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JEL Classification: G3, H2, K4, P2

Keywords: corporate bonds, Chinese securities markets, implicit guarantees, state capitalism, bankruptcy reform

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1 Introduction

China's corporate bond market has grown rapidly to become the second largest corporate bond market in the world. In recent years China has taken significant steps to open the its entire domestic bond market to foreign investors and issuers. However, until now the inflow of international funds into its bond market has been modest and largely confined to the government bond sector. One reason for the slow flow into the market for debt securities of non-financial enterprise is that this category of debt outstanding is extremely high relative to GDP in comparison to other middle-income countries internationally (see IMF 2016, OECD, 2013, 2015, 2017). And if these high debt levels raise the risk that market will need to retrench at some stage, international investors new to the market have a hard time assessing where within this sector the greatest risks lie and which prices are attractive on a risk-adjusted basis.

In this paper I analyse the allocation of risk in China's market for non-financial enterprise debt in order to give an answer to the question in the title both qualitatively and quantitatively. My analysis in part relies upon established methods empirical corporate finance that have been applied to markets for corporate bonds in the US and in other developed market economies. That approach takes the point of view of a bond investor and attempts to determine the compensation for credit risk and liquidity risk offered by prevailing market rates as compared to those of liquid, default risk-free issues with the same maturity or duration. As is widely recognized, the assessment of credit risk depends importantly upon the way debt of an issuer under financial stress is restructured either through formal bankruptcy proceedings or through renegotiations with large creditors outside of court. Explicitly or implicitly, analysis along these lines supposes this is a game played by two actors, the issuing firm and the creditor, each pursuing their particular interests as best they can under the framework provided by prevailing corporate and bankruptcy laws (see, Anderson and Sundaresan, 1996).

However, in some respects this approach focussing on the state-dependent allocations between shareholders and creditors is too simplistic for understanding the allocation of risk in Chinese debt markets. In China the institutions of the market economy are still in the process of development, and the organisms of the state have wide scope to intervene in markets. Indeed, in a Chinese context a variety of official sector entities are likely to take that view debt restructuring will have important spill overs affecting stake holders other than shareholders and creditors. These include employees, pensioners, the firm's suppliers and customers, and the tax authorities, among others. As a result, in assessing their own risks in debts of Chinese firms, creditors need to take into account of occasions when distressed firms will be allowed to fail, leaving creditors

to absorb the losses versus those when one or another government entity will step in to prevent the firm's failure or to absorb some of the losses.

In short, in order to understand the allocation of risk in Chinese debt capital markets one needs to take into consideration the actions of a third agent, the state, in addition to the shareholder and creditor entering into a debt contract. This adds to the complexity of the analysis in at least two ways. First, the objective of the state as a player in this game is not simply some function of the payoffs to the shareholders and creditor in a given contract. Instead, it takes into account implications of its own actions and those of the creditor and shareholders for other stakeholders and across a wide range contracts throughout the Chinese economy. Second, in regulating debt markets in China, "the state" is not a unitary entity implementing decisions made by some single decision maker at the top of the hierarchy. Rather, as is widely recognized, in China there is a high degree of decentralization whereby the central authorities normally operate by giving general guidance or directions, leaving implementation to be carried out at the local level. Central planning has never extended very far nor very long in China (see, Lardy, 2014, ch.1 for an overview). Instead, there has long been a recognition that central authorities simply do not have the information necessary to make effective decisions at the local level. There is generally some allowance made for the way that national policies are implemented across different local governmental units. This gives local authorities considerable scope to take initiatives. This is often summarized in the Chinese aphorism, "Those above have policies while those below have their own countermeasure". As will be discussed in what follows, this feature has a lot to do with how Chinese debt markets have evolved in the last decade or more.

In analysing the allocation of risks of levered Chinese firms in this broader context, I will need to give some historical background on the institutional development of China's market economy. This is the subject of Section 2 where I also review some of the recent literature on China's non-financial enterprise debt. Then in Section 3 I present evidence based on aggregate measures that help to make the main features of China's debt markets concrete and suggests hypotheses to be tested. Section 4 presents our main results based on the econometric analysis of disaggregated data on pricing of long-term debt issued by non-financial enterprises. Then in section 5 I develop a simple structural model of debt valuation in the presence conditional state guarantees. I calibrate this model and show that it can account for much of the observed divergence of pricing in the principal segments that was not captured by standard controls of credit analysis or market liquidity. Section 6 presents conclusions.

2 Background and literature review

While in many ways the current structure of the Chinese securities market resembles that of the US and other developed economies, some of its features are marked by the particular path that China has followed since the late 1970's in developing the market economy. As mentioned in the Introduction, the Chinese system allows for a mix of general policies set out at the national level and initiatives at three local levels: province, municipality, and county. A useful overview of this process is given by Xu (2011) who describes China as a "regionally decentralized authoritarian" system. While Beijing has very strong powers to intervene in local implementation of policies if it so chooses, in practice there are limits to its capacity to do so. This creates scope for local variations in the application of policies. Over time there has been some ebb and flow in the exertion of central control. In some periods local authorities have been left relatively free to innovate. At other times Beijing has sought to enforce strict application of centrally set guidelines. Most analysts probably would characterise the period since 2014 as one of relatively strong central control. However, as noted by Xu, there are features of the system that tend to keep some balance between central and local control. Executives at local levels may be recruited locally, but often they are brought in from other regions. In the either case, they tend to learn quickly that to succeed in their mandate and meet performance targets set from above they will need local knowledge and local cooperation. Success in one role typically is rewarded with a promotion to a role with greater responsibility at a higher level in the governmental hierarchy. This tends to be in a different geographic location and in dealing with a different local culture. Thus, by design an administrator who reaches a senior position will have experienced a wide range of responsibilities at many levels in the hierarchy and in many geographic regions, a pattern that can be seen in the biographies of virtually of all the current standing members of the Politburo.

The first steps toward building a modern market for corporate securities came early in the 1980's as a by-product of the opening up the market for central government bonds. In 1984 the market for "enterprise bonds" began to operate and shared the infrastructure for clearing, settlement and custodianship that had been set up for the government bond market. At that stage the only enterprises that had access to this channel were state owned enterprises (SOE's). Private enterprise, as such, was in its infancy and was restricted to very small-scale operations. SOE's could be sponsored by governmental entities at all levels of the governmental hierarchy. They were organized

as subdivisions within a governmental entity.[1] Thus, SOE's were "owned" only in the sense that the governmental agency was responsible for the performance of the enterprise. What set them apart from other the governmental activities was that they had a commercial purpose in producing and selling products and services. Certainly, in those early days of the reform process, a governmental body's ownership of an enterprise did not bestow it with any transferable property rights, and there was no recognizable "market for corporate control." Indeed, the basic legal framework for market-based enterprise activity was rudimentary and fragmented in these early days of market reform in China (see Wang, 2008). Shenzhen, which had been designated in 1980 as a Special Economic Zone to allow experimentation with the market economy, took the lead by passing local regulations for operation of enterprises in 1986. In the same year the National People's Congress adopted the General Principle of Civil Law which established in China the notion of an enterprise as a legal person which can possess property and bear civil responsibility independently of its sponsor. This was reaffirmed more explicitly in the 1988 Law on Enterprises Owned by the Whole People, thus establishing some legal distance between an SOE and its governmental sponsor.

The next major steps toward developing securities markets in China came in 1990 with the opening of the Shanghai Stock Exchange and the Shenzhen Stock Exchange. These were examples of locally initiated innovations that took place in advance of more general foundations being set out nationally. In particular, listing requirements impose standards on enterprises which went beyond the vague principles set out in the 1988 Enterprise Law. In the following years steps were taken to clarify and extend this law. This ultimately led to the National People's Congress passage in 1993 of the Companies Law with effect from July 1994. This was an ambitious attempt to set out the foundations for a "modern enterprise system" including a clarification of the rights and interests of companies, shareholders and creditors. It applies to two types of legal entities- limited liability corporations and joint stock corporations (where the latter may or may not be admitted for trading on a domestic stock market). The 1994 Companies Law has been criticised for giving only weak investor protections and for leaving corporate governance unclear (see, Howson, 1997). Despite this, the 1994 law was a very significant step toward putting China's securities markets on solid ground. However, it left the foundations of market incomplete in that it did not deal effectively with the issue of resolving insolvent enterprises. This came to light in the

[1]For example, the large telecommunications operator now known as China Telecom was originally created in the 1980's as an agency of the Ministry of Posts and Communications. Another firm in the sector, China Unicom, was created in 1994 in order to integrate the separate telecom activities of the Ministry of Railways, the Ministry of Electronics Industry and the Ministry of Ministry of Electric Power Industry.

course of the 1990's in the form an enormous growth of non-performing loans (NPL's) of SOE's. Despite the very strong growth of the economy and some improvements of productivity in the state sector, many SOE's were unable to keep up with the pace of change. As reported by Xu (2011, p.122) losses of loss-making SOE's increased by a factor of 6 between 1993 and 1998. Despite the principle of limited liability stated in 1994 Companies Law, this proved difficult to enforce as central authorities continued to provide ex post subsidies to local governments who sponsored the loss-making SOE's (see, Jin, Qian, and Weingast, 1997 and also Groves et al, 1994 1995). In effect, in China the soft budget constraints endemic in many socialist systems persisted long into the era of market-oriented reforms.

A bankruptcy regulation issued in 1986 had provided for the liquidation of SOE's, and this was extended to cover private companies as well through the passage of Companies Law of 1994. However, this proved insufficient to bring about an effective restructuring of loss-making firms or to bring the NPL's on the books of the banks under control. Instead, significant progress on these fronts only began at the initiative of the central authorities starting in 1995 when the Central Committee committed itself to a combination of liquidation or privatization of some, generally smaller, SOE's while at the same time bringing about organizational reforms and downsizing of larger SOE's. This policy was commonly described as "grasping the large and releasing the small" (See Lardy, 2014, ch. 2). The privatization of SOE's typically took the form of sales of shares to employees with the prices of shares set at the face value of debt outstanding. After the sale, the firm would be reorganized as stock cooperative companies, but often very quickly after this the firms were bought out by senior managers who then organized the firms into limited liability companies. The large firms retained by the state were often "corporatized" by converting them into either limited liability companies or joint-stock companies. Overall, Lardy (2014) reports that the number of industrial SOE's dropped from 127,600 in 1996 to 61,300 in 1999.

In order to prevent write-downs of NPL's from bringing down the banking sector which was still dominated by four state-owned banks, China adopted a "bad bank" solution. This involved the creation by the Ministry of Finance of four asset management companies (AMC's), each charged with taking over the non-performing loan portfolio of one of the four large state-owned banks (see Tang, 2016). They then proceeded to run off the assets through some combination of liquidations, debt-equity swaps, or other methods. The AMC's loss between the proceeds of from these asset disposals and the amount paid to the state-owned banks was absorbed by the state budget. In effect, through these mechanisms China mutualised the overall losses which remained

after attempting to minimize their value.

This restructuring of the stated-owned sector which took place over between 1997 and 2003 relied on the Company Law of 1994 as well as the Bankruptcy Law of 1986 and other efforts to build the legal and administrative architecture to support a market economy. However, the driving force for the actions clearly came from Beijing. Retaining most of the largest firms in the state sector reflected the belief, or at least hope, that through down-sizing and improved governance, the reformed state enterprises could improve their efficiency. This would complement and, possibly even, lead the private sector in promoting growth. Improved governance of the SOE's was to be achieved through corporatization and, in some cases, stock market listing. The disciplining effect of the latter was intended to come through greater transparency and the fact that outside investors could communicate their approval or disapproval of firm performance through the stock price. However, even after listing, the effective control of management was still in the hands of the state which retained a majority of shares in the firm. The fear that ministries and other administrative bodies which sponsored the SOE's might be ill-equipped to give effective direction to the firms and to control management led to one further reform in this period. This was the creation of the State-owned Assets Supervision and Administration Commission (SASAC) in 2003. This new agency was charged with holding the shares of SOE's on behalf of the state, monitoring performance and, playing a role in appointments of senior management.

These reforms were followed by a period of strong growth of the industrial sector and in aggregate growth generally. Annual growth of real GDP averaged 7.9 % from 1997 to 2001 and 11.2% from 2002 to 2007 (National Bureau of Statistics. See also Lardy, 2019, Fig. 1.4). However, given the diversity of policy initiatives during this period of rapid reforms it is not a simple matter to determine the contributions of each to this growth. There have been several attempts in the growth accounting literature to quantify various possible factors driving growth. (See, Lardy, 2014 and 2015; Wang and Yao, 2001; Brandt and Zhu, 2010). A good overview is given in Zhu (2012). He divides total output into three sectors: agriculture, non-agriculture state sector and the non-agriculture non-state sector where the non-agricultural activities groups together industrial production, services and some extractive activities. The main results of his analysis are summarised in Table 1. He finds that between 1978 and 1998 productivity growth was much higher in the non-state sector than in the state sector. Subsequently, following the reforms put in place in the late 1990's, there as a significant growth of productivity in the state sector. However, overall all growth was driven by the movement of a large part of the labour force out of the agriculture sector (and to

Table 1: Accounting for China's Growth

Period	Agriculture	Non-agriculture		Aggregate
		Non-state	State	
	Annual average total factor productivity growth %			
1978-1988	2.79	5.87	-0.36	3.83
1988-1998	5.10	2.17	0.27	2.45
1998-2007	4.13	3.67	5.50	4.68
	Employment Share %			
1978	69	15	16	100
2007	26	62	12	100
	GDP share %			
1978	28	27	45	100
2007	10	70	20	100

Source: Zhu (2012), Table 2

a lesser extent the state sector) into the non-state sector engaged in non-agriculture activities where the *level* of productivity was much higher than in the state sector.

This analysis does not explicitly take into account another major factor which has been widely attributed to be a major driver of China's high growth rates in the last two decades. This is strong increase in international trade which was facilitated by China's entry into the World Trading Organization. Tombe and Zhu (2019) have examined this question on the basis of a more detailed data set than that available to earlier studies. They find that between 2000 and 2005 reduction international trading costs contributed 8% to the overall growth in aggregate labour productivity between 2000 and 2005. This was dwarfed by the reduction of internal trade and migration costs which gave rise to increases in domestic trade and migration which contributed 28% to productivity growth in this period. They conclude that "..these results highlight the importance of internal reforms for China's growth and are in stark contrast to the widely held perception that China's growth during the period was an 'export-led,' experience." Recent theoretical work on international trade in the presence of domestic frictions has given some insight into this finding of the limits to the growth benefits of opening to international trade. Bai, Jin, and Lu (2019) extend a model of international trade when there are frictions associated with both internal and external trade. They cite as examples of domestic frictions the kinds of subsidies that SOE's and other favoured firms receive in China through land-grants and access to bail-outs. They find that when domestic frictions favour lower productivity firms an opening up to international trade may exacerbate the misallocation of domestic resources. Trade

may induce the expansion of the less productive firms at the cost of the more productive firms. Overall this can lead to a reduction in average productivity of domestic firms and a reduction of welfare.

As already mentioned, the Companies Law of 1994 did not fundamentally touch the bankruptcy Law of 1986 but rather adapted that law to the new types of companies that had come into existence. Following passage of the new company law there was a ten-year period when the Chinese legal profession debated a variety of possible revisions and precisions of the bankruptcy code. From this process emerged the new Enterprise Bankruptcy code which was adopted by the National Peoples' Congress in 2006 and entered into force in 2007 (see Parry, Xu, and Zhang, 2009, and Booth, 2008). The new law was considerably more detailed than its predecessor with 136 articles compared to just 43 in the earlier code. It reduced the scope for the state to intervene directly in the process by introducing an independent administrator of the procedure (as opposed to leaving this in the hands of the sponsor of the firm, i.e., the state in the case of an SOE). The law explicitly recognized the rights of secured creditors by giving them claims on assets identified as collateral to their contract and by giving secured creditors priority over other stakeholders including employees. The law tends to encourage reorganization rather than liquidation, and, while normally this is to be managed by an independent administrator, there is provision for this to be put into the hands of the debtor in possession (as in Chapter 11 of the US bankruptcy code). It explicitly calls for the organization of creditor committees to help reduce conflicts of interest within that stakeholder group. Also, for the first time it explicitly states the applicability of the law to banks.

In principle, the 2007 Bankruptcy law was a step to clarifying and strengthening investor protects, but in practice it seemed to have relatively minor impact, at least initially. According to data from the Supreme Court of China the number of new bankruptcy cases accepted by the courts each year went from about 3500 cases in 2006 to 2000 cases in 2012, and the recovery rate for secured creditors in completed cases rose only modestly (from about 32% to 36%) over the same period (see, Li and Ponticelli, 2019, where the recovery rate figures were based on the Shanghai Court data reported in the World Bank Doing Business Data set). Subsequently, the number of new bankruptcy cases increased starting in 2014 when specialized bankruptcy courts began to be phased-in across the country. The slow growth of bankruptcies may reflect the fact that during a transition period following the 2007 law, a number of governmental entities could intervene to delay a court's opening a case. It may as well reflect a reluctance of creditors to turn to a largely untried legal remedy for which there were

few precedents to help in predicting the treatment their claims would receive. In short, the bankruptcy system in China was still weak and underdeveloped. It would await further administrative initiatives by central authorities before it would begin to have a material impact on the resolution of financial distress. I will return to this point in the analysis in Sections 3 - 5.

As discussed above, the enterprise bonds issued by SOE's were introduced in 1984, giving access to SOE's to debt finance through capital markets rather than bank loans. While the Companies Law of 1994 gave privately-sponsored, listed firms the right to issue bonds, in practice this did not give rise to any significant new issues outside of the existing enterprise channel (Hu, Pan, and Wang, 2017). In their review of Chinese bond markets Aglietta and Maarek (2007) reported that as of 2006 the market for corporate paper (i.e., essentially enterprise bonds) accounted for only 4.3% of the total domestic Chinese bond market and only 1.2% of GDP. They argued that there was an enormous untapped potential for growth of corporate debt securities.

A first step toward fulfilling this promise came in August 2007 when the Chinese Securities Regulatory Commission (CSRC) authorised listed firms to issue corporate bonds on the Shanghai and Shenzhen exchanges. Clearing, settlement and custodian services for these issues were provided by the China Central Deposit and Clearing Corporation (CCDC). In this way a new issuance channel was created where effective control of the process was in the hands of private sector entities. Significantly, issuance in this channel did not require approval by the National Development and Reform Commission (NDRC), unlike enterprise bonds which were and still are vetted in relation to investment priorities and indicative quantitative investment targets as set out in the national 5-year plans.

