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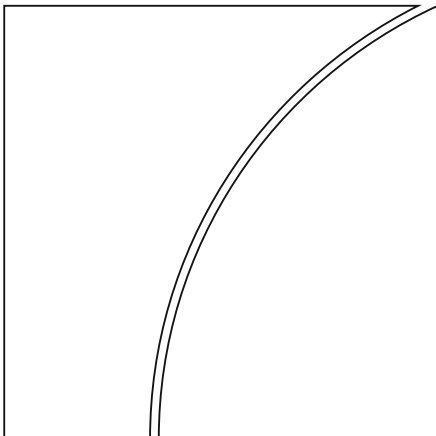
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Credit ratings of domestic and global agencies: What drives the differences in China and how are they priced?

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Credit ratings of domestic and global agencies: What drives the differences in China and how are they priced?

Xianfeng Jiang and Frank Packer¹

Abstract

The market for the credit ratings of Chinese firms is large and growing. We focus our analysis on the firms that have ratings from both domestic and global agencies. Despite the similar symbols, the rating scales of the domestic and global agencies differ: domestic agencies rate firms that are jointly rated higher than global agencies by 6-7 notches on average. Focusing on the rank order of domestic and global credit ratings, we test for differences in the determinants of ratings across global and domestic agencies. We find asset size is weighed more heavily as a positive factor by domestic agencies, and leverage is weighed more heavily as a negative factor by global agencies. Profitability and state-ownership are weighed more positively by global rating agencies. The influence of the variables is generally stable across a variety of robustness checks. In spite of these differences, both domestic and global ratings appear to be priced into the market values of rated bonds.

Keywords: Credit ratings, split ratings, state-owned firms, Chinese bond markets.

JEL classification: G12, G18, G23, G24.

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1. Introduction

Over the past few years, there has been a dramatic increase in the number of domestically issued bonds by Chinese companies. At the same time, the number of defaults have increased, as borrowers in the Chinese bond market represent a wider variety of default risks than before. However, the vast majority of published risk assessments on Chinese borrowers, made by credit rating agencies headquartered in China, still lie in the AAA and AA category. By contrast, the top global agencies, headquartered outside of China, rate the bonds that are issued overseas by Chinese corporations usually with much lower grades – around 6 to 7 notches lower on average.

In this paper, we examine the risk assessments of Chinese (non-financial) companies published by the major Chinese rating agencies and the two largest global rating agencies. The markets for the provision of credit ratings differ between domestic and global agencies. Global agencies are not accredited to rate Chinese firms in the domestic market, but do assign global ratings for Chinese firms issuing bonds in overseas markets. Meanwhile, Chinese rating agencies provide mainly ratings for Chinese firms' domestic issuances.

We examine the degree to which rating scales are comparable between domestic rating agencies, as well as between domestic and global rating agencies. Major Chinese rating agencies rate according to a similar scale which allows us to use the domestic ratings interchangeably. By contrast, the scales of Chinese and global rating agencies are not alike.

We measure the ability of quantitative and qualitative indicators of credit risk to predict the ratings of Chinese companies published by both Chinese and global rating agencies. Despite the widespread recognition of difference in credit ratings on Chinese borrowers between domestic and global agencies, our study is, to the best of our knowledge, the first that documents in detail the comparability of scales and ratings determinants among domestic and global credit rating agencies in China. In addition, we examine the degree to which the ratings of domestic and global agencies is reflected in the credit spreads of newly issued bonds in the domestic market.

To anticipate the results, we find that domestic rating agencies weigh size more heavily as a positive credit risk factor, while global agencies weigh profitability and state-ownership more as positive risk factors, and leverage more heavily as a negative risk factor. These impacts are stable even after we control for the effects of other financial variables such as retained earnings and interest coverage. The impacts are also robust to variations in the choice of global ratings, and whether Chinese or international accounting standards are used to calculate financial ratios. The economic significance of the effects appears to be greatest for size and state ownership.

When it comes to the information content of ratings, our evidence suggests that both domestic and global ratings are priced in the credit spreads of domestically issued bonds. Namely, both domestic and global ratings have explanatory power in a linear regression beyond that provided by financial statements and issue variables only. Because of the small sample size of jointly rated firms with complete financial statement data, the comparisons between the information content of domestic ratings and global ratings are more indicative than definitive.

The rest of the paper proceeds as follows. Following a literature review in section 2, we provide an institutional description of the market for credit ratings in China in section 3. We then describe our sample of domestic and global agency ratings in section 4, including their distribution, differences and correlation by class of ratings. Section 5 presents the explanatory variables and main empirical results, and section 6 conducts robustness checks. Section 7 examines the impact of various ratings on market prices of bonds for small sample of jointly rated issues. We conclude with suggestions for further research in section 8.

2. Literature review

There are two strands of research we draw upon in motivating this paper. The first is the work on the determinants of ratings differences among the established rating agencies in the United States, as well as the differences between the US agencies and smaller domestic agencies outside the United States, whose ratings are primarily of local corporate obligations. The second strand of work relates to credit risk in China and the role of domestic rating agencies in the market for Chinese debt obligations. Here the research is relatively scarce, undoubtedly due to the fact that the rapid growth of China's corporate bond market, and thus the increased business of the domestic rating agencies, is a relatively recent phenomenon. But how the characteristics of Chinese firms relate to the performance of corporations more generally has been considered in the literature for some time, in particular the distinction between state-owned and private firms.

Among US agencies, early work focused on the ratings differences between Moody's and S&P. For instance, Ederington (1986) found that over 70% of both Moody's and S&P's ratings for non-financial corporations were predicted correctly by models utilizing financial variables associated with credit risk, and that the determinants of Moody's and S&P's ratings were not significantly different from each other. When looking at the impact of the two agencies' ratings on the market pricing of corporate credit risk, various other studies found that although credit ratings themselves were not a sufficient statistic, they did have explanatory power beyond standard financial ratios and bond characteristics (Ederington, Yawitz, and Roberts 1987; Moon and Stotsky 1993). When the two majors disagree on the assessment, they tend to appear disproportionately in certain industries characterised by uncertainty, financial services in particular (Morgan 2002). Proxies for asset opaqueness such as market-to-book, intangible assets, and (inversely) firm size also tend to predict the likelihood of a split rating (Livingston, Naranjo, and Zhou 2007). More recently, Bowe and Larik (2014) have shown not only that corporate governance characteristics that reflect the ability of shareholders to monitor managers predict split ratings, but also that agencies differ in the importance they place on such factors.

Other work has also focused on the impact of rating agencies beyond the big two on the competitive dynamics of the US rating industry, in particular the tendency towards ratings inflation thanks to ratings "shopping" at smaller agencies. Some ratings agencies other than the big two have tended to have higher ratings than average. Cantor and Packer (1997) include the ratings of the third and fourth largest agencies at the time in their empirical analysis and found that sample selection bias, or the fact that more highly rated firms might tend to get ratings from smaller agencies, could not account for the higher average ratings. More recently, Becker and

Milbourn (2011) have documented that increasing competition from an agency in the structured finance area in the 1990s inflated ratings in the sector across all agencies, leading to declining correlations between ratings and bond prices across the entire ratings industry. Skreta and Veldkamp (2009) show how destructive ratings shopping of this nature can be a function of asset complexity in the entity being rated, while Bolton, Freixas, and Shapiro (2012) show how ratings shopping and ratings inflation is more likely during booms.

Ratings differences between the US agencies can be dwarfed in scale by those observed between the big two and domestic agencies of non-US countries, particularly in the rating of non-US credits. In early work Beattie and Searle (1992) and Cantor and Packer (1994) documented large, persistent differences in the credit ratings of US and non US agencies, with the typical pattern being that the rating policy of Moody's and S&P would be far more conservative, and result in lower ratings. Lower ratings from US rating agencies may have something to do with the historical evolution of the industry; in the US, bond markets and waves of defaults preceded the creation of the credit rating industry more than a hundred years ago (Sylla 2002). When the credit ratings were first assigned in the US, there were many that had ratings below BBB, which only later became an important cut-off rating for regulatory purposes. In the case of most countries with nascent bond markets, the reason for getting a rating was often to meet a regulatory cut-off for bond issuance or bond investment, and ratings had to be at high levels to have any value whatsoever.

Differences in ratings have been particularly noticeable in the country that long had the largest corporate bond market in Asia, Japan. In the 1990s, the credit ratings of domestic agencies were around 2-4 notches higher on average than those of global agencies on jointly rated issues (Watanabe 1995; BCBS 2000; Packer 2002). However, even greater differences have been documented between US agency ratings and domestic ratings for Korean bond issuers (Global Capital 2013). In the case of Korean issues, Joe and Oh (2016) find that partial foreign equity stakes in domestic issuers have done little to diminish the relatively high ratings by domestic agencies. And in China as well, it is both well known to journalists (Lee 2006; Law 2015) and documented by researchers (Wilson 2006; Kennedy 2008; Dhawan and Yu 2015) that the domestic Chinese credit rating agencies assign extremely high ratings relative to those of their international peers on jointly rated issues, more than 6 notches on average.

Whether global and domestic agencies weigh different factors when assessing the credit risk of domestic bonds has been researched surprisingly little. In one panel study covering five advanced countries and nine emerging markets (EM) in which the ratings of the US-based global agencies were compared with those of domestic agencies for the same borrowers, split ratings were shown to be more likely for EM firms with high price-to-book ratios, and less likely for EM firms with high debt-equity ratios (Ismail, Oh, and Arsyia 2015). The relative scales of the domestic vs. the global agencies were not discussed however.

