2010年12月 第12卷 第4期
中 国 会 计 与 财 务 研 究
China Accounting and Finance Review
Volume 12, Number 4 – December 2010

经营风险、产权性质、银行竞争与企业债务期限结构：基于流动性风险理论的实证检验*

廖冠民[1] 唐弋宇[2] 吴溪[3]

摘要

本文检验了2001至2008年间中国上市公司经营风险对债务期限结构的影响，以推断中国企业在债务期限决策中是否以及如何考虑流动性风险的影响。我们发现，公司经营风险越高，其长期债务比例越大；与国有公司相比，经营风险对非国有公司债务期限的正向影响更大；当公司处于银行竞争较强的环境中时，经营风险对债务期限的正向影响更大。本文结果表明，以银行借款作为主要债务融资方式的中国企业在选择债务期限时会考虑流动性风险，但这种考量因企业产权性质及所处地区的银行竞争环境的不同而有所差异。本文结果还表明，银行处于垄断地位时有更强的动机搜集企业信息，有助于降低信贷准入门槛和企业的流动性风险，这与Petersen and Rajan（1995）一致，支持关于银行市场结构的信息基础假说。此外，我们在进一步的测试中没有发现中国上市公司经营风险与债务期限之间存在倒U型非单调关系。

关键词：经营风险、流动性风险、产权性质、银行竞争、债务期限结构
中图分类号：F230

* 作者感谢俞伟峰教授（执行编辑）与匿名审稿人的修改意见和建议。本研究得到教育部人文社会科学研究项目“金融发展对债务融资治理效应的影响研究”（编号08JC630086）、北京市教育委员会共建项目以及中央财经大学“211工程”三期重点学科建设项目资助。本文的更早版本曾在2009年中国会计与财务研究国际研讨会（2009年6月，南京）和第八届中国实证会计国际研讨会（2009年12月，北京）进行交流，感谢马忠教授、苏文兵副教授、朱凯副教授在会议研讨过程中提出的建设性意见。文责由作者自负。
1 中央财经大学会计学院，副教授。电子邮箱：liaoguanmin@gmail.com。通讯地址：北京市海淀区学院南路39号中央财经大学会计学院（100081）。
2 中央财经大学会计学院博士研究生，中信银行总行。电子邮箱：tangyiyu@126.com。
3 中央财经大学会计学院，副教授。电子邮箱：snascorwu@yahoo.com.cn。

一、引言

2008年美国次贷危机引发的全球金融风暴使全球经济陷入衰退，其产生原因受到学术界与实务界的广泛关注。其中，经济体系中过高的短期债务融资以及相应的流动性风险被认为是罪魁祸首之一。事实上，短期债务对企业而言是把双刃剑，当经济形势较好时，企业可以享受其低成本的好处，但一旦外部经济环境发生变化，例如银根收缩，企业将承担流动性风险，即短期债务到期后因无法续借而不得不放弃投资机会并导致损失。更为严重的是，流动性风险的存在可能使整体经济形势进一步恶化（Diamond and Rajan, 2001）。

我国企业的债务期限结构中短期债务的比例一直居高不下。即使是上市公司，其长期债务比例也仅占13%（Fan, Titman and Twite, 2008）。一个重要的理论解释是，在投资者法律保护较差的市场，长期契约难以有效执行，债权人倾向于通过短期贷款对企业进行监督（Diamond, 1991b; Rajan, 1992）。可问题在于，我国企业如何应对随之而来的流动性风险？我国企业在债务期限决策中究竟如何考虑流动性风险的影响？对流动性风险的考量是否还受到我国特殊制度环境的影响？

Diamond（1991a）提出的关于企业债务期限结构的流动性风险理论指出，企业发行短期债务，一方面可以向市场传递其信用等级较高的私有信息，另一方面又会带来流动性风险，因此企业应该在权衡二者利弊的基础上确定最优债务期限结构。然而，不同制度环境下企业短期债务的流动性风险却可能存在差异。例如，对于具有信贷优惠的国有企业或者处于信贷准入门槛较低的金融市场环境中时，由于再融资更为容易，企业可能只承受很低的流动性风险。此时企业选择债务期限结构时流动性风险的影响较小。

由于我国大多数上市公司都缺乏公开的信用评级信息，本文检验公司经营风险对债务期限结构的影响，并以此推断我国企业在债务期限决策中究竟是否考虑流动性风险。不同理论对经营风险与企业债务期限之间的相关性存在完全相反的预测方向。高经营风险公司的信用风险等级较高，[4]根据流动性风险理论（Diamond, 1991a），企业应该选择较长的债务期限[5]；但根据合约成本理论（Myers, 1977; Jensen, 1986）和税收理论（Kane, Marcus and McDonald, 1985），由于高经营风险公司的代理成本较高，且需要更频繁地调整资本结构，因此应该选择更短的债务期限。本文检验发现，我国上市公司经营风险与债务期限正相关，支持流动性风险理论的推断。这表明平均而言，我国企业在进行债务期限结构决策时对短期债务的流动性风险是有所考虑的。

更进一步地，我们还检验了企业产权性质及银行竞争环境对经营风险与债务期限之间相关性的影响，以推断我国企业在债务期限决策中对流动性风险的考量如何受制度环境的影响。我们发现，国有企业的经营风险对其债务期限的正向影响更小。这表明国有企业的信贷优惠（Brandt and Li, 2003）可以降低其短期债务的流动性风险，致使经营风险与其债务期限的正相关性更弱。我们还发现，在银行竞争较弱

[4] 例如，Johnson(2003)等文献以经营风险作为信用风险的替代变量。
[5] 但风险等级最高的公司例外，因为此时公司难以取得长期借款。

的地区，企业经营风险对债务期限的正向影响更小。这表明银行具有垄断地位时更愿意搜集企业信息并与之维持长期信贷关系，可以降低流动性风险的影响。该结果支持关于银行市场结构的信息基础假说，而与结构业绩假说不一致。

本文的贡献主要体现在三个方面。第一，本文以中国上市公司为样本，基于经营风险视角，检验企业在债务期限决策中是否以及如何考虑流动性风险的影响，为Diamond（1991a）的流动性风险理论增添了新证据。

在国际文献中，关于流动性风险理论的经验证据并不一致。Barclay and Smith（1995）、Stohs and Mauer（1996）、Scherr and Hulbert（2001）、Johnson（2003）等文献发现，公司风险与债务期限之间存在如理论所推断的倒U型非单调关系；Goyal and Wang（2009）的研究表明，公司如果发行短期债务，其未来风险下降，而发行长期债务则相反，支持流动性风险理论中企业通过短期债务传递积极信息的推断。但Mitchell（1993）、Sarkar（1999）、Ortiz-Molina and Penas（2004）却发现公司风险与债务期限负相关，与流动风险理论的预测相悖；Berger *et al.*（2005）也发现，风险与债务期限之间的相关性只在低风险等级的公司中与理论推断一致。最近的研究（如Jansen, 2007）则表明，公司风险与债务期限之间相关性的检验结果受公司风险度量方法的影响很大。由此，有必要为流动性风险理论提供更广泛的经验证据。

更为重要的是，中国的金融市场与西方国家存在很大差异，债券市场非常不发达，银行借款是企业主要的债务融资方式。由于银行存在较多的私有信息，银行借款融资对公司风险的考量与债券融资存在很大差异（Berger *et al.,* 2005）。为此，在中国的特殊金融市场制度下，流动性风险对企业债务期限决策的影响值得检验。

然而，尽管研究中国企业债务期限结构影响因素的文献已有不少（如袁卫秋，2005；孙铮、刘凤委、李增泉，2005；肖作平、廖理，2007；肖作平，2009），但鲜有专门针对流动性风险的研究。与本文较为相关的是Cai *et al.*（2008），他们以中国1999至2004年259家制造业上市公司（1554个观测）为检验样本，发现经营风险（以盈利的标准差度量）对债务期限并不存在稳定的显著影响，有时甚至存在负向影响，因而不支持流动性风险理论。本文的样本则包括中国2001至2008年1413家非金融业上市公司，共计8070个观测。我们不仅考察了中国企业最近的债务期限选择模式，还具有更大的样本规模。而且，我们发现了不同于Cai *et al.*（2008）的实证结果：即经营风险与债务期限显著正相关，并且这种相关性受到企业产权性质与所处地区银行竞争环境的影响。这在一定程度上支持了流动性风险理论。不过由于中国过高的资本市场准入门槛，我们没有发现理论上所推断的倒U型关系。

