economic activities concentrated in agricultural products like rice and sugar during the colonial era. Because southern and central Taiwan was developed (in agriculture) earlier than northern Taiwan, we then naturally expect that the extent of downward bias of OLS estimates will be relatively larger for southern and central Taiwan. We separately run regressions for such two regions. Table C4 shows both OLS and IV estimates in the two subsamples. In southern and central Taiwan, the relative magnitude of the gaps between the OLS and IV estimates for township manufacturing outcomes is substantially larger than that in northern Taiwan.

[54] We also present IV estimates for Specification (2) where outcome variables are the difference between economic variables in 2001 and that in1976 in Table C5. The patterns are similar to that in Table 5.

4.3 Do the Colonial Bank Networks Reduce Firms' Spatial Frictions?

One of the testable implications of our hypothesis is that the path-dependence of bank expansion reduces spatial frictions of local entrepreneurs to search funds. To investigate this implication, we examine whether townships with more nearby commercial bank branches in 1945 tended to have more firms accessing to credit in the postwar period in 2001.

Panel A of Table 6 confirms this implication. Either the OLS or IV results present positive and strongly significant correlation for the township number of firms getting loans in 2001, denoted by N_{2001}^{loan}, as well as for the growth of that between 1976 and 2001, denoted by ΔN^{loan}. The results are robust to the inclusion of spatial trends and historical controls. This implies that the colonial commercial bank networks had persistently facilitated more firms to have external funds to make investments.

Next, we examine whether the colonial commercial bank networks had persistently positive impacts on the township percentage of firms getting loans. Quantitatively, the estimates in Column 4 in Panel B of Table 6 show that increasing one commercial bank branch within 10-km radius in 1945 would cause not only the 3.28% increase in the township loan rate, which is roughly 20% compared to the mean, but also a 2.35% increase in the growth of the township percentage between 1976 and 2001, which is about 26% compared to the average level of growth. Yet, our findings in Panel B is more sensitive to the spatial trends. In Columns 5 and 6, the IV estimates remain positive, but the estimated effect size substantially drops. Our cautious conclusion is that townships with more nearby commercial bank branches in 1945 tended to have higher percentage of firms getting loans in 2001, but this effect did not increase much since 1976.

[Table 6 is about here]

5 Dynamic Patterns of Industrialization

5.1 Evolution of the Persistent Effects

The results in the previous section have already confirm that the colonial bank networks indeed caused the postwar industrial growths. This section aims to demonstrate how the persistent effects evolved over time between 1976 and 2001. To do so, we estimate the following specification of panel regression:

$$y_{jt} = \beta_0 CB_j + \sum_{1981}^{2001} \beta_t \cdot d_t \times CB_j + \gamma X_{jt} + d_{County} + d_t + \epsilon_{jt} \tag{5}$$

where j indexes townships, t indexes census years, d_t denotes year fixed effects, d_{County} denotes county fixed effects, X_{jt} denote township-level control variables, and the outcome y_{jt} represents economic variables of interest. As before, CB_j represents the colonial bank networks. Essentially, we decompose the effects of CB_j into two components: β_0

captures the “fixed component" which is fixed over time, and β_t represents the “dynamic component" which varies across census years, with β_{1976} normalized to zero.

The specification in (5) allows us to explore evolution of the persistent effects. If such effects are only important in the initial period of industrialization, but decline along with industrialization, then we expect to find $\beta_0 > 0$ and $\beta_t < 0$. If the persistent effects of colonial bank networks are not only materialized in the initial period but also self-reinforcing later, then we expect to find both $\beta_0 > 0$ and $\beta_t > 0$. Moreover, If the persistent effects are rather stable over time, then we expect to find $\beta_0 > 0$ and $\beta_t = 0$. It is also possible that historical institutions harm early stages of industrialization but play an important role in later development, and in this case we would observe $\beta_0 \leq 0$ and $\beta_t > 0$.

[Table 7 is about here]

Panel A of Table 7 reports OLS estimates of equation (5). In all columns we control for county fixed effects, year fixed effects, county-specific time trends, and linear spatial trends. Column 1 examines the relationship between prewar bank networks and the number of postwar bank branch of each township. The OLS estimates suggest the path-dependence of postwar bank expansion. Townships with more prewar branches in a 10-km radius tended to persistently have more bank branches. The positive correlations get even larger over time ($\beta_t > 0$). Especially after the relaxation of bank-entry regulations in 1990s, the positive correlation became more pronounced. Columns 2, 3, and 4 further suggest that those townships with more prewar branches within a 10-km radius tended to persistently grow more rapidly, in terms of larger populations, more business establishments, and more manufacturers. The positive correlations also get larger over time. Columns 5 and 6 turn to measure the relationship between the colonial bank networks and postwar industrial production of each township over time. Townships with more nearby prewar bank branches tended to experience stronger growths of industrial and manufacturing output since the 1980s.

Panel B of Table 7 reports IV estimates of equation (5) where we utilize the same elite-distance instrument and its interaction terms with year fixed effects as additional instruments. In all columns we control for county fixed effects, county-specific time trends, and linear spatial trends. The IV estimates confirm the self-reinforcing pattern of the persistent effects especially after the deregulation of bank entry in the 1990s. Before 1990, the estimates of the dynamic components, β_{1981} and β_{1986} for most outcome variables tend to be insignificant. It means that persistent effects of the colonial bank networks remain roughly constant before the deregulation of bank entry in 1990. Since the deregulation, the persistent effects of the colonial bank networks became self-reinforcing. The dynamic components after the deregulation, that is, β_{1991}, β_{1996}, and β_{2001} for all outcome variables, turn to be significantly positive.

To sum up, the results of panel regressions not only confirm what we have founded in the cross-sectional township analysis, but also demonstrate that the role of the bank networks as a historical, inclusive institution became even more crucial when the state

sought to promote financial deepening through the relaxation of the bank entry regulation.

6 Examining Channels Using Firm-Level Data

In the previous sections, we have shown the effects of historical bank networks on local economic development. We now use firm-level data from the industrial censuses to examine the channels of bank loans in assisting firm performance. Summary statistics of the full sample are reported in Table C1 and of manufacturing subsamples in Table C2. Our baseline specification is:

$$y_{ijst} = \phi Loan_{ijst} + \zeta X_{ijst} + \mu_{ijst} \tag{6}$$

where i, j, s, t index firms, townships, 2-digit industry codes, and census years, respectively. $Loan_{ijst}$ is the dummy variable to identify whether the firm has external loans. X_{ijst} denotes control variables, including Pop_{jt}, the number of population in a township, N_{jt}^{ind}, the number of non-agricultural establishments, time fixed effects, county fixed effects, county-specific time trends, and industry fixed effects. μ_{ijst} is i.i.d firm-level shock influencing firm performance but econometricians cannot observe. The outcome variables of interest include, respectively, log firm output, $log(Y)_{ijst}$, log capital input, $log(K)_{ijst}$, log capital input per unit of labor input, $log(K/L)_{ijst}$, log labor productivity, $log(Y/L)_{ijst}$, and log total factor productivity, tfp_{ijst}.

There are at least three potential channels at work. The first potential channel is about capital formation. Getting external funds allows firms to expand their output by acquiring powerful machines or making other fixed investments, consequently enhancing firms' capital-labor ratio and labor productivity. This channel is mostly noted by the early literature which had raised the importance of rapid capital formation in postwar East Asian industrialization (e.g. Young, 1995).[55]

The second potential channel is that getting external funds may cause an improvement on the Hicks-neutral total factor productivity at the firm level. Nonetheless, Gregg (2020) discovers that the casual effects of loans on total factor productivity are neutral, because firms with external funds may tend to expand revenues by gaining more machines rather than improving total factor productivity (e.g. improving management). Gregg (2020) further notices that such effects are even possibly negative. For example, in the context of this study, accessing bank credit implies firms' additional administration costs (e.g. accounting) to deal with bank branch officers.

The third potential channel is about selection of total factor efficiency. In both colonial and postwar Taiwan, managers of bank branches decided the allocation of credit at the local level. As these branch managers were partially responsible to the outcomes of allocating credit, they might have incentives to choose more productive firms to get credit

[55] For the early debate on which channels contribute to East Asian growths, also see Hsieh (2002).

because efficient firms were more likely to survive. Consequently, firms with higher total factor productivity are more likely to get external funds. As noted by Buera and Shin (2013), this channel will contribute to the aggregate growth of total factor productivity.