In the view of critics of global rating agencies, they can be too tough on domestic bonds in their ratings because their understanding of the determinants of local credit risk in various countries is incomplete. In the case of Japan, while Packer (2002) does show that global and domestic agencies tend to weight different factors, it is *not* the case that global agencies place less weight on the importance of qualitative factors such as keiretsu ties, or traditional business group affiliation. While default study

evidence has been cited by some researchers to support the view that global agencies were too tough in Japan (JCIF 1999), the default experience at the time of the above-mentioned studies was too short for robust statistical inference.

As for China, whether global and domestic agencies weigh factors differently when assigning different ratings has yet to be examined thoroughly. Instead a number of conjectures have been made as to why the ratings from Chinese agencies are much higher (Wilson 2006). In addition, observers have noted the existence of ratings shopping on the part of issuers (Law 2015), as well as cartel-like behavior among domestic CRAs to limit less favorable ratings (Wilson 2006) and restrict the access of international CRAs (Lee 2006). To the best of our knowledge, none of these hypotheses have been subject to rigorous empirical investigation.

A recent study of the credit ratings of Chinese firms has examined the differential impact of domestic agencies with a foreign minority-ownership stake and other domestic agencies. It finds that ratings from domestic rating agencies with foreign ownership tend to be associated with lower yields and more stringent standards (Livingston, Poon, and Zhou, 2017). However, the study does not examine the actual ratings assigned by global (foreign) rating agencies. The differences between the average ratings and yields of the different types of domestic rating agencies are quite small relative to the differences documented here between domestic and global agencies.

In contrast to the limited literature on Chinese ratings, a fairly substantial literature analyzes company-specific variables that might be used in the assessment of the credit risk of Chinese firms. In our own assessment of the credit risk models of Chinese and global rating agencies, we focus on the distinction between state-owned firms and other firms. This is a distinction that motivates much of the empirical literature on Chinese corporate finance.

For instance, research suggests that non-state-owned enterprises (non-SOEs) appear to face discrimination when obtaining bank loans (Culla and Xu 2005; Allen, Qian, and Qian 2005), and have higher interest expenses and less availability of credit when monetary policy is tight (Lu, Zhu, and Zhang 2012). However, at the same time, Li, Yue, and Zhao (2009) document that while non-SOEs tend to have less debt and investment (particularly in less developed regions), at the same time their profitability is superior. In a similar vein, Fan, Huang, and Zhu (2013) find that private firms in financial distress perform better than SOE counterparts and also emerge from financial distress earlier. Ai et al (2015) also find that SOEs are more likely to default.

Hence, while literature appears to suggest that while SOEs receive preferences, they may also have greater credit risk. And it is an open question as to whether domestic or global agencies are more or less likely to weigh state-ownership as a positive or negative factor. In the analysis that follows, we will examine whether the global and domestic ratings agencies have a distinctive view on the role of SOEs. In our empirical estimations, we will also control for an array of credit risk factors that have often been cited by bankruptcy scholars such as Altman (1993). In so doing, we include financial ratios commonly taught in courses on financial statement analysis at the university level (eg see Harrington (2003) and Fridson and Alvarez (2011) for relatively recent text-book treatments).

3. Institutional characteristics of the market for credit ratings in China

3.1. Typology of bonds and markets

The bond market for firms in China is complex, with many types of bonds trading in different markets. Different agencies are able to rate the bonds in different markets. We present a typology of bonds, markets and associated credit ratings below.²

Domestic bonds trade in at least three different domestic markets: the over-the-counter market (OTC), the exchange-based market and the inter-bank market, which in turn are regulated by different authorities. Bonds falling under the category of corporate bonds, which includes the exchangeable bonds of listed companies, are all issued in the exchange-based market, which is regulated by the Chinese Securities Regulatory Commission (CSRC). Enterprise bonds – including the so-called collective bonds issued by small and medium-sized enterprises, as well as bonds issued by local government investment-financing vehicles – are issued in the exchange-based and inter-bank markets, and are mainly regulated by the National Development and Reform Commission (NDRC). Non-financial debt instruments that include short-term financial bills and commercial papers as well as medium-term notes, are all issued in the inter-bank market, and regulated by the People's Bank of China (PBoC)³.

Since each domestic bond market has different applicable regulations and regulatory authorities, any credit rating agency must be accredited⁴ in separate markets to rate the bonds trading in those markets. As a result, some rating agencies are accredited only in one or two, but not all three of the domestic bond markets described above. While none of the fully foreign funded rating agencies are accredited to rate Chinese firms in the domestic markets, they freely rate the bonds of Chinese firms in international markets outside of China.

There are currently a significant number of major domestic credit rating agencies operating in domestic markets (Table 1). They include three independent agencies with full accreditation in both the inter-bank market and the exchange-based market: Dagong, Brilliance and Orient. The two domestic independent agencies of FarEast and Pengyuan have full accreditation in exchange market, and restricted accreditation in inter-bank bond market.⁵ In addition, there are two domestically owned and capitalized multi-agency groups, Chengxin and Lianhe, which each effectively comprise two entities: a domestically-funded entity having accreditation in the

² An Inter-Ministerial Coordination Mechanism was set up in 2012. Under the lead of the PBoC, it intends to improve the integration of the bond market.

³ The National Association of Financial Market Institutional Investors (NAFMII) conducts self-regulation for the interbank market.

⁴ We judge the importance of "accreditation" from the historic public regulations mentioned in the note to Table 1. Although the Chinese rating market is evolving and the State Council has issued documents (No. GuoFa [2014] 50, GuoFa [2015] 11) that partially deregulate the accreditation of domestic rating agencies, most of the regulations of the NDRC, PBoC, CSRC had not been lifted by the end of 2015.

⁵ Although FarEast assigned very few of the ratings in our sample (Table 3), it has the oldest history among all domestic credit rating agencies set up by non-bank institutions. Its market share has fallen since 2006 (Lee 2007).

exchange-based market, and a joint-venture entity with minority foreign participation limited to rating in the inter-bank market.

The main Chinese domestic credit rating agencies:¹

Accreditation by market and regulator³

Table 1

Group ²	Sub-CRAs	Inter-bank market by PBoC	Exchange-based market by CSRC	Markets for enterprise bond by NDRC	Full name	Website
Chengxin	ChengxinS	0	1	0	China Chengxin Security Rating Co., Ltd.	www.ccxr.com.cn
	ChengxinI	1	0	1	China Chengxin International Credit Rating Co., Ltd.	www.ccxr.com.cn
Lianhe	LianheS	0	1	0	Lianhe Rating Co., Ltd.	www.unitedratings.com.cn
	LianheI	1	0	1	Lianhe Credit Information Services Co., Ltd.	www.lhcis.com
Brilliance		1	1	1	Shanghai Brilliance Investors Service Co., Ltd.	www.shxsj.com
FarEast		0	1	1	Shanghai Far-East Credit Rating Co., Ltd.	www.sfecr.com
Dagong		1	1	1	Dagong Global Credit Rating Co., Ltd.	www.dagongcredit.com
Orient		1	1	1	Golden Credit Rating International Co., Ltd.	www.dfratings.com
Pengyuan		0	1	1	Pengyuan Credit Rating Co., Ltd.	www.pyrating.cn

¹ This table does not cover rating agencies' accreditation for bank loans and other businesses. ² The first column refers to independent rating agencies or rating agency holding groups, and the second column refers to agencies who are subsidiaries of holding groups, or agencies themselves. ³ The accreditation information comes from the websites of agencies and the following latest public information. The NDRC accredited LianheI, ChengxinI, Dagong, Brilliance, FarEast in announcement FaGaiCaiJin[2003]1179, and accredited Pengyuan and Orient in 2008 and 2011 respectively. On June 6, 2014, the PBoC accredited 6 companies, including Dagong, ChengxinI, LianheI, Brilliance and Orient (<http://www.pbc.gov.cn/jinrongshichangsi/147160/147171/147358/147406/2806822/index.html>). The CSRC accredited ChengxinS, Brilliance, Dagong, Predecessor of LianheS, Orient, FarEast in security market in documents of No. ZhenJianJiGouZi [2007]223, 250, 310, ZhenJianXuKe [2008]714, [2011]893, [2014]417.

Source: Authors.

The role of global agencies in the Chinese rating industry is mainly limited to rating issuers with bonds issued overseas by mainland Chinese borrowers and the overseas bonds themselves. Though global agencies have minority shareholder stakes in the two joint venture entities as mentioned above, they do not play an active role in those entities' assignment of ratings and their own credit ratings on Chinese borrowers overseas are independently determined. Since 2007 the credit rating industry has been in the restricted industries category in the Catalogue for the Guidance of Foreign Investment, released by the NDRC and Ministry of Commerce (MOFCOM). Thus, at present, global agencies cannot obtain or establish controlling stakes in a local rating agency. The China offices of major global ratings agencies such as S&P, Moody's and Fitch are thus not accredited for rating domestic bonds in mainland China, and can only assist their parent companies in the rating of bonds issued by mainland Chinese borrowers overseas.

3.2. Regulatory usage

The most common use of ratings in regulation is to determine eligibility for bond issuance. In 1992, the government allowed issuers to obtain credit ratings for enterprise bond issuance (State Council's circular No. [1992] 68). In practice, it was mandatory for issuers to obtain ratings. From then on, many similar regulations subsequently were developed for other bonds, particularly those involved in a public offering. Some regulations also specify a minimum credit rating for bond issuance: CSRC decrees stipulate that AAA is the threshold level for a corporate bond to have a public offering, otherwise private placement is the only choice (CSRC decree No. [2007] 49, CSRC decree No. [2015] 113).

Beside the threshold role for ratings in bond issuance, issuance procedures may be simplified for issuer with high rating. One NDRC regulation (Circular No. FaGaiBanCaiJin [2013] 957) eases procedures for the approval of issuance for the bond with a debt or issuer credit rating of AAA. A further notice in October 2015 allowed conditional approval for issuance of enterprise bonds if the issuer or the debt had a AAA level of credit rating, or if it were guaranteed by an asset or guarantee company with a AAA credit rating.