第二，本文从流动性风险视角提供了金融市场制度影响公司融资行为的新证据。Demirguc-Kunt and Maksimovic (1999)、Giannetti (2003)、Jong *et al.* (2008) 等大量文献从代理成本等视角研究金融市场制度对债务融资的影响，但鲜有基于流动性风险的经验证据。本文的实证结果表明，对处于银行竞争较弱的环境中的企业而言，其融资（债务期限）决策较少考虑流动性风险的影响。

第三，本文还为银行市场结构的经济后果研究补充了新证据。关于银行市场结构如何影响企业获取信贷存在两种预测结果完全相反的理论。信息基础假说认为银行处于垄断地位时有助于企业获取信贷，而结构业绩假说则认为银行竞争的加强可以提高信贷市场的效率（Beck, Demirguc-Kunt and Maksimovic, 2004）。相关经验证

据也不一致，Petersen and Rajan (1995)、Cetorelli and Gambera (2001)、Bonaccorsi di Patti and Dell'ariccia (2004) 等文献支持信息基础假说，而Hannan（1991）、Black and Strahan（2002）、Martinez Peria and Mody（2004）、Cetorelli and Strahan（2006）、Degryse and Ongena（2008）等文献提供的证据则支持结构业绩假说。本文选择以银行贷款为主要债务融资方式的中国上市公司为检验样本，发现当银行具有垄断地位时更有动力搜集企业信息并维持长期信贷关系，从流动性风险的视角提供了支持信息基础假说的证据。[6]

本文其余部分安排如下：第二部分进行理论分析，并提出本文的研究问题；第三部分为研究设计；第四部分提供描述性统计、主要检验结果及其解释；第五部分是稳健性测试；第六部分为结论。

二、理论分析与研究问题

（一）经营风险与企业债务期限选择

Flannery（1986）研究了信息不对称条件下的公司债务期限结构决策。他认为，在信息不对称条件下，由于公司拥有其未来前景的私有信息，市场对公司证券的定价都存在一定的偏差，但长期证券的定价偏差要大于短期证券。由此，公司向市场发行短期债券可以传递其项目质量较高、未来前景较好的信息。Diamond（1991a）在此基础上进一步考虑流动性风险的影响，他指出，公司发行短期债务一方面能够向市场传递其信用等级较高的私有信息，但另一方面将带来更高的流动性风险，即短期债务到期时可能无法继续筹集债务资金以满足长期项目的资金需求而遭受损失。由此，公司选择债务期限结构时应该权衡短期债务在传递信息与流动性风险两方面的得失。对于信用风险较高的公司，其流动性风险也较高，故应选择更多的长期债务。但如果信用风险太高，由于过高的债务代理成本，公司将难以筹集长期债务资金，故而只能选择短期债务融资。因此，Diamond（1991a）推断公司信用风险与债务期限之间存在倒U型的非单调关系。

公司经营风险与信用风险以及流动性风险都密切相关。如果公司的经营风险较高，其未来盈利的不确定性较大，也就更可能无法偿还到期债务而发生违约，因此存在较高的信用风险。更进一步地，当短期债务到期时，高经营风险公司的业绩水平更可能低于银行再贷款的门槛，[7]导致难以为其长期项目续借资金。有鉴于此，Johnson (2003) 等检验流动性风险理论的实证文献以经营风险作为信用风险的替代变量。

---

[6] 当然，本文也发现了部分与流动性风险理论不完全一致的实证结果。例如，银行竞争总体上对债务期限只存在微弱的负向影响，国有产权有时甚至对债务期限存在显著的正向影响。对于这些影响结果的分析与讨论，参见随后的"实证结果"、"稳健性检验"及"结论"等部分。

[7] 高经营风险公司可能在业绩较好的时候成功筹集到短期借款，但一旦短期借款到期，由于高经营风险公司的业绩波动性较大，相对于平均业绩相同但风险较低的公司而言，其业绩水平达不到银行贷款门槛的可能性更大。

根据Diamond(1991a)的流动性风险理论，由于高经营风险公司的信用风险也较高，其流动性风险较大，因而选择较长的债务期限。但处于最高风险等级的公司难以从银行获得长期资金，因而只能选择短期债务融资。Johnson(2003)提供了相应的支持证据，他发现公司经营风险与债务期限之间存在如理论预测的倒U型非单调关系。但是这种关系可能并不适用于我国上市公司。我国资本市场存在较高的准入门槛，相对而言，上市公司是优质公司，即使其风险等级较高，可能也还是能够从银行获得长期借款。所以我们首先仅检验经营风险对债务期限的单调、线性影响，然后在稳健性测试中再考虑二者之间可能存在的非单调关系。

更进一步地，短期债务融资之所以会带来流动性风险，是由于短期债务到期时公司可能无法从债权人续借资金而无法支持长期项目。与低经营风险公司相比，高经营风险公司的这种可能性要大得多，因而承担了更高的流动性风险。然而，这种规律对不同产权性质的公司存在差异。Brandt and Li(2003)、胡奕明、谢诗蕾(2005)等大量研究表明，由于政府对银行贷款决策的行政干预，或者政府提供的隐性担保，国有公司从银行获取贷款时具有优惠，其贷款申请也更加容易得到银行的批准。由此，对于国有公司而言，由于续借银行贷款的难度较低，即使自身经营风险较高，其流动性风险与低经营风险公司差异不大，都相对较低。反之，对于非国有公司，高、低经营风险公司的流动性风险差异很大，对债务期限的影响也就更加明显。因此，从流动性风险角度来看，与国有公司相比，经营风险对非国有公司债务期限的正向影响更大。

然而，关于公司债务期限结构的合约成本理论及税收理论对公司经营风险与债务期限之间的相关性则作出了完全相反的预测。合约成本理论认为，短期债务可以促使公司频繁向投资者提供经营信息、削减自由现金流量，从而减弱资产替代、投资不足以及管理者随意处置自由现金流等代理问题(Myers, 1977; Barnea, Haugen and Senbet, 1981; Jensen, 1986; Hart and Moore, 1994)。由此，对于代理问题比较严重的公司，为了降低与债权人之间所签订债务合约的成本，将选择更多的短期债务。高经营风险公司的信息不对称程度更高，代理问题更为严重(Ortiz-Molina and Penas, 2004)，为了减小合约成本，应该更多地采用短期债务融资。Kane, Marcus and McDonald (1985) 提出的税收理论将税收因素纳入公司债务期限决策之中，他们指出，最优的债务期限结构应该权衡所得税、破产成本以及债务发行费用三方面的影响。当公司价值发生波动时，必须根据预期破产成本的变化不断调整资本结构以达致最优。对于高风险公司，其价值波动较大，资本结构的调整更为频繁，公司应该发行更多的短期债务以方便资本结构的调整，从而节约调整成本。总之，合约成本理论及税收理论都预测公司经营风险对债务期限存在负向影响。Mitchell (1993)、Ortiz-Molina and Penas (2004) 等实证文献提供了公司风险与债务期限负相关的经验证据。

（二）银行竞争、流动性风险与企业债务期限

关于银行市场结构究竟如何影响企业获取信贷，存在信息基础假说与结构业绩假说两种相互对立的理论（Beck, Demirguc-Kunt and Maksimovic, 2004）。信息基础假说认为，当银行竞争较弱时，处于垄断地位的银行更愿意在银企关系上投资，搜集更多的企业软信息，更有动力向新企业发放贷款，并倾向于与企业维持更长期的信贷关系（Petersen and Rajan, 1995）。这主要是由于来自其他银行的竞争较少，占据垄断地位的银行无需担心未来客户流失，因而具有较强的激励去搜集更多信息以获得信息租金，更可能给予新兴企业优惠信贷条件并待其成长后再索求较高的贷款利率。而在竞争激烈的信贷市场，企业选择贷款银行的空间较大，银行无法实施这种信贷战略。Marquez（2002）的研究也表明，当银行市场结构比较集中时，银行掌握的与借款公司相关的特有信息也更加集中，能够降低银企之间的信息不对称程度。由此，在银行竞争较弱的环境下，公司更容易获取信贷。Petersen and Rajan (1995)、Cetorelli and Gambera (2001)、Bonaccorsi di Patti and Dell’ariccia (2004) 等文献从企业对商业信用融资的依赖、企业成长等多个角度提供了银行信贷市场的集中有助于降低企业信贷准入门槛的经验证据。余明桂、潘红波（2008）对中国的研究发现银行竞争较弱地区的上市公司能够从银行获得更多的长期借款。

与之相反，基于传统产业组织理论的结构业绩假说则认为，处于垄断地位的银行会充分利用自身的垄断优势，过度抽取客户租金，要求非常苛刻的信贷条件，例如向储户支付过低的存款利率，但向借款企业索取过高的贷款利率（Pagano, 1993）；并且更可能使用配给的方式发放贷款，导致信贷配给问题（Guzman, 2000），致使公司获取银行信贷的难度加大。Hannan (1991)、Black and Strahan (2002)、Martinez Peria and Mody (2004)、Cetorelli and Strahan (2006)、Degryse and Ongena (2008) 等文献分别从贷款利率、新兴企业融资、产业结构等多个角度提供了银行竞争有助于企业获取信贷的经验证据。