Our main empirical predictions are the following: (1) getting external funds increases firms' output by facilitating capital accumulation, and further improves firms' labor productivity; (2) the causal effects of accessing credit on total productivity are ambiguous; and (3) firms with higher total productivity are more likely to have loans, due to the positive selection;

Because our focus is mainly the development of manufacturing industries, we estimate baseline specifications on manufacturing firms and non-manufacturing firms (e.g. commerce) separately. Further, we restrict empirical analysis to only private, single-establishment firms to avoid the loan-making decisions within multi-establishment firms.

In Panels A and B of Table 8, we use pooled OLS regressions to illustrate the correlation between getting loans and firm performance. All coefficients in both panels are positive and strongly significant, which is consistent with our aforementioned predictions. In Panel A, the positive coefficients in Column 1 and 2 suggest that the output of manufacturing firms with loans on average are 200%$(= 100 \cdot \{e^{1.1} - 1\}\%)$ higher than manufacturers without loans, and the capital input of manufacturing firms with loans on average are 190% higher. Yet, Panel B demonstrates that the size of coefficients for output and capital input are much smaller for non-manufacturing firms. Further, capital inputs per worker and labor productivity of manufacturing firms with loans are each about 24% and 39% higher than manufacturers without loans, and for the non-manufacturing firms the size of correlation for such two outcomes are similar to the ones of manufacturers. Although the estimates on total factor productivity are positive, its size and patterns are different from other outcomes, especially for manufacturing firms. In general, firms with loans are only 4% higher in total factor productivity. In contrast, the total factor productivity of non-manufacturing firms with loans is 12% larger. Overall, the results above show that manufacturers with loans tend to expand production through accumulating more capital inputs, and the non-manufacturing firms are relatively less dependent on this channel.

To separate selection into getting loans from its causal effect, we follow Gregg (2020) to construct a firm-level instrument for $Loan_{ijst}$ in the same spirit of Hausman instrument or BLP instrument (Berry, Levinsohn, and Pakes, 1995): the relative difference in labor productivity between firms with loans and firms without loans in a given township, industry, and year. Formally, the instrument is given by

$$\left(\frac{\text{mean}(Y/L)_{Loan} - \text{mean}(Y/L)_{NoLoan}}{\text{mean}(Y/L)_{NoLoan}}\right)_{-i} \tag{7}$$

for each township, industry, year cell, excluding the firm in question $(-i)$. This instrument measures the local difference of labor productivity between those firms with loans and others without loans. Intuitively, the instrument represents firms' advantages in a

given region and industry. In townships which the quantity was large, more firms tended to search funds and get loans.

Panel C and D in Table 8 report IV estimates for each outcome variable. The IV estimates of $Loan_{ijst}$ confirm our predictions that external funds causes firms, especially those in the manufacturing sector, to accumulate capital, expand output, and become more labor productive. These results support the importance of the first channel. Interestingly, manufacturing firms and non-manufacturing ones behave differently on the causal effect on total factor productivity. The IV estimates in Panel C indicate that getting external funds causes manufacturers to slightly reduce its total factor factor productivity, while the same treatment causes non-manufacturing firms to improve total factor productivity. Compared with OLS estimation, the estimated coefficients on total factor productivity are smaller under IV estimation for both manufacturing and non-manufacturing firms, indicating a positive selection in OLS estimation as a consequence of the third channel.

To summarize, empirical exercises above consistently suggest that (1) getting bank credit enables firms to expand output through increasing capital inputs per worker and labor productivity, and (2) firms with higher total factor productivity tended be selected to have loans. The finding on the direct effect of getting loans on total factor productivity is ambiguous. We find evidence that getting loans induces non-manufacturing firms to improve total factor productivity, but the same effect does not hold for manufacturers.

[Table 8 is about here]

7 Conclusion

In this research, we show that inclusive institutions are essential for the postwar rapid industrialization in Taiwan. The commercial bank networks established by local elites during the colonial era expanded extensively to meet demand of funds for local entrepreneurs. The colonial financial institution have persistently impacted how the postwar government exercised its state capacity through the banking industry. Due to path-dependence of postwar bank expansion, local entrepreneurs near the colonial bank networks were more likely to get loans, so they could expand output by accumulating more capital inputs and became more labor productive. In addition, firms with higher total factor productivity are more likely to obtain bank loans to expand.

This study illuminates the fact that beneath the veneer of the rapid industrialization in East Asian economies, the persistency of historical institutions has rooted deep. This study also sheds light on the direction of future studies of exploring what lies behind the East Asian rapid industrialization. To illustrate, how do institutions impact on the performance of large-scale economic plans in Taiwan during the 1970s (Ten Major Construction Projects)? Do land reforms in the 1950s affect rural industrialization by unbinding the historical land institutions? How do the colonial bank institution further influenced Taiwanese industrial policies to promote electronic industries in the 1980s?

Furthermore, how do Japanese legacies shape South Korea's postwar industrialization? On the one hand, both prewar Taiwan and prewar Korea under the Japanese colonial rule (1910-1945) had similar decentralized banking systems. On the other hand, Japan established a development bank, Chosen Shokusan Bank, to finance its large-scale industrial policies in Korea, but did not build its counterpart in Taiwan. Do such similar but different banking institutions explain two economies' dissimilar paths of rapid industrialization? These questions are beyond the scope of this paper, but anew roads lie ahead.

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Table 1: Township-Level Summary Statistics

	(1) Pooled	(2) 1976	(3) 1981	(4) 1986	(5) 1991	(6) 1996	(7) 2001	(8) Δy_j
CB_j	1.67	1.67	1.67	1.67	1.67	1.67	1.67	0.00
	(2.21)	(2.21)	(2.21)	(2.21)	(2.21)	(2.21)	(2.21)	(0)
BN_{jt}	5.00	2.22	2.96	3.52	4.50	7.45	9.33	7.11
	(13.11)	(5.739)	(6.927)	(8.067)	(10.29)	(17.35)	(21.02)	(17.20)
Pop_{jt}	55047.93	47193.52	49846.45	54271.82	57162.46	59693.95	62119.35	14925.83
	(71799.9)	(61183.8)	(58569.7)	(70410.9)	(76455.2)	(78245.6)	(82079.2)	(62558.2)
N_{jt}^{ind}	1942.13	1190.39	1446.16	1739.66	2115.69	2469.91	2690.98	1500.58
	(3407.1)	(1910.7)	(2322.9)	(2922.9)	(3695.1)	(4175.0)	(4405.4)	(2928.9)
N_{jt}^{manu}	345.11	197.66	257.06	337.10	413.08	443.86	421.92	224.26
	(664.7)	(380.4)	(464.2)	(612.6)	(767.7)	(825.6)	(775.2)	(540.4)
Y_{jt}^{ind}	34687.72	7374.33	8537.54	21287.63	37920.10	56442.65	76564.05	69189.72
	(148612.9)	(27174.1)	(40648.4)	(73092.1)	(124277.1)	(187290.7)	(265904.0)	(243189.4)
Y_{jt}^{manu}	19422.66	5215.39	5316.06	14709.42	22574.68	30238.96	38481.47	33266.08
	(59894.7)	(17214.2)	(24047.9)	(38881.4)	(55272.4)	(76475.7)	(96787.5)	(83963.8)
N_{jt}^{loan}	269.10	97.71	149.85	158.20	241.27	473.70	487.76	393.00
	(634.5)	(208.6)	(342.6)	(392.1)	(533.2)	(926.3)	(897.3)	(739.6)
$Loan_{jt}$%	0.10	0.06	0.08	0.07	0.09	0.16	0.15	0.09
	(0.0726)	(0.0551)	(0.0597)	(0.0520)	(0.0681)	(0.0519)	(0.0720)	(0.0826)
Observations	2190	365	365	365	365	365	365	365

NOTE.—This table reports township-level means. Standard deviations are in parentheses. Δy_j denotes $y_{2001} - y_{1976}$, representing the township-level average growth of the variable between 1976 and 2001.

Y_{ij}^{ind} and Y_{ij}^{manu} are in 2016 NTD in millions.