The use of ratings in regulation has not been limited to determine eligibility or procedures for bond issuance. Credit ratings are also used in China in calibrating capital requirement of banks, investment guidance for insurance funds, money market funds, and many other areas. For instance, only those credit bonds with issuer ratings on AA and above can be used in bond-pledged repurchase in exchange-based market. The bonds for investment by money market funds must be with issuer ratings AA+ and above. Insurance funds can only be invested in bonds with issuer rating above A if the bonds are issued by non-financial domestic firms.⁶

When enforcing regulations related to overseas issues, China regulators tend to draw on the ratings of the international rating agencies. For example, the CSRC accredits only the ratings of international CRAs when implementing the administration of qualified domestic institutional investors (QDII) according the guidance of circular No. ZhengJianFa [2007]81.

Regulators in China appear to recognize that overseas bonds, which generally do not have domestic credit ratings, and instead have ratings issued by global agencies, should perhaps be governed by different cut-offs. In a circular issued by CIRC, with index of No. BaoJianFa [2015]33, overseas bonds, which generally do not have domestic credit ratings, need bond-level ratings from the international rating agencies just at the BBB- level or above to be acceptable investments for insurance companies.

The practices of the credit rating industry in China are also regulated. For example, regulators have mandated that the symbols used by the domestic agencies be consistent with those used globally in an effort to promote transparency. In 2006, the PBoC released instructions (No. YinFa [2006] 95) mandating one system of rating symbols, and also providing definitions of the symbols for use in the inter-bank market. These symbols are similar to those of S&P's long-term ratings, and are now used by most of the domestic credit rating agencies. Regulators have also issued

⁶ See Guidance on Conversion Rates of and Qualifications for Standard Bonds in Pledged-Style Repurchase (various versions), and regulations of CSRC decree No. 120, CSRC announcement No. [2015]30, CIRC circular No. BaoJianFa [2012]58.

directives, such as NDRC circular No. [2012] 3451 and CSRC decree No. [2007] 50, aimed at minimizing the behavior of rating agencies deemed harmful, such as ratings shopping and destructive competitive behavior.

4. Domestic and global agency ratings and their distribution

4.1. Data and sample

We focus on non-financial firms headquartered in China with valid long-term issuer-level ratings in 2015 because the firms with both domestic and global ratings are too few before 2015. The domestic rating data come from the Wind database. We select the earliest rating for firms with ratings in 2015, and select the latest rating assigned for firms which have only ratings assignments before 2015. Ratings assigned before 2013 are not considered.

Global agency ratings for Chinese firms are not fully maintained in the standardised databases that are available to us, so we obtain lists of ratings from two of the major global rating agencies themselves. For Moody's rating data, we find a complete public list ("Moody's List" thereafter) of Chinese firms rated by Moody's from its publication, "Inside China" (Moody's 2016), and then retrieve the actual ratings for the listed company from Moody's website at http://www.moody.com/pages/default_ch.aspx.

On the Moody's website, there are at least four categories of long-term ratings, including long-term issuer rating, long-term corporate family rating, senior unsecured rating, supported senior unsecured rating. The ratings may also vary according to currency of the issue. We choose the rating as follows: Given the firm is on Moody's List, we then look for the long-term issuer rating, long-term corporate family rating, senior unsecured rating, supported senior unsecured rating among the ratings based on domestic currency ratings, in the above-mentioned order. If we cannot find a rating among these, then we look for ratings for foreign currency issues in the same order. Once the rating within the particular ratings category is identified, if there are multiple ratings over time, we choose the rating in 2015 or earlier according to the procedure described above for domestic agencies.

For Standard and Poor's (hereafter "S&P"), we start with a list provided to us by S&P of rated Chinese firms. We then retrieve all the historical rating data from Capital IQ (<http://www.capitaliq.com>). S&P generally provides a long-term issuer foreign currency rating, as well as a long-term issuer local currency rating. In Capital IQ, S&P also provides a rating for Chinese firms in the category of Greater China Regional rating, a regional scale in which ratings are not bounded by the sovereign ratings and the highest rating is AAA.⁷ Once again we select the domestic currency rating ahead of the foreign currency rating when available, and follow the same procedure when selecting across multiple dates.

Table 2 provides the resulting numbers of Chinese corporations with ratings assignments, broken down by the individual rating agencies. ChengxinI, Pengyuan, Dagong, LianheI, and Brilliance dominate the domestic rating market, and take up 86

⁷ See S&P (2014a) and S&P (2014b) for more detailed information on Greater China ratings.

percent of the 4000 or so available credit ratings. The total number of global ratings that we are able to collate from Moody's and S&P for the purposes of our study are around 300, far smaller than the number of domestic agency ratings. Among the global ratings, Moody's and S&P accounts for about 50% each.

Frequency of ratings by agencies Table 2

		Original ratings	
	Rating Agency	Number	Percent of total
Domestic	ChengxinI	765	19
	Pengyuan	746	19
	Dagong	684	17
	LianheI	616	16
	Brilliance	604	15
	LianheS	201	5
	ChengxinS	186	5
	Orient	153	4
	FarEast	4	0
		Total	3959
Global	Moody	150	50
	SP	149	50
	Total	299	

As done in many studies of ratings, we assign numeric values to ratings to facilitate the quantitative analysis and discussion (eg Packer, Cantor, and Cole 1997). Specifically, we assign numbers of 17 to 2 to ratings of AAA or Aaa to B- or B3, and assign the number of 1 to ratings of CCC or Caa and below. That said, because we rely on logistic regressions which assess the probability of discrete categories of ratings, none of the formal regression analysis reported below is dependent on the precise quantitative transformation of ratings, as long as the rank ordering of the ratings is unchanged. We exclude the ratings of D from the quantitative analysis, and also we do not include ratings that indicate that the bonds are already in default.

4.2. Rating differences across domestic and global agencies

As mentioned in section 3, Chinese rating agencies now use ratings symbols that correspond to those used by international agencies such as S&P. Given that the Moody's rating symbols correspond nearly one for one to those used by S&P and the domestic agencies, it is possible to directly compare the ratings distributions and frequency of different ratings across agencies. So as not to double-count individual firms, we combine the global ratings of Moody's and S&P into one category called global ratings, and leave S&P's Greater China ratings as a second category, and combine the ratings of all the domestic agencies into a third category called domestic ratings (The combination rule used to break ties is described in 4.4). Table 3 reports distributional statistics across domestic, global, and Greater China ratings separately.

Distribution of all ratings (entire sample)

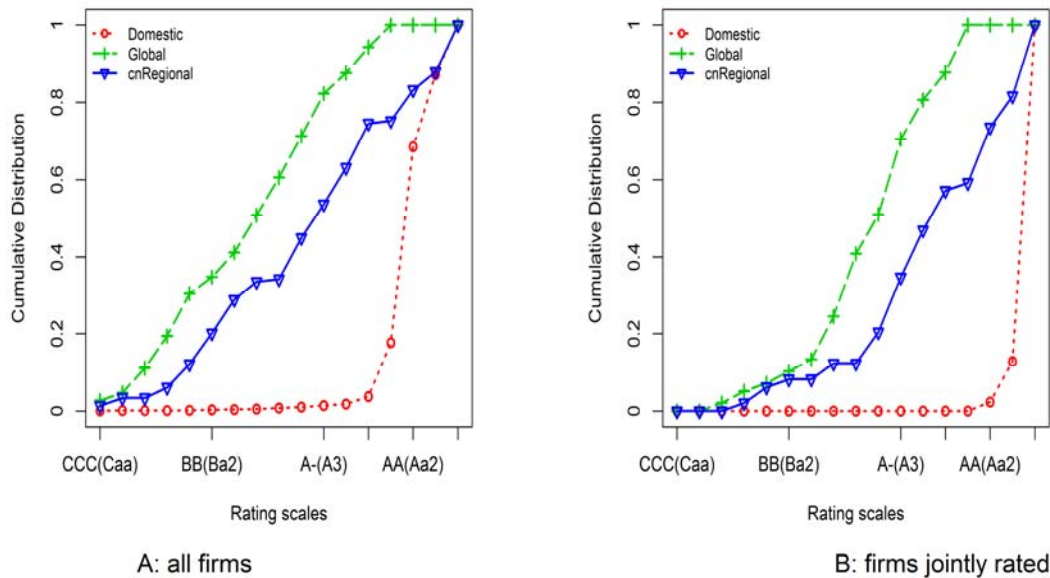
Table 3

	Numeric rating	Domestic rating		Global rating		Greater China regional rating	
		Number	Percent of Total	Number	Percent of Total	Number	Percent of Total
AAA (Aaa)	17	507	12.8			18	12.1
AA+ (Aa1)	16	743	18.8			7	4.7
AA (Aa2)	15	2011	50.8			12	8.1
AA- (Aa3)	14	551	13.9	17	5.7	1	0.7
A+ (A1)	13	75	1.9	20	6.7	17	11.4
A (A2)	12	16	0.4	16	5.4	14	9.4
A- (A3)	11	15	0.4	33	11.0	13	8.7
BBB+(Baa)	10	9	0.2	32	10.7	16	10.7
BBB (Baa2)	9	11	0.3	29	9.7	1	0.7
BBB- (Baa3)	8	5	0.1	29	9.7	7	4.7
BB+ (Ba1)	7	2	0.1	19	6.4	13	8.7
BB (Ba2)	6	6	0.2	13	4.4	12	8.1
BB- (Ba3)	5	2	0.1	33	11.0	9	6.0
B+ (B1)	4			25	8.4	4	2.7
B (B2)	3	1	0.0	19	6.4		
B- (B3)	2	1	0.0	6	2.0	3	2.0
CCC (Caa)	1	4	0.1	8	2.7	2	1.3
Total number of ratings		3959		299		149	
Total number of rated firms		3310		180		149	
Mean of ratings ¹		15.2 (AA)		8.1 (BBB-)		10.7 (A-)	

¹ Mean values of the domestic, global and Greater China numeric ratings.

