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Lending without creditor rights, collateral, or reputation: The "trusted assistant" loan in 19th century China

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Meng Miao, Guanjie Niu and Thomas Noe

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Lending without creditor rights, collateral, or reputation—The “trusted-assistant” loan in 19th century China *

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29th August, 2017

Abstract

This paper considers lending to finance projects in a setting where repayment enforcement appears impossible. The loan was illegal and thus legally unenforceable. Creditors were incapable of applying private coercion to force repayment. Borrowers lacked both collateral and reputation capital. Project cash flows were unobservable. The projects were the acquisition of Imperial administrative posts by scholars in nineteenth century Qing China. The lending mechanism was the “trusted-assistant loan.” Our model of trusted-assistant lending shows that it is a renegotiation-proof implementation of efficient state dependent financing. Empirical analysis of officials’ diaries and bank records shows that the employment of trusted-assistant lending and the performance of trusted-assistant loans conforms roughly with the model’s predictions.

Key words: contracting, creditor rights, project finance, Chinese banking.

JEL codes: N25, G21, D86.

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1 Introduction

This paper examines scholar loans issued in nineteenth century Qing China, i.e., loans made to “scholars,” examination-takers in nineteenth Century Qing China who passed the Imperial examination and thus were qualified for appointment to official posts. These scholars, who had spent years preparing for the examinations, lacked significant collateral. The loans funded the costs associated with acquiring and taking up provincial administrative positions. These costs were significant. Under the Qing’s “single-man rule system,” officials had to recruit and fund their own staff of assistants.

Although official salaries were quite generous, an official’s primary source of income was corruption, i.e., excess tax collection and bribes, and thus was not verifiable. Moreover, an official’s income stream was risky. In addition to being subject to dismissal for failing to satisfy provincial tax quotas, officials could lose their appointments because of exogenous events. Complaints or unrest in the provinces could also lead to officials being impeached. Complaints typically focused on excessive taxation, especially in difficult economic times.

Scholar-loans were legally prohibited and, as a consequence, legally unenforceable. Moreover, after the scholar took office, the scholar also became the head of the local legal system. Thus, even if scholar loans had been legal, legal enforcement would have been problematic. Because the appointed scholar had at his disposal the power of the state, and thus far greater command of the resources for coercion than the lender, enforcement through extra-legal coercion, (e.g., Gambetta, 1993), was also not viable.

As well as being constrained by unverifiability and unenforceability, contracting was constrained by information asymmetry. Because of the great distance between lenders and provincial officials, officials’ actions were not observable by creditors. Creditors, having poor information about the level of tax resistance in distant provinces, also had no effective means of verifying economic conditions in the province and the difficulties, costs, and risks, associated with tax collection. Thus, creditors had no means of determining whether an official’s reluctance to repay the loan was motivated by provincial conditions or was simply opportunistic.

Reputation-based enforcement of loan repayment was also problematic. Models of enforcement through reputation, e.g., Bolton and Scharfstein (1990), assume that borrowers have a sequence of profitable investment opportunities and that borrowers are persistently financially constrained, i.e., the output from current investment projects is insufficient to fund future project investment. In this setting, the loss of future investment opportunities resulting from default can motivate loan repayment. Neither the sequential investment nor persistent financial constraint assumptions appear to be stratified for the typical scholar loan. Reassignment of a provincial official to another province was atypical. Thus, it is doubtful that official foresaw the need for another travel loan. Moreover, official appointments typically increased a scholar’s income by

order(s) of magnitude, we estimate, on average, about 400 fold, typically permitting the scholar to self-finance the expenses associated with future appointments.

Repayment can also be motivated by the non-pecuniary costs of failure to repay, i.e., shame and dishonor associated with default. However, in the specific case of scholar loans, this motivation for repayment is rather problematic. If default generates shame, the scholar would have no incentive to publicize default. The creditor, by publicizing default, would be publicizing his own involvement in an illegal activity. Moreover, it is not even clear that default on scholar loans would produce shame. Local subjects could reasonably interpret default as sign of the official's poverty and thus honesty. The legal prohibitions on scholar loans in fact were motivated by the government's concern that satisfying creditors would lead officials to extract excessive taxes and bribes. The esteem of local elites was far more important to newly appointed scholar officials than esteem of creditors, who as we document later, typically were quite different from the scholars both in terms of social class and provincial origin.

Thus, the economic institutions of Qing China appear to lack all of the standard mechanisms for enforcing scholar loans—collateral, reputation, creditor rights, verifiability, and foreclosure. One might reasonably conjecture that institutional constraints would have prevented the emergence of a scholar-loan market. However, Acemoglu et al. (2005) argue that agents can always design contracting mechanisms that “change the terms of the contracts or the nature of their activities to protect themselves from the worst type of opportunistic behavior.” Such privately-designed contracting mechanisms circumvent the obstacles created by legal institutions and thus permit funding projects with very large returns on investment. The large private gains from funding scholars, combined with an institutional environment uniquely hostile to enforceability, renders scholar-finance a unique and rather demanding test of the Acemoglu/Johnson hypothesis.

In fact, as we document, a private contracting arrangement was designed that overcame the obstacles to financial contracting: the “trusted-assistant loan.” Creditors, typically banks, advanced funds to the scholars which specified repayment after the scholar obtained an official position. The loan was conditioned on the scholar appointing, as one of his assistants, a “trusted” or “recommended” assistant to an important post in his administration. While the explicit purpose of sending the trusted assistant was to help the debtor officials with their administrative tasks, the implicit role of the trusted assistant was monitoring the official and enforcing debt repayment.

Our theoretical analysis derives the conditions under which the trusted-assistant mechanism is an effective and efficient means of enforcing debt repayment—ensuring repayment of the loan when economic conditions in the province are favorable for collection and permitting loan extension when conditions are unfavorable. We develop an infinite date model of the relations between the officials, assistants, and financiers, typically Chinese banks. The leverage of the

assistant over the scholar/official is based on the scholar's transitory human capital deficit. In order to pass the civil service exam, scholars mastered essay writing, memorized Confucian classics, and studied neo-Confucian philosophy. However, they did not develop the practical knowledge required to govern provinces and collect revenue. Thus, they were initially dependent on the trusted assistant's aid. Moreover, they had little or no information about the quality, i.e., loyalty and competence, of potential assistants who might aid them in performing these tasks.

Creditors, typically Chinese banks, and frequently banks who specialized in scholar loans, had a stable of agents, experienced in governance and tax collection. The theoretical analysis considers contracting when the creditor bundles the loan with a trusted assistant drawn from the creditor's stable of agents, who accompanies the scholar to his jurisdiction and assists the scholar with his administrative duties.

In this setting, period-by-period Nash bargaining between the official and the assistant results in a division of provincial surplus between the assistant and inexperienced officials. However, assistant bargaining power does not ensure loan repayment. There is also an agency conflict between the assistant and the bank. The assistant has an incentive to use his bargaining power simply to extract rents from the official without inducing the official to repay the bank. This agency conflict was apparently resolved by the high-powered incentive contracting, documented in Morck and Yang (2010), that typified nineteenth century Chinese banking, assistant career-advancement rewards, and reputational sanctions for disloyal assistants.

The strong incentives to enforce loan repayment created by these incentives, however, also produced an obstacle to efficient contract enforcement: given the transitory nature of the official's human capital deficit and the rewards for successful collection, assistants had an incentive to strike an agreement with the official that called for rent extraction in states of the world where such extraction was risky and costly. We show that, even when assistants' total gain from such agreements exceeded the cost of risky collection to officials, efficient contracting could still be implemented: financing constraints and the inability to commit to binding agreements dividing future rents, prevented the assistant from credibly offering a large enough "bribe" to induce rent extraction in unfavorable economic conditions, leading to state-contingent repayment and thus supporting the observed extensible repayment pattern of these loans.

Using the insights from this model, we analyze the characteristics and employment of trusted-assistant financing. Our evidence consists primarily of 27 diaries written by intellectuals during Qing dynasty between 1810 and 1910. From these diaries, we extract 256 fairly complete narratives of debt-related transaction. We supplement this evidence with evidence from two other documents: a trusted-assistant loan contract dating from 1839 and the loan book record of a Chinese bank dating from the 1840s (Provided in Appendix Section B). In addition, we provide qualitative information on the pervasiveness of trusted-assistant lending using other primary and secondary historical source documents.

This documentation reveals that officials who borrowed through trusted-assistant loans were less experienced on average than typical borrowers and were unable to obtain co-signing guarantors or offer collateral. These results indicate that trusted assistant lending was utilized in the situation envisaged by the model: (a) Borrowers were inexperienced, and thus more likely to be dependent on assistants' expertise and (b) Borrowers lacked alternative funding sources.

Trusted assistant loans also featured more extensions than the average loans in the sample but, at the same time, higher recovery rates. These results suggest, consistent with model's predictions, that trusted assistants both increased state contingency and facilitated loan enforcement. Finally, the issuance of trusted assistant loans was to a considerable extent limited to Chinese banks, particularly Shanxi banks, exactly the sort of institutions that developed financial and reputational mechanisms to induce assistant loyalty, a desideratum for incentive compatible repayment in the model.¹ Thus, consistent with the Acemoglu et al. (2005) hypothesis, it appears that, when the economic gains from a transaction are sufficiently large, rational self-interested agents do find ways of overcoming seemingly insurmountable institutional deficits.

As well as rationalizing and documenting an inherently interesting financing mechanism through which creditors, lacking any legal rights, collateral, or coercive power, financed the one-shot projects of unrelated borrowers, this paper also contributes to answering broader questions relating to the substitutability between networks and contracts. Many financing mechanisms utilize a mixture of network construction and contract design to mitigate moral hazard. One example is provided private equity financiers, who frequently inject agents from their network into their portfolio companies' boards.² Another is J.P. Morgan's practice, at the turn of the twentieth century, of conditioning underwriting on board representation. (Ramirez, 1995; DeLong, 1991). The key difference between our setting and these examples, is that, in contrast the board members injected by private equity firms and J.P. Morgan, trusted assistants did not have any legal rights to influence the actions of the issuer, i.e., the scholar. Nor could the creditors of the scholars rely on the investor rights provided by western legal systems, e.g., minority shareholder rights, creditor rights, and enforceable contracts.

When investors inject network agents into financed entities, the efficacy of repayment enforcement is a function of both the effectiveness of network agents and investor rights. It is ultimately an empirical question of whether the two arguments of this function, network agent effectiveness and legal investor rights, are substitutes or complements. This paper provides rather dramatic evidence for substitutability as it documents effective enforcement of repayment in the absence of investor rights, suggesting that fairly complex financing arrangements such as venture capital and private equity finance can be sustained even in "lawless" environments.

The trusted assistant mechanism also illustrates the importance of monetary and reputation-

¹See Morck and Yang (2010) for a discussion of incentive compensation schemes in Shanxi banks.

²For a case study, see Baker and Wruck (1989) For a more general discussion of private equity and the provision of expertise to portfolio companies, see Kaplan and Strömberg (2009)

based incentives for aligning agents' interests in a setting where the rewards to opportunism were large and monitoring by principals impossible. Monetary incentives to ensure assistant loyalty to creditors appear to have played an important role in rendering trusted-assistant lending incentive compatible. Morck and Yang (2010) extensively documents the incentive-based compensation packages offered to assistants, employees of Shanxi banks, the primary lenders in the trusted-assistant loan market. Although our theoretical analysis models incentive alignment in a highly stylized reduced-form fashion and our empirical analysis, because of lack of quantitative data, does not investigate contracting between assistants and creditors, clearly, our qualitative evidence suggests that reputational incentive alignment was a significant concern for lenders. Reputational rewards and penalties for assistants also appear to have been important. The source documents point to the positive effect of successful collection on the reputation, and thus promotion prospects, of bank employees. Bank employment policies also aimed to create closed reputational communities and thereby amplify the effect of reputational sanctions for disloyalty.

Finally, the trusted-assistant loan is an example of the emergence of innovative mechanisms to circumvent obstacles of funding a specific type of highly profitable economic activity. Other examples are the Contractus Triunus and European sea loan, designed to circumvent usury laws and implement efficient risk allocations between borrowers and creditors (Hoover, 1926; Decock, 2013). These mechanisms were innovative contract forms which established legally enforceable constraints on borrowers. The trusted assistant loan, in contrast, implemented repayment in the absence of legal enforceability through altering borrowers' incentives.

2 Institutional background

2.1 Keju examination and exam candidates

The Chinese civil service (Keju) examination system lasted over 1,300 years and was central to maintaining the political stability of the Chinese state (Bai and Jia, 2016). Before the abolition of the Keju examination in 1911, passing the Keju Examination was a necessary condition for nomination by examination to an official position during the Qing Dynasty (1644–1912). Success in the examination required decades of hard work and persistent effort. The majority of Keju exam candidates lived very impoverished lives. Far from agricultural work, they obtained very meager earnings mostly through teaching and providing hand-writing services.³ Less than 1% of exam takers passed the exam and thus qualified for official positions (Elman, 2000).

³In Ouyang (1987), reports of candidates in Beijing dying of poverty were not exceptional. Another example is provided by Guofan Zeng, a later provincial governor and top bureaucrat in Qing Empire. He had to borrow from his relatives and classmates to travel to Beijing for Keju examination and to buy books in his early life. See Zeng (1994).

Because there was an alternate route to official appointment, donations to the government, it seems doubtful that many wealthy individuals opted to become exam candidates.⁴

The reward for passing the exam was the possibility of appointment as an official. Appointments offered the prospect an enormous increase in wealth relative to the impoverished condition of exam candidates. Even at the lowest county level of government, officials received salaries of at least 645 Liang of silver, 20 times the average yearly expenditure of a rural household (Xue, 1984). Top officials were paid more than 10,000 Liang (Tuojin, 1992). The empire lacked effective monitoring systems to detect and punish corruption. Corruption was illegal, but it was customary for officials to raise additional income through corrupt activities. In fact, it is estimated that, on average, income from corruption accounted for 95% of officials' income. Thus, receiving an appointment could realistically be estimated to increase a scholar's income 400 fold.⁵

However, success in the Keju examination did not ensure appointment. The total number of candidates passing the Keju examination was much greater than the number of official positions vacated. Thus, a lottery system was created to allocate positions, with the chance of winning the lottery being larger for those performing better on the exam. It was not unusual for a scholar to wait more than 10 years before obtaining official appointment. Sometimes scholars died of old age waiting (Ouyang, 1987). Until an appointment was received, the scholar remained in poverty. Networking with senior officials could increase a scholar's chance of moving up in the queue. Networking was expensive. For instance, one official, Zhangjixin, estimated that his expenditures after qualification but before taking office may have been as high as 17,000 Liang. Once appointed, the official had to recruit his cadre of assistants and pay for his own and their transportation to his assigned province. Officials were subject to strict deadlines for arriving in post to take office. Travel was arduous, slow and expensive. A jurisdiction could be as far as 3,000 kilometers away from Beijing, where the creditor was frequently located. The long distances, which usually took 3 to 6 months to transverse, greatly impaired the ability of the creditor to monitor.

2.2 Loans to officials

Due to these significant expenses and the poverty of scholars, large-scale external finance was required to fund scholars' pursuit of positions. This funding was supplied. According to one loan book including 66 loans to officials between 1838 and 1852 issued by one then-influential Shanxi bank, "Yu-Sheng-Ji", (Liu and Yang, 2015) more than 50% of scholar loans were more than 1,000 Liang of silver with highest loan 7,000 Liang. At least 16 of the loans were syndicated,

⁴More than three fourths of officials obtained their nominations via the examination rather than donations (Qu, 2003).

⁵Estimated by Chang (1981) and confirmed by descriptions from Du (2008).

issued with other creditors to diversify risk. Narratives of loans issued to officials are scattered across the historical archives on Qing Dynasty, suggesting that issuing loans to officials was a common practice. In fact, official loans were considered the most lucrative line of business for financial institutions, especially the Shanxi banks, which had branches that specialized in official loans (Li, 1989; Ding, 2002). Anecdotal evidence suggests the official loan market was quite competitive: “the rich around Beijing area, lured by high interest rates, all went to the capital to make loans to the officials” (Li, 1989).⁶ In fact, one borrower, Du Fengzhi, a would-be county governor in Guangning, talked to more than 50 potential creditors before borrowing (Du, 2008; Zhang, 2008).