Table 2: Cross-sectional OLS Estimates for Township-Level Outcomes in 2001

Outcome	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Panel A. Bank							
BN_{2001}	4.850***	3.430***	3.447***	3.432***	3.439***	3.465***	1.788**
	(0.614)	(0.679)	(0.693)	(0.695)	(0.721)	(0.749)	(0.774)
	[0.372]	[0.575]	[0.578]	[0.581]	[0.605]	[0.691]	[0.788]
	{0.643 }	{0.655}	{0.666}	{0.665}	{0.689}	{0.717}	{0.740}
R-squared	0.567	0.598	0.599	0.600	0.605	0.606	0.526
Panel B. The Number of Manufacturing Est.							
N^{manu}_{2001}	191.7***	231.0***	227.2***	221.6***	218.9***	232.1***	168.7***
	(43.26)	(57.07)	(57.91)	(57.62)	(59.40)	(62.68)	(43.11)
	[47.84]	[37.61]	[36.60]	[34.88]	[34.84]	[31.24]	[47.34]
	{60.20}	{68.31}	{68.40}	{66.5}	{68.45}	{73.94}	{49.64}
R-squared	0.447	0.533	0.535	0.541	0.531	0.544	0.463
Panel C. Manufacturing Output							
Y^{manu}_{2001}	12354.9***	9731.5***	9441.1***	9091.1**	8629.7**	9767.8**	11417.7***
	(3416.6)	(3463.0)	(3555.3)	(3618.8)	(3824.2)	(3861.3)	(4386.4)
	[3082.3]	[1426.1]	[1465.8]	[1502.0]	[1800.0]	[1323.5]	[3473.8]
	{5302.7}	{4389.5}	{4407.5}	{4450.0}	{4506.8}	{4698.4}	{4966.3}
R-squared	0.424	0.372	0.374	0.380	0.367	0.401	0.371
Panel D. The Number of Industrial Est.							
N^{ind}_{2001}	1188.4***	1007.2***	1004.7***	994.5***	984.3***	992.3***	633.8***
	(149.0)	(183.3)	(186.7)	(186.3)	(191.9)	(202.3)	(164.4)
	[88.83]	[129.1]	[127.5]	[125.7]	[128.1]	[145.5]	[169.7]
	{166.1}	{207.5}	{210.3}	{205.8}	{216.7}	{226.4}	{161.5}
R-squared	0.635	0.636	0.637	0.638	0.638	0.644	0.543
Panel E. Industrial Output							
Y^{ind}_{2001}	31695.4***	15688.0***	15437.9***	15059.2***	14593.7***	15894.7***	15010.0***
	(8358.3)	(4246.8)	(4359.8)	(4446.1)	(4697.5)	(4814.1)	(5220.3)
	[7830.6]	[2130.5]	[2193.1]	[2272.0]	[2590.6]	[2245.2]	[4637.5]
	{15752.1}	{5259.6}	{5364.8}	{5189.5}	{5345.1}	{5748.7}	{5597.4}
R-squared	0.471	0.459	0.460	0.466	0.454	0.490	0.430
Panel F. Population							
Pop_{2001}	21332.8***	22243.7***	21992.9***	21750.9***	21419.8***	21456.2***	13832.9***
	(3278.0)	(3887.3)	(3942.2)	(3914.2)	(4019.9)	(4178.8)	(3498.4)
	[1602.6]	[2671.7]	[2632.5]	[2553.1]	[2570.2]	[3081.1]	[3622.6]
	{4226.3}	{4781.1}	{4726.1}	{4534.0}	{4650.3}	{4602.2}	{3448.2}
R-squared	0.611	0.674	0.675	0.677	0.674	0.686	0.616
Controls:							
Dummy of Aboriginal Area	No	Yes	Yes	Yes	Yes	Yes	Yes
Number of Manu. Employees in 1938	No	Yes	Yes	Yes	Yes	Yes	Yes
Spatial Trends $f(\lambda^x_j, \lambda^y_j)$	No	No	Linear	Quadric	Quadric	Quadric	Quadric
Observations	365	314	314	314	266	222	304
Sample	Base	Base	Base	Base	West1	West2	$CB_j \leq 6$

NOTE.—The table reports cross-sectional OLS estimates for 2001 township outcomes. Each point estimate stems from a separate regression. All regressions include county fixed effects. The unit of observation is a township. Below each coefficient three standard errors are reported. The first, reported in parentheses, is robust standard errors. The second, reported in square brackets, is Conley (1999)'s standard errors adjusted for two-dimensional spatial autocorrelation with the assumed cutoff distance as 1 degree. The third, reported in curly brackets, is Kelly(2020)'s cutoff-free standard errors. For the baseline inferences, the table uses robust standard errors in parentheses to compute the levels of significance. In Column 2-4, the basic sample drops the townships that had been located in Kinmen County, Lienchiang County, old Taipei city, Taichung city, Tainan city, or Kaohsiung city during the colonial era for missing variables of historical controls. The West1 sample in Column 5 contains only townships in western Taiwan. The West2 sample in Column 6 further drops Taipei city, Hsinchu city, Hsinchu county and Kaohsiung city and contains remaining townships in western Taiwan.

* $p < 0.10$.

** $p < 0.05$.

*** $p < 0.01$.

Table 3: Falsification Tests: The Elite Distance's Effects on Predetermined Key Variables

	(1)	(2)	(3)	(4)	(5)	(6)
	Population, 1905	Population Density, 1903	Agricultural Output, 1903	Agricultural Labor Productivity, 1903	Irrigation (%), 1903	Tribe Dummy, 1788
Elite Distance	-1.83 5	-6.680	-8.025	-0.111	-0.091	-0.000272
	(6.971)	(5.096)	(69.09)	(0.0946)	(0.00133)	(0.000919)
Observations	2733	2733	2732	2730	2716	2739
R-squared	0.404	0.132	0.363	0.344	0.562	0.108
Mean	1068.36	354.12	18641.69	27.03	57.67	0.04
% variation w.r.t Mean implied by 1 km increase in instrument	-0.17%	-1.89%	-0.04%	-0.41%	-0.16%	-0.68%

NOTE.—The table reports cross-sectional OLS estimates for the elite-distance instrument's effects on village-level outcome variables in 1903 or 1905. Each point estimate stems from a separate regression. All regressions include county (*ting*) fixed effects, district (*baoli*) fixed effects, geographical controls (elevation and slope), and liner spatial trends. The unit of observation is a village (*jiezhuang*) during the early Japanese colonial period. Population density is defined to be village's population per km^2. Agricultural output in 1903 is measured by Taiwanese Yen during the census year and entails village's output of rice production and other crops' production. Agricultural labor productivity in 1903 is defined to be agricultural output in 1903 divided by village's population in 1905 (we assume that village's population in 1905 is close to that in 1903 as there was no earlier population census.) Irrigation (%) in 1903 is defined to be the village percentage of arable land area as irrigated paddies. Tribe dummy indicates whether a village had a plain indigenous tribe in 1788. The table also reports each outcome variable's sample mean and the % variation implied by one kilometer increase in the elite-distance instrument compared to the mean. For comparison, the elite-distance instrument's sample mean is 28.71 and its standard deviation is 16.70. Below each coefficient robust standard errors are reported. The table uses robust standard errors to compute the levels of significance and all results are not significant. The digitized census data in colonial Taiwan used in this table are drawn from Yap and Lio (2013). The locations of tribes in 1788 are drawn from Yap (2017).

* $p < 0.10$.

** $p < 0.05$.

*** $p < 0.01$.

Table 4: First-Stage Regressions

	(1)	(2)	(3)	(4)	(5)
Elite Distance	-0.0269***	-0.0246***	-0.0212***	-0.0254***	-0.0323***
	(0.00556)	(0.00609)	(0.00738)	(0.00630)	(0.0101)
Controls:					
Dummy of Aboriginal Area	No	Yes	Yes	Yes	Yes
Number of Manu. Employees in 1938	No	Yes	Yes	Yes	Yes
Linear Spatial Trends	No	No	Yes	No	No
Sample	Base	Base	Base	No Townships of Birth	No Counties of Birth
Excluded instrument's F	23.39	16.30	8.24	16.28	10.18
Observations	365	314	314	311	236

NOTE.—The table reports first-stage estimates of the townships number of colonial commercial bank branches in 10-km radius in 1945 on the elite distance instrument. Each point estimate stems from a separate regression. All regressions include county fixed effects. The unit of observation is a township. Below each coefficient robust standard errors are reported in parentheses. The samples used in Column2-5 drop the townships that had been located in Kinmen County, Lienchiang County, old Taipei city, Taichung city, Tainan city, or Kaohsiung city during the colonial era for missing variables of historical controls. The subsample used in Column 4 excludes townships as the bank founders' birthplaces. The subsample used in Column 5 excludes the whole counties as the bank founders' birthplaces.

* $p < 0.10$.