如果信息基础假说成立，当银行竞争较弱时，银行与公司维持长期信贷关系的动力较强，则公司能更轻易地从银行获得长期借款，也即银行竞争与公司债务期限负相关。更进一步地，此时不论公司经营风险的高低，其短期债务到期时再向银行续借的难度都较小，因而经营风险对债务期限的正向影响较弱。反之，当银行竞争较强时，银行发放长期贷款的动力较弱，公司在短期债务到期时再续借的难度也较大，对于高经营风险公司尤为如此，也即此时经营风险对流动性风险的影响变得很大，因而经营风险对债务期限的正向影响较强。由此，信息基础假说推断，在银行竞争较强的环境中，公司经营风险对债务期限的正向影响更强。

然而，如果结构业绩假说成立，银行竞争有助于公司获取信贷。当银行竞争较强时，公司更容易获取银行长期借款，即银行竞争与公司债务期限之间存在正相关性。更进一步地，此时不论公司经营风险高低，短期债务到期时进行续借的难度都相对较低，因而公司在做债务期限决策时受经营风险的影响较小。也就是说，结构业绩假说推断，在银行竞争较强的环境中公司经营风险对债务期限的正向影响更弱。

（三）本文的研究问题

根据上述理论分析，本文主要研究如下三个问题：

RQ1：公司长期债务比例是否随经营风险的增大而上升？

RQ2：与国有公司相比，非国有公司经营风险对长期债务比例的正向影响是否更大？

RQ3：当公司处于银行竞争较强的环境时，其经营风险对长期债务比例的正向影响是否更大？

三、研究设计

（一）数据来源与样本选择

本文使用的上市公司财务数据来源于国泰安CSMAR数据库，产权性质、第一大股东持股比例、行业类别数据取自色诺芬（CCER）数据库，各地区的银行竞争及GDP增长数据则由手工搜集而成。我们选择2001至2008年中国A股非金融业上市公司数据为研究样本。[8]初始样本包括10768个公司－年度观测，然后依次按如下程序剔除不符合要求的观测：(1) 缺乏历史3年（含当年）财务数据的观测1249个；[9](2) 没有银行借款或缺失银行借款信息的观测616个；(3) 缺失其他财务指标、产权性质、市场价值、大股东持股等数据的观测833个。最后得到8070个公司－年度观测。

（二）模型与变量

本文采用以下基本回归模型：

$$\begin{aligned} Longdebt = {} & \beta_0 + \beta_1 Risk + \beta_2 State \times Risk + \beta_3 State + \beta_4 Hbankcomp \times Risk \\ & + \beta_5 Bankcomp + \beta_6 Size + \beta_7 TQ + \beta_8 First + \beta_9 Roa + \beta_{10} Lev \\ & + \beta_{11} Liquid + \beta_{12} Fixas + \beta_{13} ETR + \beta_{14} GDP + \lambda IND + \varepsilon \end{aligned} \quad (1)$$

1. 因变量

因变量*Longdebt*为长期借款比例。我们以企业长期借款占全部银行借款之比作为债务期限的替代度量。一年内到期的长期借款在实质上属于公司过去筹集的长期资金，也将之归入长期借款。该变量的计算公式为：*Longdebt* =（长期借款+一年内到期的长期负债）/（长期借款+一年内到期的长期负债+短期借款）。

2. 测试变量

(1) 经营风险

模型中的变量*Risk*代表经营风险。由于我国大多数上市公司没有公开的信用评级信息，我们无法通过检验信用风险对债务期限的影响来提供流动性风险理论的直接证据。因此本文参照Johnson (2003)、Cai *et al.*（2008）等文献，考察经营风险对债务期限的影响，并以此推断流动性风险对我国上市公司债务期限决策的影响。

---

[8] 我们没有搜集到2001年之前的银行竞争数据。

[9] 按本文方法度量风险时至少需要历史3年的财务数据。

本文采用两种方法度量经营风险：一是参照Johnson（2003），以历史7年（含当年）资产报酬率的标准差（*Risk_roa*）来度量；二是参照Eriksson（1999），以历史7年（含当年）主营业务收入的标准离差率（*Risk_sales*）来度量，其中标准离差率等于变量的标准差除以其均值。如果有效年限不足7年但超过3年，则按实际年限计算。根据流动性风险理论，高经营风险企业选择更长的债务期限，因此我们预测经营风险变量的系数估计符号为正；但根据合约成本理论和税收理论，高经营风险企业选择更短的债务期限，因而预测经营风险变量的系数估计符号为负。

(2) 产权性质

基于本文研究目标，我们引入企业产权性质与经营风险的交互项*State*×*Risk*以检验产权性质是否影响经营风险与债务期限之间的相关性。其中*State*为标志公司是否为国有公司的虚拟变量。根据前文的理论分析，在流动性风险理论下，我们预测该交互项的估计系数符号为负。但在合约成本理论及税收理论下，由于不同产权性质企业的合约成本及资本结构调整成本难以比较，我们不对产权性质对经营风险与债务期限之间相关性的影响方向进行预测。

我们同时也控制产权性质对债务期限的直接影响。但理论上对产权性质如何影响债务期限却存在两个完全相反的预测：一方面，由于政府的行政干预、隐性担保等诸多缘由，国有公司具有信贷优惠，更容易从银行获取长期贷款，因此国有公司具有更长的债务期限（江伟、李斌，2006）；但另一方面，根据前文的理论分析，国有公司的流动性风险更低，因而倾向于选择更短的债务期限。

(3) 银行竞争

我们借鉴卢峰、姚洋（2004）提出的方法，以中国各地区（省、自治区、直辖市）当年年末除四大国有商业银行以外其它银行的信贷份额来度量银行竞争程度（*Bankcomp*），该变量越大，表明银行竞争越激烈。基于本文研究目标，我们引入银行竞争与公司经营风险的交互项*Hbankcomp*×*Risk*，其中*Hbankcomp*为标志公司所处地区银行竞争程度高低的虚拟变量（公司所处地区的银行竞争水平高于全部地区的2/3分位数时该变量取值为1，否则取值为0）；同时控制银行竞争（*Bankcomp*）对债务期限的直接影响。根据前文的理论分析，在信息基础假说下，银行竞争变量*Bankcomp*的系数估计符号预期为负，交互项*Hbankcomp*×*Risk*的系数估计符号预期为正。但在结构业绩假说下则完全相反，*Bankcomp*的系数估计符号预期为正，而*Hbankcomp*×*Risk*的系数估计符号预期为负。

3. 控制变量

根据Barclay and Smith (1995)、Cai *et al.* (2008) 等大量已有文献的研究，我们对以下变量进行控制：

(1) 公司规模（*Size*=总资产的自然对数）。大公司的信息披露更为透明，代理成本较低，因而银行愿意发放更多的长期贷款，企业获取长期贷款的成本较低（Titman and Wessels, 1988）。由此，根据合约成本理论，公司规模越大，其债务期限越长。Barclay and Smith (1995)、Stohs and Mauer (1996) 等文献都发现公司规模与债务期限正相关。

(2) 成长机会(*TQ* = (股权的市场价值 + 负债的账面价值)/资产的账面价值)。企业未来成长机会容易引发两类代理问题：一是投资不足(Myers, 1977)，二是过度投资(Hart and Moore, 1994)。短期债务可以缓解前者，而长期债务能够抑制后者。辛清泉等(2007)等研究表明，中国上市公司存在严重的过度投资问题。也就是说，相对于投资不足而言，过度投资是中国更为普遍的代理问题。因此对于中国上市公司，企业未来成长机会越多，债务期限越长。本文以托宾Q来度量企业成长机会。Cai *et al.*(2008)发现中国上市公司的托宾Q对其债务期限具有正向影响，但在大多数情形并不显著。

(3) 第一大股东持股(*First* = 第一大股东持股比例)。Jiang *et al.*(2010)等大量文献研究表明，中国上市公司股权结构高度集中，大股东掏空上市公司的问题非常严重。因此根据合约成本理论，公司第一大股东的持股比例与债务期限负相关。

(4) 盈利能力(*ROA* = 营业利润/总资产)。根据合约成本理论，公司的盈利能力越强，银行监督的需求越弱，公司就越容易筹集到长期借款，因而公司盈利能力与债务期限正相关。但根据信息不对称及流动性风险理论，强盈利能力公司有动力通过发行短期债务传递积极信号(Flannery, 1986)，并且具有更低的流动性风险，因此倾向于选择更多的短期债务，所以盈利能力与债务期限负相关。孙铮、刘凤委、李增泉(2005)、Cai *et al.*(2008)、Fan, Titman and Twite(2008)等研究发现，公司盈利能力与债务期限正相关。