Because the Imperial government believed that loans to officials fostered corruption, it attempted on numerous occasions to suppress the official loan market. In 1648, ‘lending to officials-to-be and accompanying to the jurisdiction with the official’ was made illegal, punishable by wearing shackles. Acting as a co-signer or guarantor was also illegal and subject to the same punishment (Tuojin, 1992). However, these bans had little effect.⁷ In the few cases in which the loans were exposed, the creditors were usually the first to be punished. The debtor, on the contrary, usually avoided the most severe punishments.⁸

Obtaining third-parties to guarantee official loans might have been attractive to creditors. The guarantor was typically much closer to the creditor, and, unlike the official, did not have effective control over the local legal system, and thus was more subject to creditor pressure. However, for these very reasons, as well as the illegality of guaranteeing loans, being a guarantor was a rather unattractive proposition for the guarantor. In addition, the likely guarantors, the close associates of the aspirant official, were typically exam-takers and thus probably also lacked significant pledgable wealth. Perhaps for these reasons, the vast majority of trusted-official loans in our sample did not feature co-signing third parties.

2.3 The official in post

Once in post, the tenure of the official was precarious. Strict performance requirements were imposed by the Imperial government. Any failure to meet these requirements would cost the official his job. In addition, officials could be impeached based on complaints to the Emperor by the official’s subjects. An official could also be forced to leave his position due to various exogenous performance-independent events, i.e., illness (Huai), death (Gu) and the required

⁶Liu and Yang (2011) documents capital flows from neighboring provinces to Beijing to fund official loans.

⁷Other approaches to curtailing official loans were also attempted. For example, emperor Qianlong (1711-1799) tried to eliminate the need for private loans of officials by providing public loans. However, this reform was ineffective mainly due to the inefficiency of public sector. See Ye (1998).

⁸For example, in 1836, Shanqing, the governor of Jiangning city refused to repay his loan. After the case become known to the emperor, the creditors were punished while the official was only briefly suspended. Two years later, he was even promoted to Minister of Education of Jiangnan Province (Jiang, 2008).

three-year mourning period following the death of a parent (Ding). Given the age of officials and their parents, and life expectancies in nineteenth century China, such removals were not unusual.⁹

Newly appointed officials lacked the experience required to meet the demands of their office. Passing the Imperial Examination during the Qing Dynasty required a scholar to master Chinese literary forms, particularly the eight-legged essay, memorize large portions of Chinese classical texts, and develop a deep understanding of neo-Confucian philosophy. Given the extreme difficulty of passing the exam, scholars had little time to learn anything else. Thus, a scholar's corpus of knowledge, though impressive, was not terribly relevant to the tasks required by his appointment—collecting taxes, handling provincial finances, adjudicating law suits, and administering public works and provincial education.¹⁰ Frequently scholars were appointed to positions in distant provinces. In such cases, the newly appointed scholar/official in all likelihood would not understand or be able to communicate in the provincial dialect. Thus, at least at the start of his appointment, the official was dependent on the cooperation of assistants. Of course, over time, the official's growing familiarity with the practical administration, provincial networks, and the provincial dialect, implied that dependence was not a permanent condition.

2.4 Assistants

Given their inexperience and the challenging demands of the Imperial government, officials typically hired assistants to help them handling their office. These assistants were experienced in business, finance, and administration. Thus, newly appointed officials, being inexperienced, were quite dependent on their assistants. Irresponsible behavior by an assistant could be disastrous for the official, and serious assistant errors or malfeasance might lead to the official losing his job.¹¹ Imperial administration during the Qing dynasty was characterized by “single-man government”: the official was the sole representative of the Imperial government. He was the only agent appointed by the government and only his name appeared on the government payroll. The relationship between the official and the trusted assistant was purely private, very flexible, and not governed by any long-term contract. The dependence of the official on assistants implied that an important assistant withdrawing his cooperation would cause great difficulties for the official. It took a great deal of time and effort to find and train qualified substitute assistants and to foster

⁹Zhang (2009) provides evidence that the average tenure of county level government official was only 1.3 years. An example is Du Fengzhi was removed after only 1 year from the position of Guangning governor due to his failure of quell the anger of the local population. Also see Du (2008).

¹⁰Lin (2011), in fact, argues that the practical and scientific irrelevance of the syllabus for the Keju exams was an important cause of the of the very weak relative economic performance of China in the late Qing period.

¹¹In the period of Guangxu (1881-1908), the county governor Shihan Peng imposed an incorrect sentence because of falsified evidence provided by the lawsuit assistant. This lead to him being dismissed from his position (Jiang, 2008). Another case occurred around 1850s, the county governor Kui Zhang was removed because his assistant Jizhou Meng secretly placed his friends in the local government (Zhou, 2007).

the connections and networks that were required for smooth functioning of the administration. Moreover, officials, operating in an unfamiliar environment, were unsure whether provincials offering assistance were trustworthy or had ulterior motives. For these reasons, officials aimed to please their assistants. For instance, Mr Du Fengzhi wrote that he distributed a great deal of extra income from tax revenue to his assistants even though he was not entirely satisfied with their performance.¹²

2.5 Assistant to official loans

Given the vast informational advantage of assistants and officials' dependence on their services, assistants clearly had a comparative advantage over distant creditors in enforcing repayment. Given that assistants, like officials, would bear the costs of any excessive taxation or bribery required to fund loan repayment, they also had an inherent interest in efficient repayment. Thus, direct lending by assistants to fund officials appears to dominate bank lending. In fact, loans by assistants to officials are frequently mentioned in the archives.¹³ However, the financial resources of assistants were typically too small to satisfy the financing needs of officials. Assistants ranked very low in the social class hierarchy. Throughout most of the period of Qing rule, assistants were classified as members of the lowest class and their offspring were not allowed to participate in Keju examinations (Zhou, 2007). Thus, becoming a career assistant was only attractive to literati who were severely financially constrained. An example of the limitations of assistant-to-official lending is provided by Fengzhi Du, who, when he left Beijing for his jurisdiction, borrowed a total of 20,000 Liang of silver but only 600 Liang were borrowed from the assistants he hired (Du, 2008).

2.6 Trusted-assistant loans

The defining feature of trusted-assistant loan was the requirement that the borrower/official incorporate a "trusted assistant" nominated by the creditor into his administrative cadre. Typically, the trusted assistant was an employee, relative, or business associate of the creditor. The assistant was "trusted" or "recommended" when the debt was issued. The trusted assistant would then follow the official to his jurisdictions to working in his government on various tasks, such as levying taxation, providing consultancy services on lawsuits, etc. The trusted assistant frequently remained with the official for some time after the loan was repaid (Du, 2008; Jiang,

¹²Mr Fengzhi Du complained about two assistants in particular, Mr Li and Mr Lang, who reportedly demanded too many bribes when handling lawsuits and collecting taxes. (Du, 2008; Zhang, 2009).

¹³For instance, Xu (1984) mentioned that one poor official hired servant and borrowed from him. That servant was appointed as gatekeeper, one lucrative position and it took years for the official to clear the debt. Those servants were referred as "backpacked burden" of officials.

2008). Out of the 66 official loans in our loan-book sample, around one-third were associated with trusted assistant loans. In most cases, the creditor sent only one trusted assistant.

A pervasive feature of trusted-assistant loans was their extendability. As we document in the empirical analysis (Section 4) and illustrate with our sample loan document (Appendix Section B), the effective maturity on these loans was much longer than the contract maturity because officials were frequently permitted to delay repayment. Because only the trusted assistant had the information required to judge the reasonableness of such requests, the decision to permit delay was effectively in the hands of the trusted assistant. The high payout (interest rate) on these loans combined with extendability made the creditors' return highly dependent on the official's success in administering the province. In this respect, the trusted assistant loan, though formally a loan contract, produced creditor returns with risk profiles similar to income bonds, fixed claims on revenue which lack foreclosure rights (McConnell and Schlarbaum, 1981).

Determining the effective yield on trusted-assistant loans is quite difficult. The sample loan book, exhibited in Appendix Section B, records the notional principal on loans. However, evidence from the diaries indicates that loan proceeds typically were less than the notional principal. Moreover, the proceeds were frequently advanced in substandard silver, while the notional principal was denominated in standard silver. Actual loan repayments frequently differed greatly, both with respect to timing and magnitude, from stipulated contract terms. In addition, separating loan repayment from payment for the assistants' "consulting services" is problematic. The trusted-assistant loans bundle financing with the services of the assistant. Thus, part of the repayment made by borrowers should be attributed to compensation by the borrower to the creditor for the opportunity cost of alternative deployments of the assistant. In addition, the contribution of provincial rent extraction to meeting the assistant's reservation compensation demands should be subtracted from this opportunity cost. We lack the information required to make any of these adjustments. Although quantifying the effective interest rate on trusted-assistant loans is difficult, historical source documents suggest that market participants found the returns on trusted assistant loans quite attractive.

The timing of these loans relative to the scholar's progress to appointment is not entirely clear from the records. However, bank records (See Appendix Section B) and the diaries provide some information. The preponderant majority of assistant loans in the diaries and bank records were recorded as "traveling loans" and thus only made to scholars who had not yet arrived in post. The remainder were for networking expenses associated with obtaining appointments or were associated with extreme financial constraints, e.g., rolling over existing debts or funding living expenses. Thus, it appears highly likely that these loans were almost always issued before scholars assumed postings. It is also fairly clear that all loans were issued after scholars passed the Keju examination. The records suggest that most loans were issued after the scholar obtained an official appointment. However, some loans appear to have been issued before official

appointments were received. Even in these cases, creditor records contain information relating to the general geographical region of the official's appointment. Thus, creditors appear to have had some information about the nature of the official's pending appointment, perhaps obtained through informal contacts and a good understanding of the queuing system.

2.7 The trusted assistant: Reputation and incentives

A loan to an incoming official is essentially a one-shot transaction. If the official remains in place, he has no need of future financing from the creditor. If the official is removed and disgraced, there are no profitable opportunities to extending further credit or extracting repayment on existing debt.¹⁴ Unless the official is dependent on the creditor based on some other relationship independent of the loan, i.e., the creditor is a relative of the official, the official has little reputational capital at stake and thus little reputation-based incentive to repay the loan.

However, trusted assistants were connected to the creditor, these connections permitted creditors to affect assistant incentives through monetary compensation, reputational rewards, and sanctions. Systems of monetary and reputation rewards were particularly well developed in the "Shanxi banks." They specialized in long-distance remittances, government loans, delivery of tax revenue to Beijing, and loans to government officials. These banks, though typically staffed by employees whose families originated from Shanxi province, were national in scope, with 475 "branches" across China and some branches outside. Each branch was organized as an independent unlimited liability joint stock company. However, the branches cooperated extensively and followed very similar operating procedures. Branches also frequently hired employees from other branches (Morck and Yang, 2010).

The Shanxi banks and some other intermediaries used a number of levers to ensure assistant loyalty. Assistants, like other bank employees, participated in stock-incentive plans. These plans involved issuing "expertise shares" to employees. Expertise shares provided the same rights to dividend cash flows as "capital shares" issued to the funders of the banks. The control rights of expertise and capital shares however differed. Expertise shares had all voting rights at management meetings. However, only capital shares exercised voting rights on "Grand Assessment Days" (typically held every three or four years). On these days, dividends were paid, managers were hired, promoted, and terminated, and new expertise shares were allocated to managers. Upon retirement, expertise shares converted into "dead shares" with the same cash flow rights as the expertise shares but no voting rights. Dead shares expired after a fixed period.

The two distinguishing features of these stock incentive programs were that they were very

¹⁴In practice, creditors seemed to recognize that collection from dismissed officials was impossible. For instance, in one account book including 66 loans to officials between 1838 and 1852 issued by one then-influential Shanxi bank, "Yu-Sheng-Ji", it was written that the bank did not pursue deposed officials, and stated that "we keep the record just in case their descendants may become officials and we could ask them to repay more or less the debt of their ancestor" (Liu and Yang, 2015).

large and completely performance based. Frequently the dividend payout to expertise and dead shares exceeded the dividend payout to capital shares. Allocations were based on employee performance rather than age or seniority. Performance was measured almost exclusively in terms of loan production and loan recovery. One indication that mechanisms to ensure assistant loyalty were an important feature of trusted-assistant lending is that same banks that were most active trusted-assistant lending, the Shanxi banks, were also the banks most likely to offer these employee stock plans.¹⁵

For employees nominated as trusted assistants, disloyalty would be manifested by the trusted assistant and dependent official “colluding,” cooperating to collect revenue but failing to repay the loan even when conditions were favorable to repayment. Since, as discussed above, there were legitimate reasons for delaying repayment, collusion could not be verified by the banks. Nevertheless, given the fairly large probability that an official would lose his post, delay risked non repayment, which would reduce the assistant’s performance rating and thus his allocation of shares on the next Grand Assessment day. In contrast, successful debt collection would greatly enhance the reputation of the trusted assistant among his peers, increase the likelihood of promotion, and lead to larger stock allocations. According to their brief biographies, several top managers of Shanxi banks, in early part of their tenure, were known for their collection ability, suggesting a correlation between debt collection and advancement within the bank. For instance, Mr Juyuan Song’s promotion to top management was based on his success in two loan collections, one of which required 7 years (Huang, 2002).

In addition to these apparently “modern” performance incentive schemes, banks followed employment policies that aimed to form closed communities in which reputational penalties could act as deterrents to opportunism: Banks only hired candidates whose families originated from the founder’s province, and a recommendation from a trustworthy person close to the bank was essential.¹⁶ Potential employees were investigated to determine whether the candidate’s family had any member whose conduct was disloyal or unfaithful within the last three generations. Any fault in the family record would lead to the candidate being rejected. Thus, unfaithful conduct would exclude the descendants of the rogue employee from bank employment for the next 100 years. Banks also spread the news of unfaithful conduct to the rogue employee’s village and to his colleagues, ruining the rogue employee’s reputation. Given the cultural disdain toward disloyal conduct, villagers would shun the rogue and he might lose his right to be buried in his family tomb, a measure that was considered to be the ultimate punishment (Peng, 1958).

As Greif (1993) points out, in reputational communities, these sort of extreme sanctions are typically reserved for verifiable transgressions and thus probably would not be applied to the

¹⁵See Gui (1988). However employee stock plans were not limited to Shanxi banks. Lu (2008) suggests that other banks sometimes offered these plans. For a much more detailed and nuanced description of incentive compensation in Shanxi banks, see Morck and Yang (2010).

¹⁶Liu (2016) provides evidence from a list illustrating the recommender of all employees of a Shanxi Bank.

unverifiable opportunism opportunities present to the trusted assistant. However, they provide evidence for a reputational community. Another aspect of bank personal policy however is directly relevant to ensuring assistant loyalty through reputation penalties. Typically banks conditioned hiring and retention on not marrying a women not originating from the bank founders' province. Moreover, the wives of assistants were required to live in their home town and thus not permitted to travel with the assistant to the official's assigned province. Thus, if an assistant decided to simply cast his lot with the official and ignore the bank's instructions and the loan, the assistant would lose contact with his family, and his family, trapped in the local reputational community, would be shamed.¹⁷

3 Model

In this section, we develop a model of trusted-assistant lending that incorporates, in a stylized fashion, the features of the institutional environment discussed above. The trusted assistant and the official are financially constrained and contractual commitment to future actions including debt repayment is not possible. Creditors are neither able to observe the actions of the trusted assistant and the debtor nor the condition of the official's assigned province. In this setting, the model investigates the question of whether trusted assistant lending can serve as a renegotiation proof mechanism for implementing efficient contracting.

3.1 Framework

Consider a world populated by three actors: a bank, an official, and an assistant. Dates are indexed by $d = \{0, 1, 2, \dots\}$. All actors are risk neutral, patient, expected utility maximizers. The official is a provincial governor and the assistant is his assistant. There is only one good in the economy called "cash." The actors must consume any cash generated in a period during that period. The expected utility of the bank is simply equal to the sum of its expected future cash flows on the loan. The utility of the official and assistant depends on the sum of expected future cash flows as well but also depend on the sum of the expected non-pecuniary costs of collecting tax *revenue* in the province.