** $p < 0.05$.

*** $p < 0.01$.

Table 5: Cross-sectional IV Estimates for Township-Level Outcomes in 2001

Outcome	(1)	(2)	(3)	(4)	(5)
Panel A. Bank					
BN_{2001}	6.200***	4.761***	5.411***	4.664***	3.878***
	(1.137)	(1.158)	(1.763)	(1.148)	(1.187)
	{1.180}	{1.158}	{1.771 }	{1.148}	{1.187}
R-squared	0.555	0.578	0.555	0.575	0.601
Panel B. The Number of Manufacturing Est.					
N_{2001}^{manu}	313.7***	365.3***	375.0***	352.7***	329.9***
	(65.26)	(75.30)	(114.8)	(71.75)	(89.61)
	{88.46}	{95.50}	{134.69}	{86.84}	{91.62}
R-squared	0.374	0.470	0.460	0.489	0.528
Panel C. Manufacturing Output					
Y_{2001}^{manu}	20000.2***	13706.3**	13280.3	13000.1**	10320.8
	(4828.3)	(5708.9)	(11059.5)	(5555.8)	(7684.9)
	{8149.2}	{8282.3}	{14783.4}	{8128.2}	{4760.1}
R-squared	0.406	0.363	0.366	0.366	0.358
Panel D. The Number of Industrial Est.					
N_{2001}^{ind}	1593.5***	1407.9***	1592.8***	1376.3***	1241.9***
	(254.4)	(268.4)	(427.3)	(263.7)	(295.1)
	{306.9}	{330.5}	{497.9}	{318.2}	{315.1}
R-squared	0.610	0.602	0.564	0.609	0.648
Panel E. Industrial Output					
Y_{2001}^{ind}	40310.4***	22181.1***	22718.9*	21301.1***	18818.9**
	(8870.1)	(6803.5)	(12824.7)	(6620.3)	(8843.1)
	{17686.5}	{9494.9}	{16052.2}	{9490.2}	{10772.1}
R-squared	0.468	0.446	0.444	0.450	0.444
Panel F. Population					
Pop_{2001}	32560.0***	32712.5***	35349.5***	32446.1***	28717.6***
	(5102.7)	(5743.6)	(9226.8)	(5723.1)	(6053.8)
	{7394.0}	{7381.9}	{11366.8}	{7309.4}	{7594.7}
R-squared	0.557	0.630	0.606	0.634	0.677
Controls:					
Dummy of Aboriginal Area	No	Yes	Yes	Yes	Yes
Number of Manu. Employees in 1938	No	Yes	Yes	Yes	Yes
Linear Spatial Trends	No	No	Yes	No	No
Sample	Base	Base	Base	No Townships of Birth	No Counties of Birth
Excluded instrument's F	23.39	16.30	8.24	16.28	10.18
Observations	365	314	314	311	236

NOTE.—The table reports cross-sectional IV estimates for 2001 township outcomes. Each point estimate stems from a separate regression. All regressions include county fixed effects. The unit of observation is a township. Below each coefficient two standard errors are reported. The first, reported in parentheses, is robust standard errors. The second, reported in curly brackets, is Kelly(2020)'s cutoff-free standard errors. For the baseline inferences, the table uses robust standard errors in parentheses to compute the levels of significance. The samples used in Column2-5 drop the townships that had been located in Kinmen County, Lienchiang County, old Taipei city, Taichung city, Tainan city, or Kaohsiung city during the colonial era for missing variables of historical controls. The subsample used in Column 4 excludes townships as the bank founders' birthplaces. The subsample used in Column 5 excludes the whole counties as the bank founders' birthplaces.

* $p < 0.10$.

** $p < 0.05$.

*** $p < 0.01$.

Table 6: Loan Accessibility

Outcome	(1)	(2)	(3)	(4)	(5)	(6)
Panel A.						
The Number of Firms Getting Loans						
N_{2001}^{loan}	228.8***	227.8***	196.3***	313.3***	332.1***	315.2***
	(31.19)	(31.87)	(40.36)	(48.86)	(53.52)	(85.58)
ΔN^{loan}	185.5***	184.4***	172.0***	261.8***	277.7***	283.1***
	(27.23)	(27.84)	(34.39)	(41.20)	(45.47)	(76.89)
Panel B.						
The Percentage of Firms Getting Loans						
$Loan\%_{2001}$	0.00468***	0.00353**	0.00545***	0.0328***	0.0134	0.00670
	(0.00145)	(0.00138)	(0.00158)	(0.00984)	(0.0106)	(0.0162)
$\Delta Loan\%$	-0.00272	-0.00373**	-0.00180	0.0235*	0.00400	-0.000192
	(0.00182)	(0.00184)	(0.00223)	(0.0120)	(0.0129)	(0.0197)
Estimator	OLS	OLS	OLS	IV	IV	IV
Controls:						
Linear Spatial Trends	No	Yes	Yes	No	Yes	Yes
Dummy of Aboriginal Area	No	No	Yes	No	No	Yes
Number of Manu. Employees in 1938	No	No	Yes	No	No	Yes
Observations	365	365	314	365	365	314

NOTE.—Each point estimate stems from a separate regression. All regressions include county fixed effects. Robust standard errors are reported in parentheses.

* $p < 0.10$.

** $p < 0.05$.

*** $p < 0.01$.

Table 7: Panel Estimates of Effects of Colonial Networks on Township Outcomes

	(1) BN_{jt}	(2) Pop_{jt}	(3) N_{jt}^{ind}	(4) N_{jt}^{manu}	(5) Y_{jt}^{ind}	(6) Y_{jt}^{manu}
Panel A. OLS						
$CB_j \quad (\beta_0)$	1.121***	12484.3***	449.7***	82.01***	4343.9***	2983.8***
	(0.161)	(2073.1)	(68.33)	(25.84)	(1022.0)	(717.8)
$CB_j \times d_{1981} \quad (\beta_{1981})$	0.314	3456.1	127.5	25.40	618.9	43.00
	(0.249)	(3349.0)	(104.9)	(38.38)	(1770.6)	(1183.3)
$CB_j \times d_{1986} \quad (\beta_{1986})$	0.524**	5527.5	301.8**	66.24	5322.8**	3035.8*
	(0.266)	(3667.0)	(117.3)	(43.35)	(2701.4)	(1550.1)
$CB_j \times d_{1991} \quad (\beta_{1991})$	1.055***	7454.5*	487.5***	108.4**	11834.4***	5209.6***
	(0.329)	(3872.5)	(144.8)	(52.97)	(4164.1)	(2014.6)
$CB_j \times d_{1996} \quad (\beta_{1996})$	2.832***	7848.5**	685.9***	122.2**	20320.4***	7783.5***
	(0.538)	(3800.6)	(158.7)	(53.11)	(6051.5)	(2664.1)
$CB_j \times d_{2001} \quad (\beta_{2001})$	3.740***	8671.4**	737.0***	108.0**	27365.3***	9281.7***
	(0.634)	(3867.1)	(163.8)	(50.30)	(8423.1)	(3491.2)
Panel B. IV						
$CB_j \quad (\beta_0)$	1.620***	17406.1***	645.4***	109.1***	7773.5***	4911.4***
	(0.458)	(4806.5)	(146.0)	(39.62)	(1991.7)	(1169.0)
$CB_j \times d_{1981} \quad (\beta_{1981})$	0.380	5884.5	132.5	47.35	-154.1	-671.8
	(0.674)	(6559.6)	(214.6)	(59.63)	(2433.1)	(1319.6)
$CB_j \times d_{1986} \quad (\beta_{1986})$	0.842	8913.3	320.5	103.5	7396.1**	5112.2**
	(0.750)	(6806.8)	(232.3)	(68.06)	(3397.2)	(1999.3)
$CB_j \times d_{1991} \quad (\beta_{1991})$	1.468*	11587.7*	550.8**	168.1**	15402.9***	9070.0***
	(0.827)	(7015.6)	(256.6)	(79.12)	(4759.2)	(2686.5)
$CB_j \times d_{1996} \quad (\beta_{1996})$	3.651***	13665.5*	863.4***	196.9**	25777.0***	13062.7***
	(1.085)	(7080.3)	(279.7)	(81.18)	(6656.3)	(3477.4)
$CB_j \times d_{2001} \quad (\beta_{2001})$	5.003***	15543.1**	1011.7***	186.0**	35360.7***	16100.7***
	(1.266)	(7225.7)	(301.2)	(76.69)	(9249.2)	(4963.1)
Observations	2190	2190	2190	2190	2190	2190

NOTE.—All regressions include year fixed effects, county fixed effects, county-specific time trends, and linear spatial trends. Robust standard errors are reported in parentheses. Panel A presents OLS estimates of equation (5) and Panel B presents IV estimates of equation (5).

* $p < 0.10$.