The exercise confirms what has frequently been found to be the case in other countries: domestic ratings are systematically higher than global ratings. The mean domestic (numeric) rating is around 15 (equivalent to AA/Aa2), higher than the mean global rating by more than 7 notches, and higher than S&P's Greater China rating by around 4.5 notches, respectively. Statistical tests reject the hypotheses that the means (and medians) are the same across domestic and global ratings at high levels of significance.

Domestic and global agencies' ratings also differ across other characteristics of the ratings distribution. While more than 97 percent of domestic ratings are at or above the ratings grade of A+, the global and Greater China Ratings of the global agencies scatter more evenly over the whole range of ratings from CCC through AAA. For instance, 81% of domestic ratings are at the level of AAA, AA- or AA, versus about 25% for the Greater China ratings, and 0% for the global ratings of Moody's and S&P. At any level of rating below AAA, the probability of the global (and Greater China) rating being at that level and below is greater than the corresponding probability for the domestic rating (Figure 1, Panel A).



Sample selection does not appear to be responsible for these outsized ratings differences. To be sure, it is theoretically possible that relatively highly rated firms choose to get ratings only from domestic firms, and this accounts for the above-documented differences. We check for this by comparing ratings distributions of the sample consisting only of the 58 firms jointly rated by domestic and global agencies. For jointly rated firms, the mean domestic rating is even higher at very close to AAA, which exceeds the (mean) global and Greater China rating for jointly rated issues by nearly 7 notches and 4 notches, respectively. Thus, the difference in the relative position of domestic and global ratings is little changed when we focus on jointly rated issues (Figure 1, Panel B).

Neither are we distorting the degree of ratings differences between domestic and global ratings by combining global ratings with each other and domestic ratings with each other. In Panel A of Table 4, we list the mean differences of all individual domestic and global agencies across jointly rated samples. The differences of numeric means between domestic and global ratings agencies range between 5 to 9 notches for the global ratings, and between 2 to 6 notches for the Greater China ratings. By contrast, the largest mean difference between domestic agency ratings is less than 0.5, and the mean difference between S&P and Moody's is effectively zero.

The differences in corporate ratings might be explained to some degree by differing assessments of the credit risk of the sovereign (the "sovereign ceiling"), but not completely. In 2015, both Moody's and S&P assigned sovereign ratings to China at the numeric rating of 14 (AA-/Aa3), 3 notches lower than the highest rating of 17. Even were we to elevate all global ratings by 3 notches, domestic ratings would still be higher than global ratings by 3 to 4 notches on average.

Pairwise statistics for ratings of agencies with jointly rated samples

Table 4

	ChengxinI	ChengxinS	Dagong	FarEast	LianheI	LianheS	Orient	Pengyuan	cnSP	Moody	SP
Panel A: Mean differences											
Brilliance	0	0	0.28		0.07	0	-0.33	-0.06	3.78	6.57	6.89
ChengxinI		0.08	0.26		0.09	0	-0.33	-0.04	2.91	5.83	6.23
ChengxinS			0.12		-0.11			0	5.57	8.11	8.14
Dagong					-0.17	-0.38	-0.52	-0.25	3.06	6.31	6.31
FarEast											
LianheI						-0.05	-0.25	-0.11	4.33	6.36	7.2
LianheS							0.4	0.15	6.5	8.25	9
Orient								0.36			
Pengyuan											
cnSP										2.76	2.69
Moody											0.03
Panel B: Spearman correlations											
Brilliance	0.95	1	0.55		0.96		0.77	0.67	0.69		0.76
ChengxinI		0.9	0.89		0.89	1		0.67		0.35	
ChengxinS			0.89		0.93			0.82	0.8	0.84	0.82
Dagong					0.86	0.54	0.26	0.31	0.43		0.43
LianheI						0.87	0.66	0.62	0.44	0.45	0.44
LianheS							0.75	0.63	0.77	0.77	0.77
Orient								0.09			
cnSP										0.99	1
Moody											0.99

4.3. Rank-order correlation

Another metric by which to compare agency ratings is rank-order correlation. For many investors, ratings are best appreciated as a metric of relative credit risk. Ratings schemes can show significant mean ratings differences, even when the rank-ordering of credit risks is quite similar; at the same time negligible average ratings differences can coexist with low rank-order correlation.

The rank-order correlations for different rating agency pairs across jointly rated firms also suggest that the ratings of domestic agencies have more in common with each other than with global agency ratings; likewise the ratings of the global agencies tend to be more correlated with one another (Table 4, Panel B). The correlation of Moody's and S&P's global ratings is close to one. The correlation coefficients between domestic and global agency ratings are much smaller, and also generally lower than the correlation coefficients among domestic agencies.

While in terms of the mean ratings, the Greater China ratings occupy a place roughly between the global ratings and the domestic ratings, in terms of the rank-order correlation, the Greater China ratings clearly belong to the global agency ratings family. For jointly rated issues, the correlation coefficient between the Greater China rating and the global rating of S&P (as well as Moody's global ratings) is also close to one.

4.4. Combining ratings

Based on the above comparisons, for the purposes of the empirical analysis to follow, we consider all domestic ratings as one class, and the global ratings of Moody's and S&P as another class. When there are multiple ratings from a single class of ratings agencies for a firm, we combine the ratings.

Combining multiple ratings requires some sort of rule to break ties when the ratings differ. For the purposes of the analysis to follow, we apply the lowest rating principle, though we later will check the robustness of our results to the use of other rules. The lowest ratings principle is justified in part by some regulatory practice in China (eg CBRC Decree No. 1 in 2012, CIRC Circular No. BaoJianFa [2012] 93), and some regulatory practice in the US (eg bank capital adequacy rule for double ratings by OCC (2007)).^{8,9}

At the same time, we also keep the Greater China regional ratings as a separate group from the global ratings because of the large average ratings difference. Because much of the analysis and ratings transformation to follow relies on the rank ordering of credits, and the greater China ratings are highly correlated with the global ratings, we use greater China ratings in place of global ratings as a later check on the robustness of the results.

4.5. Aligning the rating scales

The dramatic difference in ratings distributions between domestic and global agency ratings, which changes little even when we restrict the sample to jointly rated firms, suggests some sort of adjustment is necessary to compare global with domestic agency ratings. For jointly rated firms, almost all domestic ratings are AAA, AA+, and AA, whereas the global and Greater China ratings scatter quite widely. It is unlikely that investors view the ratings scales of global and domestic agencies are identical given the extremely large, persistent gaps. Rather, it is reasonable to assume that the rank ordering of different credits is what is most comparable across domestic and global ratings.

For the purposes of the subsequent empirical analysis, we thus transform the combined global ratings into AAA, AA+, AA ratings buckets with similar frequencies of those of domestic ratings, based on the relative rank ordering of the jointly rated issues' global ratings. We perform the transformation as follows:

Step 1. For jointly rated firms, order the domestic ratings sample in descending order (from high to low creditworthiness), and then for each ratings level compute the frequency of firm ratings for that ratings level. In a similar fashion, order the global ratings and estimate the frequency of firm ratings.

Step 2. Assign new global ratings as follows: Assign AAA to the most highly global rated firms such that the sum of the frequencies at the cut-off global rating and above is equal to or less than the frequency of domestic AAA rated

⁸ The OCC was asked to "remove references to credit ratings from its regulations pertaining to investment securities, securities offerings, and foreign bank capital equivalency deposits" in 2012. (OCC Bulletin 2012)

⁹ For further work discussing the significance of multiple ratings, see literature (Bongaerts, Cremers, and Goetzmann 2012; He, Qian, and Strahan 2016)

firms. Then, assign AA+ to the most highly global rated firms of the remainder such that the sum of their frequencies from the cut-off rating to the previous cut-off rating is equal to or less than the frequency of domestic AA+ rated firms. Assign AA to the remainder.

The adjusted global ratings keep the same relative positions (in a weak sense) as the original global ratings. The Spearman correlation coefficient between the adjusted and original global ratings is high at 0.92. Although there is less granularity in the transformed ratings than before the adjustment, the adjusted global ratings are now much more comparable to the domestic ratings, which for jointly rated issues comprise only three ratings. The alignment procedure removes the effect of difference in rating scales to a large extent.

At the same time, while the distribution is now similar, there remain differences in the ratings which suggest that domestic and global agency ratings do not comprise identical rank-ordering of ratings. While most firms have the same (adjusted) global and domestic rating, about 24 percent do not. These differences may be the result of a different rating function. The empirical analysis to follow investigates the determinants of these differences.

5. Empirical analysis of the rating decisions by domestic and global agencies

5.1. Logistic regression model for ratings differences

To assess which factors determine ratings differences between domestic and global agencies, we first run a simple ordered logistic regression by specifying it as a reversed cumulative logistic model (Agresti 2002), whereby the dependent variable takes the value 1, 0, -1 for a firm if its domestic rating is strictly higher, equal, or strictly lower than the adjusted global counterpart.¹⁰ We ask whether the probability of a split in a certain direction depends on certain commonly used ratios as well as industry dummies that are associated in the literature with credit risk, both in China and overseas.