The official borrows funds from the bank at date 0. A condition for the loan is that an assistant, an employee of the bank, travel to the province with the official and assist in collection. The face value of the official's debt equals ℓ . At each date at which the official is in post, the official collects tax revenue, t from the province. The official is required to remit, in each period τ of this revenue to the imperial government in Beijing. While the two *agents*—the official and assistant—are in post, tax revenue is their only source of cash. We will call this required

¹⁷Tragic stories relating to disloyal assistants are narrated by Ji (2005).

remittance the center's *tax quota*. Revenue in excess of the tax quota can be offered to the assistant to ensure the assistant's cooperation in collecting revenue, paid to the lender to satisfy the debt, or consumed by the official. All actions of the agents are observable by the agents. The bank only observes loan payments and whether the assistant is "in-post," working for the official in the province or has returned to the bank.

At date 0, the official is in post. At the start of each period following the first period, with probability β the official retains his position and with probability $1 - \beta$, the official is *separated* from his position. This probability represents the random exogenous shocks, e.g., mourning the death of parents, that led to officials departing from their posts. At date 0, the official is inexperienced. At the start of each subsequent period in which the official is in post and inexperienced, the official *converts* to being experienced with probability $1 - \alpha$, $\alpha \in (0, 1)$. Once an official is experienced, the official stays experienced. Experience affects the non-pecuniary cost of debt collection.¹⁸ At date 0, and all subsequent dates, the assistant is experienced.

In each period, there are two possible economic conditions for the province, "bad," B , and "good," G . The probability that the economic condition in a period is G is p . Thus, the economic condition in each period is independent of the previous and future realizations of the economic condition. The good condition is intended to represent the "normal" situation where collecting revenue is easy and agents profit from collecting revenue in excess of the tax-quota. The bad condition represents an "exceptional" time of hardship, e.g., crop failure, in which revenue collection is onerous.

We assume that, regardless of the cost of collection, the official will always raise sufficient revenue to satisfy the tax quota from the center, τ . The maximum tax revenue the official can raise in any period is given by $\bar{t} > \tau$. The cost of collecting tax revenue depends on (a) the economic condition, (b) whether the official cooperates with the assistant, and (c) on whether the official is experienced. When the official is inexperienced, the cost of collecting tax revenue, t , without the help of the assistant is $\chi_{\omega} t$, $\omega = G, B$. If the assistant and official agree to raise tax revenue, t , the cost of raising t borne by assistant is $\frac{1}{2} c_{\omega} t$ and the cost borne by the official is also $\frac{1}{2} c_{\omega} t$, $\omega \in G, B$. Whether the assistant cooperates in revenue collection or simply occupies his post without providing any useful aid to the official can only be observed by the agents. If the assistant's cooperation is not obtained in a given period, the official has no incentive to compensate the assistant and the assistant is effectively "fired" for that period.

When the official is experienced, the cost of collecting tax revenue t without the help of the assistant is given by $c_{\omega} t$, $\omega = G, B$. If the assistant and official agree to raise tax revenue, t , the cost of raising t borne by assistant is $\frac{1}{2} c_{\omega} t$ and the cost borne by the official is also $\frac{1}{2} c_{\omega} t$, $\omega = G, B$. Cooperation requires making a payment a to the assistant. This payment must satisfy

¹⁸An alternative and equivalent interpretation of experience is that the official converts when he is able to identify trustworthy local administrators who are perfect substitutes for the assistant.

limited liability, implying that, if the loan is also repaid in the period, $a \in [0, t - \tau - \ell]$ and, if the loan is not repaid in the period, $a \in [0, t - \tau]$

Thus, in any period following the first, the official and assistant are in one of four possible states:

I Indebted: The official has not repaid the loan and the official is inexperienced.

N Not indebted: The official has repaid the loan but is inexperienced.

F Free: The official is free, i.e., experienced and has no need for the assistant.

S Separated: The official is separated.

When the official is separated at the start of the period, state *S*, the payoff to the official and assistant from provincial revenue equals 0. In the first period in which separation occurs, the assistant, being a personal employee of the official not the state (under the “one-man rule” policy), returns (at the start of the period) to the bank. In state *F*, when the official is free, it is a weakly dominated strategy for the official not to cooperate with the assistant as cooperation would entail at least paying the assistant an amount equal to the assistant’s effort costs and might entail paying the assistant more. In which case, the cost of hiring the assistant is weakly larger than the cost of collecting without the assistant’s help. Also, when the official is free, paying off the loan is also a dominated action for the official—the loan is not collateralized and cannot be legally enforced and paying off the loan lowers the consumption of the official. Thus, when the official is free, the probability of repayment is zero as is the expected share of tax revenues received by the assistant. Thus, remaining in post is futile and so, we assume that, at the first date at which official is free, the assistant also returns to the bank.

In a period in which the state is *N*, i.e., when the official is not indebted but is still inexperienced, the official has the incentive to make a *cooperation* agreement with the assistant to ensure the assistant’s cooperation in tax revenue collection. Such an agreement will specify a level of tax collection, t , as share of tax revenue received by the assistant, which we call the assistant’s *compensation*, a . The terms of the agreements are determined in each period by bargaining in a fashion to be discussed later. Note our specification for state *N* assumes that the assistant remains with the inexperienced official even though the loan has been repaid. This assumption is made to conform with documentation in the historical record. In a period in which the state is *I*, i.e., when the official is both inexperienced and indebted, bargaining will fix compensation, a , in the period. However, in addition, a cooperation agreement will specify whether the loan is repaid in that period.

Upon return to the bank, the assistant will receive a *return bonus*. The return bonus equals $A > 0$ if, at the date of return, the loan has been repaid and equals 0, if, at the date of return, the loan has not been repaid. A captures, in reduced form, the net benefit, pecuniary and reputational, of returning to the bank after a successful collection, e.g., increased stock-bonus grants, increased probability of promotion, raised social status amongst his fellow employees. The period rewards

and state transition probabilities specified above are summarized in Tables A-1, A-2, and A-3. Table A-1 in Appendix Section A for convenience.

3.2 Parametric assumptions

In order to simplify the analysis, reduce the number of parameters, and restrict attention to interesting cases, we impose the following restrictions on the marginal cost of collection parameters.

Assumption 1 (Parameters).

- (i) $c_G = 0$,
- (ii) $c_B = c$, $c \in (1, 2)$,
- (iii) $\chi_G = \chi_B = \chi$, $\chi \in (1, 2)$,
- (iv) $\chi > \frac{c}{2-c}$.

Assumption 1.i captures the idea that collecting tax revenue is easy for experienced agents when the condition of the province is G . The results in this paper are robust modifying this assumption provided that $c_G < 1$. However positing positive marginal costs in condition G simply adds an additional parameter without producing any new insights. Assumption 1.ii captures the idea that, even for experienced agents, when the condition of the province is bad, B , tax collection is onerous, i.e., $c > 1$. However, it is not so onerous that the net loss from collecting revenue, $t - ct$, exceeds revenue collected, i.e., $c < 2$. Assumption 1.iii captures the idea that collecting taxes is difficult and onerous for inexperienced agents regardless of economic conditions. Assumption 1.iv implies that the marginal cost of collection is higher for inexperienced agents than experienced agents, $c < \chi$. In fact, this assumption imposes a somewhat stronger restriction: in order to attain cooperation from the experienced assistant, an inexperienced official must provide the assistant with compensation. Since the official is financially constrained, this compensation can only come out of tax revenue. Thus compensating the assistant increases the tax revenue that must be raised and thus itself increases the costs of collection. Assumption 1.iv ensures that the advantage of cooperation is sufficient to offset the increased cost of collection generated by collecting to compensate the assistant.

We also impose the following restrictions on the maximum tax capacity of the province, \bar{t} . These restrictions ensure that the bargaining solution we develop in the subsequent section is not constrained by the tax capacity constraint, $t \leq \bar{t}$. These assumptions are not required to derive the main results of the paper but greatly simplify the analysis by permitting us to avoid working out all of the “corner solutions” to the bargaining problem.

Assumption 2 (Revenue capacity).

- (i) $\bar{t} - \tau > \tau \chi$,

- (ii) $\bar{t} > \frac{\tau(c+(2-c)\chi)}{c(2-c)}$,
 (iii) $\bar{t} - \tau - \ell > A - \tau\chi$.

3.3 When the official is free or separated

When the official is separated, the official's payoff is 0. Thus the payoff to the official, the expected sum of the period rewards from the current and all future periods, is given by $v_O^S = 0$. If the official is free, then, if the economic condition is G , because the marginal cost of collection is 0, the official will therefore collect taxes up to the maximum capacity of the province, $t = \bar{t}$ and remit the tax quota to the center, leaving the official with a surplus of $\bar{t} - \tau$ which equals the official's period reward. When the condition of the province is B , the marginal cost of tax collection $c > 1$. Thus, the official will collect just enough tax revenue to meet the tax quota, $t = \tau$, and the official's period reward will equal $-c\tau$. Hence, the expected period reward to the official when the state is F , \bar{r}_O^F , is given by

$$\bar{r}_O^F = p r_O^F(G) + (1-p) r_O^F(B) = p(\bar{t} - \tau) - (1-p)c\tau.$$

Because the state transition probabilities are stationary, the collection policy of the official is stationary, and economic condition in the current period is independent of future economic conditions, in any period in which the state is F , the payoff to the official satisfies the dynamic programming equation

$$v_O^F = \bar{r}_O^F + \beta v_O^F + (1-\beta)v_O^S = v_O^F = \bar{r}_O^F + \beta v_O^F,$$

where the official's *continuation payoff*, $\beta v_O^F + (1-\beta)v_O^S$ is determined by the transition probabilities provided in Table A-3. Solving this equation yields:

$$v_O^F = \frac{\bar{r}_O^F}{1-\beta}. \quad (1)$$

3.4 When the official is inexperienced: the cooperative repayment solution

When the official is inexperienced, an agreement with the assistant to jointly collect taxes can increase the payoff of both the assistant and the official. We analyze the conditions under which an economic-condition dependent agreement can be implemented by Nash bargaining. Our key assumption is that bargaining is period-by-period. Agents cannot commit, at the given date, to the terms of future agreements. Thus, bargaining in state N centers only on the assistant's compensation, a , in that period and bargaining in state I centers only on the assistant's

compensation in that period and whether the loan will be repaid. Agents take payoffs from future negotiations as given and compute their continuation payoffs from these negotiations based on the conjectured solution to the bargaining problem.

We focus on agreements which lead to loan repayment if and only if economic conditions are good, G . We call such an agreement a *cooperative repayment solution* (CRS).

Definition 1. A CRS is a loan repayment and assistant compensation policy followed by the agents when the official is inexperienced that satisfies the following conditions:

- (i) The official and assistant agree to cooperate to raise revenue.
- (ii) In any period in which the official is indebted, i.e., the state is I
 - (a) The agreement specifies loan repayment in state I when economic conditions are good, G .
 - (b) The agreement specifies no loan repayment in state I when economic conditions are B .
- (iii) Assistant compensation, a , depends only on the state and the economic condition of the province.
- (iv) Assistant compensation is determined by period-by-period Nash bargaining.

A CRS is a payment to the assistant when the official is inexperienced that is the same in every period in which the state and economic conditions are the same. Hence, it can be represented by the vector $a_* = (a_*^N(B), a_*^N(G), a_*^I(B), a_*^I(G))$. Because, the state variable is Markovian and the current future economic condition of the province is independent of its current condition, and the CRS specifies a stationary payment to the assistant, the expected payoff to an agent at the start of any period satisfies the recursive equation of dynamic programming, i.e., if we let v_i^s represent the expected payoff to agent i , $i = \text{Official, Assistant}$ in state s , then

$$v_i^s(a_*) = \bar{r}_i^s(a_*) + \sum_{s'} p \mathbb{P}_*[s'|s, G] v_i^{s'}(a_*) + (1 - p) \mathbb{P}_*[s'|s, B] v_i^{s'}(a_*), \quad (2)$$

where $\bar{r}_i^s(a_*)$ is the expected period payment to agent i ,

$$\bar{r}_i^s(a_*) = p r_i^s(a_*^s(G)) + (1 - p) r_i^s(a_*^s(B)),$$

and \mathbb{P}_* represents the state transition probability under the CRS. These state transition probabilities follow from condition (ii) of Definition 1 and the state transition probabilities specified above.¹⁹

For the reader's convenience, an explicit table of transition probabilities under the CRS is provided in Table A-4 in the Appendix. Using equation (2), we derive the payoff function

¹⁹We assume that in all states, s and for both agents i , $v_i^s(a_*) > 0$ and thus participation in individually rational for the official and assistant. This condition is satisfied for all parameters of the model for the assistant and is satisfied for sufficiently large p for the official.

associated with each state. Given the number of states and economic conditions, the derivation of the CRS is somewhat tedious and so we defer the derivation to the Appendix Section A. Our basic result concerning the existence of a CRS is provided by the next proposition.

Proposition 1. *If*

$$\Sigma_*^I(G) = \frac{(\bar{\tau} + \tau(\chi - 1))(1 - (1 - p)\alpha\beta) + (1 - \alpha\beta)(A - \ell)}{1 - (1 - p)\alpha\beta} \geq 0,$$

then a cooperative repayment solution (CRS) exists. Under this solution, in each period in which the official is inexperienced, the assistant and official reach a cooperative agreement to collect revenue. When the official is experienced, the official collects tax revenue without the help of the assistant. If the official is indebted at the start of any period, the official repays the loan if and only if the economic condition of the province is good, G . The payments to the assistant depend only on the state of the system and the economic condition of the province. These payments a_ are given by*

$$a_*^N(B) = a_*^I(B) = \tau \left(\frac{c-1}{2-c} + \frac{\chi}{c} \right), \quad a_*^N(G) = \frac{1}{2} (\bar{\tau} - \tau + \chi \tau), \quad a_*^I(G) = \frac{1}{2} (\bar{\tau} - \tau - \ell - (A - \tau \chi)).$$

The economic intuition for the proposition is straightforward. Nash bargaining characterizes the division of *surplus revenue*, revenue in excess of the tax quota and possibly the loan repayment. In each period, this division is based on the payoff gain to the agents from reaching a cooperative arrangement. This payoff gain is determined by the status quo payoff and the cooperation payoff. Since bargaining is period-by-period, the agents' continuation payoff in a given period is the payoff specified in the CRS. Except for economic condition G and state I , when the CRS calls for the loan to be repaid, the continuation payoffs under the status-quo and the cooperative agreement are the same. Thus, the total payoff gain from cooperation to the assistant and official is the period gain and this gain is positive. Hence, the conditions for applying the Nash bargaining solution are satisfied.

When the economic condition is G and the state is N , the marginal cost of revenue collection is 0, so the Nash bargaining solution calls for the agents to collect as much revenue as possible, $\bar{\tau}$. When the economic condition is B , collection is onerous. Thus, only sufficient revenue to satisfy the tax quota and compensate the assistant will be collected. In this case, the Nash bargaining solution splits the period gains from cooperation, taking into account that cooperation requires compensation to the assistant and this compensation requires more onerous tax collection.

When the economic condition of the province is G and the official is indebted, (i.e. the state is I), repayment under cooperation generates a different set of continuation states than non-repayment under the status-quo policy. Repayment leads to the assistant capturing the return

bonus upon return from the province and this increases the assistant's gain. The bargaining solution assigns half of this gain to the official, who must agree to the repayment, by reducing the assistant's compensation. At the same time, repayment transfers cash to a third party, the bank, not participating in the bargaining. The condition, in Proposition 1, that $\Sigma_*^I(G) \geq 0$ simply requires that the total gain from cooperation to repay when the condition is G and the state is I is non-negative and thus the bargaining solution is viable.

3.5 Renegotiation proofness of the cooperative repayment solution

We next consider the question of renegotiation proofness of the CRS: i.e., does there exist an alternative allocation of period gains which makes both the assistant and official better off? When the official is not indebted the answer to this question is obviously no. As discussed above, when the official is not indebted, the only policy variable is the compensation to the assistant. When a CRS exists, its Nash bargaining allocation maximizes the joint payoff of the assistant and the official. However, when the official is indebted, there is another policy variable—whether to repay the loan. The CRS calls for the loan to be repaid if the economic condition is G and not repaid if the economic condition is B . Thus, there are two possible alternative policies—not repaying the loan when the state is G and repaying the loan when the state is B . The first alternative might be interpreted as collusion between the assistant and the official to “stiff” the bank. The second, might be interpreted as the assistant, concerned about his return bonus, bribing the official to collect revenue even in state B , where revenue collection is inefficient. The following proposition, derived in Appendix Section A, characterizes the parameters of the model that support a renegotiation-proof CRS.