** $p < 0.05$.

*** $p < 0.01$.

Table 8: Firm-Level Estimates

	(1) $log(Y)$	(2) $log(K)$	(3) $log(K/L)$	(4) $log(Y/L)$	(5) tfp
Panel A. OLS: Manufacturing					
Loan	1.189***	1.074***	0.218***	0.333***	0.0402***
	(0.00435)	(0.00390)	(0.00259)	(0.00215)	(0.000770)
Observations	656625	657257	657040	656568	655949
Panel B. OLS: Non-Manufacturing					
Loan	0.660***	0.589***	0.211***	0.286***	0.110***
	(0.00199)	(0.00208)	(0.00162)	(0.00117)	(0.000765)
Observations	3336433	3344890	3344444	3336144	3302407
Panel C. IV:Manufacturing					
Loan	1.824***	1.939***	0.451***	0.322***	-0.0763***
	(0.108)	(0.100)	(0.0666)	(0.0641)	(0.0232)
Observations	627187	627631	627631	627187	626607
Panel D.IV:Non-Manufacturing					
Loan	0.969***	0.886***	0.410***	0.496***	0.111***
	(0.0427)	(0.0404)	(0.0274)	(0.0229)	(0.0126)
Observations	3141393	3149355	3149355	3141393	3109088

NOTE.— All regressions include county fixed effects, year fixed effects, industry fixed effects, the township number of firms and the township number of population. Robust standard errors are reported in parentheses. This table presents the firm-level estimates. Panel A presents OLS estimates for manufacturing firms and Panel B for non-manufacturing firms. Panel C presents IV estimates for for manufacturing firms and Panel D for non-manufacturing firms.

* $p < 0.10$.

** $p < 0.05$.

*** $p < 0.01$.

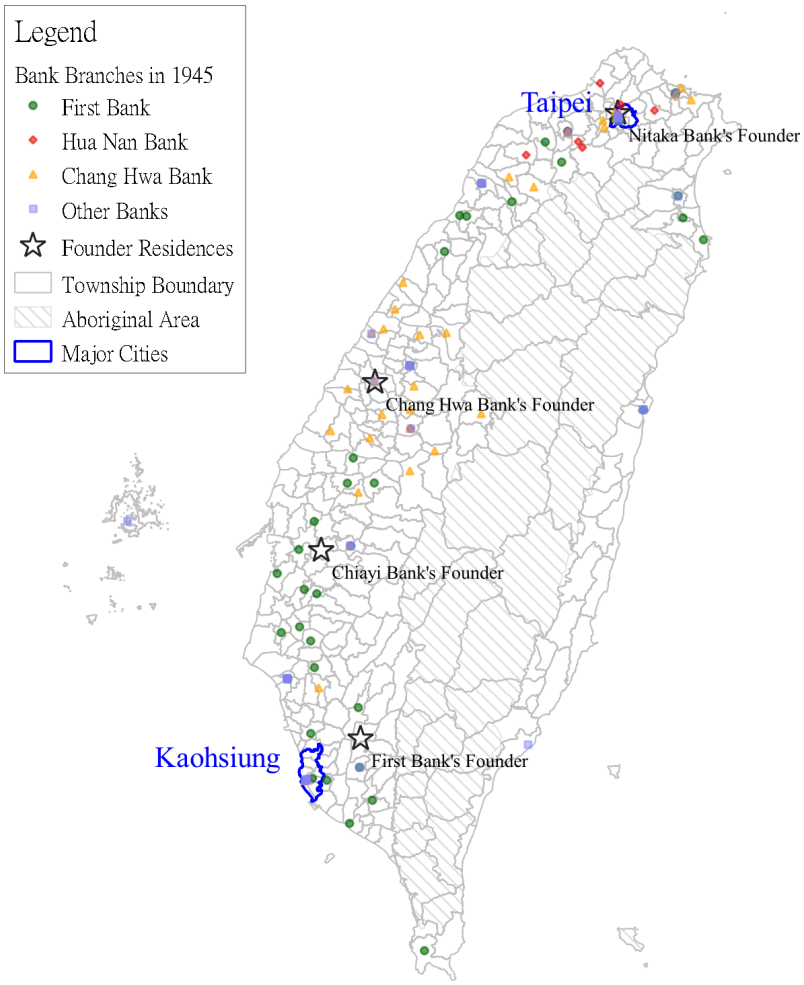


Figure 1: Locations of Bank Branches in 1945

This figure illustrates the locations of bank branches in Taiwan in 1945 (at the end of the colonial era).

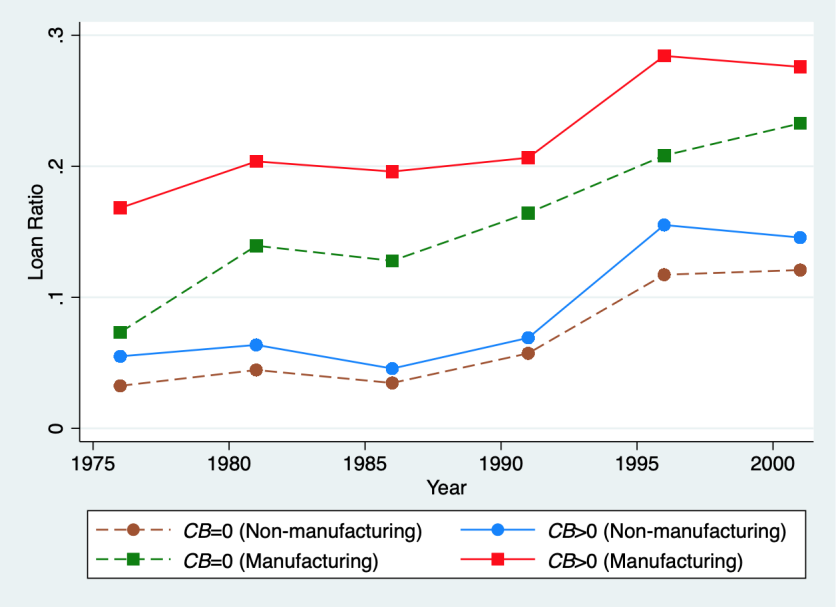
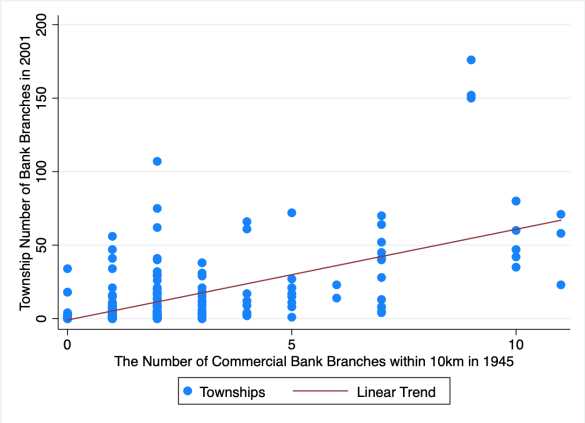
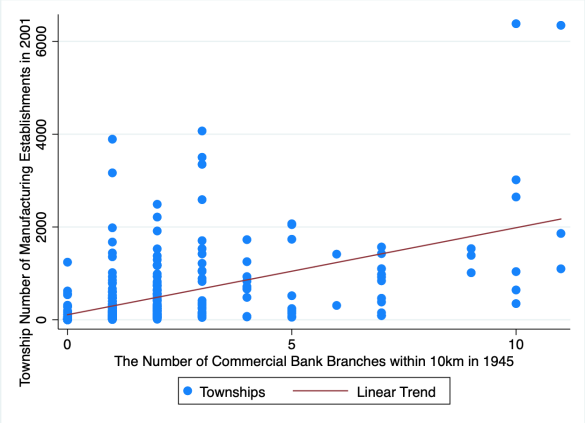


Figure 2: Loan Ratio

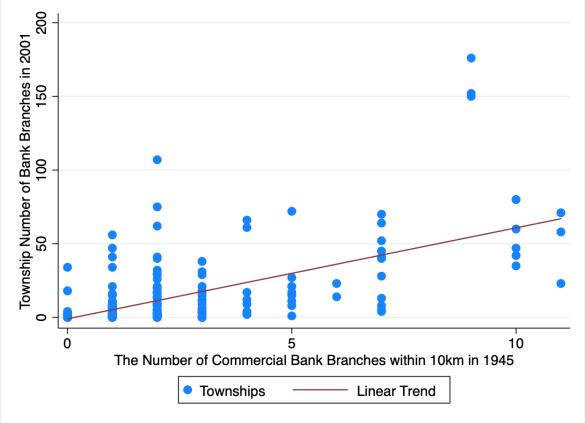
This figure presents group means of percentages of firms which got loans.



(a) Scatter Plot: Bank Branches in 2001



(b) Scatter Plot: Manufacturing Firms in 2001



(c) Scatter Plot: Manufacturing Output in 2001

Figure 3: Scatter Plot for Unconditional Correlations between Townships Outcomes in 2001 and the Number of Nearby Commercial Bank Branches in 1945

Panel (a) presents unconditional correlation between township number of bank branches in 2001 and the number of commercial bank branches in a 10-km radius in 1945. Panel (b) presents unconditional correlations between township number of manufacturing firms in 2001 and the the number of commercial bank branches in a 10-km radius in 1945. Panel (c) presents unconditional correlations between township number of manufacturing output in 2001 and the number of commercial bank branches in a 10-km radius in 1945.