5.2. Explanatory variables

In the rating agencies' published documents, agencies often describe the variables that they consider when arriving at credit ratings. Usually the criteria described are extremely numerous and to some extent reflect the subjective judgements of the rating agency. Here we focus on a few quantifiable firm-level explanatory variables, including asset size, leverage, profitability, that have been shown to be related to creditworthiness in the literature on credit risk, and a variable of particular importance in China, state-ownership, which as discussed in the literature review, may be closely

¹⁰ We implement the regressions in R (R Core Team 2016) with the function `vglm` of the package `VGAM` (Yee 2010).

related to the creditworthiness of Chinese firms. We collect the data for the following variables from Wind¹¹.

Asset size. The greater the size of the company, the greater the presumed creditworthiness, *ceteris paribus*. For a measure of size, we take the natural logarithm of total fixed asset in Wind and denote it as Net_PPE. Size measured in this way can proxy for the ability to meet obligations by selling physical assets in time of financial distress (Altman 1993). Another motivation for using size is that large firms are likely to have more information flows available to investors, and thus reduced uncertainty (Ismail, Oh, and Arsyia 2015).

Leverage. We define leverage as the ratio of total assets in book value to total equity in book value¹². A higher ratio indicates relatively little equity to cover losses in the firm's value to pay back debt holders, and should be negatively related to creditworthiness. The higher the leverage, the more burdensome are a firm's debt payments, and the greater the vulnerability to creditors unwilling to roll over obligations.

Profitability. The greater the profits, the more robust the firm, and higher the creditworthiness. The gauge of profitability we use is the ratio of operating profit (earnings before interest and taxes, or EBIT) over total asset value in book value. Operating profits are independent of interest expenses and thus should be independent of the firm's capital structure.

State Ownership. We focus on the distinction between state-owned firms and other firms. A large number of firms in China are state-owned enterprises, and these tend to borrow from state-owned banks. A body of empirical evidence, as previously discussed in the literature review, suggests that being a state-owned firm might differentiate a non-state-owned firm in terms of creditworthiness, though there are competing influences that might influence the direction of the effect. Hence, while the latest literature appears to suggest that state-owned firms receive preferences, other evidence suggests they may have greater credit risk. It is an open question as to whether domestic or global agencies are more or less likely to weigh state-ownership as a positive or negative factor when assigning credit ratings. We include a dummy variable, denoted by "State_Ownership", that equals 1 if the company is state owned, meaning the firm's biggest shareholder (or controlling shareholder) is the central government or its agencies, or the local government or its agencies, according to Wind's definition.¹³

In addition to the above explanatory variables, we also include in a number of specifications the variable of *retained earnings*, *interest coverage*, as well as a *utility industry dummy variable*. Retained earnings are measured relative to total assets,

¹¹ Because the ratings in the sample are assigned in 2015, the explanatory variables' values are taken as those in 2014.

¹² We do not use leverage based on market value calculations because about half of the sample firms that have multiple ratings from both global and domestic agencies are not listed, making it difficult to calculate their equity in terms of market value. But even when we run similar regression with market based leverage based on the smaller listed firm sample, the basic results of the first three regressions in Table 6 are generally unchanged.

¹³ We also tested the interactions between state-ownership and other variables, but did not find relationships that were stable to robustness checks. As this may be owing to the limited sample size, it may need further exploration in future work.

while interest coverage is measured by the ratio of earnings before interest and taxes to interest expenses. The positive relationship retained earnings and interest coverage might be expected to have with creditworthiness is self-explanatory, and they have been frequently used in rating regressions for firms in other countries. Similarly, belonging to a utility industry, which frequently is subject to price controls and regulations to ensure ongoing provision of essential services, has been often used in ratings regressions as an explanatory variable expected to have a positive relation with creditworthiness. As an additional control, in a few other specifications, we also include a dummy for the real estate industry.¹⁴

Table 5 reports the summary statistics of the above variables by ratings category. Panel A reports means and medians by the domestic ratings category and Panel B by the (adjusted) global ratings category. Compared with firms with global ratings, firms with the lowest domestic rating tend to have lower mean values of asset size, leverage, and are more likely to be state-owned. Other comparisons, such as across the highest rating categories, or for other explanatory variables, do not yield results that are as clear-cut.

Financial data for firms with domestic ratings and adjusted global ratings:
Summary statistics

Table 5

Numeric rating	Frequency	Stat	Net_PPE	Leverage	EBIT	EBIT2Int	Retained_	Ind_RE	Ind_Util	State_
			_Book				Earnings			Ownships
PANEL A –Domestic Ratings										
AA (Aa2)	2	Mean	11.93	3.87	0.02	3.37	0.05	0.5	0	0.5
		Median	11.93	3.87	0.02	3.37	0.05	0.5	0	0.5
		Std.	1.85	2.53	0.02	4.32	0.02	0.71	0	0.71
AA+ (Aa1)	6	Mean	14.16	2.83	0.05	2.31	0.15	0.17	0	0.67
		Median	14.03	2.97	0.04	2.14	0.19	0	0	1
		Std.	1.69	0.68	0.04	1.57	0.11	0.41	0	0.52
AAA (Aaa)	42	Mean	17.58	3.49	0.03	4.21	0.14	0.1	0.14	0.95
		Median	17.56	3.1	0.03	2.08	0.08	0	0	1
		Std.	1.28	1.57	0.03	5.1	0.13	0.3	0.35	0.22
PANEL B – (Adjusted Global Ratings)										
AA (Aa2)	2	Mean	14.43	3.97	0.02	3.75	0.13	0.5	0	0
		Median	14.43	3.97	0.02	3.75	0.13	0.5	0	0
		Std.	1.68	2.4	0.01	3.79	0.12	0.71	0	0
AA+ (Aa1)	11	Mean	15.78	4.15	0.03	1.7	0.09	0.18	0	0.91
		Median	16.73	3.62	0.02	1.62	0.06	0	0	1
		Std.	2.34	1.73	0.03	1.56	0.09	0.4	0	0.3
AAA (Aaa)	37	Mean	17.43	3.18	0.04	4.63	0.15	0.08	0.16	0.95
		Median	17.61	2.95	0.04	3.14	0.1	0	0	1
		Std.	1.71	1.37	0.03	5.29	0.13	0.28	0.37	0.23

¹⁴ Because the number of jointly rated firms is not large, the addition of other industry dummy variables other than utilities and real estate makes the estimation infeasible, or the results difficult to interpret. The industry of the firm is taken as the industry as identified by the Wind database.

5.3. Results from the ratings difference regressions

We report the results of the ordered logit regressions for rating differences described in Table 6. The likelihood ratio tests comfortably reject the hypothesis that all factor coefficients are zero. The original and adjusted McFadden's R^2 s (Long 1997) show that parsimonious regressions with just the four explanatory variables asset size, leverage, profitability and state ownership yield results with at least as much explanatory power as the other specifications.

Domestic vs. (adjusted) global ratings

Trinomial ordered logistic regressions

Table 6

	(1)	(2)	(3)	(4)	(5)	(6)
Net_PPE	0.75 ***	0.88 ***	0.74 ***	0.9 ***	0.75 ***	0.91 ***
Leverage	0.72 ***	0.72 ***	0.91 ***	0.68 **	0.73 **	1 **
EBIT	-22.14	-29.08	-36.76 *	-25.98 *	-21.9	-39.46
State-ownership	-3.36 ***	-2.84 **	-3.13 **	-3.55 ***	-3.47 **	-3.33 *
EBIT2Int		0.03				-0.02
Retained_earnings			6.62			6.49
Utility industry				-2.11		-1.35
Real estate industry					-0.16	-1.1
LogL	-24.91	-22.37	-24.07	-23.79	-24.9	-20.97
LR test	20.37 ***	20.84 ***	22.05 ***	22.62 ***	20.39 ***	23.64 ***
McFadden R^2	0.29	0.32	0.31	0.32	0.29	0.36
Adjusted McFadden R^2	0.12	0.1	0.11	0.12	0.09	0.06
Obs	53	50	53	53	53	50

Note: The dependent variable takes on the value 1 if the domestic rating is higher than the (adjusted) global rating; 0 if it is the same, and -1 if the domestic rating is less than the (adjusted) global rating. The statistical tests for the significance of the coefficients assume a normal distribution. ***, **, * indicate statistical significance at level 1%, 5%, and 10%.

In the first regression, that just includes the above-mentioned four explanatory variables, the coefficients on asset size and leverage are positive, while the ones on profitability and state-ownership are negative. This means that larger asset size and higher leverage result in greater probabilities of domestic ratings being higher than adjusted global ratings, while more profitability and state-ownership have the opposite effect. In other words, firms with higher asset size and leverage are more likely to receive higher domestic ratings than adjusted global ratings. On the other hand, firms with higher profitability or state-owned status are more likely to receive lower domestic ratings than adjusted global ratings.

The signs of the coefficients of these four explanatory variables remain stable when we add additional variables one by one in regressions 2 through 5, or add all the additional variables together in regression 6. Asset size, leverage and state-ownership are statistically significant in all the regressions at the 5% or 10% level. Profitability is significant at the 10% level in some specifications, and marginally insignificant in others, but the sign on the coefficient is stable.

The other explanatory variables are statistically insignificant in all specifications.

5.4. Results from the single rating regressions

While at least three, and perhaps four factors have been shown to significantly increase the likelihood of domestic and (adjusted) global ratings being split in a certain direction, this does not necessarily identify the reason for the split. For instance, domestic ratings can be higher than adjusted global ratings when a factor is relatively high because domestic agencies put greater weight on it as a positive factor for creditworthiness. The same phenomenon can occur if domestic agencies put less weight on the variable as a negative factor for creditworthiness. Because only one of these corresponds to a priori views about the relationship of the factor with creditworthiness, it is of interest to check which it is, by running separate ratings regressions for domestic and global ratings.

Once again we run ordered logistic regressions, but in these regressions, the three dependent variable outcomes each correspond to one of three ratings: 15(AA), 16(AA+), 17(AAA).