At about the same time as the opening up of the exchange-based corporate bond market, there was a separate initiative to create a market for shorter-term corporate paper that is traded over-the-counter by large money market participants. Contracts are to some degree standardised in that they are based on documentation developed by the National Association of Financial Market Institutional Investors (NAFMII). This is a self-regulatory association which was created in 2007 with the approval of the State Council. The two main contracts traded are Medium Term Notes (MTN) and commercial paper (CP). Post-trade activities for these issues are handled by the Shanghai Clearing House. Trading takes place on the inter-bank market electronic platform.

In effect, with opening of these markets for both long-term and short/medium term debt securities, the central authorities were encouraging local experimentation to

develop Chinese versions of the contractual forms that had proved very successful on capital markets in the US and in other developed market economies. This decision to allow multiple paths of issuance can be viewed as manifestation of the willingness of the central authorities to experiment with alternative methods of stimulating growth and development.

The statistical analysis in Sections 3-5 of this paper will focus on these non-financial securities, especially enterprise bonds and corporate bonds. However, it is important to recognize that independently of these securities market initiatives, China has developed a variety of non-bank financial intermediaries that provide firms financing alternatives to bank loans and securities issuance. Through efforts by firms to find lowest cost of funds, changes banking or securities regulation can have spill-over effects on the activities of the non-bank financial intermediaries. These interactions are not easy to monitor because there is limited public reporting available that sheds light on the non-bank financial intermediaries. For this reason, in recent years it has become popular to describe the non-bank financial intermediaries as China's shadow banking sector. But in some ways, this terminology is unfortunate because operations of these entities are very different and rather less complicated than those of operations in the US asset-backed securities markets that became notorious in the aftermath of the Global Financial Crisis. The term shadow banking is also somewhat misleading in that it suggests that the public sector does not monitor and regulate the sector. This is not really the case in China since many of the entities are themselves SOE's thereby giving state sponsors privileged access to information.

A prominent example of a non-bank financial intermediary emerging early in the market reform era was the China International Trust Investment Corporation founded in 1979 as a central SOE with the support of Deng Xiaoping. It was the predecessor of the modern CITIC Group which is currently the largest and most prominent of the 68 state-owned trust companies operating in 2016 (see, Allen, Gu, Qian and Qian 2017). China's trust companies are financial conglomerates that carry out a variety of financial services and which resemble in some ways the large holding companies that played important roles in the industrial revolution in Europe and North America throughout the 19th century and the first half of the 20th century. They are involved in traditional merchant banking activities such financial advising, organizing loans or security issuance, structuring of a group of related firms, and mergers, acquisitions, and so forth. Generally, these activities do not directly impact the retail financial markets. However, China's trusts often do own commercial banks which cater to retail customers. Furthermore, starting in the early 2000's, trust loans, that is loans originated by trusts

Figure 1:

and used to fund investments of firms, are often sold down to wealth management products (WMP's) that are marketed by banks to retail customers (see, Hachem, 2016). The China Trustee Association publishes aggregative financial statistics about this sector. Figure 1 presents the evolution from 2010 to 2019 of the trust sectors' portfolio of assets broken down by investment type. These include securities held (stocks and bonds), firms held directly (industrial/commercial and financial), real estate assets held directly, and infrastructure projects underway. This figure reveals the rather large changes over time in the composition of the trusts' portfolios. For example, it shows that the amount of bonds held by trusts grew very sharply between 2012 and 2018. Also, infrastructure holdings grew strongly between 2010 and 2015 and were relatively constant subsequently. All of this reflects major developments of the financial markets and policy initiatives by both central and local government, as will be detailed below.

There are a variety of other contracting forms that are employed by China's non-bank financial intermediaries (see, Elliott, Kroeber and Yu, 2015 and Hachem , 2018). One form that has grown in significance in recent years is the entrusted loan. These are loans between two corporations where the arrangement and custodial services are provided by a third party, typically a bank. The repayment of these loans may be guaranteed, conditionally or unconditionally, by a fourth party. It sometimes argued that the servicing bank may provide an implicit guarantee of the entrusted loans (see,

Chen, Ren and Zha, 2017). Possible reasons for this could be a banks' concern for its reputation which could be damaged in the case of default or because a bank may have become creditor by taking a position in the entrusted loan sold down on the secondary market. In 2018 the China Banking Regulatory Commission brought clarity to the issue by explicitly barring banks from guaranteeing an entrusted loan they service (Financial Times, January 8, 2018). Allen, Qian, Tu and Yu (2019) study a detailed data set on entrusted loans and find that frequently entrusted loans take place between two firms that are related to one another through share ownership or supply contracts. They also find that entrusted loans between unrelated firms are likely to have higher rates and/or third-party guarantees.

Neither trust loans nor entrusted loans appear on the balance sheets of commercial banks and therefore our not subjected to regulation of loans to deposit ratios which is one of the monetary policy tools used by the People Bank of China (PBOC). A bankers' acceptance is third form of funding contract which does not appear on banks' balance sheets which also grew to prominence on Chinese money markets in recent years. It is basically a bank's forward-dated payment order which can be traded in an OTC secondary market on a discount basis. In contrast with trust loans and entrusted loans which tend to be large and involve relatively large state-owned banks, bankers' acceptances are more often for smaller amounts and often involve smaller banks. As a consequence, the level of monitoring of these contracts was less than that of trust and entrusted loans which in turn were themselves less widely scrutinized than items include in banks on-balance sheet loan portfolio.

Aggregate data on these forms of non-bank financial intermediation are reported by the PBOC as part of their Total Social Financing database which also includes bank loans and securities issues of non-financial corporations. Figure 2 reports the evolution of amounts outstanding of these components of Total Social Financing from December 2006 through December 2019. The first thing to notice is that bank loans dominate all other sources of finance for Chinese non-financial enterprises. While the amount of finance coming from alternatives to commercial bank has risen sharply since 2006 it was still only 24% of the total in 2019.

To concentrate on non-bank debt financing to non-financial enterprises, Figure 3, plots separately the evolution of debt securities issuance by non-financial enterprises plus the three main forms of non-bank financial intermediation. This shows clearly that all of the shadow banking instruments had periods of very strong growth followed by periods of retrenchment over the period covered. The boom came early for bankers' acceptances but this sector has been in decline since 2012. There was a sharp rise of

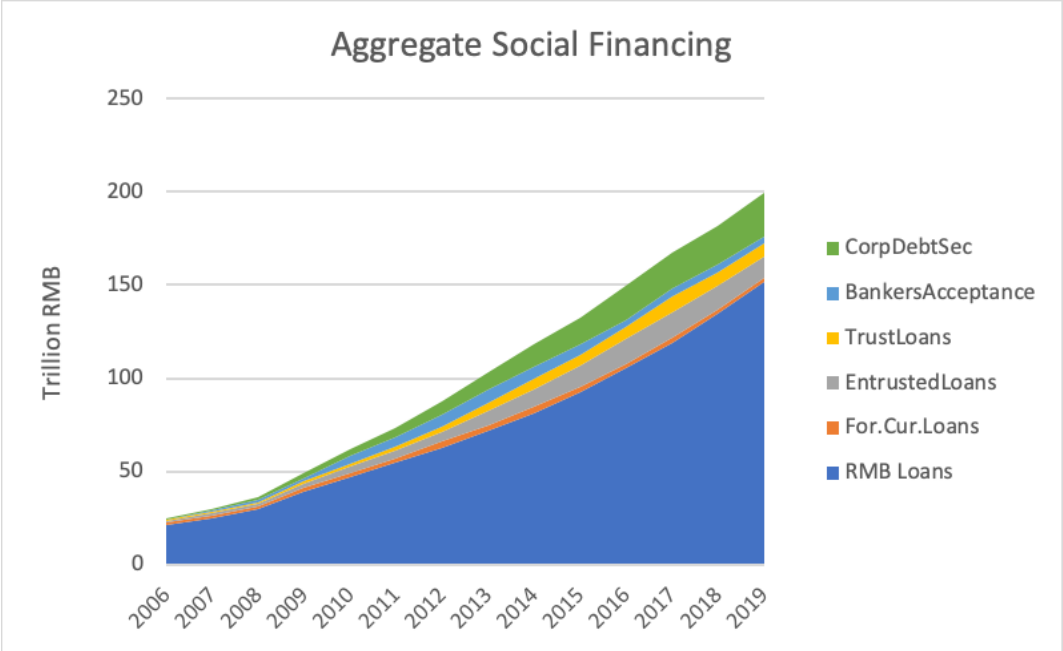

Figure 2:

entrusted loans starting in 2011 which began to decline in 2018 following the restrictions of the CBRC. Trust loans grew strongly through about 2016 and have been relatively stable subsequently. Corporate debt securities (including enterprise bonds, corporate bonds, MTN, and CP) have grown relatively starting in 2012. Overall, for the aggregate of the debt financing depicted in Figure 3, the average annual growth rate was 22.6% from 2006 to 2013, 11.6% from 2013 to 2019, and 17.5% overall.[2]

The explosive growth of non-financial enterprise debt between 2008 and 2012 attracted wide-spread attention in the international policy community and the financial press (see, IMF 2016 and OECD, 2013, 2015, 2017). There have been a number of attempts by Chinese scholars to understand the forces that gave rise to the growth and to assess whether the debt burden was sustainable. One important analysis is contained in Bai et al (2016) who emphasize the importance of a program of 4 trillion RMB fiscal stimulus that was adopted by the central authorities in late 2008 as a response to the unfolding global financial crisis. The objective was to induce a burst of domestic real investment which would mitigate the effect of the expected decline in exports and allow

[2]It should be noted that the Total Social Financing data set has included aggregates for other financing sources including equity issuance, certain categories of government bonds, asset back securities, and loans written down by banks. These are qualitatively very different from the stock of outstanding debts of non-financial enterprises, and, therefore I have omitted them from the calculation.

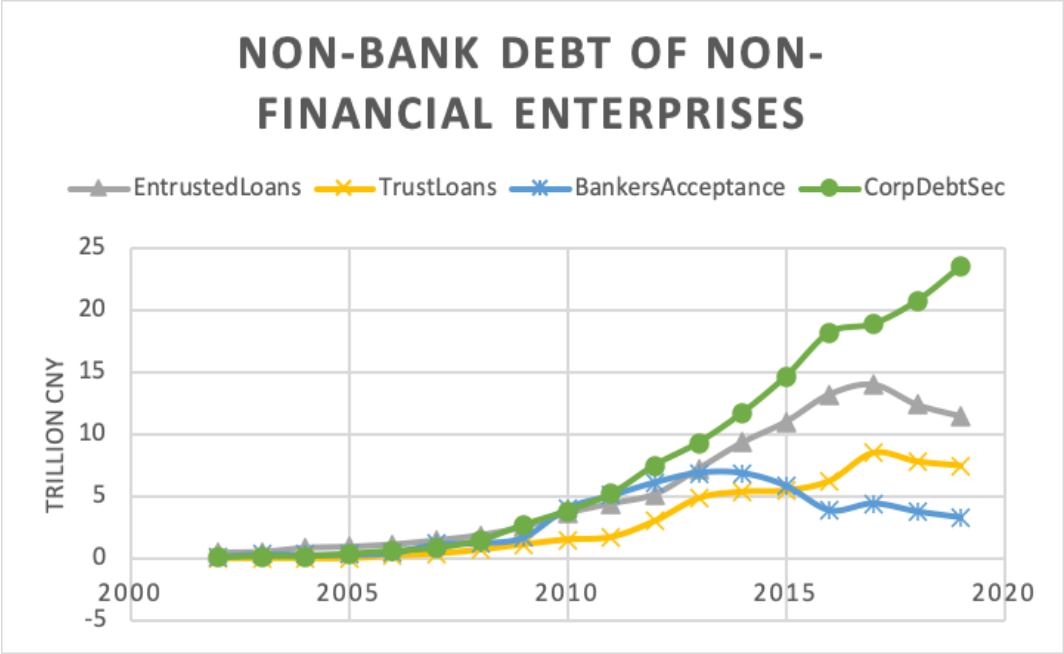

Figure 3:

China to avoid a sharp slow-down in economic growth. Indeed, it had this effect with aggregate real investment rising from 42% of GDP in 2007 to 48% in 2010. Investment was heavily oriented toward non-residential structures including infrastructure projects which by their nature are important assets of a regional economy (e.g., bridges, subway systems, water purification...). While some large infrastructure projects were managed centrally, more often it was up to local governments to plan and, in short order, to execute the projects they deemed most beneficial in the local context.

Much of the debt for infrastructure investment during this period was not raised by local governments directly. Instead, it was raised by SOE's sponsored by local governments. The reason for this rather indirect means of operation dates back to the fiscal reform of 1994 which simultaneously centralized a large share of tax collection while still expecting local government to shoulder a large share of public expenditure (see, Xu, 2011). As discussed in Aglietta and Maarek (2006) the motivation for this reform was to allow for a redistribution of resources from the coastal regions of the economy that were growing fastest toward the interior where economic development was lagging behind. Part of the reforms were aimed at preventing local government from taking-on commitments that could essential tie the hands of central authorities to bailing out local governments. Consequently, local governments were barred from most forms of bank borrowing and debt issuance.

The combined effect of these policies was to leave local governments dependent upon revenue transfers from the central government, but these typically came in the form of targeted programs which were often ill-suited to the projects deemed most needed for local development. In response to this, some local governments, notably in Shanghai Pudong development district, developed a work-around which involved sponsoring a new form of SOE for the sole purpose of developing and then operating local infrastructure projects (see, Anderson and Lu, 2018). Given their legal status as local SOE's these new enterprises were able to take on debt either through bank borrowing or through issuing enterprise bonds. This innovation was tolerated by central authorities, perhaps as a pragmatic means of smoothing over the transition of toward the new system of receipt centralisation and redistribution of funds back toward local governments. However, over time more local governments imitated the Shanghai Pudong model which became the *de facto* normal way of executing a wide variety of infrastructure projects. The specialised SOE's have come to be known as the Local Government Funding Vehicles (LGFVs) and the bonds issued by such entities are recognized in the market as City Construction Bonds.[3]

The numbers of LGFV's grew relatively slowly in the decade that followed the fiscal reforms of 1994. This changed with the 2008 fiscal stimulus which made a rapid increase in infrastructure investment a national priority. The numbers of LGFV's grew rapidly as judged by the fact that the numbers of such entities which issued bonds rose from 600 in 2008 to 1600 by 2012 (Bai et al, 2016). In fact, many local governments have sponsored many SOE's which have been used periodically to raise funds for investments many different channels. By some counts there were more than 12,000 LGVS's in 2017 (Anderson and Lu, 2019).

The consequences of this bulge of infrastructure investments being channelled through local SOE's has been a major driver of events in Chinese financial markets for the last ten years. Initially, the funding for the increased investments by these entities came in large part in the form of bank loans. However, the tenor of typical banks loans was generally much less than the horizon over which the infrastructure projects were expected to generate revenues either directly in the form of user fees or indirectly as the assets stimulate and support economic growth. As a result, the LGFV's were faced with a need to roll-over their debts. As discussed in detail by Chen, He, and Liu (2017) these roll-over pressures began to be felt strongly in 2012. By that time, the central bank had taken steps to restrain the expansion of bank credit so that LGFV's had to look to

[3]In earlier literature these bonds are sometimes called municipal bonds; however, this is a misnomer as they are not issued by local governments. They are not to be confused with genuine municipal bonds were introduced only recently as I discuss in this paper.

alternative sources of funding in order to repay their maturing bank loans. Based on provincial-level aggregate information, Chen et al find a significant positive correlation between growth in bank loans in 2009 and growth in bond issuance by provincial level LGFV's in 2012-15. Similarly using provincial level aggregates, they report a positive association between bank loan growth in 2009 and growth in entrusted loans in 2013 and 2014. In contrast, they found no significant association between bank loan growth in 2009 and subsequent bank loan growth in 2013-15.

The rapid growth of aggregate non-financial debt since 2010 and the fact that some of this has been channelled through China's shadow banking sector has led a number of analysts to question whether the trajectory of debt was unsustainable and whether Chinese authorities had the means of bringing it under control. To a certain extent the growth of non-bank debt since 2010 can be viewed as transitory, reflecting the market's adjustment to the opportunities created by securities market reforms which allowed trading in new types of debt issues. Indeed, a number of regulatory changes made it easier for the LGFV's to issue corporate bonds or MTN's for infrastructure purposes (See, Lin and Milhaupt, 2017, and Lu, 2017). These include the removal of the requirement that debt issuing firms be listed on a stock exchange. However, others have pointed to the fact that many of the new debt issues, including City Construction Bonds issued by LGFV's, were being repackaged in wealth management products which were being sold to unsophisticated investors who were ill-placed to recognize the riskiness of the underlying instruments. It was widely stated that this practice was knowingly tolerated by the Chinese authorities and that as a result there was a general expectation of government bail-outs in case of defaults (see, N. Zhu, 2016). Chen et al argue that it was the pressure of rolling-over the debts originated with the stimulus package of 2008 that forced Chinese authorities to send conflicting signals as to debt policy by which they have attempted to step back from blanket guarantees while at the same time tolerating continued debt issuance by LGFV's in some circumstances. In a similar vein Huang and Bosler (2014) argue that it is clear that Chinese authorities were faced with a clear policy dilemma of controlling the growth of debt while at the same time sustaining the real infrastructure investments aimed at promoting growth and facilitating the continued integration of the rural workforce into the modern industrial and service economy.

In fact, late in 2014 Beijing came out with an explicit statement of the main elements of the strategy it intended to pursue (see, State Council, 2014). The main elements of the strategy were (a) authorising local governments to issue issues municipal bonds directly (i.e., not through LGFV's), (b) placing limits on the ability of

local governments to give debt guarantees to SOE's it sponsored (including LGFV's), (c) restructuring local debt by swapping outstanding LGFV debt for new muni bonds, and (d) encouraging government to finance planned but not completed infrastructure investments through partnerships (PPP) with third parties that could contribute management skills and financial resources.