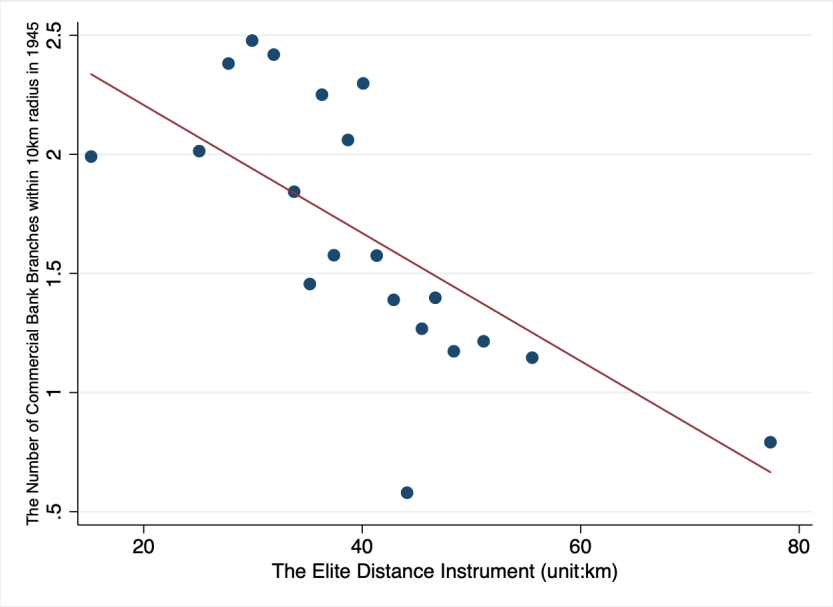


Figure 4: Binned Scatter Plot : First-stage Regression

This binned scatter plot present the first stage estimates corresponding to Column 1 of Table 4.

A More Details on Historical Background

A.1 Bank History during the Colonial Era

The following briefly introduces the history of the five commercial banks established by Taiwanese elites during the colonial era:[56]

1. First Bank: The First Bank was built in Pingtung in 1910 by local elites in Pingtung with some Japanese shareholders in Taipei. Among those Taiwanese founders, Lan Gao-chuan(藍高川), whose ancestors were the pioneers of Ligang (a rural area in Pingtung), was the one of the most prominent Taiwanese elites in colonial Taiwan, and he kept serving as the director of the First Bank in the early colonial era.[57] Initially, the aim of opening the First Bank was to supply credit to local businesses in southern and central Taiwan. Since most Japanese co-founders of the First Bank were also the shareholders of the Taiwan Bank of Saving in Taipei, the colonial government encouraged two banks to merge. After merging in 1912, the headquarter of the First Bank moved to Taipei, but Lan still lived in Pingtung. In Pingtung, the First Bank opened new branches not only in Pingtung city, where modern sugar plants was built in 1910, but also in other rural areas of Pingtung, especially around Ligang. In 1923, the First Bank acquired two local banks, Chiayi Bank and Nitaka Bank, and became the largest private commercial bank with the widest branch networks in the end of colonial period.

2. Chang Hwa Bank: Chang Hwa Bank was built in 1905 by Wu Ru-xiang (吳汝祥) as the first chairperson with other elites in central Taiwan who used the government bonds received as compensation for the 1904 land reform as collateral. Wu Ru-xiang was a typical local gentry: he personally held the title of Shengyuan, the lowest-level degree in the Qing imperial examination, and his father was one of the few gentry in Qing Taiwan earning Jinshi, the highest degree of the examination. They initially set the headquarter of bank in Changhua, but soon moved its headquarter to Taichung, the biggest city in central Taiwan, to get near Japanese sugar companies established in Taichung.[58] While the new headquarter was not in Changhau anymore, many meetings were still held in Chang Hwa, because Wu and

[56] The historical accounts below are drawn from multiple sources together. First-hand materials include banks' own publications on its historical development: Bank of Taiwan (1991), Hua Nan Bank (1987), Chang Hwa Bank (1967), First Bank (1969), and First Bank (1999). We also use Takatori (1916) for background of bank founders. Second-hand sources include Yeh (2002) on earlier development of Chang Hwa Bank and Nitaka Bank, Chang (2016) on First Bank, and Chang (2011) on Chiayi Bank. Additionally Hsu (2012) provides a short review of Lin family who founded Hua Nan Bank.

[57] Lan Gao-chuan had a famous ancestor with deep political influence in Taiwan, Lan Ding-yuan, who advise the Qing government how to rule Taiwan in the early Qing period. For example, it had been illegal to migrate from mainland China to Taiwan until a reform in 1731. This reform was indeed promoted by Lan Ding-yuan.

[58] For instance, the Japanese Imperial Sugar Company (帝國製糖株氏會社) was founded in Taichung in 1910.

other founders, as local gentry, tended to stay in their hometowns.[59] The branch network concentrated in central Taiwan, especially in Taichung and Changhua.

3. Chiayi Bank: Chiayi Bank was established in 1905 by Wang Chao-wen (王朝文) and other local Hakka elites in Chiayi who also operated sugar businesses.[60] The aim of Chiayi Bank was to promote local economic development by reducing costs to access funds. It later expanded its branches around Chiayi to provide loans to sugar-plant owners. In 1923, the Chiayi bank was acquired by the First Bank, and its branch network operated around Chiayi.

4. Nitaka Bank: Nitaka Bank was founded by Li Jing-sheng (李景盛) and other tea merchants in Twatutia (in Taipei) in 1916.[61] Nitaka bank aimed to supply loans to the tea industry, so it expanded branches toward mountainous areas in northern Taiwan to get near tea producers. Like Chiayi Bank, it was acquired by the First Bank in 1923, and its branch network remained.

5. Hua Nan Bank: Invited by the Japanese colonial government, Lin Hsiung-cheng (林熊徵), as the head of Lin Ben Yuan Family, established Hua Nan Bank in 1919. Although Lin Ben Yuan Family was one of the richest and most powerful families in Taiwan during both the Qing and the colonial period, strictly speaking, Lin Hsiung-cheng was not a local elite because the Lin family moved from Taiwan to China in 1895.[62] Growing up in China, Lin Hsiung-cheng was invited by the Japanese colonial government to make investments in Taiwan. As he had multiple businesses in China, Taiwan, and Japan, during his lifetime, he itinerantly stayed in these places. Partly due to such a reason, unlike other commercial banks listed above, Hua Nan Bank mainly expanded overseas to supply loans to Japanese businessmen in China or Southeastern Asian countries during the colonial era. Its headquarter was in Taipei, but there were no other branches in Taiwan in the 1920s. Hua Nan Bank slowly opened branches in Taiwan in the 1930s. At the end of the colonial period, it had 11 branches in Taiwan.[63]

[59] Based on chronicle of events of Chang Hwa Bank in Yeh (2002) and Chang Hwa Bank (1967), the colonial officials like Hiroshi Shimomura (下村宏) often came to Changhua, instead of Taichung, to hold meetings with Wu Ru-xiang and other local elites. This provides historical evidence that those local elites tended to stay in where they lived and why earlier bank branches would expand near their residences.

[60] Similar to the Lan family who opened the First Bank, Wang Chao-Wen had a father with high position in the Qing empire, Wang De-lu, who had been a provincial navy commander in Fujian. Wang De-lu later earned the highest-ranked title of honor for the Taiwanese elites during the Qing era, Tai Tze Tai Bao (literally meaning the teacher of the prince). His birthplace was renamed as Taibao in Japanese Taiwan and today Taibao township.

[61] Li Jing-sheng's father, Li Chun-sheng (李春生), had been a great businessman in Qing Taiwan, joined to building Tapei city in the late Qing period. Since Li Chung-sheng helped the Japanese government to rule Taipei by coordinating other Taiwanese elites, it was appointed as a councilor of Taipei.

[62] See Hsu (2012) for the history of Lin family.

[63] From 1945 to 1948, however, the Nationalist government allowed Hua Nan Bank to massively opened branches. The number of its branches increased from 11 to about 60. See Hua Nan Bank (1987).

B Details of Data Preparation

B.1 Crosswalks of Townships

To create consistent boundaries over time, some townships are combined. Precisely, East District, Hsinchu (新竹市東區) and North District, Hsinchu (新竹市北區) are combined. East District, Chiayi (嘉義市東區) and West District, Chiayi (嘉義市西區) are combined. Xinyi District, Taipei (臺北市信義區) and Songshan District, Taipei (臺北市松山區) are also combined. Thus we have 365 township observations for each year.