Proposition 2. *The CRS agreement is renegotiation proof if and only if $A \geq \ell$ and*

$$\mathcal{R} = \left(\tau \left(\frac{c}{2-c} + \chi \right) - c(\ell + \tau) \right) - p(A - \ell) \frac{\alpha \beta}{1 - (1-p)\alpha \beta} < 0. \quad (3)$$

The conditions for renegotiation proofness have a fairly intuitive interpretation. When economic conditions are good, G , collection is costless. The failure to collect in a given period deprives the assistant of an assured return bonus but increases the revenue that can be split between the assistant and official by decreasing the payment to the bank. Since collection is costless when the economic condition is G , limited liability does not prevent this total gain from being split in a fashion that increases the payoff of both the assistant and official. The net gain to the agents from stiffing the bank is $\ell - A$. Thus, the CRS is renegotiation proof in condition G if and only if $A \geq \ell$.

When $A \geq \ell$, the assistant may have an incentive to induce the official to repay the loan even when economic conditions are bad, B . However, when economic conditions are bad, B , collection is onerous. Thus, collecting additional revenue to repay the debt is costly as the cost of repayment includes not only the amount repaid but also increased revenue collection costs. In order for the assistant to induce the official to bear these costs, the official must agree to a reduction in his share of period revenue. In addition, repayment in the current period, by ensuring the return bonus, also lowers the assistant's gain from a cooperative agreement in subsequent periods. This reduction in gain increases the share of revenue required to compensate the assistant in future periods. Increasing the assistant's share of revenue lowers the continuation payoff of the official. Thus, the assistant's offer to exchange reduced compensation for "early" repayment must compensate the official, in the current period, for this loss as well as the costs of inefficient collection. When $\mathcal{R} < 0$ this compensation reduction is so large that it requires negative compensation, which is infeasible because of limited liability and thus renders the CRS renegotiation proof.

3.6 Comparative statics of renegotiation proofness

Note that $\mathcal{R} < 0$ is a necessary and sufficient condition for renegotiation proofness when $A \geq \ell$ and that the CRS is never renegotiation proof when $A < \ell$. Thus, renegotiation proofness centers on whether $\mathcal{R} < 0$. Shifting a parameter of the model in a way that decreases \mathcal{R} facilitates renegotiation proofness and parameter shifts that increase \mathcal{R} impede renegotiation proofness. Thus, to investigate the question of renegotiation proofness, we explore the effect of parameter shifts on \mathcal{R} .

In order to make these shifts more relevant to the context of our empirical analysis, it is useful to interpret the parameters of the model in a fashion that can be related to observed characteristics. The features of the economic environment that we would like to capture are the dependence of the inexperienced official on the assistant, the expected tenure of the assistant, and provincial economic conditions. These are the parameters we can reasonably proxy in our data sample.

First consider dependence. Dependence of the official on the assistant, and thus the assistant's bargaining power, depends on the attractiveness of collecting without the aid of the assistant. Assumption 1 bounds the inexperienced official's marginal cost of collection, χ , between $c/(2-c)$ and 2. Thus, we can express χ as a weighed average of these two extreme values as follows:

$$\chi = d2 + (1-d)\frac{2}{2-c}, \quad d \in (0, 1), \quad (4)$$

where d in equation (4), is a *dependency index*. In practice, the dependency index might capture how "tricky" revenue collection is in a given province in bad times. Provinces of the empire

differed in their degree of insularity, and the degree to which they resisted tax collection. In insular and rebellious provinces, the dependence of inexperienced officials on assistants with collection expertise, dialect familiarity, and local knowledge would probably have been much greater than in integrated and pacific provinces.

Using equation (4) to substitute for χ in the renegotiation condition (equation (3) in Proposition 2) yields the following version of the renegotiation condition:

$$\mathcal{R}' = \frac{(2 - c + c^2) \tau - (2 - c) c \ell - 2(c - 1) \tau d}{2 - c} - p(A - \ell) \frac{\alpha \beta}{1 - (1 - p) \alpha \beta} < 0. \quad (5)$$

Next, consider $\alpha \beta$. Because the assistant's expected tenure equals $1/(1 - \alpha \beta)$, $\alpha \beta$ is a measure of the tenure of the assistant. Thus, comparative statics with respect to $\alpha \beta$ capture the effect of the expected tenure of the assistant. Expected tenure will depend negatively on the officials exposure to idiosyncratic shocks, $1 - \beta$, and the ability of the official to develop expertise over time, $1 - \alpha$.

Finally, given that bad state B represents the realization of an abnormal adverse event such as a crop failure, p can be interpreted as a measure of the economic stability of the province. Largely because of climatic variation, provinces varied greatly with respect to economic stability.

Under these interpretations, the following results are immediate from differentiating \mathcal{R}' , defined in equation (5), with respect to the relevant parameters.

Proposition 3. *When $A \geq \ell$, then, holding all other parameters fixed,*

- (i) *Increasing the dependency index, d , facilitates renegotiation proofness.*
- (ii) *Increasing expected assistant tenure, measured by $\alpha \beta$, facilitates renegotiation proofness.*
- (iii) *Increasing the economic stability of the province, p , facilitates renegotiation proofness.*
- (iv) *Increasing the return bonus, A , facilitates renegotiation proofness.*

Thus, the trusted assistant loan mechanism is most likely to be viable, for a fixed return bonus, when officials are inexperienced and very dependent on their assistants, the expected tenure of the assistant is long, and the province is relatively stable. The creditor can of course adjust the incentives of the assistant, through affecting the return bonus, A , to compensate for the values of the other parameters. However, given that A in all likelihood represents a complex mix between monetary rewards, career advancement benefits, and avoided reputational sanctions, the extent to which creditors could fine tune A is not clear. Although we make an attempt to address the tuning question in our empirical analysis, tuning is difficult for us to document because we do not have data linking trusted-assistant loans with bank compensation of assistants.

4 Statistical Description

4.1 Sample from Diaries

The descriptions of loans to officials that are used in this study originated from diaries written by officials and other intellectuals living during the Qing dynasty. Keeping diaries, a custom among intellectuals as early as Tang dynasty (618-907), became ubiquitous in Qing Dynasty.²⁰ This ubiquity could be partially attributed to the official encouragement for keeping diaries, with the aim of recording daily lives of the emperors and of important ministers who either worked in Hanlin Academy or paid visits to foreign countries (Zhang, 2016).

Even the most conservative estimate concludes that more than 1,000 diaries written in Qing dynasty are still extant, either in China or abroad.²¹ The contents of these diaries varied dramatically, from the simple records of the trivia of the authors' personal life, poems, and descriptions of places visited, to descriptions of decision making in national affairs of ultimate importance. For majority of authors, diaries were thought of as private and confidential, and the publication of the diaries was not pursued, at least during the authors' lives.²²

In order to search for information about officials' debts, we gathered a sample of 54 diaries written in Qing dynasty. These diaries were selected because they have been punctuated, collated, and digitized and thus are suitable for electronic search. Most extant diaries have been published by photocopying, resulting in a graphics image file that cannot be searched electronically. Excluding photocopied diaries raises the question of sample-selection bias. Due to the tedious nature of punctuating and collating works written in ancient Chinese, only those diaries with great political and historical importance have been punctuated and collated. Thus, most punctuated and collated diaries were authored by high-level officials. The bias toward high officials will affect our results only the extent that the borrowing behavior of these officials, at the time they borrowed, is different from other officials. However, the loans in our sample were targeted at scholars traveling to take up their first appointment, or appointments early in their careers. The early careers of most of these high officials were quite similar to those of lower-ranked officials. At the time they borrowed, they, like the other officials whom they subsequently outranked, were frequently poor scholars.²³ Thus, at the time they entered into scholar loans, we have no reason to believe that these high officials were distinguishable from other officials whose subsequent careers were less impressive. Of course, it is possible that

²⁰See Chen (2004) for more detailed description about diary-keeping custom in Qing dynasty.

²¹In an incomplete bibliography of diaries, Chen (2004) listed more than 200 diaries written in Qing dynasty and many famous diaries are not on his list.

²²One example was Ciming Li, who used to boast about the length and delicacy of his diary, only allowed his diary to be published right before his death. See Zhang (2016). Most other authors simply handed their diary over to their sons.

²³For instance, one top official of Qing dynasty whose diary is included in our sample, Guofan Zeng, had a extremely poor early life with many debts to his peers, mostly incurred to purchase books and cloth Zeng (1994).

creditors could somehow identify scholars who were destined for success at the time of their first appointment but this seems very unlikely.

We electronically searched the 54 diaries using a series of key words such as “Borrow(Jie)”, “Debt(Zhai)”, “Owe(Qian)”, “Repay(Huan)”. After identifying the location of debt descriptions, we then asked a research assistant from history department who specializes in the Qing Dynasty, and is thus more familiar with ancient written Chinese and the economic and social context, to pull out the relevant information. Only 27 of the 54 diaries contained information about debt contracting. Through this process, we obtained a total of 254 of mentions of debt relations. For each mention, we attempted to determine the characteristics of the debtor and descriptions of the debt contract, including the interest rate, maturity, collateral, as well as information concerning repayment. Biographical information on the authors of the 27 diaries is provided in Table C-6 Appendix Section C.²⁴

One advantage of using data extracted from dairies is that the authenticity of descriptions is to large extent guaranteed. Due to the private nature of the diaries and the lack of an intention to publish, their authors have no incentive to falsify the data. On the contrary, a truthful account might be helpful as the author as it might be used to as an aid for recalling his previous financial actions. Correction of a diary after it is finished were also extremely rare, and mostly occurred for the purpose of mitigating political risk.²⁵

4.2 Characteristics of the Loans

Several criteria are imposed to further screen the sample. First, only those loans incurred between two private individuals are included in the sample. Second, to ensure that the loans are relatively comparable, loans with extreme size, either very small (less than 100 Liang) or very large (greater than 10,000 Liang) are excluded. Third, those cases in which the official is a depositor in, instead of borrower from, a financial institution are excluded. Imposing the above criteria produced a sample of 256 loans.

The timing and locational distribution for these loans is presented in Table 1. It is apparent that all loans occurred in later part of Qing dynasty, in a period between 1820 and 1910. Two factors led to the absence of pre-nineteenth century diaries in our sample. First, the nineteenth century is closer to the present and thus diaries the from this time period were more likely to be preserved. Second, in the later part of Qing dynasty, especially after 1840s, a much larger portion of positions were filled with more erudite Han officials rather than less educated Manchu

²⁴In order to make best use of our very limited information, in certain cases, we completed the data using deduction from experience with similar cases. For instance, if the information of the interest rate for a loan is missing, we then consider the available information of interest rates for loans most similar to it, i.e., loans with same location, type of issuer, terms and amount. We aimed to make these completions objective and impartial.

²⁵For instance, the diary of Weng (1998) appears to have been revised after a revolution against the government failed. However, all revisions concerned political activities not financial activities.

officials.

With regard to location, the majority of scholar loans were issued in urban rather than rural areas. Moreover, trusted-assistant loans were even more concentrated in large cities, especially Beijing. The table shows that nearly 90% of loans with trusted assistants were issued in large cities compared with only 67% for loans without trusted assistants. This is not surprising because scholars typically stayed in Beijing while waiting for their appointments. Thus, they were more likely to borrow from private individuals or financial institutions in Beijing.

The purposes of the loans are illustrated in the Panel A of Table 2. We categorized loans into 6 subsamples based on the reported purpose of the borrowing. “Daily usage” represents loans to fund living expenses. “Networking” represents loans to buy gifts to bribe senior officials without any physical movement of the borrowers. “Travel” represents loans to fund long-distance travel from the capital of the official and his assistants to appointment jurisdictions. Some of these travel loans also mention expenses related to networking. “Renewal” represents loans to repay the existing loans. “Business” represents loans to fund business investment. It is apparent that loans related to appointments constitute a large portion of the loans.

The categorization of loans by their purpose highlights the important role played by the trusted assistant in facilitating lending to officials leaving Beijing. It is apparent that the loans with trusted assistants were closely associated with the “traveling” purpose, that is, these loans were issued when the debtor/official left Beijing to reach his appointed jurisdiction. Other purposes constitute only a small fraction of trusted-assistant loans. Moreover, the average size of loans with traveling purpose was 3,000 Liang, almost 50% higher than the average over other loans purposes, 2,000 Liang of silver. The large average size of travel loans was mainly engendered by the disproportionate size of trusted-assistant loans.

The creditors for those loans are described in Panel B of Table 2. Creditor identities are categorized into 6 subgroups: relatives, friends, private individuals, domestic banks, foreign banks, and the assistant. The table highlights the role of the trusted assistant as a substitute for reputational enforcement. While loans from individual creditors, i.e., relatives, friends, or unrelated individual creditors, constitute more than 59% of total loans, they only constitute only 25% of trusted-assistant loans.

The vast majority of trusted-assistant loans were issued by domestic banks, and thus the vast majority of trusted assistants were bank employees. This regularity in the data suggests that the long-term relationship between the bank and the assistant was used to compensate for the lack of a long-run reputational relationship between the official/borrower and the bank. In cases where the assistant was not a bank employee, sending an assistant who was a relative of the creditor was common, which again suggests using reputational bonds between the assistant and the creditor to substitute for reputational bonds between the creditor and debtor. Despite the superior financial and human capital resources of foreign banks, the table shows that

these banks were only marginal players in the trusted-assistant lending market. A possible explanation for their underrepresentation is that the vast majority of officials' duties related to activities unrelated to international trade and finance, areas in which foreign banks had the most pronounced comparative advantage. Domestic banks might also have had deeper reservoirs of the China-specific human capital that officials actually needed to administer their jurisdictions.

Also note that there are some cases in which the officials borrowed from their assistants. As discussed earlier, assistants were well positioned to monitor debt repayment. However, it appears that the constraints on the financial resources of assistant were frequently binding. The total number of loans from assistants constitute a substantial fraction of loans. However, the average size of these loans is quite small compared with trusted-assistant loans from financial institutions.

5 Analysis

5.1 Adoption of trusted-assistant finance

We analyzed the determinants for the decision to send a trusted assistant through estimating the Probit regression

$$\text{Assistant}_i = \Phi(\alpha + \beta \cdot X_i + \varepsilon_i).$$

The dependent variable, Assistant_i , is a dummy variable representing a trusted assistant appearing in the loan contract. The vector of independent variables, X_i , represent lender, provincial, and debtor characteristics. Φ represents the cumulative distribution function of the standard Normal distribution. We categorize creditor identity into four categories: relatives, other private individuals, domestic banks and foreign banks. We represent membership in each, except the baseline group, relatives, with a dummy variable equal to 1 if the relationship falls in a category and equal to zero otherwise. The results of this regression are presented in Table 4. A complete description of the definitions of all the variables used in the data analysis is provided by in Table 7. We employ three specifications of the model to provide some insight into the robustness of our results.

Note that, in Table 4, the coefficient for the domestic bank dummy variable is positive and statistically significant in all three specifications. The domestic bank effect is also economically significant: the marginal effect of domestic bank on the probability that the loan is a trusted assistant loan exceeds 0.45 in all specifications. Coefficients for the other relationship categories and the constant term are all statistically insignificant. This indicates that domestic banks were significantly more likely to employ the trusted-assistant mechanisms than any other creditor type. Thus, the probability of trusted assistant finance being employed is highest when the relationship between the scholar and the creditor is most impersonal and thus enforcement of

repayment through social sanction is least likely to be effective. This result is consistent with the model's assumption that the official accrues no reputational benefits from loan repayment.

In the model, trusted assistant financing is used to reduce information asymmetry between the creditor and the debtor. Under this assumption, the adoption of assistant should be more likely when informational asymmetry is severe. We use the *Distance between the Jurisdiction and Beijing* to measure the degree of information asymmetry. Thus, the positive and significant coefficient for *Distance between the Jurisdiction and Beijing* is consistent with the model's assumptions. A 100km increase in the distance from Beijing increases the probability that the loan is a trusted assistant loan by at least 0.05 in all three specifications.