In general, the signs on the separate regression coefficients are consistent with a priori notions of the relationship of the different variables with creditworthiness. Asset size is a positive ratings factor for both agencies, but weighted more heavily by the domestic agencies. On the other hand, while the coefficient is statistically insignificant on leverage for domestic agencies, it is negative and marginally significant in one specification for the (adjusted) global ratings. Thus, leverage is weighted as a negative factor only for global ratings. Namely, the domestic rating tends to be relatively higher at high leverage ratios because global agencies tend to view leverage as a more negative factor.

As for the fact that higher values of profitability lead to lower domestic than global ratings, the separate regressions suggest that is because global agencies tend to view profitability as a positive ratings factor and domestic ratings agencies do not. At the same time, the coefficients of the separate ratings regressions strongly suggest that both domestic and global rating agencies view state ownership as a positive factor, but global rating agencies place a higher positive weight on state ownership for creditworthiness, so much so that state ownership is statistically significant in all the global ratings regressions.

The identified patterns are generally stable to the addition of other variables such as interest coverage, retained earnings, and the utilities industry dummy. However, when the dummy variable for real estate is included, the coefficients for leverage and state-ownership tend to switch signs. But the decline in the adjusted McFadden R^2 for specifications that include a real estate dummy suggests that these specifications are not as relevant as the others.

The economic impact of certain factors appears to be quite significant. Using the coefficients reported from the first specification of the domestic and global ratings regressions, we estimate the changes in probabilities that occur when an explanatory variable is increased by one standard deviation from its median, while the other variables are all set at their median.¹⁵ Among the continuous variables, shocks to asset size have the most impact by this criterion. A one standard deviation increase in asset size raises the probability of a domestic rating of AAA by around 29 percentage points

¹⁵ One exception is size, which we take at its median value times 0.9. This is because setting all factors to the median values in both the domestic and global rating regressions generates predicted probabilities much higher than actual frequencies for AAA ratings.

to 99%. The probability of an adjusted global rating of AAA also increases, though by a smaller 18 percentage points to 86%. The effects of leverage, and profitability (EBIT) are also economically significant, though somewhat more modest. An increase in leverage and profitability by one standard deviation leads to a probability of an adjusted global AAA dropping by 19 percentage points to 62%, and increasing by 6 percentage points to 82%, respectively.

The determinants of domestic ratings

Trinomial ordered logistic regressions

Table 7

	(1)	(2)	(3)	(4)	(5)	(6)
Net_PPE	1.56 ***	1.47 ***	1.51 ***	1.55 ***	2.03 ***	3.64 **
Leverage	0.25	0.12	0.46	0.25	-0.25	-1.55
EBIT	-22.2	-31.87	-30.39	-22.03	-38.65	-122.98 *
State-ownership	1.68	1.18	2	1.66	3.51 **	13.32 *
EBIT2Int		0.15				-0.38
Retained_earnings			5.21			10.3
Utility industry				0.51		-3.85
Real estate industry					3.15	16.36 **
LogL	-10.32	-9.41	-10.17	-10.31	-8.51	-3.16
LR test	40.7 ***	34.14 ***	41.01 ***	40.73 ***	44.32 ***	46.65 ***
McFadden R ²	0.66	0.64	0.67	0.66	0.72	0.88
Adjusted McFadden R ²	0.47	0.38	0.44	0.44	0.49	0.5
Obs	53	50	53	53	53	50

Note: The dependent variable takes on the value 1 if the domestic rating is AAA; 0 if it is AA-, and -1 if it AA. The estimated intercepts associated with the ratings cutoffs between AA/AA+ and AA+/AAA are not reported. The statistical tests for the significance of the coefficients assume a normal-distribution. ***, **, * indicate statistically significance at level 1%, 5%, and 10%.

The determinants of (adjusted) global ratings

Trinomial ordered logistic regressions

Table 8

	(1)	(2)	(3)	(4)	(5)	(6)
Net_PPE	0.38 **	0.4 **	0.38 **	0.33 *	0.44 **	0.46 **
Leverage	-0.33	-0.41	-0.35	-0.29	-0.43	-0.66 *
EBIT	15.77	3.15	17.08	14.02	13.07	2.25
State-ownership	2.53 **	1.94 *	2.49 **	2.45 **	3.1 **	3.53 **
EBIT2Int		0.2				0.15
Retained_earnings			-0.84			-2.26
Utility industry				3.12		3.09
Real estate industry					0.95	2.48
LogL	-29.26	-25.96	-29.24	-28.61	-28.97	-24.32
LR test	19.64 ***	16.56 ***	19.68 ***	20.94 ***	20.22 ***	19.82 ***
McFadden R ²	0.25	0.24	0.25	0.27	0.26	0.29
Adjusted McFadden R ²	0.1	0.04	0.07	0.09	0.08	0
Obs	53	50	53	53	53	50

Note: The dependent variable takes on the value 1 if the (adjusted) global rating is AAA; 0 if it is AA-, and -1 if it AA. The statistical tests for the significance of the coefficients assume a normal-distribution. ***, **, * indicate statistically significance at level 1%, 5%, and 10%.

In the case of state-ownership, we look at the simple comparison of being non-state-owned versus state-owned, and find a significant impact as well. At the medians of the other explanatory variables in equation (1) of both tables 7 and 8, the probability for a domestic AAA rating drops from 77% for state-owned firms to 39% for non-state owned firms, and the probability of an adjusted global AAA rating drops from 73% to 18%.

6. Robustness checks

6.1. Are the results similar for comparisons between domestic and Greater China ratings?

As discussed in section 4, S&P provides one additional kind of rating for Chinese firms, called "Greater China regional ratings". Figure 1 shows that the cumulative distribution function for Greater China ratings lays between that of the domestic ratings scale and the global ratings scale. But in terms of the rank-order correlation, these ratings are much closer to the global than domestic ratings. Given that the adjustment of the global ratings is based on their rank-ordering, we would expect that the comparisons between domestic and similarly adjusted Greater China ratings would be quite similar to those of domestic versus global ratings. As a robustness check, we run the same rating difference regressions of section 5.3 for a sample with domestic and (adjusted) Greater China ratings.

Domestic vs. (adjusted) Greater China ratings

Trinomial ordered logistic regressions

Table 9

	(1)	(2)	(3)	(4)	(5)	(6)
Net_PPE	1.13 ***	1.22 ***	1.43 ***	1.26 ***	1.13 ***	1.36 **
Leverage	0.87 **	0.82 **	1.73 ***	0.84 **	0.84 *	1.79 **
EBIT	-59.88 **	-85.36 **	-110.88 ***	-64.09 **	-60.21 **	-123.21 ***
State-ownership	-5.16 **	-5.24 ***	-5.81 **	-5.27 **	-4.98 *	-6.35 **
EBIT2Int		0.26				0.24
Retained_earnings			21.16 ***			19.99 **
Utility industry				-2.24		0.41
Real estate industry					0.24	-1.23
LogL	-12.77	-11.28	-8.53	-12.28	-12.77	-8.03
LR test	22.92 ***	25.2 ***	31.41 ***	23.91 ***	22.92 ***	31.71 ***
McFadden R ²	0.47	0.53	0.65	0.49	0.47	0.66
Adjusted McFadden R ²	0.23	0.23	0.36	0.2	0.18	0.25
Obs	45	43	45	45	45	43

Note: The dependent variable takes on the value 1 if the domestic rating is higher than the (adjusted) Greater China rating; 0 if it is the same, and -1 if the domestic rating is less than the (adjusted) Greater China rating. The statistical tests for the significance of the coefficients assume a normal distribution. ***, **, * indicate statistical significance at level 1%, 5%, and 10%.

Table 9 reports the results of these ordered logistic regressions using (adjusted) Greater China ratings in place of global ratings. If anything, the results are

strengthened somewhat. All of the variables whose coefficients were statistically significant continue to be so and with the same sign. In addition, the coefficients on the profitability variable show greater statistical significance in more specifications than before. And in contrast to the earlier results, the retained earnings variable is also significantly positive, suggesting that domestic agencies are more likely to rate a firm higher, the higher its retained earnings.

6.2. Do the results vary owing to alignment procedure?

The above regression results could perhaps be an artifact of noise from the alignment procedure. Recall that so-called adjusted global ratings were derived from the original global ratings by aligning them to domestic ratings in descending order, or in a top-down fashion. When the proportions of the original global ratings bucket did not match completely the ones of the corresponding domestic ratings group, the remainder of the original global ratings would be assigned the higher domestic group. However, an equally justifiable procedure is to align in a bottom-up fashion, whereby remainders are assigned to the lower domestic rating group.¹⁶

Domestic vs. (adjusted) global ratings when alignment procedure is modified

Trinomial ordered logistic regressions

Table 10

	(1)	(2)	(3)	(4)	(5)	(6)
Net_PPE	1.08 ***	1.16 ***	1.27 ***	1.19 ***	1.16 **	1.25 **
Leverage	0.34	0.24	1.21	0.26	0.05	0.95
EBIT	-33.44	-52.43 *	-82.61 **	-37.82 *	-36.64 *	-83.64 **
State-ownership	-3.39	-3.89 *	-3.42	-3.5	-1.05	-2.85
EBIT2Int		0.22				0.11
Retained_earnings			20.87 **			18.72 *
Utility industry				-1.47		1.04
Real estate industry					3.19	0.98
LogL	-10.68	-9.16	-7.61	-10.44	-9.97	-7.08
LR test	16.77 ***	19.18 ***	22.91 ***	17.25 ***	18.18 ***	23.34 ***
McFadden R ²	0.44	0.51	0.6	0.45	0.48	0.62
Adjusted McFadden R ²	0.13	0.14	0.23	0.09	0.11	0.09
Obs	53	50	53	53	53	50

Note: The dependent variable takes on the value 1 if the domestic rating is higher than the (adjusted) global rating; 0 if it is the same, and -1 if the domestic rating is less than the (adjusted) global rating. In contrast to previously reported adjusted ratings, the procedure for adjusting the global rating is modified as described in the text on page 13. The statistical tests for the significance of the coefficients assume a normal distribution. ***, **, * indicate statistical significance at level 1%, 5%, and 10%.