B.2 Construction of Establishment-Level Key Variables

B.2.1 Input and Output

In our baseline identification, for firm i in township j, industry s, and year t, we identify firm output, Y_{ijst}, by deflating revenue by the wholesale price index (WPI, henceforth) in the census year. Similarly, we construct capital inputs, K_{ijst}, and material inputs, M_{ijst}, by deflating book value of capital stocks and total expenditures of intermediate inputs by the WPI in the census year, respectively. We have considered alternative measures of WPI as robustness checks for census years after 1981 when different price indexes are available. We tried replacing the general WPI by the industry-specific WPI at the 2-digit industry-code level. We also tried deflating book value of capital stocks by the WPI specific to capital products. No specification is perfect, because we cannot observe firm-level input prices and output prices. We will present empirical results based on the baseline identification for simplicity. Using other specifications does not change main results.

B.2.2 Loan Dummy Variable

To identify whether a firm currently accessing credits, we construct an indicator variable $Loan_{ijst}$ based on whether a firm pays interest on loans during the census year. If a firm pays interest, the indicator variable $Loan = 1$ and otherwise $Loan = 0$.

B.2.3 Total Factor Productivity

We measure total factor productivity by assuming that each establishment i in year t and in industry j uses the following Cobb-Douglass Hicks-neutral technology:

$$Y_{ijst} = e^{tfp_{ijst}} L_{itj}^{\alpha_l} K_{ijst}^{\alpha_k} M_{ijst}^{\alpha_m}.$$

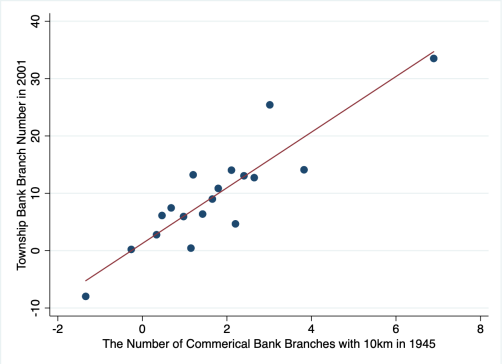
Specifically, we assume it as gross output production function (containing intermediate inputs) rather than value-added one, because Gandhi, Navarro, and Rivers (2017) mentions that using value-added production function will overestimate heterogeneity of productivity among firms. Although empirical studies of industrial organization have developed some econometric methods to address “transmission bias" (Marschak and

Andrews, 1944) of using OLS to estimate production function, since our data are repeated cross-sectional, we cannot utilize the control function approach that relies on time-series variation of panel data structure to account for endogeneity issues.[64]

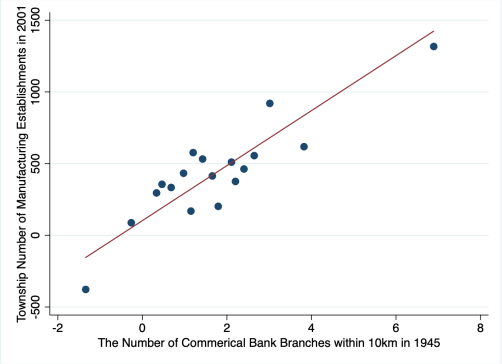
We estimate total factor productivity by running OLS with respect to the log production function in each industry with year fixed effects and taking residuals (plus constant term) as tfp_{ijst}. As robustness checks, we also compute total factor productivity based on factor shares, but as with observations in Syverson (2011), using the alternative measure does not change conclusions of our empirical results.

[64] See Olley and Pakes (1996), Levinsohn and Petrin (2003), Ackerberg, Caves, and Frazer (2015), and more recently, Gandhi, Navarro, and Rivers (2020). For the review of the literature, see Ackerberg, Benkard, Berry, and Pakes (2007).

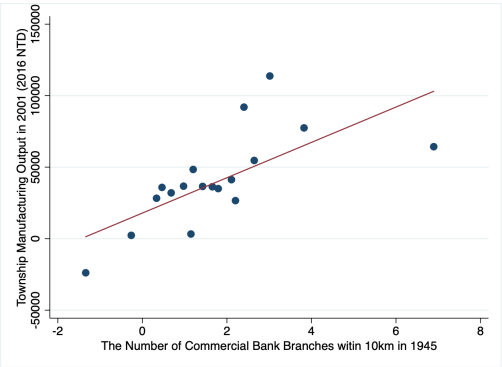
C Additional Figures and Tables



(a) Binned Scatter Plot: Bank Branches in 2001



(b) Binned Scatter Plot: Manufacturing Firms in 2001



(c) Binned Scatter Plot: Manufacturing Output in 2001

Figure C1: Binned Scatter Plots for Conditional Correlations between Townships Outcomes in 2001 and the Number of Nearby Commercial Bank Branches in 1945

In each panel we control for county fixed effect. The visualized estimates correspond to Panel A, B, and C of Column 1 in Table 2. Panel (a) presents conditional correlation between township number of bank branches in 2001 and the number of commercial bank branches in 10-km radius in 1945. Panel (b) presents conditional correlations between township number of manufacturing firms in 2001 and the number of commercial bank branches in 10-km radius in 1945. Panel (c) presents conditional correlations between township number of manufacturing output in 2001 and the number of commercial bank branches in 10-km radius in 1945.

Table C1: Firm-level Summary Statistics

	(1) Pooled	(2) 1976	(3) 1981	(4) 1986	(5) 1991	(6) 1996	(7) 2001
$Loan_{ijst}$	0.14	0.08	0.10	0.09	0.11	0.19	0.18
	(0.345)	(0.271)	(0.304)	(0.287)	(0.318)	(0.394)	(0.385)
Y_{ijst}	17860.65	6194.88	5903.61	12236.66	17923.25	22852.11	28452.16
	(638201.6)	(220620.6)	(344797.2)	(379281.1)	(538792.1)	(695930.0)	(955126.2)
L_{ijst}	9.49	10.53	10.45	10.20	9.51	8.98	8.50
	(107.6)	(114.4)	(114.0)	(110.9)	(110.6)	(105.7)	(97.68)
$(K/L)_{ijst}$	2644.64	511.75	811.78	983.18	2513.74	4130.30	4385.08
	(22401.5)	(1563.2)	(2651.5)	(11891.8)	(19456.2)	(24424.0)	(34937.0)
M_{ijst}	8345.34	4845.74	3740.11	5919.46	7037.92	12273.72	11358.89
	(377842.8)	(187801.2)	(264445.0)	(199047.0)	(262629.8)	(391708.5)	(586786.1)
Age	8.62		6.85	7.28	8.33	9.03	10.30
	(8.987)		(7.908)	(7.892)	(8.698)	(9.147)	(9.897)
tfp_{ijst}	2.76	2.85	2.81	2.80	2.75	2.68	2.74
	(0.684)	(0.809)	(0.771)	(0.682)	(0.661)	(0.686)	(0.571)
Observations	4253267	434493	527847	634976	772228	901517	982206

NOTE.—This table reports firm-level means (including all industries). Standard deviations are in parentheses.
Y_{ijst}, $(K/L)_{ijst}$, M_{ijst} are in 2016 NTD in thousands.
Census in 1976 does not contain firms' ages.

Table C2: Firm-level Summary Statistics (Manufacturing)

	(1) Pooled	(2) 1976	(3) 1981	(4) 1986	(5) 1991	(6) 1996	(7) 2001
$Loan_{ijst}$	0.23	0.17	0.20	0.20	0.20	0.27	0.29
	(0.421)	(0.375)	(0.403)	(0.399)	(0.401)	(0.443)	(0.453)
Y_{ijst}	56279.18	26385.63	20680.43	43635.73	54649.73	68127.20	91204.90
	(1108553.0)	(513885.3)	(703875.5)	(662451.8)	(931677.8)	(1176739.2)	(1716293.6)
L_{ijst}	24.58	33.46	29.62	29.09	22.80	19.60	20.73
	(158.7)	(197.1)	(190.3)	(167.4)	(148.6)	(136.1)	(140.2)
$(K/L)_{ijst}$	1793.68	410.74	596.12	665.16	1844.52	2796.73	2965.79
	(7951.7)	(1412.8)	(1357.8)	(1467.4)	(5384.2)	(15399.3)	(4833.2)
M_{ijst}	30473.69	22295.06	15316.01	23152.24	25354.70	43216.01	40996.34
	(671958.4)	(444716.5)	(593905.2)	(370100.4)	(460179.4)	(680835.8)	(1050481.5)
Age	9.02		6.18	7.04	8.00	9.85	12.46
	(8.115)		(6.750)	(7.194)	(7.556)	(8.037)	(8.818)
tfp_{ijst}	2.12	2.08	2.11	2.13	2.13	2.13	2.13
	(0.351)	(0.401)	(0.421)	(0.362)	(0.331)	(0.372)	(0.248)
Observations	755797	72146	93826	123040	150774	162009	154002

NOTE.—This table reports township-level means (including only manufacturing industries). Standard deviations are in parentheses.
Y_{ijst}, $(K/L)_{ijst}$, M_{ijst} are in 2016 NTD in thousands.
Census in 1976 does not contain firms' ages.