The coefficient for *First Appointment* is positive and significant in all specifications, indicating that probability of trusted assistant finance being used is higher when the official is inexperienced. In fact, the marginal effect of *First Appointment* on the probability that the loan is a trusted-assistant loan is always more than 0.54. Inexperienced officials are more likely to remain dependent on assistants for a longer period of time. In the model, inexperience is captured by the parameter α , the probability the official remains dependent on the assistant in the next period. Because increasing α facilitates renegotiation proofness of the cooperative repayment solution, this result is consistent with the model's predictions.

The variable *Parent Alive* is a rough proxy for $1 - \beta$, the likelihood that the scholar is separated from the position by an exogenous shock. As mentioned before, Imperial law required that an official resign from his position and mourn for 3 years after the death of either parent. Thus, if either parent is alive when the scholar receives the appointment, the risk of exogenous separation from post is much higher. The results show that the coefficient for *Parent Alive* is always negative and is significant in two of the three specifications. Its marginal effect is economically significant in all three specifications. Because, increasing β increases expected tenure and thus facilitates renegotiation proofness, the negative association between *Parent Alive* and employing trusted assistant finance is consistent with the model's predictions.

We use the *Volatility of Local Rice Price* to measure the instability of local economy. Because the Qing Empire was mainly a agricultural society with grains being main production and consumption good, the price of local rice is a good reflection of the situation of local economy, and more importantly, is closely correlated with the capacity of officials to extract taxes. Volatility was primarily generated by crop failure, which corresponds roughly to the "bad" state in our model. The results show the coefficient for volatility of local rice price is always negative and is significant in two of the three specifications. The effect is also fairly sizable. Increasing volatility from its mean value of 0.14 to 0.15 increases the probability that the loan is a trusted-assistant loan more than 0.08 in all specifications. This evidence provides some support our theoretical prediction that a stable local economy facilitates renegotiation proofness.

The coefficients for the variables *Violent Tradition in Locality* and *Jurisdiction with Dialect*

are more difficult to interpret. One plausible interpretation of these variables is that when there is a violent tradition in locality, or local people speak a dialect that is hard for outsiders to understand, an assistant, who is likely to be more familiar with the provincial conditions, customs and language, should have a larger comparative advantage in extracting rents relative to an inexperienced official. Thus, the official should be more dependent on the assistant. Because dependency facilitates renegotiation proofness, under this interpretation, the positive and significant coefficient for *Violent Tradition in Locality* and the positive and marginally significant coefficient for *Jurisdiction with Dialect* are consistent with the model. *Official's Position* and *Richness of Jurisdiction* are included as control variables. *Official's Position* represents the 0-9 ordinal ranking of official positions used by the Qing Dynasty. *Richness of Jurisdiction* represents the average tax receipts per county in the official's jurisdiction. The coefficients for these control variables are insignificant.

5.2 Assistant Assignment

As discussed in Section 3.5, although most model parameters are dependent on the characteristics of the assistant and jurisdiction, the creditor can ensure renegotiation proofness of the trusted assistant mechanism through increasing the return bonus, the gain to the assistant from successful collection. As Proposition 3 shows, the renegotiation proofness condition is most difficult to satisfy when the province is unstable, the official is not very dependent, the official's expected tenure is short, and he is likely to be able to master provincial administration quickly. Thus, one might expect that, in these cases, the creditor would make efforts to ensure that the return bonus was quite large.

Because, Chinese banks during the Qing Dynasty routinely employed incentive contract mechanisms, a logical approach to identifying endogenous adjustments aimed to affect the return bonus would be to relate the assistant's bank compensation package with characteristics of the official's jurisdiction. Unfortunately, we lack bank compensation data.

However, the return bonus will not only depend on compensation but also other gains accrued by the assistant from loyal collection. Under the assumption of kin altruism, this gain should be larger, *ceteris paribus*, when the assistant is related to the bank's manager, as the assistant will internalize some of the manager's gains from repayment. At the same time, we expect that the position of the assistant in the official's administrative cadre will be positively correlated with the assistant's rank in the bank. Further, we expect that higher ranked bank officials have greater human capital and thus risk more human capital when acting disloyally. Under these assumptions, the return bonus should be larger for assistants in senior positions and assistants who are related to the bank's manager.

These observations imply the sending a senior/related assistant should be negatively corre-

lated with our dependency proxies, *Violent Tradition in Locality* and *Jurisdiction with Dialect*, inexperience proxy, *First Appointment*, and positively correlated with economic instability, proxied by *Volatility of Local Rice Price*, and exogenous separation proxy, *Parents alive*,

To investigate these hypotheses, we perform further Probit regressions. The sample for this regression is domestic bank trusted assistant bank loans. In the first regression, the dependent variable is whether the assistant is in a senior position, in the second, whether the assistant is a relative of the bank manager. The independent variables are characteristics of the official and the jurisdiction. The results of this regression are reported in Table 5.

In both regressions, our results are consistent in sign with our predictions. With the exception of the *Parents Alive* in the first regression and *Violent Tradition in Locality* in the second regressions, the estimated coefficients are significant. These results provide some support for the hypothesis that creditors acted to affect the incentives of assistants to ensure that assistants' incentive compatibility conditions were satisfied. Clearly, these regressions suffer from a severe omitted variable problem engendered by the lack of bank compensation data. Given the results in Morck and Yang (2010), such compensation might have been a first-order determinant of assistant incentives.

5.3 Loan characteristics and performance

5.3.1 Evidence from the diaries

As well as making predictions about the adoption of trusted assistant financing, the model makes predictions about the ex post performance of trusted assistant loans. The model derives conditions for efficient and effective contract enforcement using the trusted assistant mechanism. Efficiency requires forgoing repayment in periods economic conditions in the official's jurisdiction are adverse. Effectiveness requires that in periods where conditions are favorable. Unfortunately our ability to test these predictions is far more circumscribed than our ability to test the ex ante predictions of the model. As discussed in Section 4 we lack data on actual loan proceeds and the timing of borrower repayments. We are also unable to adjust for the fact that trusted assistant loans bundle a loan with the trusted assistant's consulting services. However, we do have data on nominal principal, nominal interest rates, actual maturity, and total loan repayments.

With these caveats kept in mind, we present our data on loan contract terms and ex post loan performance in Table 6. The table reveals that trusted-assistant loans featured more relaxed ex ante financing constraints, as reflected their larger nominal principal amounts, and lower nominal interest rates. Because officials almost never had sufficient funds to repay at the contracted date (usually right after taking office), negotiations over the debt maturity extension were quite common. Trusted assistant loans, on average, had maturities more two years longer than non

trusted assistant loans. Their longer maturity and extensibility suggests efficient delays in repayment.

Due to the function of the trusted assistant in enforcing the debt repayment, the recovery rate should also be higher for trusted assistant loans. The recovery rate is calculated using the reported repayments in the diary divided by the principal. Note that our definition of the recovery rate is the total amount of repayment as percentage of the principle, rather than the conventional definition the repayment on the loan conditional on default. The reason we modify the definition of recovery rate is that scholar loans are almost never paid within the contracted loan period, making the traditional definition of “default” a problematic measure of recovery. The results suggest that having the trusted assistant increases the recovery rate by as much as 40% and that more senior assistants are associated with higher recovery rates than junior assistants.

5.3.2 Evidence from a bank loan book

To provide additional insight into loan performance, we also report evidence from loan book of the Shanxi Bank Yu-Sheng-Ji mentioned earlier.²⁶ Because bank appears to by a typical Shanxi bank operating in the fairly competitive scholar/official loan market, data from the loan book should shed some light on the performance of trusted assistant loans. The loan book contains records for 66 Loans, 18 of which are trusted-assistant loans. The loan book contains less information about the borrowers than the diaries. However, the loan book does provide some loan performance information that the diaries lack—notably the bank’s qualitative rating loan performance. Loans are rated “good,” “bad,” and “worst.” The bank also recorded whether the borrower suffered an adverse shock, i.e. was dead, ill, mourning, or impeached. Eighteen of the 66 records indicate an adverse shock.

Of the remaining 48 loans, (15/18 =)83% of the trusted assistant loans were scored as good loans as opposed to (5/30 =)17% of non-trusted assistant loans. Thus, the loan book record of Yu-Sheng-Ji confirms a positive association between loan performance and use of the trusted assistant mechanism documented in the diary record.

6 Summary and Conclusion

In this paper, we considered a novel mechanism for debt contracting developed in nineteenth century China during the Qing Dynasty: Creditors attempted to enforce debt repayment through “trusted-assistant loans,” loans which required official/debtors to accept a “trusted assistant,” an assistant recommended by the creditor. Creditors used this mechanism to enforce debt repayment in the absence of any legal protection of creditor rights and in the face of extreme information

²⁶A complete description of the loan book’s contents is provided in Appendix Section B.2

asymmetry. We developed a theoretical model which derived conditions under which the trusted-assistant mechanism is both efficient and renegotiation proof. Empirical evidence from Qing Dynasty diaries of scholars and officials supports the model's predictions and shows that trusted assistants greatly reduced the costs of information asymmetry and contractual incompleteness.

More generally, our analysis points to the importance, in some contexts, of "resource provision" as a mechanism for payment enforcement. Think of the exploitation of a jurisdiction in Qing China as a project. What are the resources required for undertaking this project? Official administrative authority, the funds required to set-up administration, and the know-how required to extract wealth from the jurisdiction. The appointed scholar had one of these resources, administrative authority, but lacked the other two. Chinese banks had the other two resources, funds and expertise. These resources were strategic complements, without all three, the project could not be undertaken.²⁷

The key problems faced by the banks funding projects were that (a) their competitive advantage was evanescent and (b) the provision of know-how required deploying an agent with his own private incentives. Once the bank provided funding, officials typically did not need further funding. Once the official was in place, he would likely develop an understanding of the workings of his jurisdiction and thus be able to find substitute sources for the agent's administrative expertise. Unless the bank provided the right incentives for the embedded agent, the agent might "go native" and collude with the official to evade repayment of the loan or be "too zealous" and force inefficient repayment, making the loan ex ante unattractive to potential scholar/borrowers.

Thus, focusing on the essential features of the analysis, we see that it can be applied to many other financing contexts where contracts are incomplete and one party has a significant but evanescent comparative advantage in providing human-capital resources essential for project implementation.

Such contexts extend far beyond the venture capital and private equity settings discussed in the introduction. For instance, joint ventures and minority equity alliances between firms typically transfer of employees of at least one of the partners to the newly-founded alliance entity. Frequently, the know how of these employees is the key resource sought by the other partner. Since close cooperation involves knowledge transfer, the comparative advantage of the partner in providing this know how is likely to be evanescent. Contracting in alliances that involve joint production is usually quite incomplete either because of the complexity of formulating a complete set of contingencies ex ante or because the enforceability of contracts is problematic. This model implies that such ventures can be viable even in the absence of effective legal regimes provided the bargaining power of the parties is sufficiently balanced and the incentives of the agents transferred to the venture are appropriately designed. Since, in much

²⁷This conceptualization of the problem is reminiscent of the resource-based theory of the firm (Barney, 1991)

of the world, the ability of foreign firms to enforce contracts with well-connected domestic firms is doubtful, this implication is relevant in many contemporary real-world situations.

	Total		With Assistant		Without Assistant	
	Cities	Counties	Cities	Counties	Cities	Counties
1810	2	1	0	0	2	1
1830	8	2	3	1	5	1
1840	28	23	6	1	22	22
1850	23	9	7	1	16	8
1860	19	6	0	0	19	6
1870	24	18	2	1	22	17
1880	14	4	2	0	12	4
1890	13	2	1	1	12	2
1900	6	7	1	0	5	6
1910	43	4	19	0	24	4
Total	180	76	41	5	139	71

Table 1: Date and locational distribution of loans. This table provides the dates and locations for all the loans recorded in the diaries of the officials. For urban areas and cities, location represents the city of loan issuance. For loans not issued in urban areas or cities location represent the county of issuance.

	All Loans			With Assistant			Without Assistant		
	N	Liang		N	Liang		N	Liang	
		Mean	Median		Mean	Median		Mean	Median
Panel A. Loan Purpose									
Daily Usage	55	1825	1771	3	1898	1871	52	1821	1771
Networking	40	1907	1778	2	1858	1858	38	1910	1773
Travel	80	3119	1913	34	4778	3740	46	1760	1666
Renewl Loans	42	1882	1801	5	1860	1861	37	1885	1801
Business	29	2008	1851	1	1901	1901	28	2012	1826
Others	10	2136	2081	1	2011	2011	9	2150	2151
Panel B. Creditor Identity									
Relatives	50	1816	1763	4	2154	1981	46	1787	1758
Friends	65	1820	1771	3	1863	1861	62	1818	1766
Unrelated Individuals	38	2124	1783	5	3887	3705	33	1857	1771
Domestic Banks	58	3488	2280	32	4724	3703	26	1966	1823
Foreign Banks	30	2153	1926	2	3040	3040	28	2089	1901
Assistant	15	1875	1846	2	1871	1871	13	1876	1801
Total	256	2284	1801	48	4055	2847	208	1876	1771

Table 2: Loan purposes and creditor identities. This table provides the purpose and creditors' identities for the loans record in the diaries.

	Total Loans (N=80)		With Assistant (N=34)		Without Assistant (N=46)	
	Mean (1)	Median (2)	Mean (3)	Median (4)	Mean (5)	Median (6)
Panel A. Debtors						
Age	43.97	43.5	50.77	47	39.17	37
Position	3.76	5	5.38	7	2.57	3
Income	7988	5000	13441	20000	3957	4000
Financial Distress	0.84	1	0.62	1	1	1
Other Debt	0.6	1	0.76	1	0.48	0
Father's Position	2.05	1	1.53	1	2.43	1
Parent Alive	0.41	0	0.12	0	0.63	1
First Appointment outside Beijing	0.5	0.5	0.74	1	0.33	0
Panel B. Jurisdictions						
Distance b/w Jurisdictions and Beijing	819	1000	1324	1341	445	0
Easiness of Transportation	0.73	0.65	0.68	0.66	0.76	0.65
Courier Station (per county)	115.94	120	111.79	124	119	89.5
Taxation (1,000 Liang per county)	26.70	29.23	19.58	15.51	31.96	29.23
Administrative Complication	0.61	0.64	0.69	0.73	0.56	0.64
Dialect Area	0.11	0	0.24	0	0.02	0
Violent Tradition	0.44	0.3	0.42	0.30	0.46	0.29
Volatility of Local Rice Price	0.14	0.13	0.14	0.12	0.15	0.16

Table 3: *Characteristics of debtors and their jurisdictions for travel-related loans.* This table presents characteristics of debtors and debtors' jurisdictions of travel-related scholar loans.