(5) 财务杠杆(*Lev* = 负债/总资产)。根据合约成本理论，当公司财务杠杆较高时，投资不足代理成本较高(Dennis *et al.,* 2000)，银行收回贷款的风险加大，倾向于发放短期贷款以加强监督，因此财务杠杆与债务期限负相关。但根据流动性风险理论，高财务杠杆公司的流动性风险较高，因而有动机选择更多的长期债务。Leland and Toft(1996)也证明，财务杠杆较高的公司倾向于选择更多的长期债务。Morris(1992)基于破产风险的考虑也认为高杠杆公司会更多地使用长期债务。

(6) 企业资产的流动性(*Liquid* = (货币资金 + 短期投资)/总资产)。公司资产的流动性越强，流动性风险越低，根据流动性风险理论，应该选择越多的短期债务。Myers and Rajan(1998)也认为，流动资产的担保价值更低，容易被转移，故持有过多流动资产的公司难以从银行获得长期贷款。因此，资产的流动性与债务期限负相关。不同于Cai *et al.*(2008)使用流动比率度量资产流动性，我们以货币资金与短期资产之和占总资产的比例作为流动性的度量指标，这主要是考虑到计算流动比率时的分母是流动负债，而模型因变量就是长期债务占全部债务的比例，显然，“全部债务与长期债务之差”和流动负债在数量上非常接近，因此在数量关系上，流动比率与长期债务比例就具有“天然”的正相关性，故使用流动比率可能无法真实反映资产流动性与债务期限之间的理论关系。

(7) 固定资产比例(*Fixas* = 固定资产合计/总资产)。根据资产与债务期限匹配原则(Hart and Moore, 1994)，长期资产比重越高，对长期债务的需求越强，因此固定资产比例与债务期限正相关。Barclay and Smith(1995)、Fan, Titman and Twite(2008)、孙铮、刘凤委、李增泉(2005)提供了相应的经验证据。

(8) 有效税率(*ETR* = 所得税费用/税前利润总额)。根据Kane, Marcus and McDonald(1985)提出的税收理论，当税率较高时企业本身具有更大的税收利益，因而会筹集更多的利息费用相对较低的短期债务，这样还能降低调整资本结构的交易费用。由此，有效税率与债务期限负相关。我们以平均税率作为公司有效税率的替代度量，但如果计算的平均税率小于0或大于1，则分别取值为0和1。

(9) 地区经济增长(*GDP* = (地区当年GDP － 地区上年GDP)/地区上年GDP)与行业固定效应(*IND*)。地区经济增长、行业特征对公司融资行为存在重要影响，我们都予以控制。行业分类依据中国证监会2001年颁布的《上市公司行业分类指引》，其中制造业由于内部差异较大，取前两位代码分类，其他行业取第一位代码分类。

四、实证结果

(一)描述性统计

表1列示了模型变量的描述性统计结果。在全部样本中国有公司占72%；处于银行竞争较强地区的观测为3417个，约占全部样本的42%。上市公司长期借款比例Longdebt的均值(中值)为28.4%(19.3%)；国有公司的长期借款比例显著大于非国有公司，表明国有产权有助于企业从银行获取长期信贷；强银行竞争地区的公司长期借款比例高于银行竞争较弱的地区，这可能是由于银行竞争有助于企业获取长期信贷，但也可能是因为不同地区的企业特征存在差异，例如，强银行竞争地区的公司规模显著大于弱银行竞争地区，[10]而大规模企业更容易获得长期信贷。

公司成长性*TQ*、盈利能力*ROA*、财务杠杆*Lev*存在明显的异常值，我们对之实施(1%，99%)区间的截尾处理。可以看到，对于不同产权性质、不同银行竞争程度的地区，上市公司的各项财务指标、股权特征存在很大差异，因此在回归中须予以控制。

表2列示了各变量的相关系数矩阵，以空白的对角线为界，表的左下半部分列示简单相关系数，右上半部分列示偏相关系数。可以看到，因变量长期借款比例*Longdebt*与绝大多数自变量呈现显著的相关性。*Longdebt*与经营风险变量*Risk_sales*显著正相关，符合流动性风险理论的预期。从简单相关系数来看，*Longdebt*与经营风险变量*Risk_roa*显著负相关，与流动性风险理论的预期相反；但从偏相关系数来看，*Longdebt*与*Risk_roa*显著正相关，与流动性风险理论的预期一致。这主要是由于*Risk_roa*与资产规模*Size*存在较强的负相关性(简单相关系数达0.3，在1%的水平上显著)，而*Size*与*Longdebt*显著正相关(简单相关系数达0.32)。

我们也进行了如下测试(未列表)：首先将*Longdebt*对*Risk_roa*进行回归(仅控制行业固定效应)，此时*Risk_roa*在1%的水平显著为负，与简单相关系数的结果一致；但引入变量*Size*之后，可以看到*Risk_roa*立即变为在1%的水平显著为正。这表明债务期限与经营风险之间的相关性受规模因素的影响很大，*Longdebt*与*Risk_roa*之间的简单相关系数可能无法反映二者的真实相关性。鉴于此，有必要通过更严谨的多元回归分析予以验证。

---

[10] 强、弱银行竞争地区的公司资产规模变量*Size*的均值分别为21.57和21.26，二者差异的t检验在1%的水平上显著。

表1 描述性统计

	全部样本						按产权性质分组					按银行竞争程度分组				
							非国有		国有			弱竞争		强竞争		
	Obs.	Mean	Median	Std.	Min	Max	Obs.	Mean	Obs.	Mean	t-test	Obs.	Mean	Obs.	Mean	t-test
Longdebt	8070	0.284	0.193	0.295	0.000	1.000	2258	0.236	5812	0.302	-9.15***	4653	0.274	3417	0.297	-3.58***
Risk_roa	8070	0.041	0.028	0.037	0.000	0.281	2258	0.048	5812	0.038	11.25***	4653	0.040	3417	0.042	-2.24**
Risk_sales	8070	0.417	0.370	0.252	0.010	3.179	2258	0.455	5812	0.402	8.49***	4653	0.406	3417	0.431	-4.38***
State	8070	0.720	1.000	0.449	0.000	1.000						4653	0.722	3417	0.718	0.45
Bankcomp	8070	0.487	0.488	0.081	0.027	0.677	2258	0.486	5812	0.488	-1.25	4653	0.436	3417	0.557	-99.23***
Size	8070	21.393	21.302	1.020	16.704	27.346	2258	21.043	5812	21.529	-19.68***	4653	21.260	3417	21.574	-13.79***
TQ	8070	2.029	1.621	1.223	0.871	7.669	2258	2.196	5812	1.965	7.67***	4653	2.016	3417	2.048	-1.16
First	8070	0.397	0.377	0.166	0.000	0.852	2258	0.319	5812	0.427	-27.23***	4653	0.409	3417	0.380	7.67***
ROA	8070	0.028	0.031	0.072	-0.304	0.201	2258	0.023	5812	0.030	-3.67***	4653	0.028	3417	0.027	0.56
Lev	8070	0.268	0.258	0.154	0.003	0.714	2258	0.283	5812	0.261	5.75***	4653	0.273	3417	0.260	3.84***
Liquid	8070	0.145	0.124	0.099	0.000	0.786	2258	0.146	5812	0.144	0.59	4653	0.148	3417	0.141	3.05***
Fixas	8070	0.308	0.282	0.184	0.000	0.960	2258	0.265	5812	0.325	-13.32***	4653	0.309	3417	0.307	0.49
ETR	8070	0.202	0.169	0.178	0.000	1.000	2258	0.195	5812	0.204	-1.98**	4653	0.204	3417	0.198	1.5
GDP	8070	0.166	0.172	0.052	-0.093	0.497	2258	0.170	5812	0.165	3.64***	4653	0.157	3417	0.179	-18.85***