In the statistical analysis of Sections 3-5 below we will see some evidence that this strategy has indeed had at least some of intended effect. However, initially at least, the announcement of the policy may have done little to dispel the widespread belief that the authorities would ultimately back up the outstanding debts in one way or another. Something that contributed to this scepticism was that in the midst of the extreme volatility of the equity markets in spring of 2015 and of the foreign exchange market in August 2015 government officials made statements intended to reassure investors of the fundamental structural stability of the markets. One such statement was made in July 2015 by a member of NDRC council who said that markets they supervised (i.e., enterprise bonds) had received governmental backing and therefore, in principle, were protected against default. This was widely interpreted in the financial press as signalling a general commitment toward debt relief. Subsequently, there were repeated statements in 2016 and 2017 from the Ministry of Finance and the State Council emphasising the limited scope of government guarantees, and these were reinforced by disciplinary actions against local governments for violating guidance restricting the scope of guarantees in PPP projects. This all is consistent with the Huang/Bosler view that authorities were engaged in a delicate balancing act involving conflicting policy objectives. Others, notably Lin and Milhaupt (2017) point to mixture of messages from different authorities as a manifestation regulatory competition. They argue that, as in the US, China's regulatory architecture has led different regulatory bodies pursue policies that favour the growth in size and fiscal impact of the market segments covered by their mandate. The result is that sectors wax and wane as the balance of power between these regulatory bodies shifts. I will return to this issue after presenting the statistical analysis below.

Finally, it should be noted the most previous academic work on China's non-financial corporate securities involve the analysis of aggregate data by sector or by region (national or provincial). The evidence I explore in what follows is mostly based on individual securities issues where I have detailed information about both the issue and the issuer. Recently, there have been two analyses that also look at non-financial enterprise debt security issues. Liu, Lyu and Yu (2017) examine pricing of issues of LGFV's and focus on the cross-sectional variations across different regional and in-

dustrial sectors. I cover a wider range of debt issues which includes LGFV issues as a subsegment, and I explore a wider array of explanatory variables including performance measures at the firm level rather than at the regional level. Mo and Subrahmanyan (2019) focus on differences of liquidity in secondary markets as a determinant of cross-sectional differences in pricing. My analyses in Section 4 uses explores liquidity effects along with a wide variety of other indicators that I will develop on the basis of the analysis in the following section.

3 Analysis of Non-financial Enterprise Debt Securities

Section 2 traced the major steps taken by China in developing a financial system adapted to the needs of the market economy. It was argued that, while basic changes to the legal and regulatory framework were put into place by about 2006, the development of its debt securities market gained impetus only after central authorities had adopted a policy of macroeconomic stimulus to counter-act the effects of the global financial crisis. In this section I present statistical evidence on development of the debt securities market in the last decade. I will argue that in their efforts to restrain the growth of debt to sustainable levels the central authorities have adopted a set of policies that have reshaped China's debt capital markets as a reflection of a *de facto* reform of local public finances.

Figure 4 reports the aggregate debt securities outstanding for the five countries with the largest corporate bond markets in 2019 according to figures compiled by the BIS. China stood in second position behind the United States with a total of 3.3 trillion USD outstanding, half the size of the US market. However, China's market was 5 times the size of the Japanese corporate bond market which was the third largest national corporate bond market. What is perhaps even more striking in this figure is the growth of the market since Q4 of 2008, the time when China's macro stimulus programme was announced. China's corporate bond market grew by a factor of 15. Over that same period the markets of the US, France and Canada each doubled in size while that of Japan actually declined by 20 per cent.

What form did the expansion of Chinese corporate debt securities markets take? In Section 2 I described three channels through which non-financial firms can issue debt securities in China, each with distinct regulatory processes and custody arrangements. Table 2 reports the amounts of the non-financial debt securities outstanding at the

Figure 4:

beginning of 2017 broken down by type of security and by depository institution. The traditional official channel through which enterprise bonds enter the system accounted for 4.6 trillion CNY. About 80 per cent of this were enterprise bonds, the long-term debt instrument introduced in 1984 and which still today is subject to review by the NDRC to assure the financing is consistent with publicly-stated investment priorities as set out in the 5-year plans. This official channel was smaller than either of the two alternative channels which began operating in about 2007. The stock market channel for long-term corporate debt had 6.3 trillion CNY outstanding while the channel for short-term corporate paper stood at 7.7 trillion CNY. Thus, ten years after private sector debt securities platforms were introduced, they had come to dominate the market.

This transformation of the composition of the corporate debt market in China coincided with a period of very strong growth of the sector. As seen in Figure 3 the total amount of non-financial corporate debt securities went from 800 billion CNY in 2007 to 18 trillion CNY in 2017 and on to 23 trillion CNY at the end of 2019. As documented by earlier papers (Bai et al, 2016 and Chen et al, 2017), some of the impetus for the growth of the market for corporate papers resulted from the fiscal stimulus decided in 2008 and implemented in the form of real investments concentrated in infrastructure. However, since early 2015 these investments have been subjected to a stronger scrutiny as part of a "deleveraging" policy as laid out by the state council, the ministry of finance

Table 2: Non-financial Enterprise Debt Securities, Jan 2017

	Official CCDC	OTC SHCH	Stock Market CSDC	Total
Enterprise Bonds	3536	0	946	4482
Corporate Bonds	0	0	4128	4128
SME Private Bonds	0	0	1194	1194
Medium Term Notes	1026	3431	0	4457
Commercial Paper	0	2124	0	2124
Private Placement Notes	0	2180	0	2180
Total	4563	7735	6268	18,566

Outstanding at Depository Institutions, January 2017, (Billion CNY),Source: WIND

and other central authorities. These policies did not just concern debt of non-financial corporations. As already noted in Section 2 they also involved opening a true muni bond market which allowed local governments to issue directly rather than through their LGFV's. This new market was given impetus by the two additional initiatives. First, the Ministry of Finance took a direct hand in the origination of bond issues on behalf of local governments which initially did not have in-house the capacity to do so. Second, again the Ministry of Finance organized a swap mechanism whereby new muni bond issues were used to retire old construction bonds issued through LGFV's. At the same time, further stages of planned but incomplete infrastructure projects were supported through PPP arrangements whereby local governments joined partners which contributed about 20 per cent of required funding. The remaining 80 per cent of funding could be sourced through bond issues but in practice a significant amount of funding has come as loans from policy banks such as the China Development Bank. The policy banks in turn finance their lending by issuing their own securities.

Taken together these policies have contributed to a large-scale restructuring of China's debt capital markets. This is seen in Figure 5 which shows the evolution of five subsectors of the domestic bond market which reflect this transformation. Between 2010 and 2020 central government debt grew steadily at the rate of about 10 per cent annually. Over this same time enterprise bonds, the main form of securities funding for non-financial enterprises in the first two decades of the reform era, grew slowly from 2010 to 2017 and have been in decline since then. In contrast, the markets for corporate bonds, medium term notes and commercial paper have grown very rapidly — 27 per cent annually over the last ten years. What is even more striking is the

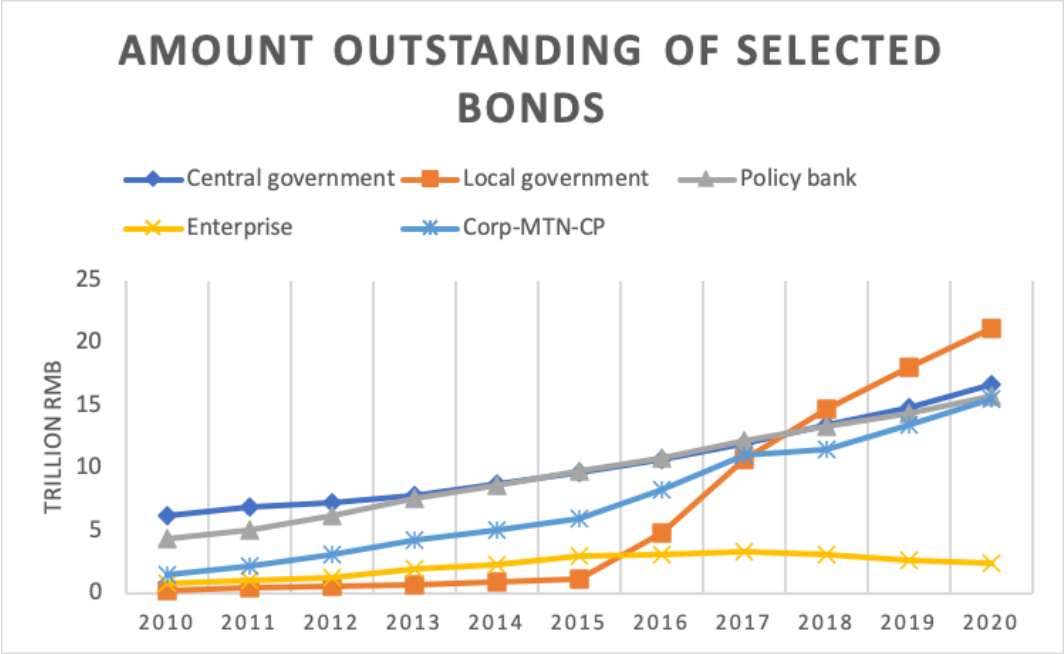

Figure 5:

growth of the new market for direct-issue local government bonds which has gone from 1.2 trillion CNY outstanding in 2015 to 21.1 trillion in 2020. Finally, Figure 5 shows that policy bank securities issues grew slightly faster than central bank issues between 2010 and 2013 and have kept pace with central bank issues subsequently.

This restructuring of the debt markets is consistent with the view that state has recognized responsibility for at least some of the obligations taken on as part of the strong growth of infrastructure of the last ten years. The effect of this reallocation can be gauged in Figure 6 which plots the evolution of two broad debt aggregates. The category "government and related" is the sum of central government bonds, local government bonds, policy bank bonds and enterprise bonds that had been depicted in Figure 5. The category "corporate bonds and related" is aggregate corporate debt as in the total social financing statistics depicted in Figure 3 less enterprise bonds outstanding plus the shadow banking aggregates of trust loans, entrusted loans, and bankers' acceptances as in Figure 3. There is a legitimate question of extent to which under current laws and regulations there is a commitment of the state to back local government bonds, policy bank bonds and enterprise bonds. I will return to this in what follows. However, accepting for now the hypothesis that these categories are state-backed, the implications of Figure 6 is that the effect of the local debt policy put into place by the State Council in late 2014 has been led to a significant moderation

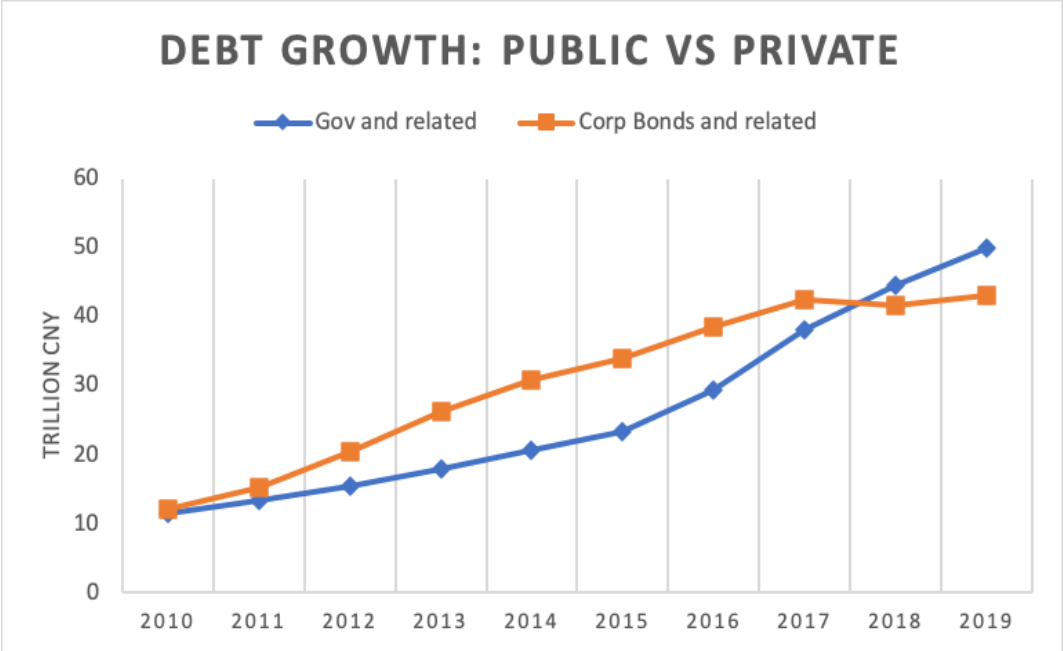

Figure 6:

of the growth of private enterprise debt while at the same time there has been an acceleration in the growth of public debt.

This point is of major significance for the way one looks at the question of the sustainability of China's debt burden. If, as depicted in Figure 6 the fast-growing segment of the debt market is public debt, then its sustainability should be analysed in the same manner that the size of public debt is discussed in other countries. Here the question turns on the effect of policies upon the government's budgetary balance, the interest rate and the growth rate of the economy. The dynamics of the government debt are given as follows (see, Escolano, 2010),

$$d_t = \frac{1+r_t}{1+g_t} d_{t-1} - ps_t \tag{1}$$

where d_t is the ratio of real public debt at date t to real GDP at date t, r_t is the real rate of interest payable on public debt, g_t is the growth rate of real GDP from $t-1$ to t, and ps_t is the primary budgetary surplus expressed as a ratio to GDP. A policy contributes to sustainability of the debt to the extent that it increases the budgetary surplus, reduces the rate of interest on public debt, and promotes aggregate growth of the economy. Note that the relative importance of the interest rate and of growth depends upon the level of debt relative to GDP. Based on 2019 numbers when China's

GDP was 99 trillion CNY and the broad measure of public debt as in Figure 6 was 49.9 trillion CNY, the debt ratio was 51 per cent, a very low number as compared to any G7 country and almost any other G20 country. At the same time the cost of public debt was approximately 3.07 per cent which was 17 bps over the CPI inflation rate in 2019 of 2.9 per cent.[4] Thus the real rate of interest on public borrowing was essentially zero. At the same time the GDP growth rate in 2019 was 6.1 per cent or a real rate of 3.2 per cent. The result is that any budget deficit less than 3 per cent of GDP would result in a decline in the broad public debt burden as I have defined it here.

According to the IMF between 2010 and 2015 China ran a public budget deficit comfortably below 3 per cent; however, subsequently their estimates of the deficit have grown steadily. This is largely due to the fact that since 2014 they have included a significant fraction of local government debts in calculating total government debts.[5] This is broadly similar to what I have done in arriving at Figure 6. Overall the IMF assessment is that while public debt has been rising, it is starting from a comparatively low base and that in the medium term a moderate fiscal consolidation would suffice to contain public debt at low levels internationally (see, particularly, Appendix 1 of IMF, 2019). What tools does China have available to assure this fiscal consolidation? The IMF argues and many other international observers would agree that improving credit allocation by removing implicit guarantees and hardening budget constraints on SOE's would help to channel resources into higher productivity activities thus promoting growth. That is, the recommendation is liberalize markets in order to increase g_t in the debt dynamics relationship. The analysis of the drivers of China's growth between 1978 and 2007 summarized in Section 2 lend support for this view. However, many analysts would probably fear that Chinese authorities may be tempted to maintain or even strengthen the preferential access to credit that the public sector and SOE's have traditionally enjoyed. Proponents of this approach, often referred to as "financial repression", might justify it as a necessary precaution in the face of exogenous shocks including international trade pressures that have reduced China's aggregate growth below its long-term sustainable path. This view supports the continued use of various

[4]The value weighted average public sector interest rate is calculated as T-bond interest + Local Government interest+Policy Bank Intererst + Enterprise Bond interest = (.2918*2.88+.3621+3.08+.2882*3.1+.0515*4.00)=3.07. Here the rate for Enterprise Bonds is based on an average of enterprise bonds in our disaggregated data set as discussed below while the other rates were taken from the ChinaBond yield curves at year end 2019.

[5]See the IMF, 2019, Table 1. The IMF reports the structural budget balance which makes a variety of adjustments to primary balance e.g. including off-balance sheet items as well as expressing debt as a ratio of potential GDP to remove cyclical effects. It is notable that one of their adjustments it to include 2/3 of their estimate of total LGFV debt including trust loans and entrusted loans.

quantity restrictions to reduce r_t in the debt dynamics equation. These arguments have no doubt been actively debated in official circles ever since the deleveraging policy initiative got underway in 2015.

The other side of the question of the sustainability of China's debt strategy concerns the debts included in the "corporate and related" component in Figure 6. In order to see to what extent there has been an improvement in credit allocation and in restraining implicit guarantees for this segment, it is necessary to turn to an analysis of the market structure at a more disaggregated level. To do so I focus on the market for long-term debt securities of non-financial enterprises and examine a large data set of individual issues of enterprise and corporate bonds over the period from April 2015 to November 2019. In addition to information about basic characteristics of each issue I also obtain information about the firms issuing the securities, the ratings both of companies and of securities, and securities pricing measured as yields to maturity at the close of the last trading date of each month. Details of this data set are given in Appendix A.

Table 3 summarises the numbers of bonds in this data set outstanding as of November 2019 for which the type of company issuing the bond is reported. It consists of 5016 bonds of which about 54 per cent were enterprise issues, 33 per cent were corporate issues listed at the Shanghai Stock Exchange and 13 per cent were corporate bonds listed at the Shenzhen Stock Exchange. Among types of firms, LSOE's were the largest issuers of long-term debt securities with 3203 outstanding in late 2019. Of these 75 per cent were enterprise bonds. Private enterprises were the next largest issuer of bonds with 848 outstanding of which 94 per cent were corporate bonds, fairly evenly split between Shanghai and Shenzhen. CSOE's account for 677 bond issues, predominantly corporate bonds issued in Shanghai but also a significant number of enterprise bonds. Between themselves CSOE's, LSOE's and private firms accounted for more than 94 per cent of total issues. The remaining categories of issuers include foreign firms (mostly registered in Hong Kong), foreign/domestic JV's where the local partner could be either state-owned or private, public companies, that is, domestic listed companies typically with a minority of state ownership (see, Lardy, 2014), and a few state-owned companies which are not classified as either central or local. The main message of Table 3 is that the market of long-term debt securities of Chinese has three main categories: LSOE's which issue mainly in enterprise bonds, private firms that issue mainly corporate bonds, and CSOE's which issue both enterprise and corporate bonds.