Table C3: Cross-sectional OLS Estimates for the Growth of Outcome Variables between 1976 and 2001

Outcome	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Panel A. Bank							
ΔBN	3.740***	3.092***	3.104***	3.089***	3.085***	3.118***	1.632**
	(0.569)	(0.557)	(0.568)	(0.569)	(0.591)	(0.614)	(0.685)
R-squared	0.505	0.597	0.597	0.597	0.598	0.590	0.495
Panel B. The Number of Manufacturing Est.							
ΔN^{manu}	108.0***	151.4***	147.9***	143.8***	139.7***	145.9***	141.8***
	(28.21)	(33.55)	(33.61)	(33.33)	(34.49)	(36.52)	(34.08)
R-squared	0.358	0.486	0.489	0.496	0.487	0.497	0.418
Panel C. Manufacturing Output							
ΔY^{manu}	9281.7***	7834.8**	7556.8**	7230.9**	6771.8**	7766.5**	9810.9**
	(2897.1)	(3091.7)	(3177.9)	(3240.1)	(3434.6)	(3443.5)	(4189.6)
R-squared	0.407	0.343	0.346	0.352	0.340	0.362	0.348
Panel D. The Number of Industrial Est.							
ΔN^{ind}	737.0***	745.1***	741.0***	730.3***	717.3***	718.7***	505.7***
	(113.7)	(114.7)	(116.3)	(115.9)	(119.2)	(124.6)	(124.7)
R-squared	0.529	0.648	0.649	0.652	0.649	0.649	0.500
Panel E. Industrial Output							
ΔY^{ind}	27365.3***	13579.9***	13337.1***	12975.5***	12517.3***	13658.4***	13216.4***
	(7538.7)	(3769.9)	(3874.1)	(3959.9)	(4195.9)	(4276.0)	(4929.7)
R-squared	0.467	0.440	0.441	0.448	0.436	0.469	0.413
Panel F. Population							
ΔPop	8671.4***	12370.8***	11866.6***	11777.9***	11415.6***	11265.6***	8015.7**
	(2317.4)	(2374.0)	(2486.6)	(2428.4)	(2470.8)	(2624.9)	(3722.1)
R-squared	0.292	0.383	0.388	0.389	0.389	0.364	0.271
Controls:							
Dummy of Aboriginal Area	No	Yes	Yes	Yes	Yes	Yes	Yes
Number of Manu. Employees in 1938	No	Yes	Yes	Yes	Yes	Yes	Yes
Spatial Trends $f(\lambda_j^x, \lambda_j^y)$	No	No	Linear	Quadric	Quadric	Quadric	Quadric
Observations	365	314	314	314	266	222	304
Sample	Base	Base	Base	Base	West1	West2	$CB_j \leq 4$

NOTE.—The table reports cross-sectional OLS estimates for the growth of outcome variables between 1976 and 2001. Each point estimate stems from a separate regression. All regressions include county fixed effects. The unit of observation is a township. Below each coefficient robust standard errors are reported in parentheses. In Column 2-4, the basic sample drops the townships that had been located in Kinmen County, Lienchiang County, old Taipei city, Taichung city, Tainan city, or Kaohsiung city during the colonial era for missing variables of historical controls. The West1 sample in Column 5 contains only townships in western Taiwan. The West2 sample in Column 6 further drops Taipei city, Hsinchu city, Hsinchu county and Kaohsiung city and contains remaining townships in western Taiwan.

* $p < 0.10$.

** $p < 0.05$.

*** $p < 0.01$.

Table C4: OLS and IV Estimates for Comparison between Northern Regions and Central-Southern Regions in Western Taiwan

	(1) OLS	(2) IV	(3) OLS	(4) IV
Sample	Northern	Northern	Central-Southern	Central-Southern
Panel A. Bank				
BN_{2001}	5.214***	6.869***	4.408***	7.503***
	(0.995)	(1.282)	(0.770)	(2.085)
Panel B. The Number of Manufacturing Est.				
N_{2001}^{manu}	243.0***	336.5***	91.99***	256.6**
	(69.69)	(74.38)	(24.07)	(117.8)
Panel C. Manufacturing Output				
Y_{2001}^{manu}	16069.0***	24571.6***	5578.3	20644.7**
	(5714.6)	(7813.1)	(3825.4)	(8509.7)
Panel D. The Number of Industrial Est.				
N_{2001}^{ind}	1279.6***	1653.9***	993.8***	1810.7***
	(231.1)	(280.6)	(191.0)	(490.1)
Panel E. Industrial Output				
Y_{2001}^{ind}	43043.4***	54827.2***	15608.3***	38283.1***
	(15260.3)	(15820.1)	(4501.7)	(11880.8)
Panel F. Population				
Pop_{2001}	21928.7***	30905.2***	18002.1***	35667.8***
	(4953.1)	(5619.9)	(4133.8)	(9608.6)
Observations	75	75	232	232

NOTE.—The table reports cross-sectional OLS and IV estimates for township-level outcome variables in 2001. Each point estimate stems from a separate regression. All regressions include county fixed effects and liner spatial trends. The unit of observation is a township. Below each coefficient robust standard errors are reported. The table uses robust standard errors to compute the levels of significance.

* $p < 0.10$.

** $p < 0.05$.

*** $p < 0.01$.

Table C5: Cross-sectional IV Estimates for the Growth of Outcome Variables between 1976 and 2001

Outcome	(1)	(2)	(3)	(4)	(5)
Panel A. Bank					
ΔBN	5.003***	4.163***	4.866***	4.094***	3.551***
	(0.895)	(0.958)	(1.502)	(0.954)	(1.001)
R-squared	0.490	0.578	0.547	0.577	0.597
Panel B. The Number of Manufacturing Est.					
ΔN^{manu}	186.0***	242.6***	258.6***	237.1***	224.7***
	(40.04)	(47.45)	(79.65)	(46.12)	(55.36)
R-squared	0.297	0.425	0.402	0.435	0.466
Panel C. Manufacturing Output					
ΔY^{manu}	16100.7***	10938.4**	10312.0	10323.6**	7576.9
	(4303.0)	(5383.5)	(10640.0)	(5255.8)	(7314.1)
R-squared	0.388	0.338	0.341	0.339	0.329
Panel D. The Number of Industrial Est.					
ΔN^{ind}	1011.7***	995.4***	1153.1***	973.4***	946.9***
	(156.5)	(168.2)	(290.1)	(163.9)	(193.8)
R-squared	0.503	0.620	0.573	0.629	0.647
Panel E. Industrial Output					
ΔY^{ind}	35360.7***	19175.3***	19411.7	18384.8***	15983.8*
	(8029.1)	(6341.8)	(12201.8)	(6183.3)	(8317.3)
R-squared	0.463	0.429	0.428	0.432	0.424
Panel F. Population					
ΔPop	15543.1***	19352.2***	15274.5**	19007.7***	21832.1**
	(4202.1)	(6689.3)	(6949.9)	(6509.0)	(9847.6)
R-squared	0.257	0.352	0.381	0.360	0.326
Controls:					
Dummy of Aboriginal Area	No	Yes	Yes	Yes	Yes
Number of Manu. Employees in 1938	No	Yes	Yes	Yes	Yes
Linear Spatial Trends	No	No	Yes	No	No
Sample	Base	Base	Base	No Townships of Birth	No Counties of Birth
Excluded instrument's F	24.37	16.26	11.81	15.70	9.28
Observations	365	314	314	311	236

NOTE.—The table reports cross-sectional IV estimates for the growth of outcome variables between 1976 and 2001 Each point estimate stems from a separate regression. All regressions include county fixed effects. The unit of observation is a township. Below each coefficient robust standard errors are reported in parentheses. The samples used in Column2-5 drop the townships that had been located in Kinmen County, Lienchiang County, old Taipei city, Taichung city, Tainan city, or Kaohsiung city during the colonial era for missing variables of historical controls. The subsample used in Column 4 excludes townships as the bank founders' birthplaces. The subsample used in Column 5 excludes the whole counties as the bank founders' birthplaces.

* $p < 0.10$.

** $p < 0.05$.

*** $p < 0.01$.