*、**、***分别代表统计检验的显著性水平为0.1、0.05、0.01。

变量界定：

Longdebt = (长期借款+一年内到期的长期负债)/(长期借款+一年内到期的长期负债+短期借款)；

Risk_roa = 历史7年(含当年)资产报酬率(ROA)的标准差；

Risk_sales = 历史7年(含当年)营业收入的标准离差率；

State = 1，最终控股股东类别为国有控股；0，其他；

Bankcomp = 公司所处地区四大国有商业银行之外的其他银行市场份额；

Size = 总资产的自然对数；

TQ =(股权的市场价值+负债的账面价值)/资产的账面价值；

First = 第一大股东持股比例；

ROA = 营业利润/总资产；

Lev = 负债/总资产；

Liquid =(货币资金+短期投资)/总资产；

Fixas = 固定资产合计/总资产；

ETR = 所得税费用/税前利润总额，但如果该值小于0或大于1，则分别取值为0和1；

GDP =(地区当年GDP－地区上年GDP)/地区上年GDP；

公司所处地区的银行竞争水平高于全部地区的2/3分位数时界定为强银行竞争，否则为弱银行竞争。

表 2　相关系数表

	Longdebt	*Risk_roa*	*Risk_sales*	*State*	*Bankcomp*	*Size*	*TQ*	*First*	*ROA*	*Lev*	*Liquid*	*Fixas*	*ETR*	*GDP*
Longdebt		0.052***	0.038***	0.034***	-0.033***	0.233***	0.008	-0.003	0.122***	0.103***	-0.051***	0.147***	0.010	-0.024**
Risk_roa	-0.060***		0.241***	-0.052***	0.041***	-0.152***	0.222***	0.035***	-0.326***	0.004	-0.061***	-0.022**	-0.092***	0.008
Risk_sales	0.076***	0.194***		-0.060***	0.001	0.151***	0.061***	-0.051***	0.181***	0.092***	-0.034***	-0.146***	-0.005	0.067***
State	0.101***	-0.124***	-0.094***		-0.002	0.143***	0.017	0.240***	-0.090***	-0.079***	0.014	0.103***	0.024**	-0.036***
Bankcomp	0.018	0.003	0.046***	0.014		0.220***	0.049***	-0.086***	-0.057***	-0.102***	-0.035***	0.008	0.050***	0.193***
Size	0.316***	-0.290***	0.108***	0.214***	0.197***		-0.343***	0.148***	0.188***	0.118***	0.009	0.018	-0.076***	0.035***
TQ	-0.095***	0.279***	0.084***	-0.085***	-0.033***	-0.375***		0.027**	0.196***	-0.009	0.030***	-0.011	-0.101***	-0.018**
First	0.082***	-0.093***	-0.052***	0.290***	-0.052***	0.205***	-0.037***		0.085***	-0.073***	0.002	0.046***	-0.024**	-0.036***
ROA	0.149***	-0.380***	0.103***	0.041***	0.010	0.252***	0.039***	0.163***		-0.363***	0.123***	0.113***	0.182***	0.008
Lev	0.115***	0.148***	0.061***	-0.064***	-0.055***	0.041***	-0.085***	-0.115***	-0.386***		-0.188***	0.106***	0.057***	-0.005
Liquid	-0.117***	-0.124***	-0.011	-0.007	-0.030***	-0.020*	0.058***	0.029***	0.219***	-0.315***		-0.307***	-0.008	-0.017
Fixas	0.223***	-0.073***	-0.119***	0.147***	0.015	0.136***	-0.081***	0.097***	0.044***	0.154***	-0.331***		-0.039***	0.024**
ETR	0.032***	-0.183***	-0.011	0.022**	0.035***	0.046***	-0.103***	0.001	0.207***	-0.038***	0.039***	-0.011		-0.003
GDP	0.000	0.011	0.085***	-0.041***	0.213***	0.077***	-0.030***	-0.051***	0.013	0.003	-0.031***	0.018	0.005	

*、**、***分别代表统计检验的显著性水平为0.1、0.05、0.01。

以空白的对角线为界，表的左下半部分列示简单相关系数，右上半部分列示偏相关系数。

变量界定：

Longdebt =（长期借款+一年内到期的长期负债）/（长期借款+一年内到期的长期负债+短期借款）；

Risk_roa = 历史7年（含当年）资产报酬率(ROA)的标准差；

Risk_sales = 历史7年（含当年）营业收入的标准离差率；

State = 1，最终控股股东类别为国有控股；0，其他；

Bankcomp = 公司所处地区四大国有商业银行之外的其他银行市场份额；

Size = 总资产的自然对数；

TQ =（股权的市场价值+负债的账面价值）/ 资产的账面价值；

First = 第一大股东持股比例；

ROA = 营业利润/总资产；

Lev = 负债/总资产；

Liquid =（货币资金+短期投资）/总资产；

Fixas = 固定资产合计/总资产；

ETR = 所得税费用/税前利润总额，但如果该值小于0或大于1，则分别取值为0和1；

GDP =（地区当年GDP－地区上年GDP）/地区上年GDP。

（二）多元线性回归

我们首先检验经营风险对债务期限的影响，并考察不同产权性质下该影响的差异。检验结果如表3所示，其中第(1)、(2)列以*Risk_roa*度量经营风险，第(3)、(4)列则以*Risk_sales*来度量经营风险；第(2)、(4)列还引入了产权性质与经营风险的交互项。由于我们使用面板数据，可能同时存在截面上的异方差及时间序列上的自相关问题，因此根据Petersen（2009），我们同时按公司与年度两个维度对估计系数的标准误（standard error）进行群（cluster）调整。

在第(1)至(4)列，经营风险变量*Risk_roa*与*Risk_sales*都显著为正。特别地，此时的*Risk_roa*系数估计符号不同于表2所列示的简单相关系数的符号，表明在控制了公司规模等诸多因素之后，以*Risk_roa*度量的经营风险对公司债务期限存在正向影响。该结果支持流动性风险理论，而与合约成本理论及税收理论的预测不一致，表明当经营风险较高时，公司在短期债务到期时向银行续借资金的难度加大，从而导致较高的流动性风险，公司倾向于选择更长的债务期限以降低流动性成本。

产权性质与经营风险的交互项*State*×*Risk_roa*与*State*×*Risk_sales*都在5%的水平显著为负，表明国有公司的信贷优惠可以降低高经营风险公司的流动性风险，因而其经营风险对债务期限的正向影响更小。这与流动性风险理论的推断是一致的。

我们还可以看到，产权性质变量*State*的系数符号为正，但只当引入产权性质与经营风险的交互项时该系数才通过显著性检验，而且交互项的符号显著为负。我们也进行了如下测试（未列表）：按经营风险变量*Risk_roa*的大小将全部样本等分为3个子样本并分别回归，结果显示，在最低风险组，变量*State*在1%的水平显著为正；但在中等风险组，变量*State*变得不再显著；而在最高风险组，变量*State*的系数反而为负。这说明只有在经营风险较低的情况下，国有产权才对公司债务期限存在正向影响，而当经营风险较高时，该影响变为负向。这是由于产权性质对债务期限存在两种相反的影响：国有公司具有信贷优惠，一方面它更容易获得长期借款，另一方面又因具有更低的流动性风险而倾向于选择更多的短期借款。当经营风险较高时，公司的流动性风险比较突出，国有产权能在降低流动性风险方面起到重要作用，因而会在很大程度上增加公司选择短期借款的激励，这正好与国有产权给公司获取长期借款带来的便利相抵消，致使国有产权对债务期限并无显著影响。但当经营风险较低时，不论公司产权性质，其流动性风险都较小，国有产权对降低流动性风险变得并不重要，因而对公司选择短期借款的激励影响不大，致使国有产权在获取长期信贷方面的便利更占主导作用，故国有产权对债务期限存在显著的正向影响。

银行竞争变量*Bankcomp*显著为负，支持关于银行市场结构的信息基础假说。当银行面对的同业竞争较弱时，因不担心客户流失，存在较强的动机搜集企业信息并与之维持更长期的信贷关系，发放更多长期贷款。

对于控制变量，公司规模*Size*与长期借款比例正相关，与Barclay and Smith（1995）等文献一致，支持合约成本理论，即由于大公司的代理成本较低，能够获得更多的长期信贷。公司成长性*TQ*的系数估计符号为正，与前文述及的理论预测方向一致，即中国上市公司普遍存在过度投资代理问题，高成长性企业应该选择更多的长期债务，但并不显著。公司第一大股东持股比例*First*的系数估计符号为负，与合约成本理论的预测方向一致，但也不显著。

盈利能力*ROA*与长期借款比例显著正相关，与Cai *et al.*（2008）和Fan, Titman and Twite（2008）的发现一致，不支持信息不对称理论，说明中国的高盈利能力公司并不需要通过短期债务传递正面信息，相反地，因银行对其进行监督的需求较弱，高盈利能力公司获得了更多的长期信贷。这可能是由于中国债券市场不发达，主要的债权人就是银行，而银行具有较多私有信息，无需公司通过短期债务来传递信号（Cai *et al.,* 2008）。财务杠杆*Lev*的符号显著为正，说明高杠杆公司的流动性风险较大，因而选择更长的债务期限，支持流动性风险理论，而与合约成本理论的预测不一致。资产流动性*Liquid*与债务期限负相关，在第（3）、（4）列还在10%的水平上显著，表明资产流动性较高的企业面临更低的流动性风险，因而选择更多的短期债务，这支持流动性风险理论。