Table 4 presents the data in a way that sheds light on the intended investment financed by a bond. Here bonds have been categorized as either City Construction

Table 3: Bonds Outstanding by Issuance Channel

Company Type	Enterprise	Corporate		Total
		SSE	SZSE	
Central state-owned	254	374	49	677
Foreign-owned enterprise	8	93	29	130
Joint ventures	8	64	4	76
Local state-owned enterprise	2,397	648	158	3,203
Other state-owned companies	2	11	7	20
Private Enterprise	55	431	362	848
Public company	2	30	30	62
Total	2,726	1,651	639	5,016

Source: WIND

Bonds or Others. City Construction is a designation of a bond intended to fund infrastructure projects. This terminology emerged in the market based on methodology that was originally developed in reports by the National Audit Office in 2010 and 2013 that gave a first assessment of the growth of debt related to infrastructure investments following the macroeconomic stimulus adopted in 2008. The data show clearly that local infrastructure investments have been dominated by LSOE's with 98.5 per cent of the City Construction Bond issues outstanding in November 2019. In fact, the LSOE share has grown over time. A similar break-down of the bonds outstanding in April 2017 sets the LSOE share at 91.5 per cent. In contrast, between 2017 to 2019 the CSOE share went from 3.5 per cent to 0.3 per cent in 2019 and the private enterprise share went from 1.8 per cent to 1.1 per cent. In light of the discussion above, this pattern suggests that CSOE's have been the most active participants in the muni bond swap programme pursued by the Ministry of Finance.

The pattern that emerges from Tables 2-4 is that there are distinct segments in the market for long-term debt of non-financial firms. LSOE's are the largest issuers of enterprise bonds many of which have been used to fund infrastructure investments. Private firms' long-term debt typically takes the form of corporate bonds and are used to fund non-infrastructure investments such as plant, equipment or real estate. The fact that these two distinct issuance channels tend to cater to different types of firms and different investment purposes raises the issue of whether the firms compete for funds on a level playing field. A possible source of distortion of credit allocation may be that the two channels for long-term debt in China are accessible only to different sets of investors and that there are significant impediments to capital flowing from one channel to another.

Table 4: Bonds Outstanding by Funding Purpose

Company Type	Construction		Total
	no	yes	
Central state-owned	661	9	670
Foreign-owned enterprise	126	2	128
Joint ventures	76	0	76
Local state-owned enterprise	628	2,560	3,188
Other state-owned companies	20	0	20
Private Enterprise	798	29	827
Public company	57	1	58
Total	2,366	2,601	4,967

Source: WIND

As seen in Section 2, the exchange market for corporate bonds has been built upon the market infrastructure developed for equities trading. From the outset of trading corporate bonds in 2007, domestic retail investors have had access to this market through the securities dealers and brokers that also support retail trade in equities. These same investors do not have direct access to trading in the interbank system where most enterprise bonds are traded. Furthermore, many of the issuers of enterprise bonds are not listed firms and historically have not been held to the same public reporting requirements faced by firms listed on stock the stock exchanges. However, by 2016 steps had been taken toward removing this friction (see, ADB, 2019). First, securities firms that are members of the Shanghai or Shenzhen exchanges can execute trades on the interbank market on behalf of qualified individuals. These securities are then held in the name of the ultimate beneficial investor or their nominee within the master account that the CSDC holds at CCDC.[6] Second, the NDRC now requires issuers of enterprise bonds to report annually their financial condition and to divulge any material change in their solvency position. This information is collected by CCDC and fed into the China Credit Information Sharing Platform which is accessible to the major regulatory bodies. In 2017, the two exchanges made modifications to their rules for qualified investors so that very similar rules apply on the two exchanges. These rules establish minimum financial qualifications for individual investors and prohibit their direct holding of bonds rated below AAA-. However, they do have access to lower rated corporate debt through funds offered by securities firms or banks' wealth management products both of which are subject to supervision by their respective

[6]China Securities Depository Corporation is the central depository of the exchange market. China Central Depository and Clearing Ltd is the central depository of the interbank market.

regulators. Reciprocally, the large domestic institutional investors that are the main participants on the interbank market may gain access to the corporate bond market either through accounts with exchange members or by gaining exchange membership of their own subsidiaries.

As a result of these developments, there are multiple channels of communication that facilitate capital flowing between the secondary markets for corporate and enterprise bonds. The CCDC publishes statistics on amounts of securities for which beneficial owners enter both from the interbank market and the exchange market. As of March 2020, there were 2.89 trillion CNY of enterprise bonds outstanding. Of this total 2.44 trillion CNY or 84 per cent had some proportion of cross market holding.

All of this suggests that funds controlled by domestic institutional and private investors can flow reasonably freely between corporate and enterprise bond markets. However, many of the biggest domestic financial firms, notably commercial banks, trust companies, insurance companies, and sovereign wealth funds, are state-owned. It is possible they face other constraints so that their investment objectives are not just maximizing risk adjusted returns. If so, even though channels have been opened permitting capital flow from low return segments to high return segments, the domestic investors may not exploit them sufficiently to achieve efficient credit allocation. This leads to the question of whether international investors have sufficient access to the markets in order to exploit possible mis-pricings.

China began to open its domestic bond market as early as 2002 when it introduced the Qualified Foreign Institutional Investor (QFII) scheme whereby foreign financial institutions could apply for permission to invest in a range of Chinese domestic debt securities. The scheme was constrained quantitatively by quota and involved a number of rigidities such as committing investors to keep funds on-shore for a minimum period and setting certain conditions on repatriation of funds. The QFII scheme grew only gradually over time as quotas were increased but probably also reflecting limited international interest given the undeveloped nature of China's debt markets at the time. Another way a foreign institution could gain access to Chinese markets was by opening on-shore securities firms registered as joint ventures with Chinese domestic investors. Again, there were constraints, notably that the foreign partner was restricted to be a minority shareholder in the firm.

More recently, the access of international investors to China's domestic bond market has increased significantly. In the run-up to China's 2015 bid to have the renminbi included as a constituent currency of the SDR of the IMF, China undertook a variety of bilateral actions to promote international financial linkages. These included increasing

QFII quotas and then finally in May 2020 dropping quotas altogether. Furthermore, restriction on repatriation of funds have been significantly relaxed.[7] In 2017 came the Bond Connect programme whereby investors at HK banks and brokers were given access to the bond exchange markets of Shanghai and Shenzhen. Foreign listed companies have been authorised to tap Chinese domestic market by issuing so-called Panda bonds either through the interbank or bond exchange channels. Finally, in 2020 China removed the restriction of foreign holdings in domestic securities firms, which brought the immediate response by such major players as JP Morgan Chase and Blackrock to establish their own wholly-owned Chinese domestic securities firms.

In summary, a variety of forces have operated in recent years that have reshaped China's market for debt securities. The authorities have opened the market for municipal bonds in which local governments can obtain funding directly based on their fiscal capacity and have taken steps to cut off the former indirect source of fund through LGFV's. At the same time, they have pursued a "deleveraging" policy aimed at dampening the expectation of implicit government guarantees. Finally, there have been a number of changes in the structure of debt securities markets that have opened up additional channels through which capital can flow between various market segments. It is natural then to ask whether combined effect of these forces has had a material impact in the pricing of credit in China and whether there has been an improvement on the efficiency of credit allocation.

Figure 7 presents the evolution of the pricing of credit within the two key segments of the market that have been identified in Tables 3 and 4. Over the period from April 2015 to November 2019 it plots the mean credit spreads for enterprise bonds classified as 'city construction' and for corporate bonds classified as 'other'. The spreads are the difference between yield to maturity on a given enterprise or corporate bond and the yield on a Chinese treasury issue with the same time to maturity. Treasury yields are obtained from the China Bond yield curves that are published daily. For both of these segments I calculate the arithmetic average of the spreads at month end.

The figure reveals a clear divergence in pricing of enterprise construction bonds and corporate non-construction bonds. In April 2015 there was a 38 bp difference between the mean spreads in the two segments, with the spread on enterprise construction bonds standing at 2.65 per cent as compared to corporate non-construction bonds at 2.27 per cent. Subsequently, spreads on corporate non-construction bonds have risen relative to enterprise construction bonds. In November 2019, the spread on corporate non-construction bonds was 3.82 per cent; whereas, that of enterprise construction

[7] Caixin, May 8, 2020, 'Four Things to Know about China's Foreign Investor Program.'

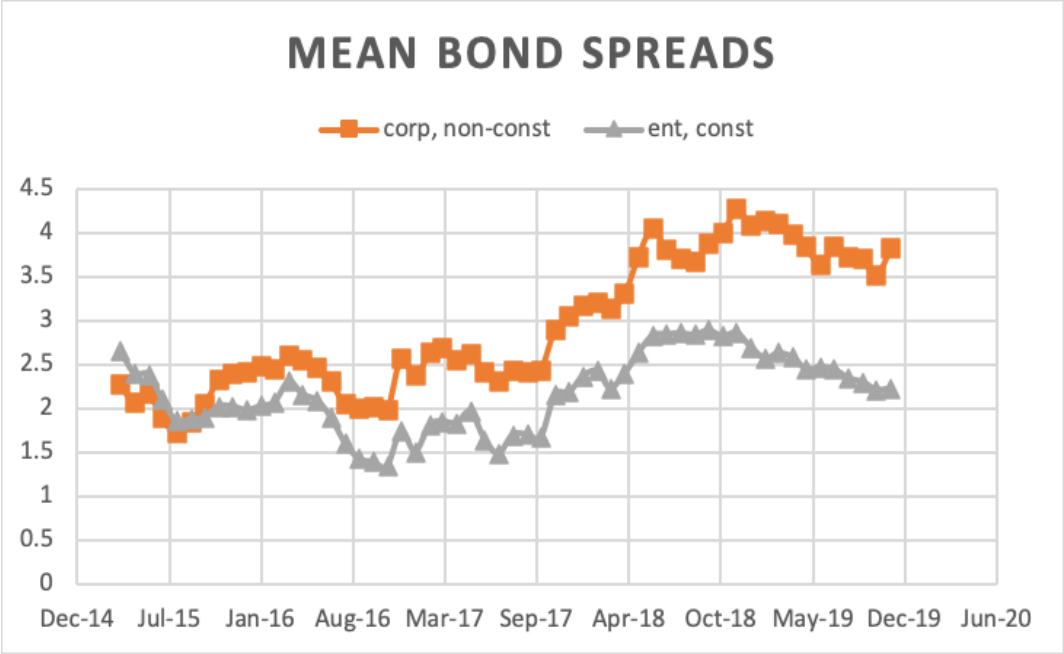

Figure 7:

bonds had a spread of 2.22 per cent. Broadly, there has been a very significant increase in the yield spreads on corporate bonds while over the same period the yield spreads on enterprise bonds used to fund infrastructure projects moved comparatively little. This apparent reassessment by the market in the relative riskiness of the two segments started to appear in the summer and fall of 2015 so that by December 2015 the corporate non-construction spread index stood at 18 bps above that of enterprise construction bonds. Recall that, as discussed in Section 2, this was a period in which there had been mixed messages from officials concerning public policies for the securities market. This included a statement in early July by a board member of the NDRC to the effect that, in principle, enterprise bonds should not default because they had been issued only after receiving assurances of sound funding basis by the relevant sponsoring government. Subsequently, statements by the ministry of finance pointed out the limited nature of guarantees and that they did not apply to debt securities in general. During 2016 and 2017 the messages stressing the importance of market discipline became stronger and more authoritative. At the same time, the divergence in the pricing of these to major segments became greater particularly from the second half of 2017.

Other developments in the credit markets may have contributed to the differences in pricing of enterprise construction bonds compared to corporate non-construction

Figure 8:

Table 5: Number of First-time Defaults

2014	2015	2016	2017	2018	2019
5	25	29	9	40	40

Source: WIND

bonds. As discussed in Section 2, court bankruptcy was traditionally not an important method for the resolution of insolvent firms. However, western style bankruptcy law was introduced in 2006. Subsequently, specialized bankruptcy courts were introduced in two waves across the country starting in 2014 with their introduction in 11 relatively developed provinces followed in 2016 by their introduction in the remaining provinces.[8] These reforms appeared to have tangible effect at about the same time that the deleveraging campaign was being emphasized by senior officials. Figure 8 reports the numbers of bankruptcy petitions accepted annually as well as the number of cases resolved between 2008 and 2018. There was a perceptible uptick of new case in 2015 and explosion of cases subsequently in 2017 and 2018.

A similar story is told by statistics debt service histories of bond issuers. Table 5

[8]See, Li and Ponticelli, 2019. In 2014 the specialised courts were rolled out in Anhui, Beijing, Guangdong, Hebei, Hubei, Hunan, Jiangsu, Jilin, Shanghai, Tianjin, and Zhejiang. Li and Pontecelli refer to the 2016 roll-out as the second phase of bankruptcy court reform since some experimentation with specialised courts took place in selected cities from 2007.

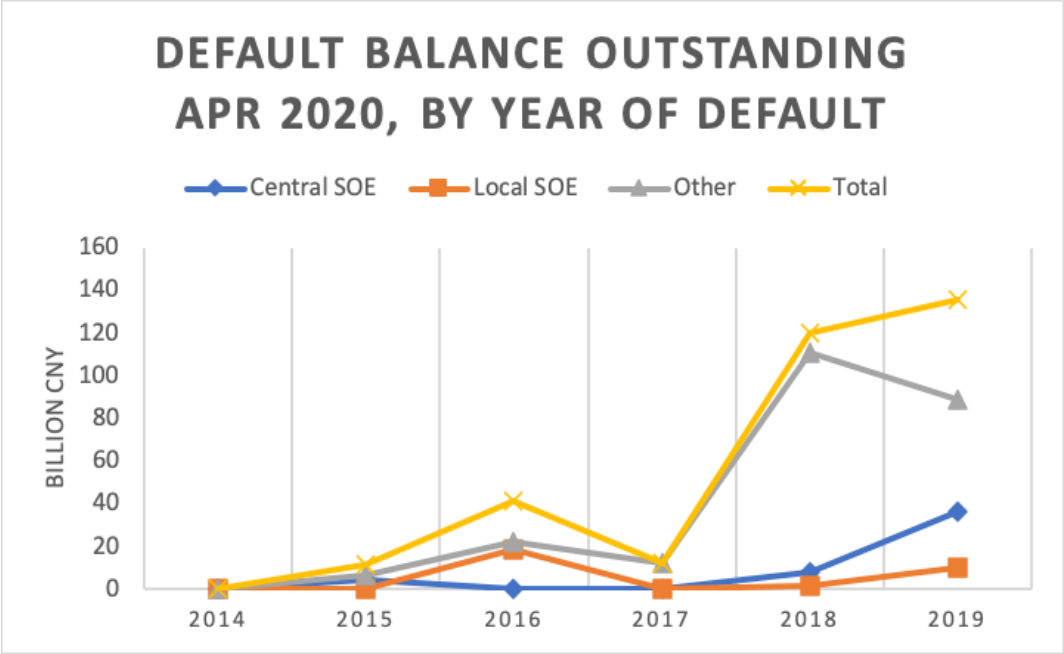

Figure 9:

summarizes the number of first defaults (first occurrence of a failure to make payment or principal payment on schedule) by bond issuers. Warning signs of the change of treatment of debt issuers came in 2015 when 25 private bond issuers defaulted, a fivefold increase from 2014. The tightening of discipline on borrowers became very clear in 2016 when there were a further 29 first-time defaults including for the first time defaults by some LSOE's. Figure 9 gives the scale of the defaults by reporting the total amount of defaulted securities still outstanding in 2020 reported by year of the issuer's first default. This shows that formal bond defaults have been mainly concentrated among private enterprises. Despite widespread reporting of financial stress of central and local SOE's with a few exceptions, judicial bankruptcy has been used to resolve non-state-owned firms. This is consistent with the view that evolution of credit spreads seen in Figure 7 reflects the change in credit risk borne by investors in bond of different classes. Overall, this evidence from bankruptcies and defaults suggests that over the course of 2017 and 2018 investors learned that the force of the deleveraging campaign's discipline would be felt principally in the market segments where private issue paper not related to infrastructure is dominant. This seems to be a very plausible explanation for the increase over this period in Figure 7 in average credit spreads for corporate, non-construction bonds relative to those of enterprise, construction bonds.

This interpretation emphasises the importance of implicit government guarantees as

a major driving force for the pricing of credit in China between 2015 and 2019. A short version of this view is that the reliance on infrastructure spending to support continued growth over 2008 to 2014 gave rise to a general expectation of open-ended government backing for most if not all of non-financial enterprise issues. In the face of this, starting in 2015 central authorities put in motion a variety of policies that effectively reformed local public finances while at the same time curbing expectations of debt bail-outs. The solution was to restrict guarantees to issues with a clear demonstrable link to a government sponsor while at the same time letting a larger number of distressed issues to be resolved in a decentralised way through judicial bankruptcy. This shifted the risks of future defaults for corporate issues of private firms more squarely onto creditors. Over time this increasingly came to be reflected in credit spreads.

While this interpretation based on semi-aggregative statistics from the China's non-financial bond market seems very plausible, it is of course possible that changes in other market relevant factors might have accounted for some or perhaps all of the evolution of credit spreads seen in Figure 7. For example, it could be that the composition of the outstanding of issues of corporate bonds has shifted toward riskier firms or more illiquid issues. In order to deal with these possibilities, I turn to multivariate statistical analysis the next section.

4 Regression Analysis

In this section I study the pricing in China's enterprise and corporate bond markets using a large, disaggregated data set covering individual bond issues traded between April 2015 and October 2019. The data include a wide number of specific issue characteristics and issuer characteristics that allow an assessment of the relative contribution of factors generally used as proxies for credit and market liquidity risk. In addition, the analysis of Section 3 has suggested the hypothesis that macroprudential policies of Chinese authorities have had very different effects on different segments of the bond market. To explore this, I adopt a formulation that allows for segmentation in two dimensions depending upon type of bond (enterprise or corporate) and type of investment purpose (infrastructure or other).

Table 6 summarizes the variables that are used in our regressions. The data set is described in more detail in Appendix A. The measure of bond pricing is the spread of the issue measured as yield to maturity on a particular issue less the yield to maturity of a domestic treasury bond with the same remaining time to maturity. The yields of enterprise or corporate issues are those reported by China Securities Index Ltd (CSI)

which is the major data provider in China and is a joint initiative of the Shanghai and Shenzhen stock exchanges. The monthly yield of the issue is taken as the daily close on the last trading day in each month. Treasury yields are obtained by linear interpolation of the Wind constant maturity treasury yield time series, also read on the last trading day of each month.