¹⁶ Another source of noise may come from the rule for combining multiple ratings. When there are multiple global (or domestic) ratings, we take the lowest, but beside the lowest rating principle for choosing among multiple ratings, there at least two alternative principles, namely highest rating principle or average rating principle (Packer, Cantor, and Cole 1997). The basic results do not change for the ratings difference regressions when we use as input (before alignment, in the case of global ratings) ratings which are derived from multiple ratings using the highest principle or average principle.

Table 10 reports the results of ordered logit regressions for rating differences when the original global ratings are aligned to domestic ratings in a bottom-up fashion. The results are generally similar, as the results for asset size and profitability are basically unchanged. Although the coefficient on leverage loses significance and that on the state-ownership dummy is only marginally significant, both coefficients retain the same signs and the economic significance of the variables is little changed for most specifications across alignment procedures.

6.3. Do the results vary because of accounting standards?

When a Chinese firm issues bonds out of mainland China, it is usually required by local regulation in the market of issuance to report financial statements in line with that market's local accounting standards or international accounting standards. Although Chinese accounting standards are gradually converging to international standards, there are still some discrepancies (Ding and Su 2008; Eng, Sun, and Vichitsarawong 2013). One case in point is Yanzhou Coal Mining Company Limited, which in 2015 reported its net profit as 2284 million RMB by Chinese accounting accords, but 766 million RMB by international accounting accords (Yanzhou Coal Mining Company Limited 2015). It may be the case that the accounting standards adopted by rated firms differ across the sample, and this difference may bias the empirical results for global and domestic ratings in some fashion.

Domestic vs. (adjusted) global ratings with normalized financial data

Trinomial ordered logistic regressions

Table 11

	(1)	(2)	(3)	(4)	(5)	(6)
Net_PPE	0.5 **	0.44 **	0.49 **	0.57 **	0.59 **	0.63 **
Leverage	0.39 *	0.36 *	0.43 *	0.37 *	0.28	0.28
EBIT	-19.52	-18.93	-22.04	-21.23	-23.04 *	-27.9
State-ownership	-2.5 **	-1.86	-2.47 **	-2.52 **	-1.17	-0.77
EBIT2Int		-0.01				-0.01
Retained_earnings			1.21			1.42
Utility Dummy				-1.21		-1.16
Industry Dummy					2.22	2.15
LogL	-26.71	-25.86	-26.68	-26.21	-25.41	-24.23
LR test	11.66 **	13.36 **	11.72	12.67 **	14.27 **	16.62 **
McFadden R ²	0.18	0.21	0.18	0.19	0.22	0.26
Adjusted McFadden R ²	-0.01	-0.01	-0.03	-0.02	0	-0.05
Obs	49	49	49	49	49	49

Note: The dependent variable takes on the value 1 if the domestic rating is higher than the (adjusted) global rating; 0 if it is the same, and -1 if the domestic rating is less than the (adjusted) global rating. The statistical tests for the significance of the coefficients assume a normal distribution. ***, **, * indicate statistical significance at level 1%, 5%, and 10%.

Fortunately, S&P's Capital IQ ("Capital IQ" thereafter) database offers a normalisation of financial data that provide greater comparability across accounting

standards.¹⁷ We thus repeat the rating difference regressions only for those firms for which normalized data are available in Capital IQ.¹⁸

We report the results for the slightly smaller sample with normalized financial data in Table 11. The signs of the explanatory variables are the same as calculated earlier with non-normalized financial data, indicating the main estimated impacts are relatively robust. The statistical significance of the results tends to be lower, however. This suggests that some of the difference in the results of the individual rating regressions may stem from the differences in data examined by different agencies, which might be a fruitful topic for future research.

6.4. Do the results vary when extending the analysis beyond the jointly rated sample?

The previous analysis of ratings differences relies on the sample of firms that are jointly rated by domestic and global rating agencies. This helps to identify the differences between the determinants of domestic and global ratings because the sample of firms is the same across agencies. However, the sample size is only about 50, which not only limits the statistical inference, but raises the question of how representative is the small sample of ratings to the larger set of ratings in China. Were a much larger set of firms to have both domestic and global ratings, would the determinants of ratings differences be similar?

To partially answer this question, we run the logistic regressions for the domestic ratings¹⁹ of all firms in the top three rating levels, which is also the range of all domestic ratings for the jointly rated firms, and accounts for more than 80 percent of all domestic ratings. To account for the possibility that simply having a credit rating from a global rating agency might increase the perceived creditworthiness of the entity, we also include an additional dummy variable, denoted as "AccAltMkt", which is 1 to indicate a firm is jointly rated, and otherwise 0. As might be expected by theory, having a higher global rating is indeed associated with a higher domestic rating. The entire set of results are reported in Table 12.

The regressions indicate that a number of important results carry through to the larger sample. Consistent with the small sample results, asset size and state ownership positively affect the domestic ratings. Leverage continues to be statistically insignificant in the large sample. But as might be expected from the much larger sample, a number of other variables gain statistical significance, and generally these have the expected sign. For instance, both profitability and retained earnings positively affect credit ratings, at levels of high statistical significance. This suggests that the greater tendency of global ratings to be higher for profitable firms in the jointly rated sample, based in part on an insignificant weight in the domestic ratings function, might not be as robust to the larger sample. Further use of the full sample

¹⁷ The normalization details can be traced in Capital IQ system.

¹⁸ The industry dummy variables and state-ownership variables are still from Wind because of the unavailability in Capital IQ.

¹⁹ We do not run the separate regressions for global ratings for the following two reasons. First, for comparability, we would have to adjust the global ratings into three ratings buckets based on the cutoffs of the smaller jointly rated sample, which may itself introduce a source of bias. Second, it is difficult to identify most of the firms rated only by global firms as state-owned or not state-owned from public information.

to investigate the extent to which ratings differences in the small sample might result from sample selection might be a worthwhile topic for future research.

The determinants of domestic ratings (large sample)

Trinomial ordered logistic regressions

Table 12

	(1)	(2)	(3)	(4)	(5)	(6)
Net_PPE	0.75 ***	0.78 ***	0.77 ***	0.76 ***	0.78 ***	0.85 ***
Leverage	-0.04	-0.06	0.03	-0.04	-0.06	0
EBIT	9.11 ***	9.54 ***	4.89 ***	9.89 ***	9.3 ***	5.83 ***
State-ownership	1.65 ***	1.59 ***	1.8 ***	1.71 ***	1.66 ***	1.88 ***
EBIT2Int		0				0
Retained_earnings			3.22 ***			3.4 ***
Utility dummy				-0.45 **		-0.31 *
Real estate dummy					0.64 ***	0.76 ***
AccAltMkt	2.97 ***	3.08 ***	2.91 ***	2.96 ***	2.8 ***	2.88 ***
LogL	-1602	-1499	-1589	-1598	-1596	-1476
LR test	1137 ***	1071 ***	1163 ***	1144 ***	1147 ***	1118 ***
McFadden R ²	0.26	0.26	0.27	0.26	0.26	0.27
Adjusted McFadden R ²	0.26	0.26	0.26	0.26	0.26	0.27
Obs	2380	2174	2380	2380	2380	2174

Note: The dependent variable takes on the value 1 if the domestic rating is AAA; 0 if it is AA-, and -1 if it AA. The statistical tests for the significance of the coefficients assume a normal-distribution. ***, **, * indicate statistically significance at level 1%, 5%, and 10%.

7. Ratings and Yields on Chinese Bonds

While we have shown that domestic and global ratings are influenced by distinct determinants, it is of interest to test whether the ratings influence market prices. We next examine the correlation of agency ratings and credit spreads for Chinese corporate bonds. We also ask whether any observed relation persists even after controlling for the credit risk factors identified earlier. While we might expect ratings to be correlated with spreads if both agencies and market participants take into account similar credit risk factors, we do not know whether ratings independently influence spreads above and beyond other publicly observed variables.

We look at bonds issued domestically as price data for these are much more available to us than for bonds issued overseas. We collect a sample of bonds issued by corporations before the end of the 2015, yet after the latest domestic agency rating date for the company used in the previous sections. Only bonds with only long-term ratings that are identical to the long-term issuer-level ratings are selected. By these criteria, there are a total of 985 bonds issued by 670 firms with domestic ratings on and above AA/Aa2. A small subsample of these bonds also were issued by firms with global ratings in addition to their domestic ratings: 46 bonds issued by 25 firms with complete data on credit risk factors are identified. For each of these bond issues, we calculate the credit spread between the coupon rate and the corresponding

government bond yield²⁰ with closest maturity on the trading date immediately prior to the bond issuance date.

Table 13 lists the average yield spreads for both the large and smaller sample – broken down by original domestic ratings, and adjusted global ratings. We find a negative relationship between yield spread and ratings in all cases: namely, the higher the rating, the less the spread. For instance, in the large sample (second column), the average credit spread at issuance is 157 basis points for firms rated AAA (by Chinese agencies), 197 basis points for firms rated AA+, and 280 basis points for firms rated AA. The same relation holds for the smaller sample in the third column as well, sorted by Chinese agency ratings, or in the fourth column by global agency ratings. While this relationship between rating and credit spread may seem like an obvious result, there have been cases in the history of ratings where the correlation between ratings in certain jurisdictions and spreads has been negligible.²¹

Average issuance spread over government bond yield by ratings

Basis points

Table 13

	All firms		Jointly rated firms	
	By domestic ratings		By domestic ratings	By adjusted global ratings
AA (Aa2)	2.8 (479)		2.9 (2)	3.32 (7)
AA+ (Aa1)	1.97 (245)		1.74 (4)	1.72 (10)
AAA (Aaa)	1.57 (265)		1.48 (46)	1.16 (35)

Note: The ratings are original ratings for domestic ratings, and adjusted ratings for global ratings. The issuance spread is measured as the corporate coupon rate minus the government bond yield with maturity closest to the corporate bond on the trading date immediately prior to issuance. The numbers in the parentheses reflect the numbers of bonds with the corresponding rating.