固定资产比例*Fixas*显著为正，符合资产与债务期限的匹配要求（Barclay and Smith, 1995）。有效税率*ETR*都不显著，并且符号不稳定，说明中国上市公司选择债务期限时税率并不是一个重要因素。地区经济增长变量*GDP*对公司债务期限也不存在显著影响。

2. 银行竞争、经营风险与债务期限结构

我们接下来考察上市公司所处地区的银行竞争环境是否以及如何影响经营风险与债务期限之间的相关性。我们首先引入银行竞争与经营风险的交互项*Hbankcomp*×*Risk*，然后将全部样本区分为强、弱银行竞争组两个子样本并分别回归。如果变量*Hbankcomp*取值为1，则界定为强银行竞争，否则为弱银行竞争。回归结果如表4所示，其中第（1）、（4）列是全部样本回归结果，第（2）、（5）列为银行竞争较强的子样本的回归结果，第（3）、（6）列为银行竞争较弱的子样本的回归结果；第（1）-（3）列以*Risk_roa*度量经营风险，第（4）-（6）列则以*Risk_sales*度量经营风险。

从第（1）和（4）列可以看到，银行竞争与经营风险交互项（*Hbankcomp*×*Risk_roa*或*Hbankcomp*×*Risk_sales*）的系数符号都在1%的水平显著为正。而且在子样本回归中可以进一步看到，如第（2）、（3）列所示，当公司 处于银行竞争较强的环境中时，经营风险变量*Risk_roa*对公司债务期限的边际影响为0.675，而处于银行竞争较弱的环境中时，该边际影响仅为0.329，前者大约是后者的2倍；再如第（5）、（6）列所示，当公司处于银行竞争较强的环境中时，经营风险变量*Risk_sales*对公司债务期限的边际影响为0.079，并在1%的水平显著，而处于银行竞争较弱的环境中时，该边际影响仅为0.01，而且并不显著。这些结果表明，当银行竞争较强时，公司经营风险对债务期限的正向影响更加明显。这一方面与流动性风险理论一致，另一方面也支持了关于银行市场结构的信息基础假说，即当银行市场结构比较集中时，银行同业竞争较弱，对占据垄断地位的银行而言，未来客户不易流失，因而更具动力去搜集信息以攫取信息租金，并愿意扶持新兴企业，待其成长后索求较高的贷款利率，但这种信贷战略在银行竞争非常激烈的环境中难以实施。

银行竞争变量*Bankcomp*与公司债务期限显著负相关，也与信息基础假说的预测一致。国有产权变量*State*在银行竞争较弱时对公司债务期限的影响显著为正，但在银行竞争较强时这种影响变为负向。我们还进行了如下测试[11]：将国有产权变量与

[11] 部分测试结果参见稳健性检验中的表6。

表3 经营风险与产权性质对债务期限结构选择的影响

因变量：*Longdebt*	(1)	(2)	(3)	(4)
Risk_roa	0.456***	0.716***		
	(3.26)	(3.95)		
State×Risk_roa		-0.429**		
		(-2.09)		
Risk_sales			0.038*	0.087***
			(1.69)	(2.80)
State×Risk_sales				-0.074**
				(-2.25)
State	0.010	0.029*	0.010	0.042**
	(0.72)	(1.81)	(0.70)	(2.09)
Bankcomp	-0.117*	-0.118*	-0.108*	-0.105*
	(-1.88)	(-1.89)	(-1.71)	(-1.66)
Size	0.068***	0.068***	0.064***	0.065***
	(12.09)	(12.22)	(11.35)	(11.52)
TQ	0.003	0.003	0.005*	0.005*
	(1.03)	(0.93)	(1.66)	(1.68)
First	-0.018	-0.021	-0.014	-0.017
	(-0.61)	(-0.71)	(-0.46)	(-0.57)
ROA	0.472***	0.473***	0.381***	0.389***
	(5.36)	(5.32)	(4.65)	(4.69)
Lev	0.147***	0.146***	0.145***	0.147***
	(4.06)	(4.02)	(3.90)	(3.93)
Liquid	-0.092	-0.089	-0.099*	-0.097*
	(-1.62)	(-1.54)	(-1.74)	(-1.72)
Fixas	0.205***	0.206***	0.206***	0.208***
	(3.49)	(3.49)	(3.50)	(3.55)
ETR	0.005	0.005	-0.002	-0.003
	(0.23)	(0.24)	(-0.09)	(-0.16)
GDP	-0.108	-0.106	-0.115	-0.106
	(-1.31)	(-1.30)	(-1.47)	(-1.36)
Constant	-1.249***	-1.266***	-1.176***	-1.211***
	(-10.84)	(-11.16)	(-10.25)	(-10.64)
行业固定效应	Yes	Yes	Yes	Yes
Obs.	8070	8070	8070	8070
Adj. R-squared	0.217	0.218	0.216	0.217

*、**、***分别代表统计检验的显著性水平为0.1、0.05、0.01。

括号内为按公司与年度两个维度经群(cluster)调整的t检验值。
变量界定：
Longdebt =(长期借款+一年内到期的长期负债)/(长期借款+一年内到期的长期负债+短期借款)；
Risk_roa = 历史7年(含当年)资产报酬率(ROA)的标准差；
Risk_sales = 历史7年(含当年)营业收入的标准离差率；
State = 1，最终控股股东类别为国有控股；0，其他；
Bankcomp = 公司所处地区四大国有商业银行之外的其他银行市场份额；
Size = 总资产的自然对数；
TQ =(股权的市场价值+负债的账面价值)/资产的账面价值；
First = 第一大股东持股比例；
ROA = 营业利润/总资产；
Lev = 负债/总资产；
Liquid =(货币资金+短期投资)/总资产；
Fixas = 固定资产合计/总资产；
ETR = 所得税费用/税前利润总额，但如果该值小于0或大于1，则分别取值为0和1；
GDP =(地区当年GDP－地区上年GDP)/地区上年GDP。

银行竞争变量的交互项*State*×*Bankcomp*引入模型，结果显示，该交互项在1%的水平上显著为负；按银行竞争变量*Bankcomp*的大小将全部样本等分为四个子样本并分别回归，可以发现，在银行竞争最弱的子样本中，变量*State*显著为正，但随着银行竞争的加强，该变量不再显著，而在银行竞争最强的子样本中，变量*State*反而变得显著为负。这表明银行竞争与国有产权在降低企业流动性风险的作用方面存在替代性：当银行竞争较弱时，企业更容易获得银行信贷[12]，其流动性风险较低，国有产权在降低流动性风险方面的作用较小，而其为公司获取长期借款带来的便利占主导作用，故此时国有公司具有更高的长期借款比例；但当银行竞争较强时，企业获取银行信贷的难度加大，流动性风险较高，国有产权对于降低流动性风险变得非常重要，因而国有公司的债务期限反而比非国有公司更短，与流动性风险理论的预测一致。对于其他控制变量，其符号及显著性水平与表3基本一致。

五、稳健性检验

(一)其他估计方法

在前文的主回归中，我们按公司和年度两个维度对t统计量值进行群(Cluster)调整。根据Petersen (2009)，我们也尝试仅按公司进行群调整但引入年度固定效应的估计方法；我们还使用随机效应面板模型与固定效应面板模型进行估计。回归结果如表5所示，第(1)、(2)列为引入年度固定效应但按公司进行群调整的估计结果，第(3)、(4)列为随机效应面板模型估计结果，第(5)、(6)列为固定效应面板模型估计结果。可以看到实证结果保持稳定。经营风险变量*Risk_roa*显著为正，产权性质与经营风险的交互项大多显著为负，银行竞争与经营风险的交互项全部显著为正。