The explanatory variables used are grouped in Table 6 by general effects for which the variables serve as proxies. As discussed in detail in Section 3, a major issue in credit evaluation in China is to gauge the strength of guarantees, either explicit or implicit, that may be provided by a governmental unit or some other third party. Three variables are used to capture this. Construction is a binary variable equal to 1 if the issue is an city construction bond. GuaranteeYN is a binary variable equal to 1 if the issue carries an explicit third-party guarantee. ConstGuar is the interaction term which equals 1 for construction bonds carrying explicit guarantees. In order control for the possibility that issue riskiness may depend the issuer type, binary variables are introduced depending upon registration type of issuer (joint venture, central state-owned enterprise, etc). Both enterprise and corporate bonds are generally rated, typically by a single domestic rating agency. Chinese ratings are concentrated with almost all issues that are not in distress classified in the AAA to AA range. Historically, down-grades have been relatively infrequent among bonds outside of severe distress and typically occur at the point where bonds are no longer actively traded. Accordingly, ratings are represented with four binary variables (AAA, AA+, AA, AA-) based on rating at time of issue.

Information from issuers' financial reports is incorporated by a number of analysts' ratios grouped under the general heading of credit analysis. These are often used as inputs into a variety scoring models or other models used in credit risk analysis. It should be noted that many of the firms issuing bonds included in the data set are not listed. This point applies in particular to bonds issued by LSOE's. As a result, it is not possible to incorporate stock price-based indicators employed in some credit risk models used in other settings where there is a closer link between the entity issuing the bond and a listed firm.

Market liquidity is proxied through issuer size as measured by total registered capital and by issue size as measured by total original principal. The issue age variable is included to take into account of possible on-the-run effects. Time to maturity is included to allow the possible uptick in trading activity near maturity driven by clientele effects.

Two other variables enter as controls for particular effects. Contractual coupon is included as a proxy for the market expectation at the time of issuance of future credit

Table 6: Variable Descriptions

Group	Variable name	Description
Dependent variable	spread	yield to maturity on bond on last trading day of month less yield on treasury bond with time to maturity
Guarantee class	Construction	=1 if Urban Construction issue
	GuaranteeYN	= 1 if 3rd party guarantte
	ConstructionGuar	Construction*GuaranteeYN
Issuer type	CoTypeNo	1 JV, 2 CSOE, 3 Public, 4 Other SOE, 5 Other, 6 LSOE, 7 Foreign, 8 Private
Rating	Issuerrating	1 AAA, 2 AA+, 3 AA, 4 AA-
Credit analysis	roe	return on equity
	roa	return on assets
	rorev	net return/ operating revenue
	catarat	current assets/total assets
	leval	total liabilities/total assets
	debtcap	total debt/equity
	derat	total debt/total assets
	quickrat	quick ratio
	cashrate	cash ratio
Market liquidity	registeredcapital	issuer size (total capital)
	issueamount	issue size (original principal)
	timetomat	time to maturity
Other	coupon	contractual interest rate
	Phase2	=1 if issuer from province in Phase 2 bankruptcy zone

Source: WIND

risk and market liquidity of the issue. Finally, the variable Phase2 is a binary variable that takes the value of 1 if the issuer is legally registered in a province included in Phase 2 of the roll-out of specialized bankruptcy courts as discussed in Section 3.

The regression models are estimated by least squares, and hypothesis tests are based on heteroscedasticity-adjusted standards errors clustered by province of registration of the issuing firm. Other approaches based on alternative clustering arrangements such as industrial sector of issuer or issuer's registration type were tried. The results reported are more conservative than those alternatives in the sense that they typically gave rise to lower t-ratios than the alternatives. All regressions reported here include month fixed effects to allow for general time variation of other factors. I return to the interpretation of the time fixed effects below.[9]

The main results of our regression analysis are summarised in Table 7. The benchmark models which include the full range of explanatory variables are run for enterprise bonds and corporate bonds separately and are reported in columns 1 and 3 respectively. For readability this table omits detailed estimates regarding company type, ratings, analysts' credit risk proxies, and market liquidity proxies. Instead it includes p-values of robust F-tests of the restricted model obtained by dropping all the explanatory variables within these four subgroups of variables. The detailed coefficient estimates and t-tests are reported in Appendix C.

There are marked differences between the enterprise and corporate results both in the values and significance of coefficient estimates and in the goodness of fit.[10] Company type is significant in the enterprise model but insignificant in the corporate model. Similarly, the market liquidity proxies are significant as a group for enterprise bonds but not for corporate bonds. In contrast, credit analysts' ratios are insignificant for enterprise bonds but are significant for corporate bonds.

Turning to the detailed parameter estimates regarding guarantees, the coefficients estimates for the construction dummy are negative, large and highly significant in both the enterprise and corporate regressions. That is, all else equal, bond issues for infrastructure projects have significantly lower credit spreads as compared to comparable non-infrastructure issues. The estimated discount is very large for enterprise bonds—more than 150 bps. For construction bonds the discount of 65 bps is still quite substantial. The results on explicit third-party guarantees differ across the two bond

[9]Alternative estimates based on linear time trends gave rather similar parameter estimates and pattern of significance for the other parameters of the model. However, they tended to have rather lower R-squares suggesting the general non-linear time effects were appropriate.

[10]The classical F test of the restriction of equality coefficients across the two models rejects the null with a very high level of significance.

Table 7: Summary of Benchmark Regressions and Hypothesis Tests

		1	2	3	4
		Enterprise bond		Corporate bond	
Guarantee status	Construction	-1.542***	-1.528***	-0.648***	-0.744***
		(-3.36)	(-3.40)	(-6.34)	(-6.94)
	GuaranteeYN	0.454	-0.227	-0.179	-0.172
		(1.31)	(-0.9)	(-1.58)	(-1.68)
	ConstGuar	-0.040	0.681***	0.628***	0.562***
		(-0.11)	(2.45)	(4.31)	-3.81
Other	coupon	0.253***	0.192***	0.669***	0.673***
		(7.64)	(6.93)	(9.04)	(9.71)
	Phase2	-0.361***	-0.399***	-0.174	
		(-3.82)	(-3.97)	(-1.11)	
Time fixed effect		✓	✓	✓	✓
Company type		✓	✓	✓	X
p-value		0.0179	0.0084	0.2625	
Rating		✓	✓	✓	✓
p-value		0.0000	0.0000	0.0000	0.0000
Credit analysis		✓	X	✓	✓
p-value		0.1861		0.0000	0.0000
Market liquidity		✓	✓	✓	X
p-value		0.012	0.005	0.1386	
Number of clusters		31	31	31	31
Nobs		87,332	95,571	32,300	32,407
R-squared		0.308	0.3039	0.212	0.206

segments. For enterprise bonds, both the third-party guarantee dummy and the interaction of explicit guarantee and construction dummy are insignificant. For corporates, the third-party guarantee dummy is negative but insignificant while the interaction term is positive significant. As expected, the estimates of the coefficient of contract coupon is positive and highly significant. Finally, the dummy on bankruptcy zone is significantly negative for the enterprise bonds but insignificant for corporate bonds. Overall, the enterprise model has a better fit than does the corporate model.

In order to give an indication of the robustness of the results in the benchmark regressions, Table 7 reports the results when the sub-groups of variables that were found to be insignificant in the benchmark models are dropped. The results are given in columns 2 and 4 of Table 6 and in the detailed results in Appendix B. The main results from the benchmark models carry over to the restricted models. For enterprise

bonds, when credit analysis proxies are omitted, company type, rating and market liquidity proxies all remain significant and the point estimates of the remaining parameters are very similar to those of the unrestricted model. The only exception is the interaction of the construction and explicit guarantee dummies which is now positive and significant. For construction bonds, dropping company type, market liquidity proxies and the bankruptcy region dummy leads to hardly any change in the remaining variables estimates.

It is useful to consider the interpretation of the results in Table 7 in light of the discussions in Section 2 and 3 . The fact that the credit risk proxies proved to be insignificant the enterprise regression is not surprising. As seen in Section 3, enterprise bonds are mostly issued by SOE's, and among these LSOE's are most prominent. Although many CSOE's are listed, most LSOE's are not. In particular, the LGFV's which historically were the big issuers of enterprise bonds for local governments are rarely themselves traded on stock exchanges. As a result, the financial reports of the issuing firm first may not meet the reporting standards required of listed firms and second may not be a good indication of the financial resources that could be mobilised if ever the issue were to come under stress. It is best to think of the LGFV's issuers as one subsidiary within a much larger group involving other LSOE's as well as potentially the fiscal resources of the sponsoring local governments. In particular, it should be pointed out that many local governments sponsored a number of commercial and industrial enterprise as early as the period of the 'grasping the large and releasing the small' reforms. Often the values of the shares of these firms appear on the financial statements of the local governments at book value. If these shares were sold off a current market value either on the public stock market or in a private sale, they may yield significant capital gains. Furthermore, over time the rules for the retention of earnings of SOE's have been changed by central authorities from time to time. In particular, during in 2019 as the trade tensions with the US ran high, the share of SOE's earning that were transferred to national treasury were reduced, leaving a greater share to be distributed to local uses possibly including debt service of LGFV's.[11] All of this suggests that Financial Statement of the specific issuer of an enterprise bond may not be very informative about underlying financial strength. For corporate bonds, however, most issuers are listed and many of these are private. They might be subsidiaries within

[11]There are many other ways that fiscal transfers can be made within a local government and between the central government and a local government. See, eg,Guo Yingzhe and Cheng Siwei, "China Scraps Metric for Local Government Tax Revenues as Cuts Bite," Caixin Global, January 21, 2020 and Cheng Siwei and Guo Yingzhe, "China Greenlights Use of Local Government Bonds to Recapitalize Small Banks," Caixin Global, July 2, 2020.

a larger group, but any infusions of capital from the group are likely to be decided on a commercial basis. Thus, their effective financial strength will be more accurately reflected in their audited financial reports of the issuing entity.

This discussion is related to the interpretation of the fact that the Phase2 dummy was negative and significant statistically and economically for enterprise issues but insignificant for corporate issues. The Phase 2 provinces— Anhui, Beijing, Guangdong, Hebei, Hubei, Hunan, Jiangsu, Jilin, Shanghai, Tianjin, and Zhejiang—are the most developed regions of China from the point of view of GDP per capita as well as many measures of industrial and administrative development. These are areas with strong local governments from which many of their former chief administrators have moved on to powerful positions in Beijing. This is a source of fiscal strength for local governments in these areas and thus indirectly for the issuers of the bonds supporting infrastructure investments located there. These resources do not automatically benefit a private issuer, and, if they do, they should be reflected in the financial performance of the issuing firm.

The results on ratings deserve some comment. As a whole ratings dummies are highly significant in both the enterprise and corporate regressions. In the detailed results of Appendix B, the individual coefficients are all highly significant and the point estimates are positive and ordered so that the coefficient of the AA dummy is greater than that of the AA+ dummy. All of this might be viewed as what we would expect. In fact, it is slightly surprising in the Chinese context where domestic ratings have often been criticised as being largely uninformative. The results here suggest that Chinese ratings are at least somewhat informative and mean what they say.

Finally, the monthly time fixed effects of the benchmark regressions are plotted in Figure 10. The time effects as a whole where significant in both the enterprise and corporate regressions. Furthermore, they display clearly divergent patterns. Overall, the time effects in the corporate bond regressions have tended to increase over the four years following April 2015 and stood at 300 bps in April 2019. In contrast, the monthly effects in the enterprise regression decline initially reaching -86 bps in November 2016. Subsequently they rose relatively moderately and stood at 68 bps in April 2019.

The time fixed effects from the benchmark regressions tells us something about the evolution of expectations of risks in these two market segments after controlling for standard credit and liquidity risk measures as well as whether the bond was used to fund infrastructure. It is interesting to compare these conditional estimates with Figure 7 which plotted average yields to maturity for the main segments of the enterprise and corporate bond markets without conditioning on other factors. The patterns

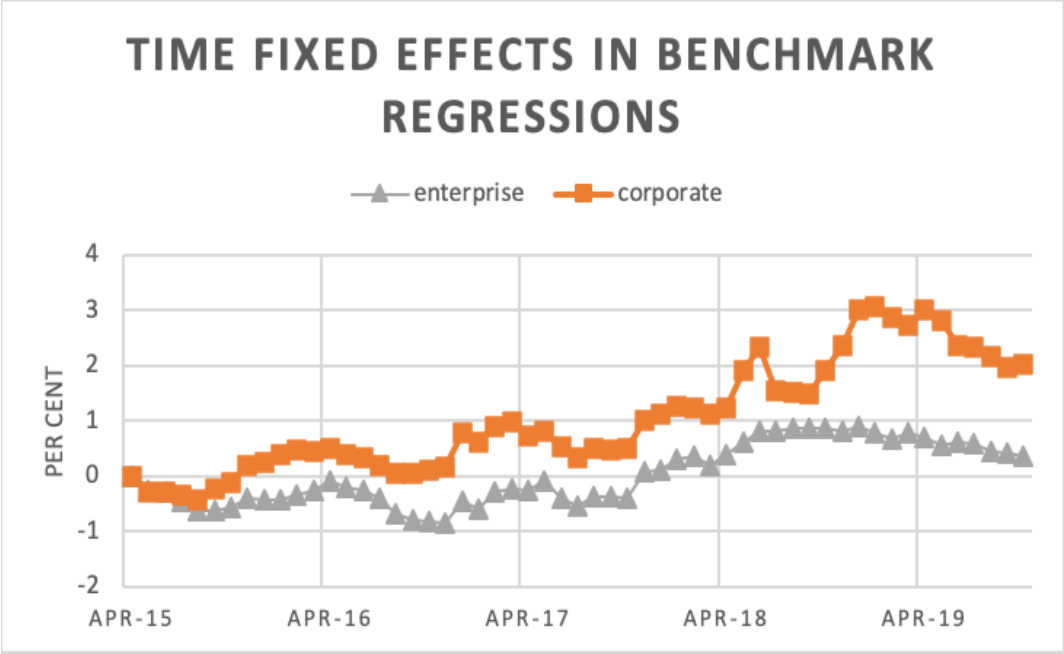

Figure 10:

are remarkably similar in Figures 7 and 10. Thus controlling for measures of firm profitability, leverage, balance sheet liquidity and market liquidity, leaves us with the same distinctive pattern of rising spreads in the corporate bond market relative to the enterprise market.

This is displayed explicitly in Figure 11 where I have plotted the difference of the expected spreads in the corporate bond market versus the enterprise bond market for the unconditional estimates (Figure 7) and the conditional estimates (Figure 10) separately. Both series display clear upward trends between April 2015 and April 2019. This is strong evidence of a repricing of risks by creditors between enterprise bond markets which are dominated by SOE's versus corporate bond markets where private issuers are most prominent. This tends to support the hypothesis expressed in Section 3: first, that the multiple measures taken by the Chinese authorities to restrict public sector backing of debt issues to a narrower range of issuers where government entities exert greater control and, second, private issuers would be left exposed to the discipline of the market including the prospect of judicial bankruptcy in the case of severe distress.

These results show how the sharing of risk in the market has evolved over time under the influence of continuing structural reforms that have been coordinated with macroprudential policies aimed at sustaining China's high growth rates. In the next

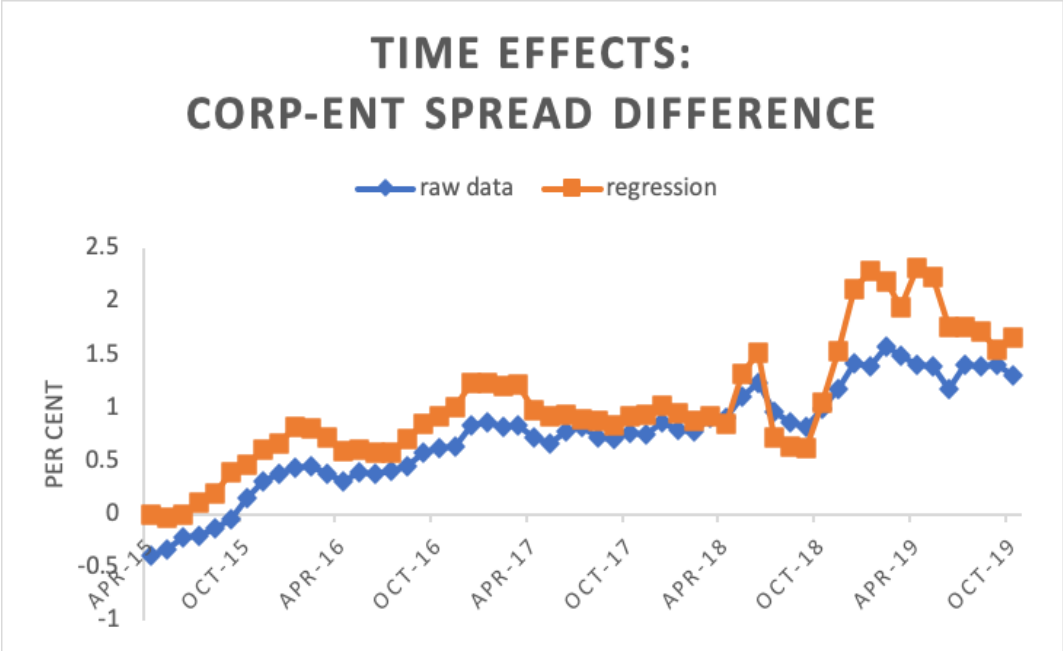

Figure 11:

section I will sharpen this argument by developing a structural model of selective public guarantees. I then calibrate this model for the policy change taken in 2015, and see to what extent this action can account for the observed divergence in the spreads as depicted in Figure 11.

5 Modelling Conditional Guarantees

5.1 Inefficient Bankruptcy and State Guarantees

I consider a firm which can invest in a technology that will generate revenues each period for the indefinite future until such time that it defaults on contractual debt payments. Upon default it enters into a costly bankruptcy procedure. To focus on the consequences of costly bankruptcy I consider the extreme case where any default leads to the liquidation of the firm with 100 per cent loss of any current and all future cash flows. In order to mitigate the consequences of this inefficiency of the bankruptcy process the state may intervene by providing bail-outs that cover the short-fall between current cash flows and contractual debt service, up to some pre-set maximum.

The assumption of 100 per cent loss given default is extreme. However, examples of institutional settings with weak contract and bankruptcy law and/or inefficient or

corrupt judiciary are not uncommon. When this is the case large losses in bankruptcy are widespread. For example, Arner *et al* (2007) survey creditor rights and insolvency protections in East Asia. They classify 11 national systems on an increasing scale of 1 to 5 with respect to enforcement of unsecured rights, security interest legislation, registration and disclosure of secured rights, and enforcement of secured rights. Hong Kong and and Singapore are taken as a reference with each of these systems rated 5 with respect to enforcement of secured and unsecured creditor rights and 4 with respect to the legislation, registration and disclosure. Their ratings suggest that bankruptcy law and practice elsewhere in East Asia was quite weak in the early 21st century. Cambodia and Vietnam were rated 1 in all categories. Indonesia was rated 1 or 2. And China was rated 2 in all four categories.