	Having Trusted Assistants					
	(1)		(2)		(3)	
	β	<i>M.E.</i>	β	<i>M.E.</i>	β	<i>M.E.</i>
Creditor Domestic Banks	1.589*	0.585	1.268*	0.4801	1.444***	0.550
	(1.905)	(2.163)	(1.786)	(1.893)	(2.571)	(2.612)
Creditor Unaffiliated Private Individuals	0.833	0.307				
	(0.843)	(0.872)				
Creditor Foreign Bankers	0.273	0.100				
	(0.218)	(0.225)				
Distance between the Jurisdiction and Beijing (1000 km)	1.908**	0.703	1.995***	0.756	1.505**	0.573
	(2.288)	(2.123)	(2.412)	(2.312)	(2.258)	(2.151)
First Appointment	1.599*	0.588	1.806**	0.684	1.438**	0.547
	(1.812)	(1.821)	(2.080)	(2.135)	(2.228)	(2.253)
Parents Alive	-1.499*	-0.552	-1.413*	-0.535	-0.989	-0.377
	(-1.731)	(-1.901)	(-1.799)	(-1.928)	(-1.571)	(-1.627)
Volatility of Local Rice Price	-34.882**	-12.841	-30.621*	-11.605	-21.014	-8.002
	(-1.972)	(-1.945)	(-1.909)	(-1.874)	(-1.583)	(-1.583)
Violent Tradition in Locality	3.499*	1.289	3.298*	1.250	3.339**	1.272
	(1.813)	(1.672)	(1.748)	(1.644)	(2.077)	(2.010)
Jurisdiction with Dialect	5.086***	1.873	5.083***	1.926	3.514*	1.338
	(2.420)	(2.373)	(2.442)	(2.372)	(1.712)	(1.584)
Position of the Official	-0.561*	-0.207	-0.452	-0.171		
	(-1.705)	(-1.635)	(-1.540)	(-1.475)		
Richness of Jurisdictions	0.491	0.181	0.554	0.210		
	(0.941)	(0.954)	(1.102)	(1.124)		
Age of the Official	-0.042	-0.015	-0.046	-0.017		
	(-1.216)	(-1.262)	(-1.382)	(-1.435)		
Income of the Official (1000 Liang)	0.348*	0.128	0.310*	0.117	0.043	0.017
	(1.929)	(1.783)	(1.804)	(1.693)	(0.852)	(0.837)
Constant	0.617		0.328		-1.565	
	(0.245)		(0.133)		(-0.840)	
R^2	0.8254		0.7557		0.7094	
obs.	80		80		80	

Table 4: *Determinants of using trusted-assistant finance.* This table presents the regression analysis of the determinant of the using a trusted assistant. Probit regressions are estimated using information of the identities of the creditors and characteristics of the debtors and their jurisdictions. The model selected by the Akaike's information criterion (AIC) is presented in Column (3). We report both the Probit coefficients, β , and their corresponding marginal effects, *M.E.* The marginal effect of a variable is measured at the mean values of the other variables. For continuous variables, the marginal effect is the derivative of the estimated probability with respect to the variable. For dummy variables, marginal effect is the effect of shifting the value of the variable from 0 to 1. *, **, *** indicate significance at the 10%, 5%, and 1% level respectively.

	Assistant in Senior Position (1)		Relatives as Assistant (2)	
	β	M.E.	β	M.E.
First Appointment	-1.361*	-0.516	-1.241*	-0.494
	(-1.762)	(-1.798)	(-1.686)	(-1.683)
Parents Alive	0.794	0.301	1.876*	0.748
	(1.001)	(1.003)	(1.794)	(1.792)
Volatility of Local Rice Price	26.468**	10.033	25.222**	10.050
	(2.285)	(2.354)	(2.224)	(2.221)
Violent Tradition in Locality	-3.070**	-1.163	-2.114	-0.842
	(-2.083)	(-2.101)	(-1.337)	(-1.334)
Jurisdiction with Dialect	-1.746*	-0.662	-1.879*	-0.749
	(-1.773)	(-1.811)	(-1.842)	(-1.848)
Constant	-0.76		-1.54	
	(-0.560)		(-1.094)	
R2	0.218		0.206	
obs.	34		34	

Table 5: *Determinants of using highly placed and related trusted-assistants.* This table presents the regression analysis of the determinants of banks sending highly placed trusted assistants and assistants who are related to the bank's manager. Probit regressions are estimated using information of characteristics of the debtors and their jurisdictions. We report both the Probit coefficients, β , and their corresponding marginal effects, M.E. The marginal effect of a variable is measured at the mean values of the other variables. For continuous variables, the marginal effect is the derivative of the estimated probability with respect to the variable. For dummy variables, marginal effect is the effect of shifting the value of the variable from 0 to 1. *, **, and *** indicate significance at the 10%, 5%, and 1% level respectively.

	Total Loans (N=80)		With Assistant (N=34)		Without Assistant (N=46)	
	Mean (1)	Median (2)	Mean (3)	Median (4)	Mean (5)	Median (6)
Panel A. Debt Contract						
Loan Amount	3031	2051	4411	3400	2010	1851
Loan Amount / Annual Income	1.00	0.10	0.67	0.04	1.25	1.27
Contracted Maturity	0.75	0.5	1.09	1	0.50	0.5
Interest Rate on Contract	0.22	0.12	0.22	0.12	0.22	0.12
YTM (Arithmetic, %)	0.36	0.33	0.22	0.19	0.46	0.40
YTM (Geometric, %)	0.30	0.29	0.20	0.18	0.37	0.33
Multiple Creditors	0.78	1	0.88	1	0.70	1
Collateral	0.04	0	0	0	0.07	0
Guarantor	0.01	0	0	0	0.02	0
Panel B. Resolution						
Number of Repayments	1.17	1	1.24	1	1.11	1
Recovery Rate	56.03	54.75	76.63	78.42	40.81	33.75
Actual Maturity	2.72	2.45	4.19	4.13	1.64	1.59

Table 6: *Characteristics of debt contracts and resolutions for travel-related loans.* This table presents terms of debt contracts and the resolutions of travel-related scholar loans.

Variables	Definition
<i>A. Identities of Creditors</i>	
Relatives	=1 if the creditor is described as a relative of the debtor
Friends	=1 if the creditor is described as a friend. Usually his pseudonym is used to show intimacy
Unrelated individuals	=1 if the creditor is described as a stranger, usually introduced by friends.
Domestic Banks	=1 if the creditor is described as domestic bank, whose name usually includes “Ji/Xiang(Lucky/fortune)” or “Sheng(Prosper)”
Foreign Banks	=1 if the creditor is described as foreign bank, usually mentioned as “Yanghang”
Assistant	=1 if the creditor is described as an assistant
<i>B. Loan Purpose</i>	
Daily Usage	=1 if the loan is for daily usage, e.g., purchasing goods for festivals
Networking	=1 if the loan is for purchasing gifts for senior officials
Travel	=1 if the loan is for traveling expenses, e.g., steamer tickets
Renewal	=1 if the loan is for repaying another loan that would soon expire
Business	=1 if the loan is for investment, e.g., starting a factory
Other	=1 if the loan's purpose cannot be categorized into any of the other categories. purpose
<i>C. Location of the loan</i>	
City	=1 if the loan is issued in cities, including large metropolitan areas such as Beijing, Shanghai.
Rural	=1 if the loan is not issued in cities.
<i>D. Identities of Debtors</i>	
First Appointment	=1 if the current appointment is the first Out-of-Beijing appointment of the official.
Parent Alive	=1 if either of the parents of the debtor is alive
Position of the Official	An ordinal variable indicating the bureaucratic ranking of the official. The official ranking is ranged from 1 to 9 with 9 being the highest.
<i>E. Debtor's jurisdictions</i>	
Distance between Creditors and Debtors	The distance between the place where the loan occurred and the jurisdiction of the debtor.
Dialect Area	The percentage of debtor's jurisdictions that speak a language significantly different from Mandarin
Volatility of Local Rice Price	The standard deviation of prefectural-level monthly rice price for the last 10 years before the loan.
Violent Tradition in the Locality	The percentage of debtor's jurisdictions where residents are associated with violent traditions (Nan), as evaluated and rated by the imperial government
Richness of Jurisdiction	The average taxation per county within the jurisdictions of the official.
<i>F. Debt contract</i>	
Loan Amount	The total amount of the loan as mentioned by the debtor
Maturity on Contract	Contracted maturity
Interest Rate on Contract	The nominal interest rate
Multiple Creditors	=1 if there is more than one creditor for the loan
Collateral	=1 if any collateral is attached with the loan
Guarantor	=1 if a guarantor is associated with the loan
<i>G. Debt Resolution</i>	
Number of Repayment	The total number of stipulated payments before the debt is repaid
Actual Maturity	The total length of time before the debt actually repaid
Recovery Rate	The recovery rate measured by the total debt collected as percentage of the sum of principal and interest

Table 7: *Definitions.* This table presents the definitions of the variables used in the empirical analysis.

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Appendix

On line supplement to
Lending without creditor rights, collateral, or reputation—The
“trusted-assistant” loan in 19th century China

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Abstract

This document provides proofs, a sample loan document, description of a bank loan book, and biographic information on diarists for “Lending without creditor rights, collateral, or reputation—The “trusted-assistant” loan in 19th century China.”

A Derivations of results

A.1 Period rewards and transition probabilities

Table A-1 presents the period rewards to the official and assistant assuming an cooperative agreement is struck when the official is inexperienced. Table A-2 presents status quo period payoffs, period rewards when the official is inexperienced and a cooperative agreement is not reached. These rewards will affect the *status-quo* or default payoffs in official/assistant bargaining. Table A-3 presents the state transition probabilities.

	Current state				
	Indebted <i>I</i>	Not Indebted <i>N</i>	Free <i>F</i>	Separated <i>S</i>	
	Payment of loan				
	Pay	Not Pay			
$r_A =$	$a - \frac{1}{2}c_\omega$	$a - \frac{1}{2}c_\omega$	$a - \frac{1}{2}c_\omega$	0	0
$r_O =$	$t - a - \ell - \tau - \frac{1}{2}c_\omega$	$t - a - \tau - \frac{1}{2}c_\omega$	$t - a - \tau - \frac{1}{2}c_\omega$	$t - a - \tau - c_\omega$	0

Table A-1: Period rewards, r , to official and assistant if collection agreement is reached when the official is inexperienced and official collects with out assistance when the official is free.

	Current state		
	Indebted I	Not Indebted N	
	Payment of loan		
	Pay P	Not Pay $\neg P$	
$\delta_A =$	0	0	0
$\delta_O =$	$t - \ell - \tau - \chi_\omega$	$t - \tau - \chi_\omega$	$t - \tau - \chi_\omega$

Table A-2: Period rewards, r , to official and assistant if collection agreement is not reached when the official is inexperienced.

	Current state			
	I	N	F	S
	Payment of Loan			
	P	$\neg P$		
Next State				
I	0	$\alpha\beta$	0	0
N	$\alpha\beta$	0	$\alpha\beta$	0
F	$(1 - \alpha)\beta$	$(1 - \alpha)\beta$	$(1 - \alpha)\beta$	β
S	$1 - \beta$	$1 - \beta$	$1 - \beta$	$1 - \beta$

Table A-3: Transition probabilities from current state to next state.

A.1.1 The CRS

In this section we provide the transition probabilities, reward, and payoff functions associated with the CRS. These functions will be used repeatedly in the derivations and, so, for ease of reference, they are collected below. All the characterizations in this section follow from the period rewards, specified in Tables A-1 and A-2, the transition probabilities in Table A-3, the definition of a CRS provided by Definition 1, and recursive dynamic programming equation, equation (2).

A.1.2 Transition probabilities under the CRS

s	I		N		F		S	
	Condition		Condition		Condition		Condition	
s'	G	B	G	B	G	B	G	B
I	0	$\alpha\beta$	0	0	0	0	0	0
N	$\alpha\beta$	0	$\alpha\beta$	$\alpha\beta$	0	0	0	0
F	$(1-\alpha)\beta$	$(1-\alpha)\beta$	$(1-\alpha)\beta$	$(1-\alpha)\beta$	β	β	0	0
S	$1-\beta$	$1-\beta$	$1-\beta$	$1-\beta$	$1-\beta$	$1-\beta$	1	1

Table A-4: Transition probabilities under cooperative repayment solution (CRS): $\mathbb{P}_*[\cdot|s, \omega]$

A.1.3 Payoff functions for CRS

Let $a_* = (a_*^N(B), a_*^N(G), a_*^I(B), a_*^I(G))$, represent the candidate CRS solution provided in Proposition 1.

A.1.4 Value in the CRS

$$\begin{aligned}
v_A^S &= 0, \\
v_A^F &= 0, \\
v_A^N(a_*) &= A + \frac{\bar{r}_A^N(a_*)}{1 - \alpha\beta}, \\
v_A^I(a_*) &= A + \frac{\bar{r}_A^N(a_*)}{1 - \alpha\beta} - \frac{A(1-p)(1-\alpha\beta) + (\bar{r}_A^N(a_*) - \bar{r}_A^I(a_*))}{1 - (1-p)\alpha\beta}.
\end{aligned} \tag{A-1}$$

$$\begin{aligned}
v_O^S &= 0, \\
v_O^F &= \frac{\bar{r}_O^F}{1 - \beta}, \\
v_O^N(a_*) &= \frac{\bar{r}_O^F}{1 - \beta} - \frac{\bar{r}_O^F - \bar{r}_O^N(a_*)}{1 - \alpha\beta}, \\
v_O^I(a_*) &= \frac{\bar{r}_O^F}{1 - \beta} - \frac{\bar{r}_O^F - \bar{r}_O^N(a_*)}{1 - \alpha\beta} - \frac{\bar{r}_O^N(a_*) - \bar{r}_O^I(a_*)}{1 - (1-p)\alpha\beta}.
\end{aligned} \tag{A-2}$$

A.1.5 Period rewards in CRS

$$\begin{aligned}
\bar{r}_A^S(a_*) &= 0, \\
\bar{r}_A^F(a_*) &= 0, \\
\bar{r}_A^N(a_*) &= \frac{1}{2}p(\bar{\tau} + \tau(\chi - 1)) + \frac{1}{2}(1-p)\tau \left(\frac{2-c}{c} \right) \left(\chi - \frac{c}{2-c} \right), \\
\bar{r}_A^I(a_*) &= \frac{1}{2}p(\bar{\tau} - \tau - \ell - (A - \tau\chi)) + \frac{1}{2}(1-p)\tau \left(\frac{2-c}{c} \right) \left(\chi - \frac{c}{2-c} \right).
\end{aligned} \tag{A-3}$$

$$\begin{aligned}
\bar{r}_O^S &= 0, \\
\bar{r}_O^F &= p(\bar{t} - \tau) - (1-p)c\tau, \\
\bar{r}_O^N(a_*) &= \frac{1}{2}p(\bar{t} - \tau(\chi + 1)) - \frac{1}{2}(1-p)\tau \left(\frac{c}{2-c} + \chi \right), \\
\bar{r}_O^I(a_*) &= \frac{1}{2}p(A + \bar{t} - \ell - \tau(1 + \chi)) - \frac{1}{2}(1-p)\tau \left(\frac{c}{2-c} + \chi \right).
\end{aligned} \tag{A-4}$$

A.2 Proof of Proposition 1

The proof will compute the Nash bargaining solution for assistant compensation under the CRS. This involves considering all state/condition pairs under which the official is dependent.