[12] 根据关于银行市场结构的信息基础假说。

表4 经营风险与银行竞争对债务期限结构选择的影响

	全部样本	强竞争	弱竞争	全部样本	强竞争	弱竞争
因变量：*Longdebt*	(1)	(2)	(3)	(4)	(5)	(6)
Risk_roa	0.225	0.675***	0.329*			
	(1.34)	(3.63)	(1.66)			
Hbankcomp×Risk_roa	0.514***					
	(3.87)					
Risk_sales				0.002	0.079***	0.010
				(0.09)	(3.23)	(0.45)
Hbankcomp×Risk_sales				0.083***		
				(3.71)		
Bankcomp	-0.211***			-0.263***		
	(-3.25)			(-3.44)		
State	0.011	-0.024	0.032***	0.010	-0.022	0.031***
	(0.74)	(-1.55)	(2.75)	(0.77)	(-1.46)	(2.66)
Size	0.068***	0.072***	0.064***	0.063***	0.065***	0.062***
	(12.15)	(11.39)	(7.66)	(10.96)	(10.81)	(7.39)
TQ	0.003	-0.000	0.003	0.004	0.002	0.005
	(0.89)	(-0.18)	(0.55)	(1.35)	(0.99)	(0.94)
First	-0.016	-0.054	0.003	-0.013	-0.051	0.005
	(-0.53)	(-1.17)	(0.08)	(-0.44)	(-1.13)	(0.12)
ROA	0.477***	0.415***	0.519***	0.387***	0.284***	0.456***
	(5.46)	(3.54)	(5.87)	(4.83)	(2.81)	(6.10)
Lev	0.151***	0.153***	0.167***	0.147***	0.144***	0.168***
	(4.22)	(3.49)	(4.06)	(3.97)	(3.10)	(4.13)
Liquid	-0.090	0.055	-0.178***	-0.094*	0.051	-0.186***
	(-1.60)	(0.64)	(-3.05)	(-1.66)	(0.59)	(-3.18)
Fixas	0.206***	0.156**	0.249***	0.211***	0.163**	0.247***
	(3.46)	(2.22)	(4.43)	(3.53)	(2.26)	(4.30)
ETR	0.006	-0.015	0.003	0.001	-0.024	-0.002
	(0.29)	(-0.56)	(0.13)	(0.04)	(-0.91)	(-0.11)
GDP	-0.118	0.178	-0.264***	-0.123	0.150	-0.259***
	(-1.42)	(1.15)	(-4.04)	(-1.50)	(1.01)	(-3.97)
Constant	-1.209***	-1.465***	-1.192***	-1.082***	-1.324***	-1.152***
	(-10.37)	(-9.93)	(-6.72)	(-8.63)	(-9.39)	(-6.51)
行业固定效应	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	8070	3417	4653	8070	3417	4653
Adj. R-squared	0.219	0.243	0.217	0.219	0.242	0.215

*、**、***分别代表统计检验的显著性水平为0.1、0.05、0.01。

括号内为按公司与年度两个维度经群(cluster)调整的t检验值。

变量界定：

Longdebt =（长期借款+一年内到期的长期负债）/（长期借款+一年内到期的长期负债+短期借款）；

Risk_roa = 历史7年（含当年）资产报酬率(ROA)的标准差；

Risk_sales = 历史7年（含当年）营业收入的标准离差率；

Bankcomp = 公司所处地区四大国有商业银行之外的其他银行市场份额；

Hbankcomp = 1，如果公司所处地区的银行竞争水平高于全部地区的2/3分位数时；0，其他；

State = 1，最终控股股东类别为国有控股；0，其他；

Size = 总资产的自然对数；

TQ =（股权的市场价值+负债的账面价值）/资产的账面价值；

First = 第一大股东持股比例；

ROA = 营业利润/总资产；

Lev = 负债/总资产；

Liquid =（货币资金+短期投资）/总资产；

Fixas = 固定资产合计/总资产；

ETR = 所得税费用/税前利润总额，但如果该值小于0或大于1，则分别取值为0和1；

GDP =（地区当年GDP－地区上年GDP）/地区上年GDP。

（二）银行竞争程度的进一步细分

前文按银行竞争程度将样本总体划分为两个子样本分别进行回归，可以看到经营风险都对债务期限存在显著的正向影响，但在银行竞争较弱的环境中这种影响较小。据此我们推测，当银行竞争非常弱时，这种影响可能不再显著。我们进一步按银行竞争变量*Bankcomp*的大小将全部样本等分为四个子样本。因为对有些子样本按公司与年度两个维度进行群调整时出现非正定矩阵情况而无法实现，我们只按公司进行群调整，并控制年度固定效应。回归结果如表6所示，在银行竞争最强的环境中，如第(4)列所示的结果，经营风险对债务期限的正向影响最为显著；但在银行竞争最弱的环境中，如第(1)、(2)列所示，经营风险对债务期限的影响不再显著。该结果对流动性风险理论及信息基础假说提供了更强有力的支持，即集中的银行市场结构可以降低企业的流动性风险，会大大减弱经营风险对公司债务期限的正向影响。

（三）关键变量的替代度量

我们尝试以长期借款与全部银行借款之比或者长期负债与全部负债之比作为因变量进行回归，以销售增长率（*Sgrow*）度量成长性[13]，当银行竞争程度高于全部地区的3/4分位数时界定为强银行竞争。限于篇幅，我们仅列示以*Risk_roa*度量经营风险的情形（以*Risk_sales*度量经营风险的结果与此类似）。如表7所示，主要的回归结果都保持不变：经营风险变量在多数模型中显著为正，产权性质与经营风险的交互项都显著为负，银行竞争与经营风险的交互项都显著为正，说明本文实证结果不因核心变量度量方法的差异而变化。

[13] 由于中国股票市场不够发达，有人认为托宾Q不能有效度量中国上市公司的成长性。

表5 模型的其他估计方法

	年度固定效应		随机效应模型		固定效应模型	
因变量：*Longdebt*	(1)	(2)	(3)	(4)	(5)	(6)
Risk_roa	0.505**		0.367**		0.355**	
	(2.25)		(2.38)		(1.99)	
State×Risk_roa	-0.415		-0.352**		-0.382**	
	(-1.63)		(-2.11)		(-1.99)	
Hbankcomp×Risk_roa	0.442**		0.396***		0.328***	
	(2.36)		(3.48)		(2.73)	
Risk_sales		0.051		0.024		-0.003
		(1.44)		(1.07)		(-0.11)
State×Risk_sales		-0.071*		-0.065***		-0.051*
		(-1.73)		(-2.59)		(-1.79)
Hbankcomp×Risk_sales		0.076***		0.038***		0.028*
		(3.42)		(2.73)		(1.95)
State	0.030*	0.042**	0.029**	0.038***	0.031**	0.030*
	(1.85)	(2.09)	(2.40)	(2.71)	(2.02)	(1.76)
Bankcomp	-0.237***	-0.280***	-0.211***	-0.202***	-0.239**	-0.237**
	(-2.92)	(-3.45)	(-3.06)	(-2.88)	(-2.24)	(-2.21)
Size	0.068***	0.064***	0.067***	0.062***	0.059***	0.054***
	(10.77)	(10.06)	(13.08)	(12.19)	(7.29)	(6.66)
TQ	0.002	0.006	0.004	0.007**	0.005	0.007*
	(0.49)	(1.24)	(1.33)	(2.09)	(1.39)	(1.92)
First	-0.014	-0.014	0.051*	0.057**	0.106***	0.118***
	(-0.42)	(-0.39)	(1.92)	(2.15)	(2.94)	(3.28)
ROA	0.486***	0.403***	0.263***	0.233***	0.185***	0.178***
	(6.33)	(5.70)	(5.58)	(5.09)	(3.64)	(3.60)
Lev	0.152***	0.151***	0.110***	0.115***	0.087***	0.094***
	(3.92)	(3.89)	(4.43)	(4.61)	(2.92)	(3.19)
Liquid	-0.086	-0.092	-0.058*	-0.066**	-0.053	-0.058
	(-1.39)	(-1.51)	(-1.73)	(-1.97)	(-1.41)	(-1.55)
Fixas	0.210***	0.216***	0.129***	0.132***	0.068**	0.072**
	(5.44)	(5.55)	(5.51)	(5.61)	(2.38)	(2.50)
ETR	0.011	0.005	0.004	0.001	0.006	0.003
	(0.52)	(0.22)	(0.26)	(0.04)	(0.38)	(0.20)
GDP	-0.130	-0.134	-0.082	-0.071	-0.081	-0.065
	(-1.61)	(-1.64)	(-1.53)	(-1.32)	(-1.46)	(-1.17)
Constant	-1.199***	-1.112***	-1.178***	-1.094***	-0.854***	-0.765***
	(-9.02)	(-8.24)	(-10.53)	(-9.68)	(-4.25)	(-3.74)
行业固定效应	Yes	Yes	Yes	Yes	Yes	Yes
年度固定效应	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	8070	8070	8070	8070	8070	8070
R-squared	0.224	0.224	0.217	0.216	0.069	0.068