The weakness of bankruptcy regimes is not restricted to East Asia. In a large, case study (Djankov *et al*, 2008) make a worldwide comparison of the efficiency of resolution of a hypothetical firm in financial distress. They find that with the exception of a small number of countries with high income *per capita* resolutions regimes are generally inefficient with respect to their ability to resolve the firm quickly, restore it as a going concern, and do so without excessive direct cost. In particular, for China they find an overall efficiency rating of 43 % . This is somewhat better than the average for lower, middle-income countries as a whole (35%) but much lower than Singapore (96%), the UK (92%) and Hong Kong (88%). In the face of such weak institutional frameworks, it is understandable why agents do not rely on judicial bankruptcy. In these settings, other, stronger organisms of the state may intervene *ex post* to mitigate the consequences of poor cash flows for firms that may otherwise be viable. This is the phenomenon of *soft budget constraints* as described by Janos Kornai in the context of socialist or ex-socialist economies.

5.2 Model

Consider a firm which for an investment cost, I, could acquire a technology that would produce a random cash flow, y_t for each period $t = 1, 2, ...$ in the future as long as the firm avoids defaulting on any contractual debt claims the firm may have incurred. The cash flows are perishable so that all earnings after debt service are paid out in dividends.

5.2.1 Valuing equity and debt in the absence of subsidies

Assume that if the firm is alive at the start of period t, y_t is drawn from a uniform distribution $U(0,1)$ which is independent of previous history. Thus the expected cashflow in that period is

$$E(y_t|alive) = \int_0^1 ydy = \frac{1}{2} \tag{2}$$

Suppose the entrepreneur with this technology was able to cover the initial investment I, and thus has 100 per cent of equity in the firm and zero debt outstanding. Then the probability of survival of the all equity firm is 1 each period. Assume that the default risk-free rate of interest is $r > 0$ and the entrepreneur is risk neutral. Then the value of the all equity firm, V is,[12]

$$V = \sum_{t=1}^{\infty} \frac{.5}{(1+r)^t} = \frac{0.5}{r} \tag{3}$$

Now, instead, suppose that the entrepreneur is penniless and needs to fund I through the issue of debt which takes the form of a perpetual promise to pay c per period. Note that c is expressed as a cash flow, that is, in the same units as the output y_t. As already discussed, bankruptcy is very costly. Specifically, we assume that if, at any time t current cash flows $y_t < c$, the firm defaults and is liquidated. No further cash flows are paid either to the creditor or to the shareholder. It follows then that if the firm is still alive at the start of period t, expected payoff to the creditor in that period is $prob(y_t \geq c)c$. The expected payoffs to the shareholder in period t are $prob(y_t \geq c)E(y_t - c|y_t \geq c)$.

Assume as above that the distribution of cash flow in t conditional on surviving through $t-1$ is independent and identical in all t. Then write the probability of surviving t conditional upon having survived through $t-1$ as $p \equiv prob(y \geq c)$. Further assume that debt is issued to a risk neutral creditor. Given the risk-free interest rate is $r > 0$, then it can be shown that the value of the debt at time $t = 0$ is given by,

$$b = \frac{c(1-c)}{r+c} \tag{4}$$

Note that $b(0) = 0 = b(1)$. $b(c)$ is increasing at $c = 0$. It is concave over $c \in [0,1]$ and attains a maximum at $c^* = -r + \sqrt{r^2 + r}$. $b(c^*)$ can be interpreted as the firm's *debt capacity*. It can be shown that the value of the firm's debt capacity can be expressed

[12]Proofs of this expression and others in this Section are given in the Appendix B

as,

$$b(c^*) = 1 + 2r - 2\sqrt{r^2 + r} \tag{5}$$

This can be expressed as a fraction of the all equity firm value by using equation (3) to find,

$$\frac{b(c^*)}{V} = 2r + 4r^2 - 4\sqrt{r^2 + r} \equiv cap \tag{6}$$

This is increasing in r, tends toward 0 as $r \to 0$ and at $r = 1$ equals approximately 0.3431. Given the cashflow process, y_t, is assumed to be stationary, it is natural to interpret r as a real rate of interest. Thus, values of r slightly above 0 are most plausible, in which case this result shows us that the debt capacity of the firm is only a very small fraction of the investment cost I at which the firm would be break-even for the entrepreneur absent cash constraints. For example, with 2 per cent real rate ($r = 0.02$), the cash constrained entrepreneur could borrow a maximum of only about 3 per cent of the investment cost of a project that would be break-even for the entrepreneur in the absence of cash constraints.

To find the value of equity of the levered firm the discounted value of expected future cash flows of the firm in period $t = 0$ given by,

$$e = \frac{0.5(1 - c)^2}{r + c} \tag{7}$$

Equity of the levered firm is a decreasing and convex function of c over the economically relevant region.

Combining these results we have the value of levered firm

$$V = b + e = \frac{0.5(1 - c^2)}{r + c} \tag{8}$$

This is decreasing in c and takes on the value of $.5/r$ if $c = 0$, as seen above in the case of the unlevered firm. When $c = 1$ the value of the firm goes to zero. In short, this analysis makes a basic, simple point. In the face of a very inefficient bankruptcy regime, heavy reliance on debt can be a very large impediment to undertaking productive investments and thus extremely socially wasteful. This suggests that there are potential big gains to be attained if improving the bankruptcy regime is possible. However, if such institution building is difficult to achieve for some reason, it also suggests that perhaps substitutes for judicial bankruptcy may be alternative ways of mitigate these inefficiecies.

5.2.2 Costly bankruptcy and state guarantees

I now augment the model of the levered firm by allowing for state guarantees. Specifically, I assume that the state stands ready support the distressed firm at time t by paying a subsidy $s_t = c - y_t$ up to a maximum $\hat{s} \leq c$. Thus if $c - \hat{s} \leq y_t \leq c$, the creditor receives c, the shareholder receives 0, but the firm lives to continue to $t+1$. If $y_t < c - \hat{s}$, the firm is bankrupt and is liquidated with no further cash flows paid out either to the creditor or the shareholder.

Under these assumptions the probability the firm survives in period t is

$$prob(y_t \geq c - \hat{s}) = \int_{c-\hat{s}}^{1} dy = 1 - c + \hat{s} \equiv p^* \tag{9}$$

Note that at this stage we assume the maximum per period subsidy is a fixed constant so that the conditional probability of survival, p^*, is a constant also.

Given this, the values of debt and equity can be found along similar developments as for the levered firm in the absence of guarantees. The value of debt is,

$$b^* = \frac{c(1 - c + \hat{s})}{r + c - \hat{s}} \tag{10}$$

This is increasing in $\hat{s}$ for $\hat{s} \in [0, c]$. Recall that for the levered firm absent subsidies, as c is increased in the interval $[0, 1]$ the value of debt initially rises, reaches debt capacity, and then falls monotonically to 0. Under the regime of state subsidies this is somewhat more complicated. For low $\hat{s}$ the value of debt is initially increasing, attains a maximum and then declines as c is increased in the interval $[\hat{s}, 1]$. However, for $\hat{s}$ sufficiently large, debt value declines monotonically in c in $[\hat{s}, 1]$.

Turning to the valuation of equity, for a firm still alive at the beginning of period t then, conditional upon surviving in period t, expected payment to the shareholder that period is,

$$\frac{1}{1 - c + \hat{s}} \int_{c-\hat{s}}^{1} (max(y - c, o))dy = \frac{.5(1 - c)^2}{1 - c + \hat{s}} \tag{11}$$

Using this, the value of equity under this regime with debt bailouts becomes,

$$e^* = \frac{.5(1 - c)^2}{r + c - \hat{s}} \tag{12}$$

This is decreasing in c for $c \in (0, 1)$. It is increasing in $\hat{s}$ for $\hat{s} \in [0, c]$.

Combining the results for the value of debt and the value of equity gives the value

of the levered firm in the presence of state debt bailouts,

$$V^* = b^* + e^* = (\frac{c(1-c+\hat{s}) + .5(1-c)^2}{r+c-\hat{s}}) \\ = \frac{.5 - .5c^2 + c\hat{s}}{r+c-\hat{s}} \tag{13}$$

This takes on the value of the levered firm as in Equation (8) when $\hat{s} = 0$. It is increasing in $\hat{s}$ for $\hat{s} \in [0, c]$. This takes on the value of the unlevered firm as in Equation (3) when $\hat{s} = c = 0$.

I now assess the value of cash flows for the state for given values of c, r and $\hat{s}$. Assuming the firm is alive at the start of period t the state will have non-zero cash flows in that period if $c - \hat{s} \leq y_t \leq c$. The conditional expectation of the state's cash flows is,

$$\frac{1}{1-c+\hat{s}} \int_{c-\hat{s}}^{c} (y-c)dy = \frac{-.5\hat{s}^2}{1-c+\hat{s}} \tag{14}$$

Again, this characterisation is valid only for $0 \leq c - \hat{s} \leq 1$. On that assumption we can express the fair value of expected cash flows to the state as,

$$s^* = \frac{-.5\hat{s}^2}{r+c-\hat{s}} \tag{15}$$

This is decreasing in $\hat{s}$ over $\hat{s} \leq c$. If we combine this with the value of the firm above we obtain a measure of the total surplus, TS, given by,

$$TS = b^* + e^* + s^* = \frac{.5(1-(c-\hat{s})^2)}{r+c-\hat{s}} \tag{16}$$

5.2.3 Optimal state guarantees in the face of inefficient bankruptcy

I now turn to the question of how the state will choose maximum guarantees, $\hat{s}$, in the face of a weak bankruptcy regime. Consider first the problem of a central planner who could fix both $\hat{s}$ and c. Furthermore, the planner knows the investment cost, I, needed to start this firm. Equation (16) tells us that by setting $c = \hat{s}$ for any $\hat{s} \in [0, 1]$ the firm would produce a total social surplus of $.5/r$. Thus the planner could maximise total surplus net of investment cost by undertaking the project so long as $0.5/r \geq I$ and selecting a capital structure such that $c = \hat{s}$ with $\hat{s} \in [0, 1]$. This describes the first-best solution.

Given this reference, now consider the problem of the state trying to implement the best policy that can be obtained by fixing a maximum per period guarantee, $\hat{s}$, that will be provided to a levered firm with a funding cost I that is known to both the firm and

the state. I assume the state would reject any project that would have negative NPV for the entrepreneur were he not cash constrained. Thus we consider only projects with positive social NPV in the sense that $I \leq \frac{.5}{r}$. Under this assumption, the state sets the parameter $\hat{s}$ in the guarantee program offered to the firm. Given this, the entrepreneur will solve the problem of choosing c to maximise the value of equity subject to the rules of the subsidy program and the funding constraint that the value of debt is sufficient to cover investment cost. That is, the entrepreneur first-stage problem is,

$$\begin{aligned} maximise_c \quad & e(c, \hat{s}) = \tfrac{.5(1-c)^2}{r+c-\hat{s}} \\ s.t. \quad & c \geq \hat{s} \\ and \quad & b(c, \hat{s}) \geq I \end{aligned} \tag{17}$$

Let $c^*(\hat{s})$ be the solution if it exists. Then the entrepreneur's second stage problem is to issue debt and invest if $c^*(\hat{s})$ exists and

$$e(c^*(\hat{s}), \hat{s}) + b(c^*(\hat{s}), \hat{s}) - I \geq 0 \tag{18}$$

Then the state's problem is to choose a maximum subsidy $\hat{s}$ to maximise the total surplus net of investment cost subject to the constraint that the firm solving (17) and (18) undertakes the project. That is, the state solves: choose $\hat{s}$ to maximise $[TS(c, \hat{s}) - I]$ subject to (16), (17) and (18).

To understand the state's problem, first recall that by equation (12) the value of equity is decreasing in c. Thus given $\hat{s}$, the firm will choose the smallest value of $c \in [\hat{s}, 1]$ that satisfies the funding constraint in (17). Suppose that the state sets $\hat{s}$ at a very low level. In that case the value of riskless debt would be $\hat{s}/r$. Thus all the projects with $I \in (\hat{s}/r - .5/r]$ would require the firm to issue risky debt ($c > \hat{s}$) to try to cover investment cost. For some projects with I slightly above $\hat{s}/r$, this will be feasible. In these cases the firm sets some $c > \hat{s}$, risky debt will be issued that just covers the investment cost, and the project will be undertaken. However, for $\hat{s}$ set at this low level there still will be a wide rage of positive NPV projects which cannot be financed even with risky debt. Thus to incentivise undertaking a wider range of projects the state would need to raise $\hat{s}$. As $\hat{s}$ is increased, the state will cover a range of projects that can be implemented with risky debt. However, as shown in the previous subsection, at some point the value of subsidised debt becomes strictly decreasing in $c \in (\hat{s}, 1)$. Thus for some relatively costly projects, (i.e., with positive but relatively small NPV) it will be feasible to fund the project only with relatively high subsidies and riskless

debt ($c = \hat{s}$). By setting $\hat{s}$ at these relatively high levels, the firm will choose to issue riskless debt ($c = \hat{s}$) whose value is equal to *or greater than* the investment cost I. I will return to this last point below.

These results can be summarised as,

Proposition 1. *Given $r > 0$ and $I \in (0, .5/r]$, there exist two threshold values $\hat{s}_1$ and $\hat{s}_2$ with $0 \leq \hat{s}_1 \leq \hat{s}_2 \leq 1$ such that*

- *if $\hat{s} < \hat{s}_1$ the firm will not issue debt and will not undertake the project and $TS = 0$*
- *if $\hat{s}_1 < \hat{s} < \hat{s}_2$ the firm will undertake the project by issuing risky debt with some $c > \hat{s}$ such that $b(c, \hat{s}) = I$, $TS < .5/r$, and*
- *if $\hat{s}_2 \leq \hat{s} \leq 1$ the firm will undertake the project by issuing riskless debt with some $c = \hat{s}$ such that $b(\hat{s}, \hat{s}) \geq I$, $TS = .5/r$,*

One notable thing about this result is that there is a range of maximum subsidies that all give rise to riskless debt and attain the maximum total surplus. Under the assumptions made here nothing suggests that the state would prefer one particular value of the parameter $\hat{s}$ in that range over another. This is the consequence of the fact that in deriving total surplus as given in Equation (16) we have implicitly assumed a frictionless tax system that would allow the state to make large transfers as easily as small transfers.

Now if one steps away slightly from the assumptions of this model, many would probably argue that in reality there are costs to raising taxes and making transfers and that these costs are probably increasing in the size of the transfers involved. If this is correct, then that might argue that the state should have a preference for keeping subsidies as low as it 'reasonably' can do. For example, this might argue for setting $\hat{s} = \hat{s}_2$ so that the value of debt just meets the meets the funding constraint and $TS = .5/r$). Alternatively, by making an assumption about the costliness of fiscal transfers one could build that into the calculation of the constrained optimal $\hat{s}$ which might lead to risky debt and to a level of total surplus strictly less than $.5/r$.

Another way in which one may regard the model as too stylised is in assuming that the state has perfect information the about cost of investment, I. In practice, there may be some firms where these state is relatively well-informed, but in many cases it is not. Offering access to state guarantees in both cases could have possibly perverse results. For example, assume that the state knows for a fact that the cost of investment technology for some firms I. For other firms, which have access to the same technology the state is unsure of the investment's cost. To be concrete suppose, these costs may be either I_{lo} or I_{hi} with $I_{lo} < I < I_{hi}$. If is attempts to implement a subsidy system as

above by reference to the firm it knows well, it might set $\hat{s}$ so that $b(\hat{s}, \hat{s}) = I$. In that case, a firm with I_{hi} will either take up the project by issuing risky debt or will pass up the project altogether. In contrast, for a firm with I_{lo}, it will take up the project by issuing debt with $c = \hat{s}$. This means that at the outset of the project it has available a surplus of $b(\hat{s}, \hat{s}) - I_{lo}$ which is available to be paid out as an exceptional "dividend". Suppose this more productive firm (at least, relative to the firm whose investment cost is I) could use these resources to develop another project with where it would be similarly productive, i.e., it would have investment cost l_{lo}. If this project would also qualify access to the system of subsidised loans, the firm could again borrow at a privileged rate r, and this would result in a second exceptional dividend $b(\hat{s}, \hat{s}) - I_{lo}$. From this point the firm might try to repeat the process again and again, and in so doing accumulate a massive amount of assets all through its advantage in aggressively exploiting a subsidy system that had been tailored to some firms less productive than themselves.

This account might strike some readers as a somewhat fanciful prospect. However, in China something like this process may have contributed to a number of well-known cases of commercial groups which have used their privileged access to state-supported finance to grow at a fantastic pace but subsequently fell into an equally dramatic decline once authorities recognised the scale of risks they had implicitly assumed. It does suggest that if the state is to make use of a program of partial subsidies as set out here, it would wish to restrict it to technologies and firms that it knows relatively well. This might capture something of the reasoning that led to the reforms in the funding of infrastructure and in local public finance which were initiated in 2015 as described in Sections 2 and 3 above.

5.2.4 Changing level of state guarantees

Following on the discussion of the previous subsection I now adapt the analysis of the partial state debt guarantees to allow for changing of the parameters of the system over time. The extension is a simple one: the state establishes a subsidy scheme whereby it commits to change the maximum subsidy rate at some given date in the future. In particular, suppose that at time $t = 0$ the state agrees a subsidy arrangement with the firm. Under the arrangement the firm can fund its investment by issuing a perpetual debt contract with a contractual debt service c. The state will guarantee payment of debt with a maximum debt guarantee $\hat{s}_1$ at dates $t = 1, 2, ..., t_1 - 1$ and with a maximum debt guarantee of $\hat{s}_2$ for $t \geq t_1$.