Condition B, state I or N Suppose the agents bargain in state N when the condition is B . Under the conjecture that the CRS outcome will characterize payoffs in all subsequent periods, the payoff to the official from the status quo outcome of no cooperation is given by

$$\delta_O^N + \beta(\alpha v_O^N(a_*) + (1-\alpha)v_O^F) = t - \tau - \chi t + \beta(\alpha v_O^N(a_*) + (1-\alpha)v_O^F), \quad t \in [\tau, \bar{t}].$$

Because $\chi > 1$, the official, absent a cooperator agreement, will set $t = \tau$, resulting in a status-quo payoff of

$$-\chi\tau + \beta(\alpha v_O^N(a_*) + (1-\alpha)v_O^F). \tag{A-5}$$

Note that the marginal cost of cooperative collection in state B , $c > 1$. Thus, if a cooperative agreement is reached surplus revenue above the tax quota will be raised only to fund payments to the assistant, a . The official will not raise surplus funds for personal consumption. Thus $a = t - \tau$ and the official's period payoff under cooperation will equal $-\frac{1}{2}ct$ and the official's payoff will equal

$$-ct + \beta(\alpha v_O^N(a_*) + (1-\alpha)v_O^F). \tag{A-6}$$

Hence, the official's gain from cooperation, the difference between expressions (A-5) and (A-6), equals $-\frac{1}{2}ct - (-\chi\tau) = (\chi - \frac{1}{2}c)t$. Note that, because the continuation payoff is the same under both the status-quo and cooperate outcomes, the gain to the official from an agreement to cooperate is simply the period gain. For the assistant, the period gain from cooperation is the payment received, a , less the cost of collection, $\frac{1}{2}ct$. Again, because the assistant's continuation value is the same under the cooperation and status quo outcomes, the payoff gain from cooperation is simply the period gain. Thus, the payoff gain to the assistant equals $a - \frac{1}{2}ct$. The Nash bargaining solution maximizes the product of the gains to the assistant and official subject to the constraint that the gains to both agents are nonnegative. Thus, the Nash bargaining

solution is determined by the program:

$$\begin{aligned} & \text{Max}_{t \in [0, \bar{t}]} \left(a - \frac{ct}{2} \right) \left(\chi \tau - \frac{ct}{2} \right) \\ & \text{s.t.} \\ & a - \frac{ct}{2} \geq 0, \\ & -\frac{ct}{2} - (-\chi \tau) \geq 0. \end{aligned}$$

The revenue collection policy, t that solves this problem is given by

$$t_*^N(B) = \frac{\tau(c + \chi(2 - c))}{(2 - c)c}.$$

This revenue collection policy implies that the payment to the assistant in state N when the condition is B is given by

$$a_*^N(B) = t_*^N(B) - \tau = \tau \left(\frac{c - 1}{2 - c} + \frac{\chi}{c} \right). \quad (\text{A-7})$$

Assumption 2.ii ensures that the limited liability condition is satisfied. Next, note that when the state is I and the condition is B , it is never optimal for the official to pay the loan under the status quo policy. In state I , the CRS also calls for no repayment when the condition is B . Thus, the continuation payoffs to both agents are again the same regardless of whether a cooperative agreement is reached. Also, because $\chi > 1$ under the status quo outcome, in this case as well, the official will collect revenue just sufficient to satisfy the tax quota, and, under a cooperation agreement, because $c > 1$ all revenue raised in excess of the tax quota will be used to fund payments to the assistant. Thus, the Nash bargaining solution in state I when the condition is B is the same as the Nash bargaining solution in state N when the condition is B , i.e.

$$a_*^I(B) = \tau \left(\frac{c - 1}{2 - c} + \frac{\chi}{c} \right). \quad (\text{A-8})$$

Condition G, state N As in the previous case, the continuation payoffs to the agents are the same under the status quo and cooperative outcomes. Thus the Nash bargaining solution will maximize the product of the period gains to the two agents. Because the marginal cost of collection is 0 in state G . Under the status quo because the marginal cost of collection, $\chi > 1$ the official will collect just enough revenue to satisfy the quota, producing a period gain to the official of $-\chi \tau$. Under cooperation, the marginal cost of collection is 0, and thus optimal collection policy is $t = \bar{t}$. Because, in state N , the loan has already been repaid, the limited liability restriction implies that $a \in [0, \bar{t} - \tau]$. Thus, the Nash bargaining solution is given by the

solution to the following program.

$$\begin{aligned} & \text{Max}_{a \in [0, \bar{t} - \tau]} (a) \left((\bar{t} - a - \tau) - (-\chi \tau) \right) \\ & \text{s.t.} \\ & a \geq 0, \\ & (\bar{t} - a - \tau) - (-\chi \tau) \geq 0. \end{aligned}$$

Solving this program yields

$$a_*^N(G) = \frac{1}{2} (\bar{t} - \tau + \chi \tau). \quad (\text{A-9})$$

Assumption 2.i ensures that the limited liability constraint is satisfied.

Condition G, state I As in the previous case, because the state is G , it is optimal to maximize tax revenue collection, so $t = \bar{t}$ in any solution. The payoff from cooperation to the official is thus given by

$$\bar{t} - \ell - \tau - a + \beta \left(\alpha v_O^N(a^*) + (1 - \alpha) v_O^F \right).$$

The status quo payoff is given by not cooperate:

$$-\chi \tau + \beta \left(\alpha v_O^I(a^*) + (1 - \alpha) v_O^F \right).$$

Thus, the gain from cooperation to the official is given by

$$\bar{t} - a - \ell + \left(v_O^N(a^*) - v_O^I(a^*) \right) \alpha \beta + \tau (\chi - 1).$$

For the assistant, the cooperation payoff is given by

$$a + \left(\beta \alpha v_A^N + (1 - \beta \alpha) A \right).$$

The status quo payoff to the assistant equals

$$0 + \beta \alpha v_A^I.$$

Thus, the official's gain from cooperation equals

$$a + \beta \alpha \left(v_A^N(a^*) - v_A^I(a^*) \right) + (1 - \beta \alpha) A.$$

In contrast to the previous cases, the continuation payoffs are different under the status quo and cooperative agreement policies. A necessary condition for a bargaining solution to exist is that the sum of the payoff gains of the assistant and the official is positive. Using the explicit

representations of the period reward and value functions presented by expressions the Appendix, simple algebra shows that the sum of payoff gains, $\Sigma_*^I(G)$, is based on algebraic substitutions into equations (A-1), (A-2), (A-3), (A-2) in this appendix.

$$\Sigma_*^I(G) = \frac{(\bar{\tau} + \tau(\chi - 1)) (1 - (1 - p) \alpha \beta) + (1 - \alpha \beta) (A - \ell)}{1 - (1 - p) \alpha \beta}. \quad (\text{A-10})$$

The Nash Bargaining solution maximizes the product of payoff gains over $a \in [0, \bar{\tau} - \tau - \ell]$ given by

$$(\bar{\tau} - a - \ell + (v_O^N(a^*) - v_O^I(a^*)) \alpha \beta + \tau(\chi - 1)) \times \\ (a + \beta \alpha (v_A^N(a^*) - v_A^I(a^*)) + (1 - \beta \alpha) A). \quad (\text{A-11})$$

At an interior solution of the bargaining problem, the bargaining solution splits the sum of payoff gains equally between the assistant and official. Thus if $\Sigma_*^I(G) \geq 0$ the interior solution produces non-negative payoff gains to both the assistant and the official. Differentiating with respect to a shows that an interior solution must satisfy the condition that

$$a = \frac{1}{2} (\bar{\tau} - \ell + (v_O^N(a^*) - v_O^I(a^*))) - \\ \frac{1}{2} ((v_A^N(a^*) - v_A^I(a^*)) \alpha \beta + \tau(\chi - 1) - A(1 - \alpha \beta)). \quad (\text{A-12})$$

Since, by definition, the CRS is stationary, it must be the case that $a = a_*^I(G)$. Imposing this condition, and using the solutions to the bargaining problem for the other state/condition pairs derived above, and the explicit period reward and payoff functions provided into equations (A-1), (A-2), (A-3), (A-2) in this appendix, shows that if an interior solution is feasible, the solution to the Nash bargaining problem is given by

$$a_*^I(G) = \frac{1}{2} (\bar{\tau} - \tau - \ell - (A - \tau \chi)). \quad (\text{A-13})$$

Assumption 2.iii implies that the interior solution is in fact feasible. Because the interior solution is the unconstrained solution to the maximization problem, feasibility implies optimality. Thus, the Nash Bargaining solution when the state is I and the condition is G is given by equation (A-13).

A.3 Proof of Proposition 2

The proof will first consider renegotiation in state I when the economic condition is G . Next, the case of renegotiation in state I when the economic condition is B is considered. As discussed in the body of the paper, the efficiency of the Nash Bargaining solution and the fact that no

repayment is made to the lender in other states imply that the CRS is renegotiation proof for all other states.

Condition G renegotiations When the state is I and the condition is G , the CRS calls for repayment of the loan. Consider an alternative agreement between the official and assistant in which the official and the assistant cooperate but agree not to repay the loan. Let a_N be the payment to the assistant under this agreement. The payoff to the official under the alternative agreement equals

$$\bar{i} - \tau - a_N + \beta (\alpha v_O^I a_*) + (1 - \alpha) v_O^F.$$

The payoff gain to the official from the alternative agreement relative to the CRS is thus

$$G_O(G)[a_N] = (a_*^I(G) - a_N) + \ell - \alpha \beta (v_O^N - v_O^I). \quad (\text{A-14})$$

The assistant's payoff from the alternative agreement is

$$a_N + \beta \alpha v_A^I.$$

Thus, the assistant's payoff gain from the alternative agreement relative to the CRS is given by

$$G_A(G)[a_N] = (a_N - a_*^I(G)) - (A(1 - \alpha \beta) + (v_A^N - v_A^I) \alpha \beta).$$

Using the explicit representations of period rewards under the CRS and the payoff functions provided by equations (A-1), (A-2), (A-3), (A-2) in this appendix, we can compute the total payoff gain $G_\Sigma(G) = G_A(G) + G_O(G)$ from the alternative agreement:

$$G_\Sigma(G) = -\frac{(A - \ell)(1 - \alpha \beta)}{1 - (1 - p)\alpha \beta}. \quad (\text{A-15})$$

Thus, expression (A-15) shows that, if $A < \ell$, the total gain from the alternative arrangement is positive. Next note that if $a_N = \frac{1}{2}(\bar{i} - \tau + \chi \tau)$, then $G_A(G)[a_N] = G_O(G)[a_N]$. Because the total gain is positive, $G_A(G) = G_O(G)$ implies that the gain to both the official and assistant is positive. By Assumption 2.i, $a_N = \frac{1}{2}(\bar{i} - \tau + \chi \tau)$ satisfies the limited liability constraint. Thus, the CRS is not renegotiation proof. If, on the other hand, $A \geq \ell$, expression (A-15) shows that the total payoff gain from the alternative agreement is non positive and thus the alternative agreement cannot produce a positive payoff gain for both the official and the assistant. Thus, the CRS is renegotiation proof when $A \geq \ell$, the CRS is renegotiation proof in state G .

Condition B renegotiations Since all alternative agreements produce the same continuation value, if any alternative agreement produces a payoff gain for both agents, an efficient alternative

agreement, i.e., an alternative agreement that maximizes the total payoff to the agents conditioned on the payment to the assistant will produce a payoff gain for both agents. Because in state B the marginal cost of collection $c > 1$, efficient agreements specify collecting the minimum revenue required to satisfy the center and the payment to the agent. Hence, we restrict attention to efficient alternative agreements. Under such agreements the payoff to the official equals

$$-\frac{1}{2} c (\tau + a_P + \ell) + \beta (\alpha v_O^N + (1 - \alpha) v_O^I).$$

Thus, the payoff gain to the official from the alternative arrangement is given by

$$G_O(B)[a_P] = \frac{1}{2} \left(\tau \left(\frac{c}{2-c} + \chi \right) - c (a_P + \ell + \tau) \right) + (v_O^N - v_O^I) \alpha \beta. \quad (\text{A-16})$$

The assistant's payoff under the alternative arrangement is given by

$$a_P - \frac{1}{2} c (\tau + \ell + a) + (\alpha \beta v_A^N + (1 - \alpha \beta) A).$$

Thus, the payoff gain to the assistant is given by

$$G_A(B)[a_P] = a_P - a_*^I(B) - \frac{1}{2} c (\tau + \ell + (a_P - a_*^I(B))) + (A(1 - \alpha \beta) + (v_A^N - v_A^I) \alpha \beta). \quad (\text{A-17})$$

The total payoff gain from renegotiation is given by

$$G_\Sigma(B) = \frac{(A - \ell)(c(1 - \alpha \beta) + (c - 1)p \alpha \beta)}{2 - 2(1 - p) \alpha \beta}. \quad (\text{A-18})$$

Thus if $A \leq \ell$, the CRS is renegotiation proof in state B . So suppose that $A > \ell$. Because of limited liability, the alternative payment to the assistant must be non negative, i.e., $a_P \geq 0$. Next note that if $G_O(B)[0] \leq 0$, then, because the official's gain is strictly decreasing in a_P the alternative agreement cannot produce a higher payoff to the official than the CRS, thus the CRS is renegotiation proof. Finally note \mathcal{R} , defined in the body of the paper by equation (3), is the algebraic simplification, after substituting the definitions of continuation values provided by equations (A-2), of $G_O(B)[0]$, defined by equation (A-16). Thus, if $\mathcal{R} = G_O(B)[0] \leq 0$, the CRS is renegotiation proof in state B .

Next we show that if the agreement is renegotiation proof then $G_O(B)[0] \leq 0$ by proving the contrapositive, i.e. that if $G_O(B)[0] > 0$, then the CRS is not renegotiation proof. So suppose that $G_O(B)[0] > 0$. First consider the case where $G_A(B)[0] > 0$. In this case an alternative agreement that specifies $a_P = 0$ will generate a payoff gain for both the assistant and the official and so the CRS is not renegotiation proof. Now consider the case where $G_O(B)[0] > 0$ but $G_A(B)[0] < 0$.

First note that if $a_P \geq a_*^I(B)$, then $G_A(B)[a_P] > 0$. Thus, $G_A(B)[a_*^I(B)] > 0$. If it is also the case that $G_O(B)[a_*^I(B)] > 0$, then again the CRS is not renegotiation proof.

Finally, consider the case where $G_O(B)[0] > 0$ and $G_A(B)[0] \leq 0$ and $G_O(B)[a_*^I(B)] \leq 0$ and $G_A(B)[a_*^I(B)] > 0$. Define the function Δ_G by

$$\Delta_G(a_P) = G_O(B)[a_P] - G_A(B)[a_P], \quad a_P \in [0, a_*^I(B)]. \quad (\text{A-19})$$

Because Δ_G is continuous, and $\Delta_G(0) > 0$ and $\Delta_G(a_*^I(B)) < 0$, the intermediate value theorem implies that there exists $a'_P \in [0, a_*^I(B)]$ such that $\Delta_G(a'_P) = 0$, i.e., $G_O(B)[a'_P] = G_A(B)[a'_P]$. Equation (A-18) shows that $G_O(B)[a'_P] + G_A(B)[a'_P] > 0$ and thus

$$G_O(B)[a'_P] = G_A(B)[a'_P] > 0. \quad (\text{A-20})$$

Hence, setting $a = a'_P$ produces a higher payoff to both the assistant and the official. Because $a_P \in [0, a_*^I(B)]$ and both $a = 0$ and $a = a_*^I(B)$ satisfy the limited liability constraint, $a = a'_P$ is feasible. Thus, expression (A-20) implies that the CRS is not renegotiation proof.

B A sample trusted-assistant loan documents

In order to provide more detailed descriptions of loans to officials, we collected several documents that contain detailed information with regards to various aspects of loans with trusted assistant.

B.1 Sample loan agreement

A typical debt contract (debt receipt) written by the debtor and signed by the creditor and the trusted assistant is presented in Figure B-1. The contract is signed by an incoming official, Mr Jialin He, with a then influential middle-sized bank “Yu-Sheng-Ji” in the year of 1839 in Beijing. It provides information about the identity of the borrowers: the debtor’s name (Jialin He), his official positions, and his jurisdiction (County official candidate in Shanxi Province). The document also provides the loan terms: the type of total amount of silver borrowed (800 Liang, silver with standard purity), the primary and alternative repayment date (next April or when the borrower obtains official certification of appointment), and interest charged given extension (20% as the market price). The family name of the creditor (Zhou), names and signatures of two middlemen also appear in the contract.¹ A repayment of 50 Liang made 13 months after the

¹Their identities are marked as “middleman” in the contract. These middlemen are probably associates of trusted assistant rather than the official because they appear to be poorly educated and of low social class, as evidenced by the fact that their handwritten signatures are quite primitive, suggesting limited education. Middlemen appear to be agents who connect and facilitate the loan in some fashion. Many loans had no “middlemen” listed on the

debt was issued also appears on the list.

The interest rate specified in the debt contract seems quite low. However, the interest rate on the contract only specifies the stated rate interest; the interest rate charged if the borrower paid on time, which was unusual. In fact, ample evidence suggests that the effective nominal interest rate was much higher than the stated rate. First, the proceeds that the borrower obtained from the creditor were usually lower than the principal written on the debt contract. Discounting the principal bypassed the anti-usury laws that imposed an official interest ceiling of 30%. Note that the total proceeds received by the debtor are frequently not stated in the debt contracts. Many sources confirm that principal discounting was a common practice. For most of the early and middle period of Qing dynasty, the proceeds of the loan were only 50%-70% of the contracted principal but, in certain extreme case in the late Qing, proceeds could be as low as 30% of the principal.²

The effective interest rate was also affected by the quality of silver received by the debtor. The silver received by the debtor was usually of lower in quality and purity than the quality of the silver specified for principal, and thus lower than the quality of the silver that the borrower was obligated to return to the lender. For instance, Mr Fengzhi Du in his diary mentioned that half of the his proceeds of his of 2,000 Liang loan were advanced in the form of inferior-quality Songjiang, silver, whose value was 20% less than standard silver.(Du, 2008) However the debt contract stipulated that the principal on the Loan was 2,000 Liang of standard silver.

1. Borrower's appointment: Candidate county governor in Shanxi province
2. Name of borrower: Jialin He
3. Family name of the creditor (owner of "Yushengji" Bank): Zhou
4. Specie: Silver of standard purity
5. Quantity: 800 Liang
6. Repayment date: End of July next year
7. Interest rate after repayment date: 20% per month
8. Alternative repayment date: When borrower obtains appointment
9. Middlemen: Dachuan Yang, Zhigui Wang
10. Date signed: 26th Sep, 1839
11. Repayment signature: On 11th Nov, 1840, the borrower returns principal of 50 Liang of silver

contract.