Column (1) of Table 14 reports an OLS regression of the logged credit spread in basis points on the rating of Chinese agencies for the large sample, represented by two dummies for AAA and AA+, respectively, with the left out rating category being AA. As should be expected from the earlier table, the dummies indicate yield spreads are lower as the rating is higher. The dummies explain about 37% of the variation of the corporate spread over the corresponding government bond yield.

While column (1) reports the relation between credit spreads and Chinese ratings, column (2) presents the results of a regression of spreads against the four main corporate characteristics of the earlier ratings prediction models, plus one bond specific variable: the maturity of the bond (TERM) at issuance.²² The coefficients of the firm-specific control variables of size, profitability, leverage and state ownership have the right signs and are statistically significant. As for the bond-specific variable, one counterintuitive result is that spreads are narrower with the increased maturity of the bond, perhaps indicative of a sample selection effect whereby better quality firms

²⁰ The government bond yields come from China Central Depository & Clearing Co., Ltd. at www.Chinabond.com.cn.

²¹ See discussions in Cantor and Packer (1994, p. 20) and Kennedy (2008, p. 73).

²² We do not include more bond-specific characteristics, in order to make the results as comparable as possible with those of Table 15, where the sample is insufficiently large to allow the dropping of observations that occurs when more bond-specific characteristics are included as explanatory variables.

issue at longer-term maturities.²³ This regression itself explains 21% of the sample variation, and suggests that the ability of ratings to explain spreads might stem in large part from their relation with financial measures of the risk of corporate default. At the same time, the regression explains considerably less than the one with only credit rating dummies as explanatory variables. These results hark back to an earlier study of Japanese credit ratings, in which financial variables were found to explain less of the variation in market spreads than credit ratings themselves (Packer 2002).

The determinants of credit spreads at issuance (sample with domestic ratings)

OLS Regression

Table 14

	(1)	(2)	(3)
c	5.59 ***	6.49 ***	5.58 ***
AAA rating (domestic)	-0.67 ***		-0.68 ***
AA+ rating (domestic)	-0.35 ***		-0.37 ***
Net_PPE		-0.06 ***	0.00 ¹
Leverage_Book		0.04 ***	0.07 ***
EBIT		-3.28 ***	-2.04 ***
State_Ownership		-0.32 ***	-0.17 ***
Term of bond		-0.02 ***	-0.00 ¹
R ²	0.37	0.22	0.44
Adj R ²	0.37	0.21	0.43
No. of firms	590	590	590
No. of rating	868	868	868

Note: The dependent variable is the log of the differences of the coupon rate of the issued bond and the corresponding government bond yield with maturity closest to the corporate bond on the trading date immediately prior to issuance. **, * indicate statistical significance at level 1%, 5%, and 10%.

¹ The coefficients for Net_PPE and term are 0.001 and -0.003, respectively after rounding at three digits.

Column (3) of Table 14 reports the regression where both the ratings dummies *and* the corporate credit risk factors are included. The credit ratings dummies retain significance, as do three out of the four corporate credit risk variables (asset size being the exception). The adjusted R-squared of 43% is significantly higher than either the first or the second specification, suggesting that it is the combination of both ratings and corporate credit risk indicators that best explain credit spreads; namely, the credit rating adds explanatory power to corporate spreads even after other standard indicators of credit risk are controlled for.

Columns (1), (4) and (5) of Table 15 report identical regressions as the three just discussed, but only for the smaller sample of firms that also have global ratings. Some results are similar, but an important difference should be pointed out. Whereas ratings explain more than financial indicators for the large sample, the reverse is true in the small sample, as domestic ratings explain only 15% of the sample variation versus 34% for the financial indicators. This is likely related to the fact that the limited sample is quite squeezed in terms of the top end of the ratings distribution, as more

²³ The same negative relation between credit spread and maturity was also observed for project finance loans (Sorge and Gadanez 2008).

than 90% of bonds fall in the top rating category, versus three-quarters of the smaller sample. Constrained in this fashion, domestic ratings do not add marginal value to the full regression in column (5).

The determinants of credit spreads
(sample with both domestic and global ratings)

OLS Regression

Table 15

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
c	5.59 ***	5.6 ***	5.77 ***	6.49 ***	6.48 ***	6.19 ***	6.49 ***
AAA rating (domestic)	-0.88 ***		-0.37		-0.37		0.36
AA+ rating (domestic)	-0.4		-0.34		-0.14		-0.06
AAA rating (global)		-0.95 ***	-0.76 *			-0.93 ***	-1.35 ***
AA+ rating (global)		-0.5	-0.35			-0.5 *	-0.85 **
Net_PPE				-0.07 ***	-0.06 **	-0.03	-0.04
Leverage_Book				0.1	0.11 *	0.14 **	0.13 **
EBIT				-10.72 ***	-9.13 **	-8.47 **	-9.36 **
State-ownership				0.01	0.01	0.16	0.24
Term				-0.1	-0.1	-0.09	-0.09
R ²	0.19	0.28	0.29	0.41	0.44	0.57	0.59
Adj R ²	0.15	0.24	0.22	0.34	0.33	0.49	0.49
No. of firms	25	25	25	25	25	25	25
No. of ratings	46	46	46	46	46	46	46

Note: The dependent variable is the log of the differences of the coupon rate of the issued bond and the corresponding government bond yield with maturity closest to the corporate bond on the trading date immediately prior to issuance. **, * indicate statistical significance at level 1%, 5%, and 10%.

Column (2) presents a regression that applies the (adjusted) global rating instead of the domestic rating. The dummy coefficients on the global rating are the right sign and magnitude relative to each other, with an adjusted R-squared of 24%. Including also the financial variables in column (6)'s regression gains considerable explanatory power; global ratings and the financial variables explain 49% of the variation in spreads (versus 34% for the financial indicators alone). As for domestic ratings, columns (3) and (7) make clear that they do not add value to the global ratings regressions.

It must be acknowledged that the sample size of spreads for jointly rated issuers is quite small: the number of jointly rated firms with both available market prices and complete financial variable data is only 25. The small sample size thus limits the inferences that can be made in terms of comparing the impact of domestic and global ratings. Further, the lack of explanatory power for domestic ratings is likely due to the lack of ratings dispersion of domestic ratings in the small sample noted earlier.²⁴ In

²⁴ We checked whether a difference in the domestic and (aligned) global ratings made an additional difference to the yield beyond the ratings dummies themselves, but the coefficient on the split variable was insignificant.

the larger sample where domestic ratings were more dispersed among the three categories, they explained a much larger percentage of variation in spreads.

Tests of a similar nature have been run for US and Japanese corporate ratings (eg Ederington and Yavitz (1987), Packer (2002)) as well as sovereign ratings (Cantor and Packer (1996)). Like these studies we find that credit ratings add value to publically available financial indicators when predicting cross-sectional variation in credit spreads. And we also find that *both* domestic *and* global ratings appear to be taken into account by market participants in the pricing of risk, despite their disparate scales and distinct approaches to the estimation of credit risk.

8. Conclusion

The market for the provision of credit ratings of Chinese firms has some unique features. On the one hand, domestic firms issuing bonds in China can only receive ratings from domestic rating agencies; global rating agencies are not accredited to rate these issues. On the other hand, global rating agencies do issue ratings of Chinese firms issuing bonds in international markets, but there the demand for the ratings of domestic agencies is not pronounced.

We have documented that domestic ratings agencies rate Chinese companies at much higher levels than do global rating agencies. Rating differences can be driven by differences in ratings scales – or the probabilities of default associated with any rating grade. Differences in ratings thresholds for default probabilities are evident from the large average (and median) differences between global and domestic agency ratings on jointly rated issues, between 6 and 7 notches. Similar differences do not exist between different global agency ratings, nor among different Chinese agency ratings.

We asked whether the rating evaluation function – or the agencies' mapping of observable factors into ratings categories – may also explain ratings differences. To abstract from the impact of rating scale, we adjusted global ratings so that they fell into the same number of rating levels with roughly the same proportion as observed for domestic agencies, yet maintained the same rank ordering of the unadjusted global ratings. Larger, more leveraged firms tended to receive higher ratings from domestic agencies; profitable, state-owned firms are favored by global agencies. This suggests that global and domestic agencies have systemic differences of opinion that reflect different weights attached to the factors underlying the default risk of Chinese firms, as opposed to simple differences in the ratings scales.

With a sample of credit spreads of domestically issued bonds, we also examine whether the market prices the domestic ratings and global ratings of bonds. Both domestic ratings and global ratings appear to have information content, in the sense that both add explanatory power to linear regressions predicting spreads compared to regressions with only non-rating-related variables. But the small size of the sample suggests caution is in order when comparing the information content of the two types of ratings.

In future research, expanding the size of the sample both cross-sectionally and longitudinally to include more bonds and more ratings (including of other agencies) will help to confirm the robustness of the results, but also allow for a more nuanced measurement of the impact of state ownership. It will be of further interest to see

how the ratings of domestic and global agencies line up with corporate bonds defaults in China, which have increased more recently. The questions on the measurement and calibration of credit risk in China are many, and we look forward contributing further to this research agenda going forward.

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