Under these assumptions the value of debt will depend upon the parameters of the

system and also the time remaining until date t_1 when the maximum subsidy level will change. The one-period survival probabilities conditional upon the firm being alive at the start of the period are $p_1^* = 1 - c + \hat{s}_1$ for $t < t_1$ and $p_2^* = 1 - c + \hat{s}_2$ for $t \geq t_1$. Then the *ex coupon* value of debt for some date $\hat{t} < t_1$ when the firm is still alive can be written,

$$b(\hat{t}, \hat{s}_1, \hat{s}_2, t_1) = c\frac{p_1^*}{1+r} + .. + c(\frac{p_1^*}{1+r})^{t_1-1-\hat{t}} + c(\frac{p_1^*}{1+r})^{t_1-1-\hat{t}}\frac{p_2^*}{1+r} + ..$$
$$= c\sum_{\tau=1}^{t_1-1-\hat{t}}(d_1^*)^\tau + c(d_1^*)^{t_1-1-\hat{t}}\sum_{\tau=1}^{\infty}(d_2^*)^\tau \qquad (19)$$

where $d_1^* = \frac{p_1^*}{1+r}$ and $d_2^* = \frac{p_2^*}{1+r}$. For a firm still alive at $\hat{t} \geq t_1$ the *ex coupon* value of debt is,

$$b(\hat{t}, \hat{s}_1, \hat{s}_2, t_1) = c\sum_{\tau=1}^{\infty}(d_2^*)^\tau \qquad (20)$$

Note that for $\hat{t} \geq t_1$ the value of debt is independent of $\hat{t}$; whereas for $\hat{t} > t_1$ it varies as a function of $\hat{t}$. How the value of debt evolves as time passes and the firm is still alive will depend upon the relationship between p_1^* and p_2^*. This in turn will depend upon whether the guarantee level is increased or decreased at t_1, that is, whether $\hat{s}_1 < \hat{s}_2$ or $\hat{s}_1 > \hat{s}_2$. Substituting for d_2^* in (20) yields the value of debt for $\hat{t} \geq t_1$,

$$b(\hat{t}, \hat{s}_1, \hat{s}_1, t_1) = c\frac{p_2^*}{1+r-p_2^*} \qquad (21)$$

For $\hat{t} < t_1$, it can be shown that debt value can be written as,

$$b(\hat{t}, \hat{s}_1, \hat{s}_2, t_1) = c\sum_{\tau=1}^{t_1-1-\hat{t}}(d_1^*)^\tau + c(\frac{p_1^*}{1+r})^{(t_1-1-\hat{t})}\frac{p_2^*}{1+r-p_2^*}$$
$$= \frac{cp_1^*}{1+r-p_1^*} + \frac{c(p_1^*)^{t_1}}{(1+r)^{(t_1-1)}})(\frac{(1+r)}{p_1^*})^{\hat{t}}[\frac{p_2^*}{p_1^*(1+r-p_2^*)} - \frac{1}{(1+r-p_1^*)}] \qquad (22)$$

The value of debt for a firm alive will vary with time if $\hat{t} < t_1$. It can be shown that if $p_1^* > p_2^*$, the value of debt decreases as $\hat{t} \to t_1$. If $p_1^* < p_2^*$, then the value of debt increases as $\hat{t} \to t_1$.

Table 8: The Corporate/Enterprise Spread Difference

Dependent variables	monthraw b/t	monthreg b/t
rho-0-70	50.752***. (18.22)	59.828*** (9.60)
gov10	-13.165** (-2.17)	-46.717*** (-3.44)
liceic	0.017*** (5.47)	0.009 (1.25)
ssecomp	-0.000** (-2.28)	-0.000 (-0.27)
cons	-5.988*** (-10.71)	-5.119*** (-4.09)
R-sq	0.932	0.765
Nobs	55.000	55.000

The sample covers monthly observations between April 2015 and October 2019. The dependent variable *monthraw* is the difference between the monthly mean spread of corporate bond yields over the treasury yields with the same time to maturity and the monthly mean spread of enterprise bond yields over the treasury yield with the same time to maturity. The dependent variable *monthreg* is difference between the monthly fixed effects of the benchmark regressions of corporate bond yields and enterprise bond yields as reported in Appendix 2. The explanatory variables are: *rho-0-70*, the index of simulated yields to maturity under the hypothesised deleveraging policy as explained in the text; *gov10*, the yield on 10-year Chinese treasury bonds reported at month end; *liceic*, the CEIC index of leading indicators for China; and *ssecomp*, the Shanghai Stock Exchange composite A-shares index. The regressions are estimated by OLS. T-ratios are reported in parentheses. *, **, and *** indicates significant at the 10%, 5% and 1% levels respectively.

5.3 Using two-stage subsidies to account for observed evolution of corporate-enterprise bond spreads

I now examine whether the structural model set out in Section 5.2 can be calibrated to account for the evolution of spreads on enterprise bonds and corporate bonds in the period between 2015 and 2019 during which Chinese authorities were attempting to implement their announced deleveraging strategy. The variable we seek to explain is the spread difference either as depicted unconditionally as in Figure 7 or conditionally as in Figure 10 where I had used multiple regression to control for a wide variety of observable factors affecting solvency, liquidity, and levels of guarantee.

The key explanatory variable is based on using the bond value relationship in (22) which allows for a one-time change in the level of guarantees. Based on the discussion in Section 3, the hypothesis is that by the end of 2014 there was an a level of $\hat{s}$ prevailing that was specific to the enterprise market and another in the corporate bond market and that initially these subsidy levels were projected to apply indefinitely into the future. Then it is assumed that the authorities undertook a new policy that would gradually reduce or eliminate subsidies for the corporate bond segment. In the enterprise bond market segment it is assumed that subsidy levels would be unchanged and that deleveraging would be accomplished through quantity rationing, (e.g., restricting approvals by the NDRC).

For corporate bonds I assume that given an initial level of maximum subsidy $\hat{s}_1$ the authorities chose a cut-off date t_1 in the future at which time the maximum subsidy rate would pass to $\hat{s}_2 < \hat{s}_1$. Given values of $\hat{s}_1$, $\hat{s}_2$ and t_1, I construct an index number that can be calibrated to the monthly evolution of spreads over the 55 months from April 2015 and October 2019, the sample period used in the econometric estimations based on disaggregated bond spreads in Section 4. I express this index number in terms of yield to maturity, $\rho(\hat{t}, \hat{s}_1, \hat{s}_2, t_1) = \frac{c}{b(\hat{t}, \hat{s}_1, \hat{s}_2, t_1)}$.

This formulation is based on a stationary process for the idiosyncratic risk y, the underlying cash flows of the firm. In order to take this to the data I have combined the index together in a regression framework as follows,

$$\Delta_t = \alpha + \gamma\rho(t; \hat{s}_1, \hat{s}_2, t_1) + \beta x_t + \epsilon_t \tag{23}$$

Here Δ_t the difference between the corporate and enterprise spreads, $s_t^c - s_t^e$. I measure this in either of two ways. One way is based on the mean sample spreads for corporate bonds $j = c$ and enterprise $j = e$ subsets. The second way is based on multiple regression equivalents (i.e., the month fixed effects from our bench mark regressions

reported in the benchmark regressions reported in Appendix C). The variable x_t is a vector of controls for changing macroeconomic conditions over between 2015 and 2019 and includes the China Bond constant maturity yield on 10 year Treasuries, the Shanghai Stock Exchange A Shares Composite Index and CEIC China Leading Indicator Index. For a given triple $(\hat{s}_1, \hat{s}_2, t_1)$ the parameters of (23) are obtained by OLS.

The parameters $\hat{s}_1$ and c are calibrated from data for the April 2015 (which is $t = 1$ in our sample) as follows. First, using the assumption that $\hat{s}_1 = \hat{s}_2$ for enterprise bonds, I fix $\hat{s}_1$ and c by calculating the yield to maturity on enterprise bonds as the 10 treasury yield (our proxy for r), fluctuates over the sample period from 4/15 to 10/19. Some experimentation yielded a $(\hat{s}_1, c)$ pair that produced implied enterprise yields that were within the relatively narrow band that was observed within the sample of observed monthly mean enterprise bond yields in that period. For corporate bonds I set the level of $\hat{s}_1$ to be same as the calibrated value for enterprise bonds. Using the observed mean corporate bond yield in 4/15 I use the equation $p = \frac{1+r}{1+\rho}$ to infer the value of p_1 for corporate bonds and then using this I back-out the implied coupon, c using $p_1 = 1 - c + \hat{s}_1$. Then using (22) I simulate the implied values of $\rho(t; \hat{s}_1, \hat{s}_2, t_1)$ for alternative choices of the $(\hat{s}_2, t_1))$ pair. Finally, for each choice of these last two parameters, I run the regressions (23).

In this calibration I found by setting t_1 at either 70 or 80 months (corresponding to January 2020 and November 2020, respectively) and setting $\hat{s}_2$ at 0, $0.1\hat{s}_1$, $0.2\hat{s}_1$, or $0.3\hat{s}_1$ all produced very good fits (R^2 of 0.93 for regressions using sample mean spreads and 0.76 for regressions using month fixed effects from the benchmark regressions). The results of the calibration for $t_1 = 70$ and $\hat{s}_2 = 0$ are summarised graphically in Figure 12 and Figure 13. These graphics are based on the estimates as reported in Table 8. Note that $\rho(\hat{t}, \hat{s}_1, \hat{s}_2, t_1)$ is very highly significant.

This result shows that structural model from Section 5.2 combined with hypothesised policy of severely reducing the level of state guarantees for corporate bonds while leaving the level of subsidy for enterprise bonds is quite successful in capturing evolution of spreads in those two bond segments that was unexplained in our regression analysis of Section 4. This fits very well with the view that despite the often expressed skepticism about the Chinese authorities' commitment to its announced deleveraging policy, in the course of 2015 investors came to view the policy as credible. Corporate bond yields began to reflect the view that authorities increasingly would be willing to stand back and let distressed borrowers face market based restructuring through bankruptcy or negotiations with creditors.

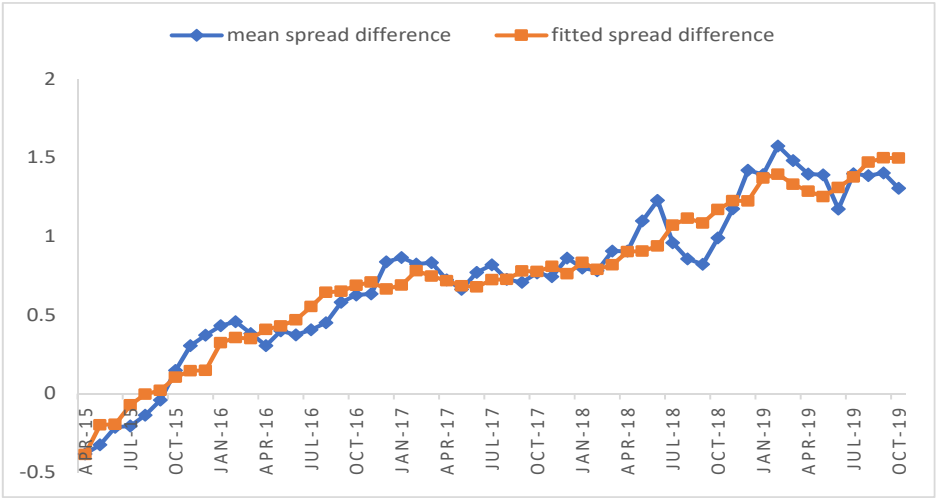

Figure 12: Sample Mean Spread Difference

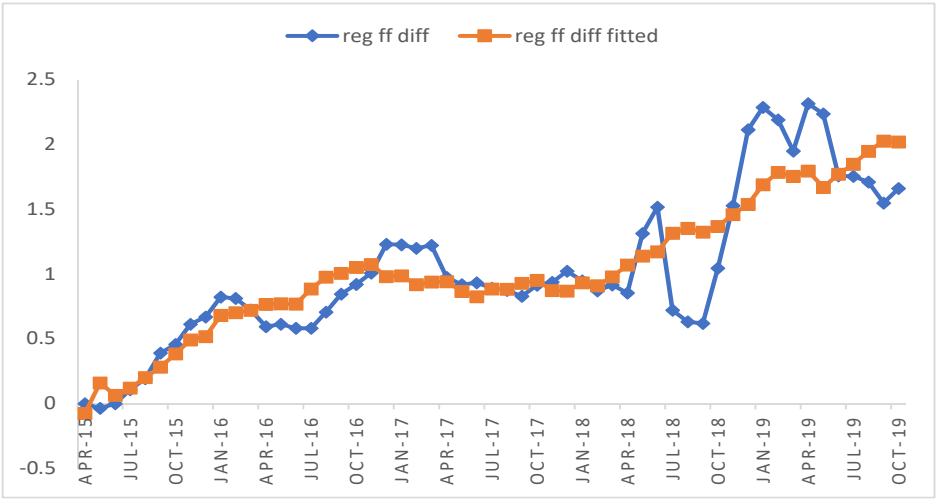

Figure 13: Regression Month Effects Difference

6 Conclusions

This paper provides an explanation of how risk is allocated in China's markets for debt issued by non-financial firms. I have argued that the state plays an integral role in this process and that this role has been restructured continually since the late 1970's when China first moved to embrace the market. During the first phase of the development of corporate debt markets institution-building focused on state-owned enterprises. It was only in the early 1990's when a rudimentary company law was passed which applied to private enterprises. At that stage the architecture of corporate debt markets was left incomplete because there was no bankruptcy law that provided clarity on how financial distress of firms would be resolved. So when a first, massive wave of non-performing loans appeared in the mid-1990's, resolution was accomplished by state-led administrative measures rather than by the decentralised, creditor-initiated actions through the judicial system.

Subsequently, credit market foundations were reinforced through the passage of a bankruptcy law and also through the introduction of new corporate securities traded on exchanges and over-the-counter. Nevertheless, just as the new and untested institutions of the debt markets were put into place, another major threat to macro stability emerged in 2008 with the onset of the global financial crisis. Again, it was the concerted action of the state which drove events, this time in the form of the massive fiscal stimulus through debt-financed investment spending, especially infrastructure investments by local governments. This served to counteract the effects of the sharp contraction of global trade and allowed China to maintain high GDP growth rates. However, by 2012 unintended consequences of the policy became apparent as the debt burden of local state-owned enterprises grew at an alarming and possibly unsustainable rate. While many analysts called for China to enforce market discipline and purge the system of nonviable projects, again Chinese authorities chose not to rely on the decentralised use of judicial bankruptcy. Instead, they undertook a variety of actions aimed at keeping debt issuance sustainable while allowing the growth-supporting benefits of infrastructure investments to continue.

In 2014 at the time these measures were first announced, there was wide-spread skepticism as to the whether the central government could avoid bailing-out over-committed borrowers. Instead, many analysts argued that most debt carried implicit state guarantees, and this would continue to feed excessive leverage. The analysis in this paper has traced the main effects of the government's policy between spring 2015 and fall 2019 as reflected in changes in major subaggregates of types of debt issued and through detailed information about pricing of corporate and enterprise bonds, the two

principal long-term debt securities issued by Chinese non-financial enterprises.

This analysis has documented a clear reorientation in the mode of funding infrastructure investments. Taken together, Beijing's multiple policy initiatives amount to a major reform of local public finance in China. Furthermore, it has brought a significant degree of discipline to debt issuance. However, the form this discipline takes differs according to the type of entity issuing the debt and the purpose for which it is issued. A key part of the policy has been to restrict the usage of local government funding vehicles, i.e., the enterprises sponsored by local governments as a means of contravening the constraints on direct local government borrowing that had been in place since 1994. Instead, a new municipal bond market has been created that allows direct bond issuance by local governments. At the same time the use of enterprise bonds which had previously which had been heavily used by local state-owned enterprises have been quantity-rationed through administrative procedures which prohibit local governments providing tax supported guarantees to issuers.

In contrast, the discipline of private borrowers has come in part by encouraging the use of more transparent securities markets for corporate debt and curbing the growth of shadow-banking instruments. Furthermore, judicial bankruptcy procedures have been stream-lined and are being used more frequently for resolving distressed debt. Private firms have been disciplined as well by the market price of debt where spreads on corporate paper have risen sharply relative to enterprise bonds used to finance infrastructure. I have found that this divergence of spreads cannot be explained by standard measures of solvency and liquidity. A more successful explanation is that over time the market came to recognise that the state was committed to leaving most cases of private distressed debt to be dealt with through bankruptcy or negotiated restructuring. In particular, it was shown in a structural model of partial debt guarantees that incorporating a change in expectations of future bail-outs can account for much of change in yield spreads of corporate bonds observed between 2015 and 2019.

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Appendices

A Data

The data used in this paper consists of detailed data on Chinese enterprise and corporate bonds trading on the domestic Chinese market in May 2018 as reported in Wind data services. This includes all the enterprise bonds identified by Wind as trading in the interbank market and all the corporate bonds listed in the Shanghai and Shenzhen stock markets.

The data set includes a wide variety of information concerning the debt issue including coupon and other pricing terms, face value at issue, issue date, maturity date and many other details from the contract terms and conditions. In addition, there is information on the intended purpose of the funding including the PBOC designation as a City Construction Bond if applicable.

Issuer information includes precise legal name and address of the issuing enterprise, type of legal status, industrial classification of the firm, among other details. In addition for most firms there are accounting data from past financial reports as well as a variety of standard analysts' ratios based on these reports. Beyond this there is information about third party guarantees including type of guarantee and the type of body providing the guarantee.

Pricing information for each bond consists of the CSI yield to maturity registered at month end for the 56 months from April 2015 to October 2019. These are calculated daily based on the CSI estimates of applicable yield curves fitted using all available market transactions. Yield spreads for individual securities were calculated as the difference of the security's yield and the yield of a Chinese central government bond with the same maturity. This latter yield was obtained by linear interpolation of points on the constant maturity central government yield curve as reported by Wind.

B Proofs of results in Section 5

Derivation of unlevered equity value

The value of the all equity firm, V is,

$$V = \sum_{t=1}^{\infty} \frac{.5}{(1+r)^t} = .5 \sum_{t=1}^{\infty} d^t \tag{24}$$

where $d = \frac{1}{1+r}$. Note that for $r > 0$, $(1-d)V = d$ which implies that the value of all equity firm is,

$$V = .5 * \frac{d}{1-d} = \frac{0.5}{r} \tag{25}$$

as in Equation (3). This property of present values of perpetual cash flows will be used repeatedly in what follows.