²At the beginning of Qing dynasty, the proceeds-to-principal ratio was about 70%. For instance, in a novel by Ding (2002), the loan proceeds were reported to be equal to 60% of the principal and in the novel of Wu (1958), the reported ratio of proceeds-to-principal ratio was 70%. However, the proceeds-to-principal ratio appears to have declined to about 50% by the middle of Qing dynasty. For instance, in the case of Fengzhu Du (c. 1860) the proceeds equaled 50% of the principal. Liu and Yang (2015) assert that the ratio was sometimes as low as 30%.

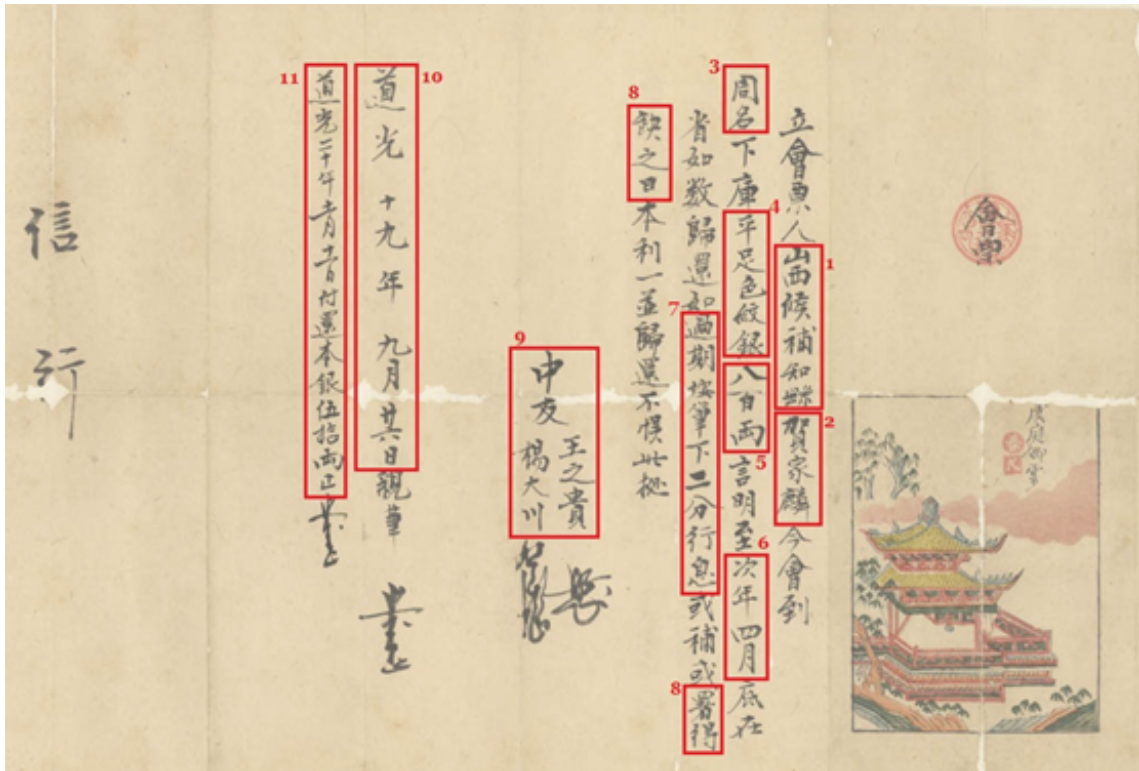


Figure B-1: A trusted-assistant loan document

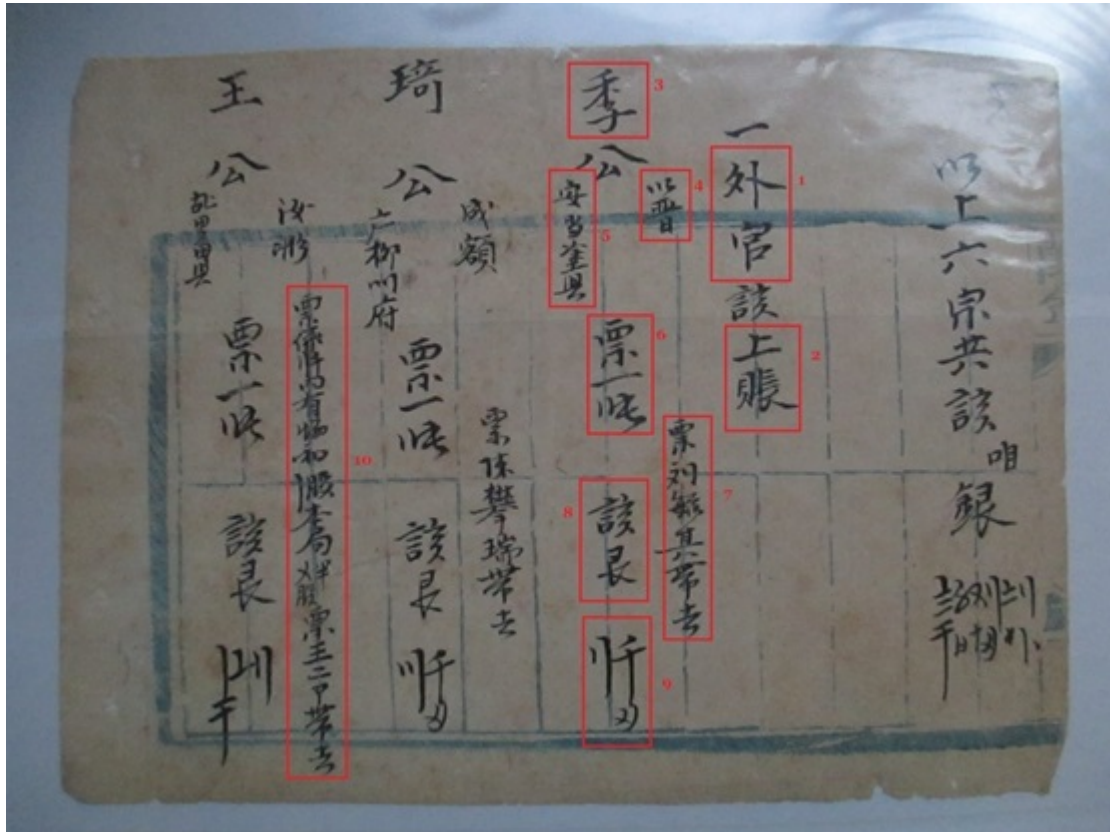


Figure B-2: Sample page from loan record book of the Shanxi Bank Yu-Sheng-Ji (circa 1840)

B.2 Loan book

Our second document is an loan book that contains information of 66 loans to officials. The contents on the loan book were estimated to be recorded around late 1840s.³ The loan book recorded the identities and positions of borrowers. The loan book also contained information about the loan: the notional principal and the contracted maturity, whether the loans were syndicated, and, if a trusted assistant loan, the name of trusted assistant sent. In addition, the loan book rated the quality of each loan categorized into good loans, bad loans and worst loans. The loan book also indicated whether the debtor suffered from adverse circumstances, e.g., death, illness, or mourning for parents. For some problem loans, the loan book also contained information on the specific reason why the loan has not yet been repaid.

In the loan book, 18 loans out of the total of 66 were trusted assistant loans. With a couple of exceptions, in which the assistant followed big city mayors, most trusted assistants were sent to follow county governors, who were usually in their early stage of their career and thus financially constrained. The geographic distribution of the assigned provinces of these officials

³This estimate is based on a borrower appearing in the book, Zhi Feng, who was the vice minister of Board of Rites in the 1840s.

was extensive and included 12 out of 18 provinces of Qing Empire.⁴ The most distant province, Guangxi is 2000 kilometers from Beijing and the nearest province, Shandong, located less than 400 kilometers away. There was also a substantial variation in the size of loans, with the smallest loans 400 Liang and highest loans as much as 4000 Liang.⁵ In certain cases, the loans were syndicated. Loans were usually syndicated with connected banks, and the contributions to funding the loans were clearly specified in the loan book.

Most loans entries on the account specified the exact jurisdictions for the borrower, suggesting the loans were issued after officials' formal appointments. However, there were several entries that only specified on the general region where the official would take his post. Summary information for each of the loans in the loan book is provided by Table B-5

⁴The jurisdictions of Shenjing and Xinjiang were also listed although these regions were not generally considered provinces.

⁵In one case, the official was appointed to a military position, such positions were usually associated with lower income due to limited rent-seeking opportunities. The size of this loan was much smaller than the other loans.

Borrower	Nominal Principal	Trusted Assistant	Syndicated	Rating	Adverse Shock
季以晋	2000	Yes	No	Good	No
琦成额	3000	Yes	No	Good	No
王汝彤	2000	Yes	Yes	Good	No
糜良泽	9400	Yes	Yes	Good	No
糜良泽	3500	Yes	No	Good	No
李均	1000	No	No	Good	No
金光耀	1000	Yes	Yes	Good	No
程庆森	205	No	Yes	Good	No
鹿傅洵	200	No	No	Good	No
李安中	300	No	No	Good	No
唐汝潘	600	Yes	No	Good	No
清山	1100	Yes	No	Good	No
周云凤	500	Yes	No	Good	No
冯芝	290	No	No	Good	No
徐金	2000	Yes	No	Good	No
陈尚邵	3900	Yes	No	Good	No
洪大镛	1400	Yes	Yes	Good	No
张绩	700	Yes	Yes	Good	No
邵荣	2000	Yes	No	Good	No
崇元	2460	Yes	No	Good	No
刘锡侯	4000	No	Yes	Bad	Yes
惠礼	900	No	Yes	Bad	No
姚庆元	2400	No	No	Bad	No
音清纳	700	No	No	Bad	No
富显	2700	Yes	No	Bad	No
承启	820	Yes	No	Bad	No
周长安 (明廉)	650	No	No	Bad	Yes
刘用和	4800	No	Yes	Bad	Yes
俞大全	350	No	No	Bad	No
刘用和	1200	No	No	Bad	No
周饼	500	No	Yes	Bad	Yes
潘名魁	660	No	No	Bad	No
孙请涵	100	No	No	Bad	No
马方珏	1650	No	Yes	Bad	No
刘肇绅	2000	Yes	Yes	Bad	No
张椿年	4000	No	Yes	Bad	Yes
沈祥龄	180	No	No	Bad	No
李浴	350	No	No	Bad	No
金和	1400	No	No	Bad	No
保元	500	No	No	Bad	No
张其瀚	300	No	Yes	Bad	No
和陆额	200	No	No	Bad	No
荣贵	3000	No	Yes	Bad	No
许应藻	3000	No	No	Bad	Yes
李光瑞	60	No	No	Bad	No
德勒克沉玛	1000	No	No	Bad	No
李汝魁	22.6	No	No	Bad	No
张佑安	550	No	No	Bad	No
彭玉田	100	No	No	Bad	No
高瑞	200	No	No	Bad	No
夏祥培	3000	No	Yes	Bad	No
增龄	300	No	No	Bad	Yes
陈衍福	150	No	No	Bad	No
福慧	7300	No	No	Worst	Yes
佟涤	7400	No	No	Worst	Yes
灵保	3000	No	No	Worst	Yes
文景兴	9400	No	No	Worst	Yes
满承绪	1500	No	Yes	Worst	Yes
王元凤	4000	No	No	Worst	Yes
王元凤	10000	No	Yes	Worst	Yes
胡惠璞	300	No	No	Worst	Yes
石鲤	1500	No	No	Worst	Yes
曹启	1300	No	No	Worst	Yes
徽良	1300	No	No	Worst	Yes
李国均	100	No	No	Worst	No
福珠凌何	350	No	Yes	Worst	No

Table B-5: Loan records from the Shanxi Bank Yu-Sheng-Ji (circa 1840).

C Biographic information on the diarists

Table C-6 provides biographical information on the diary writers used to construct the sample.

Name of the Book	Author	Birth and Death	The Place of Origin	Year and Level in Keju exam	Highest Official Position
Observations in the Upper-Class Circle in Qing Dynasty	Jixin Zhang	1800-1878	Yizheng, Jiangsu	1829, Imperial	Magistrate of a Prefecture
Letter and Diary of Deyu Pan	Deyu Pan	1785-1839	Shanyang, Jiangsu	1829, Jiangsu Provincial	Magistrate of a County
Diary of Huaxi Deng	Huaxi Deng	1826-1916	Shunde, Longshan	1851, Imperial	Governor of a Provincial
Diary of Rongbao Wang	Rongbao Wang	1878-1933	Wu County, Jiangsu	1898, County	Head of Staff: Ministry Of Civil Affairs
Diary of Zenghan Weng	Zenghan Weng	1837-1878	Changshu, Jiangsu	1858, Jiangsu Provincial	Secretary of Cabinet
Diary of Youzhi Mo	Youzhi Mo	1811-1871	Dushan, Guizhou	None	None
Diary of Baozhen He	Baozhen He	1978-1949	Shenzhou, Zhili	None	None
Diary From Lu Mountain	Baoxuan Sun	1874-1924	Qiantang, Zhejiang	Not Known	Supervisor of Customs, Ningbo
Diary of House of Anachronism	E Liu	1857-1909	Dangtu, Jiangsu	None	Magistrate of a Prefecture
Diary of Guofan Zeng	Guofan Zeng	1811-1872	Changsha, Hunan	1838, Imperial	Governor of Zhili Provincial
Diary of Visiting Yunnan	Shana Hua	1806-1859	Mongolia	1833, Imperial	General of Heilongjiang Provincial
Diary of Visiting Western Countries in 1900	Yong Wu	1865-1936	Wuxing, Zhejiang	Not Known	Vice Governor of Jaodong Provincial
Diary of Visiting Korea	Yinhui Xu	Not Known	Shangyuan, Jiangsu	Not Known	Ambassador to Korea
Diary of Kunying	Jingchen Shi	1873-1955	Changle, Fujian	1897, Provincial	Sanate Secretary of Beiyang Government
Diary of Xingyuan Li	Xingyuan Li	1797-1851	Ziangyin, Hunan	1832, Imperial	Governor of Zhejiang And Jiangsu Province
Diary of Xingrui Li	Xingrui Li	1827-1904	LiuYang, Hunan	Not Known	Governor of Zhejiang And Jiangsu Province
Diary of Zexu Lin	Zexu Lin	1785-1850	Fuzhou, Fujian	1804, Provincial	Governor of a Provincial
Diary of Travelling in London and Paris	Songtao Guo	1818-1891	Xiangyi, human	1837, Province	Governor of Guangdong Provincial
Note of Qinghe	Degang He	1855-1936	Min County, Fujian	1877, Imperial	Magistrate of a Prefecture
Diary of Taiwan Sea Defence and Exploration	Xiangying Fang	1631-1683	Suian, Zhejiang	1667, Imperial	Secretary of Cabinet
Dairy from Taiwan	Dachn Luo	1833-1891	Shibing, Guizhou	Not Known	Vice General of Henan Provincial
Diary of Rangqing Wang	Zhuan Hu	1841-1895	Jixi, Anhui	1858, Prefecture	Magistrate of a Prefecture
Diary of Tao Wang	Tao Wang	1860-1911	Qiantang, Zhejiang	1894, Imperial	Assistant of Zhidong Zhang, Member Of Cabinet
Diary of Tonghe Weng	Tonghe Weng	1823-1897	Wu County, Jiangsu	1841, County	Head of School of Gezhi
The complete work of Qian Zhang	Qian Zhang	1820-1904	Changshu, Jiangsu	1856, # 1 Imperial	Member of Cabinet
Diary of Wenhui Zhang	Wenhui Zhang	1853-1926	Changshu, Jiangsu	1894, # Imperial	Head of Shanghai Sea University
		1808-1885	Nanhui, Shanghai	Not Known	Head Lecturer in Jinling Bookstore

Table C-6: *Resources from the archives*. This table presents the primary sources of the historical archive containing the descriptions of the loans. The sample consists of 27 diaries written by high level intellectuals who were living in Qing Dynasty (1616-1912). The Level of Keju examination is referred to the highest level of Keju examination the diary author passed.

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