Derivation of values in the levered firm

The value of the debt at time $t = 0$ can be written as,

$$b = c\frac{p}{1+r} + c(\frac{p}{1+r})^2 + ... = c\sum_{t=1}^{\infty} d^t \tag{26}$$

where now $d = \frac{p}{1+r}$. Since $p \leq 1$ and supposing $r > 0$, d^t vanishes as $t \to \infty$. Then we have,

$$b = c\frac{d}{1-d} = c\frac{p}{1+r-p} \tag{27}$$

The conditional probability p will depend upon c. Making the assumption that y is distributed $U(0,1)$, the one period survival probability is,

$$p = \int_c^1 dy = 1 - c \tag{28}$$

which holds for $c \in [0,1]$. So the value of debt can be written as,

$$b = c\frac{1-c}{1+r-1+c} = \frac{c(1-c)}{r+c} \tag{29}$$

as in Equation (4). For a given value of r the debt capacity of the firm is obtained by choosing c to maximize $b(c)$ given by Equation (29)). Taking derivatives with respect

to c yields

$$\begin{aligned}\frac{db(c)}{dc} &= (1-2c)(r+c)^{-1} - (c-c^2)(r+c)^{-2} \\ &= (r+c)^{-2}[(1-2c)(r+c) - c + c^2)] \\ &= (r+c)^{-2}[r + c - 2cr - 2c^2 - c + c^2] \\ &= (r+c)^{-2}[r - 2cr - c^2] \end{aligned} \tag{30}$$

For given $r > 0$ this is positive at $c = 0$. The second derivative is negative, i.e., the value of debt is concave in c. First derivative (30) equals 0 at $c^* = -r + \sqrt{r^2 + r}$. The debt capacity of the levered firm is thus,

$$\begin{aligned} b(c^*) &= (c^* - c^{*2})(r + c^*)^{-1} \\ &= (-r + \sqrt{r^2+r} - (-r + \sqrt{r^2+r})^2)(r - r + \sqrt{r^2+r})^{-1} \\ &= [-r + \sqrt{r^2+r} - (r^2 - 2r\sqrt{r^2+r} + r^2 + r)](r^2+r)^{-0.5} \\ &= [-r + \sqrt{r^2+r} - r^2 + 2r\sqrt{r^2+r} - r^2 - r](r^2+r)^{-0.5} \\ &= [-2(r^2+r) + (1+2r)(r^2+r)^{0.5}](r^2+r)^{-0.5} \\ &= 1 + 2r - 2(r^2+r)^{0.5} \end{aligned} \tag{31}$$

The value of equity in period $t = 0$ is e given by,

$$\begin{aligned} e &= E[y - c | y \geq c][\frac{p}{1+r} + (\frac{p}{1+r})^2 + ...] \\ &= E[y - c | y \geq c]\frac{d}{1-d} \\ &= E[y - c | y \geq c]\frac{p}{1+r-p} \end{aligned} \tag{32}$$

The conditional one period expected payoff to equity is,

$$\begin{aligned} E[y - c | y \geq c] &= \frac{1}{1-c}\int_c^1 (y-c)dy \\ &= \frac{1}{1-c}(\frac{y^2}{2} - cy)|_c^1 \\ &= \frac{1}{1-c}(\frac{1}{2} - c - \frac{c^2}{2} + c^2) \\ &= .5 * (1-c) \end{aligned} \tag{33}$$

Then the value of equity of the levered firm is,

$$\begin{aligned} e &= .5 * (1-c)\frac{p}{1+r-p} \\ &= \frac{0.5(1-c)^2}{r+c} \end{aligned} \tag{34}$$

as in Equation (7). Differentiating with respect to c yields, $\frac{\partial e}{\partial c} = -.5[(r+c)^{-1} + (1-c)(r+c)^{-2}]$ which is strictly negative for $0 \leq c \leq 1$. The second derivative is $\frac{\partial^2 e}{\partial c^2} = (r+c)^{-2} + (1-c)(r+c)^{-3}]$ which is strictly positive for $0 \leq c \leq 1$. Thus equity of the levered firm is a decreasing and convex function of c over the economically relevant region.

Combining these results we have the value of levered firm

$$\begin{aligned} V = b + e &= (c + E[y-c|y \geq c])\frac{d}{1-d} \\ &= (c + E[y-c|y \geq c])\frac{p}{1+r-p} \end{aligned} \tag{35}$$

This can be written as,

$$\begin{aligned} V = b + e &= \frac{c(1-c)}{r+c} + \frac{0.5(1-c)^2}{r+c} \\ &= \frac{0.5(1-c^2)}{r+c} \end{aligned} \tag{36}$$

as in Equation (8). This is decreasing in c and takes on the value of $.5/r$ if $c = 0$, as seen above in the case of the unlevered firm. When $c = 1$ the value of the firm goes to zero. It also can be shown that the second derivative of equation (8) with respect to c depends upon the value of r. The value of the levered firm is convex in c for $r \in [0, 1[$, linear if $r = 1$ and concave for $r > 1$.

Derivation of values in the levered firm with state guarantees

The value of debt is,

$$b^* = c\frac{p^*}{1+r} + c(\frac{p^*}{1+r})^2 + ... = c\sum_{t=1}^{\infty}(d^*)^t \tag{37}$$

where $d^* = \frac{p^*}{1+r-p^*}$. This can be developed as for the levered firm absent subsidies to find,

$$\begin{aligned} b^* = c\frac{d^*}{1-d^*} &= c\frac{p^*}{1+r-p^*} \\ &= \frac{c(1-c+\hat{s})}{r+c-\hat{s}} \end{aligned} \tag{38}$$

as stated in Equation (10).

The sensitivity of the value of debt to the contractual debt service c is given by,

$$\begin{aligned} \frac{\partial b^*}{\partial c} &= (1-2c+\hat{s})(r+c-\hat{s})^{-1} - c(1-c+\hat{s})(r+c-\hat{s})^{-2} \\ &= [(1-2c+\hat{s})(r+c-\hat{s}) - c(1-c+\hat{s})](r+c-\hat{s})^{-2} \\ &= [(1-c+\hat{s})(r+c-\hat{s}) - c(r+c-\hat{s}) - c(1-c+\hat{s})](r+c-\hat{s})^{-2} \\ &= [(1-c+\hat{s})(r+c-\hat{s}) - c(r+1)](r+c-\hat{s})^{-2} \\ &= [(1-c+\hat{s})(r-\hat{s}) + c(1-c+\hat{s}) - c(r+1)](r+c-\hat{s})^{-2} \\ &= [(1-c+\hat{s})(r-\hat{s}) - c(r+c-\hat{s})](r+c-\hat{s})^{-2} \end{aligned} \tag{39}$$

This sign of this derivative is the sign of the bracketed term, $[(1-(c-\hat{s}))(r-\hat{s}) - c(r+c-\hat{s})]$. Recall that $c-\hat{s} \geq 0$. Thus for c small and $\hat{s}$ small relative to r, the term in brackets is positive. However, for c and $\hat{s}$ large it is negative. Thus as stated in Section 5, for low $\hat{s}$ the value of debt is initially increasing, attains a maximum and then declines as c is increased in the interval $[\hat{s}, 1]$. However, for $\hat{s}$ sufficiently large, debt value declines monotonically in c in $[\hat{s}, 1]$.

To value equity, note the conditional upon surviving in period t, expected payment to the shareholder that period is,

$$\begin{aligned} &\frac{1}{1-c+\hat{s}} \int_{c-\hat{s}}^{1} (max(y-c, o))dy \\ &= \frac{1}{1-c+\hat{s}} \int_{c}^{1} (y-c)dy \\ &= \frac{1}{1-c+\hat{s}} (\frac{y^2}{2} - cy)|_c^1 \\ &= \frac{1}{1-c+\hat{s}} (\frac{1}{2} - c - \frac{c^2}{2} + c^2) \\ &= \frac{.5(1-c)^2}{1-c+\hat{s}} \end{aligned} \tag{40}$$

as reported in Equation (11).

Thus, the value of equity under this regime with debt bailouts becomes,

$$\begin{aligned} e^* &= (\frac{.5(1-c)^2}{1-c+\hat{s}})(\frac{d^*}{1-d^*}) \\ &= (\frac{.5(1-c)^2}{1-c+\hat{s}})(\frac{p^*}{1+r-p^*}) \\ &= (\frac{.5(1-c)^2}{1-c+\hat{s}})(\frac{1-c+\hat{s}}{r+c-\hat{s}}) \\ &= \frac{.5(1-c)^2}{r+c-\hat{s}} \end{aligned} \tag{41}$$

as reported in Equation (12). This is decreasing in c for $c \in (0,1)$. It is increasing in $\hat{s}$ for $\hat{s} \in [0,c]$.

I now calculate the value of cash flows for the state for given values of c, r and $\hat{s}$. Assuming the firm is alive at the start of period t the state will have non-zero cash flows in that period if $c - \hat{s} \leq y_t \leq c$. The conditional expectation of the state's cash flows is,

$$\begin{aligned} &\frac{1}{1-c+\hat{s}} \int_{c-\hat{s}}^{c} (y-c)dy \\ &= \frac{1}{1-c+\hat{s}} (\frac{y^2}{2} - cy)|_{c-\hat{s}}^{c} \\ &= \frac{1}{1-c+\hat{s}} [(\frac{c^2}{2} - c^2) - (\frac{(c-\hat{s})^2}{2} - c(c-\hat{s}))] \\ &= \frac{1}{1-c+\hat{s}} [-\frac{c^2}{2} - \frac{c^2}{2} + c\hat{s} - \frac{\hat{s}^2}{2} + c^2 - c\hat{s}] \\ &= \frac{-.5\hat{s}^2}{1-c+\hat{s}} \end{aligned} \tag{42}$$

as stated in Equation (14). Again, this characterisation is valid only for $0 \leq c - \hat{s} \leq 1$. On that assumption we can express the fair value of expected cash flows to the state as,

$$\begin{aligned} s^* &= (\frac{-.5\hat{s}^2}{1-c+\hat{s}})(\frac{d^*}{1-d^*}) \\ &= (\frac{-.5\hat{s}^2}{1-c+\hat{s}})(\frac{p^*}{1+r-p^*}) \\ &= (\frac{-.5\hat{s}^2}{1-c+\hat{s}})(\frac{1-c+\hat{s}}{r+c-\hat{s}}) \\ &= \frac{-.5\hat{s}^2}{r+c-\hat{s}} \end{aligned} \tag{43}$$

as stated in Equation (15). This is decreasing in $\hat{s}$ over $\hat{s} \leq c$.

If we combine this with the value of the firm above we obtain a measure of the total surplus, TS given by,

$$\begin{aligned} TS &= b^* + e^* + s^* \\ &= \frac{.5 - .5c^2 + c\hat{s}}{r + c - \hat{s}} + \frac{-.5\hat{s}^2}{r + c - \hat{s}} \\ &= \frac{.5 - .5c^2 + c\hat{s} - .5\hat{s}^2}{r + c - \hat{s}} \\ &= \frac{.5(1 - (c - \hat{s})^2)}{r + c - \hat{s}} \end{aligned} \tag{44}$$

in agreement with Equation (16).

Derivation of values of debt with two stage state guarantees

For $\hat{t} < t_1$, substituting of d_1^* and d_2^* in (19) yields,

$$\begin{aligned} b(\hat{t}, \hat{s}_1, \hat{s}_2, t_1) &= c \sum_{\tau=1}^{t_1-1-\hat{t}} (d_1^*)^\tau + c(\frac{p_1^*}{1+r})^{(t_1-1-\hat{t})} \frac{p_2^*}{1+r-p_2^*} \\ &= c\frac{(1-d_1^*)}{(1-d_1^*)} \sum_{\tau=1}^{t_1-1-\hat{t}} (d_1^*)^\tau + c(\frac{p_1^*}{1+r})^{(t_1-1-\hat{t})} \frac{p_2^*}{1+r-p_2^*} \\ &= c\frac{(d_1^* - (d_1^*)^{(t_1-\hat{t})}}{(1-d_1^*)} + c(\frac{p_1^*}{1+r})^{(t_1-1-\hat{t})} \frac{p_2^*}{1+r-p_2^*} \\ &= c[\frac{p_1^*}{1+r-p_1^*} - (\frac{p_1^*}{1+r})^{t_1-\hat{t}} \frac{1+r}{1+r-p_1^*}] + c(\frac{p_1^*}{1+r})^{(t_1-1-\hat{t})} \frac{p_2^*}{1+r-p_2^*} \\ &= \frac{cp_1^*}{1+r-p_1^*} - \frac{c(p_1^*)^{t_1-\hat{t}}}{(1+r)^{(t_1-1-\hat{t})}(1+r-p_1^*)} + \frac{c(p_1^*)^{(t_1-1-\hat{t})}}{(1+r)^{(t_1-1-\hat{t})}} \frac{p_2^*}{(1+r-p_2^*)} \\ &= \frac{cp_1^*}{1+r-p_1^*} + \frac{c(p_1^*)^{t_1}}{(1+r)^{(t_1-1)}} (\frac{(1+r)}{p_1^*})^{\hat{t}} [\frac{p_2^*}{p_1^*(1+r-p_2^*)} - \frac{1}{(1+r-p_1^*)}] \end{aligned} \tag{45}$$

as stated in Equation (22). Suppose that $p_1^* > p_2^*$. Then,

$$[\frac{p_2^*}{p_1^*(1+r-p_2^*)} - \frac{1}{(1+r-p_1^*)}] < [\frac{p_1^*}{p_1^*(1+r-p_1^*)} - \frac{1}{(1+r-p_1^*)}] = 0$$

It follows then the value of debt decreases as $\hat{t} \to t_1$. If $p_1^* < p_2^*$, then the value of debt increases as $\hat{t} \to t_1$.

C Supplementary tables

Table 9: Benchmark Regressions

		Enterprise bond			Corporate bond		
		b/t	b/t	b/t	b/t	b/t	b/t
Guarantee status	Construction	-1.528***	-1.423***	-1.542***	-0.729***	-0.469***	-0.648***
		(-3.40)	(-3.00)	(-3.36)	(-6.08)	(-4.55)	(-6.34)
	GuaranteeYN	-0.228	0.472	0.454	-0.151	-0.292**	-0.179
		(-0.90)	(1.43)	(1.31)	(-1.44)	(-2.42)	(-1.58)
	ConstGuar	0.681**	-0.035	-0.040	0.595***	0.678***	0.628***
		(2.45)	(-0.10)	(-0.11)	(3.69)	(4.90)	(4.31)
Other	coupon	0.192***	0.246***	0.253***	0.648***	0.688***	0.669***
		(6.93)	(7.68)	(7.64)	(8.97)	(8.90)	(9.04)
	Phase2	-0.399***	-0.358***	-0.361***	-0.176	-0.177	-0.174
		(-3.97)	(-3.89)	(-3.82)	(-1.14)	(-1.13)	(-1.11)
Company type	1.CoTypeNo	0.000	0.000	0.000	0.000	0.000	0.000
		(.)	(.)	(.)	(.)	(.)	(.)
	2.CoTypeNo	-1.328	-0.651	-0.317	-0.829	-0.815	-0.898
		(-1.61)	(-0.59)	(-0.39)	(-1.38)	(-1.29)	(-1.48)
	3.CoTypeNo				-0.634	-0.784	-0.639
					(-0.91)	(-1.04)	(-0.93)
	4.CoTypeNo	-1.617**	-0.995	-0.620	0.418	0.419	0.423
		(-2.19)	(-0.92)	(-0.78)	(0.37)	(0.33)	(0.37)
	6.CoTypeNo	0.011	0.094	0.368	-0.750	-0.729	-0.748
		(0.01)	(0.08)	(0.38)	(-1.29)	(-1.22)	(-1.28)
	7.CoTypeNo	0.102	-0.636	-0.289	-0.380	-0.515	-0.415
		(0.10)	(-0.52)	(-0.30)	(-0.70)	(-0.87)	(-0.75)
	8.CoTypeNo	2.520	2.473	2.255	-0.716	-0.863	-0.734
		(1.61)	(1.53)	(1.49)	(-1.26)	(-1.40)	(-1.28)

		Enterprise bond			Corporate bond		
		b/t	b/t	b/t	b/t	b/t	b/t
Rating	1.Issuerating	0.000	0.000	0.000	0.000	0.000	0.000
		(.)	(.)	(.)	(.)	(.)	(.)
	2.Issuerating	0.530***	0.529***	0.524***	0.774***	0.790***	0.771***
		(4.12)	(5.47)	(4.70)	(6.30)	(5.18)	(6.24)
	3.Issuerating	0.874***	0.945***	0.877***	1.410***	1.366***	1.402***
		(7.04)	(11.28)	(8.34)	(10.15)	(10.60)	(11.01)
	4.Issuerating					0.827***	
						(5.86)	
Credit analysis	roe	-0.021		-0.024*	-0.001*		-0.001*
		(-1.61)		(-1.74)	(-1.93)		(-2.03)
	roa	-0.007		-0.013	-0.051*		-0.046
		(-0.19)		(-0.41)	(-1.77)		(-1.54)
	rorev	-0.000		-0.000	-0.000		-0.000
		(-1.13)		(-0.25)	(-0.24)		(-0.37)
	catarat	0.004**		0.000	-0.004		-0.004
		(2.54)		(0.15)	(-1.02)		(-1.00)
	leval	-0.000		0.001	-0.007		-0.008
		(-0.03)		(0.16)	(-0.83)		(-0.90)
	debtcap	0.001		0.002	0.015**		0.016**
		(0.19)		(0.25)	(2.37)		(2.50)
	derat	-0.001		-0.001*	0.000**		0.000**
		(-1.60)		(-1.84)	(2.59)		(2.68)
	quickrat	0.000		0.000	0.105		0.118
		(1.54)		(0.79)	(0.97)		(1.03)
	cashrat	-0.000		-0.000	-0.251		-0.260
		(-0.81)		(-0.68)	(-1.48)		(-1.42)
Market liquidity	reg. cap.		-0.000***	-0.000***		0.000	0.000
			(-2.95)	(-3.04)		(1.03)	(1.29)
	issueamnt		-0.000	-0.000		0.001**	0.001*
			(-0.32)	(-0.91)		(2.30)	(2.04)
	issueage		-0.000***	-0.000**		0.000	0.000
			(-2.95)	(-2.57)		(1.06)	(0.95)
	timetomat		0.000	0.000		-0.000*	-0.000**
			(0.11)	(0.03)		(-1.95)	(-2.43)
	month fe	yes	yes	yes	yes	yes	yes
	cons	1.894**	1.739	1.525*	-1.285*	-1.391**	-1.214*
		(2.14)	(1.60)	(1.86)	(-1.93)	(-2.17)	(-1.92)
	R-sq	0.283	0.304	0.308	0.210	0.202	0.212
	Nobs	87332	95571	87332	32300	33945	32300

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