*、**、***分别代表统计检验的显著性水平为0.1、0.05、0.01。
第(1)、(2)列的括号内为按公司经群(cluster)调整的t检验值；第(3)、(4)列的括号内为未经调整的z检验值；第(5)、(6)列的括号内为未经调整的t检验值。
第(3)至(6)列报告的R-squared为面板模型估计的overall R-squared。
变量界定：
Longdebt =(长期借款+一年内到期的长期负债)/(长期借款+一年内到期的长期负债+短期借款)；
Risk_roa = 历史7年(含当年)资产报酬率(ROA)的标准差；
Risk_sales = 历史7年(含当年)营业收入的标准离差率；
Hbankcomp = 1，如果公司所处地区的银行竞争水平高于全部地区的2/3分位数时；0，其他；
State = 1，最终控股股东类别为国有控股；0，其他；
Bankcomp = 公司所处地区四大国有商业银行之外的其他银行市场份额；
Size = 总资产的自然对数；
TQ =(股权的市场价值+负债的账面价值)/资产的账面价值；
First = 第一大股东持股比例；
ROA = 营业利润/总资产；
Lev = 负债/总资产；
Liquid =(货币资金+短期投资)/总资产；
Fixas = 固定资产合计/总资产；
ETR = 所得税费用/税前利润总额，但如果该值小于0或大于1，则分别取值为0和1；
GDP =(地区当年GDP－地区上年GDP)/地区上年GDP。

(四)经营风险对债务期限的非单调影响

Diamond(1991a)指出，当公司信用风险等级达到最高时，基于流动性风险的考虑，公司自身确实更需要较长的债务期限，但是此时公司却难以从银行获得长期贷款。因此，公司风险与债务期限之间应该存在倒U型的非单调关系。为此，我们采用三种方法考察在本文样本中经营风险对债务期限是否存在非单调影响：一是在前述模型中引入经营风险变量的平方项；二是引入标志公司处于高风险的虚拟变量，我们分别以最高的1/5与1/3为标准界定公司是否处于高风险(*Hrisk_20%*与*Hrisk_33%*)；三是进行Spline分析，我们将经营风险划分为3个等级(*Risk_bottom*、*Risk_middle*与*Risk_high*)。在Spline分析中，如果公司的经营风险低于样本的1/3分位数，Risk_bottom取值为经营风险原值，*Risk_middle*与Risk_high取值为0；如果处于1/3分位数与2/3分位数之间，*Risk_bottom*取值为1/3分位数，*Risk_middle*取值为经营风险原值减去1/3分位数，*Risk_high*取值为0；如果高于2/3分位数，*Risk_bottom*取值为1/3分位数，*Risk_middle*取值为2/3分位数减去1/3分位数，*Risk_high*取值为经营风险原值减去2/3分位数。

表6 银行竞争程度的进一步细分

	银行竞争=1(弱)	银行竞争=2	银行竞争=3	银行竞争=4(强)
因变量：*Longdebt*	(1)	(2)	(3)	(4)
Risk_roa	0.159	0.372	0.610**	0.672**
	(0.56)	(1.48)	(2.39)	(2.27)
State	0.040**	0.037**	0.020	-0.057***
	(2.06)	(2.25)	(1.12)	(-2.60)
Size	0.069***	0.067***	0.071***	0.075***
	(4.91)	(6.78)	(7.38)	(8.46)
TQ	0.009	0.002	0.009	-0.007
	(0.94)	(0.16)	(1.19)	(-0.81)
First	-0.035	0.018	0.022	-0.074
	(-0.65)	(0.36)	(0.39)	(-1.27)
ROA	0.421***	0.547***	0.349**	0.512***
	(3.07)	(4.20)	(2.57)	(3.97)
Lev	0.215***	0.139**	0.086	0.195***
	(3.67)	(2.32)	(1.27)	(3.02)
Liquid	-0.103	-0.223***	-0.066	0.094
	(-1.20)	(-2.61)	(-0.56)	(0.83)
Fixas	0.221***	0.280***	0.201***	0.160**
	(3.39)	(4.80)	(2.98)	(2.49)
ETR	0.000	0.025	0.013	-0.042
	(0.01)	(0.76)	(0.29)	(-0.96)
GDP	-0.195	-0.543***	-0.184	0.492**
	(-1.15)	(-3.26)	(-1.01)	(2.07)
Constant	-1.283***	-1.282***	-1.381***	-1.543***
	(-4.21)	(-5.83)	(-6.15)	(-7.72)
行业固定效应	Yes	Yes	Yes	Yes
年度固定效应	Yes	Yes	Yes	Yes
Obs.	2029	2014	2058	1969
Adj R-squared	0.200	0.243	0.212	0.268

*、**、***分别代表统计检验的显著性水平为0.1、0.05、0.01。

括号内为按公司经群(cluster)调整的t检验值。

按公司所处地区的银行竞争程度的1/4、1/2、3/4三个分位数为界将全部样本划分为银行竞争由弱到强的四组。

变量界定：

Longdebt =（长期借款+一年内到期的长期负债）/（长期借款+一年内到期的长期负债+短期借款）；

Risk_roa = 历史7年（含当年）资产报酬率(ROA)的标准差；

State = 1，最终控股股东类别为国有控股；0，其他；

Size = 总资产的自然对数；

TQ =（股权的市场价值+负债的账面价值）/资产的账面价值；

First = 第一大股东持股比例；

ROA = 营业利润/总资产；

Lev = 负债/总资产；

Liquid =（货币资金+短期投资）/总资产；

Fixas = 固定资产合计/总资产；

ETR = 所得税费用/税前利润总额，但如果该值小于0或大于1，则分别取值为0和1；

GDP =（地区当年GDP－地区上年GDP）/地区上年GDP。

回归结果如表8所示，限于篇幅，我们仅列示以*Risk_roa*度量经营风险的情形（以*Risk_sales*度量经营风险的结果与此类似）。可以看到，在第（1）列中，平方项并不显著；在第（2）、（3）列中，标志公司处于高风险的虚拟变量也不显著；在第（4）列中，只有标志公司处于最高风险等级的变量*Risk_high*显著为正，其余两个风险等级变量都不显著。据此，我们可以认为在本文样本中，经营风险对债务期限不存在倒U型非单调影响，而且当风险较高时对债务期限的正向影响更为重要。这可能是由于中国资本市场存在较高的准入门槛，样本公司在中国经济体系中相对而言是优质公司，即使其风险等级较高，也能够从银行获得长期贷款，因而没有出现如Diamond（1991a）预测的倒U型关系。

（五）银行竞争对债务期限的非线性影响

我们从表3发现，尽管银行竞争变量*Bankcomp*显著为负，但显著性水平仅为10%，这可能是由于银行竞争对债务期限存在非线性影响。我们通过两种方法检验二者之间的非线性关系：一是在模型中引入标志银行竞争较强的虚拟变量*Hbankcomp*；二是进行Spline分析，我们将银行竞争划分为3个等级（*Bankcomp_bottom Bankcomp_middle*与*Bankcomp_high*）。在Spline分析中，如果银行竞争程度低于样本的1/3分位数，*Bankcomp_bottom*取值为*Bankcomp*原值，*Bankcomp_middle*与*Bankcomp_high*取值为0；如果处于1/3分位数与2/3分位数之间，*Bankcomp_bottom*取值为1/3分位数，*Bankcomp_middle*取值为*Bankcomp*原值减去1/3分位数，*Bankcomp_high*取值为0；如果高于2/3分位数，*Bankcomp_bottom*取值为1/3分位数，*Bankcomp_middle*取值为2/3分位数减去1/3分位数，*Bankcomp_high*取值为*Bankcomp*原值减去2/3分位数。

表7 关键变量的替代度量

	Longdebt = 长期借款/全部银行借款	*Longdebt* = 长期负债/全部负债	成长性=销售增长率	按3/4分位数定义 *Hbankcomp*
因变量：*Longdebt*	(1)	(2)	(3)	(4)
Risk_roa	0.320**	0.033	0.498**	0.593***
	(2.16)	(0.37)	(2.46)	(3.08)
State×*Risk_roa*	-0.372**	-0.228**	-0.441**	-0.418**
	(-2.24)	(-2.18)	(-2.13)	(-2.01)
Hbankcomp×*Risk_roa*	0.360***	0.144**	0.496***	
	(2.95)	(1.99)	(3.78)	
Hbankcomp2×*Risk_roa*				0.335**
				(2.45)
State	0.028**	0.018**	0.030*	0.029*
	(2.20)	(2.31)	(1.86)	(1.78)
Bankcomp	-0.204***	-0.149***	-0.207***	-0.176***
	(-4.02)	(-4.35)	(-3.17)	(-2.74)
Size	0.060***	0.033***	0.068***	0.068***
	(11.57)	(10.11)	(11.98)	(12.31)
TQ	0.001	-0.002		0.003
	(0.33)	(-1.61)		(1.07)
Sgrow			0.004	
			(1.04)	
First	-0.024	-0.016	-0.019	-0.021
	(-0.93)	(-0.97)	(-0.62)	(-0.69)
ROA	0.457***	0.297***	0.474***	0.472***
	(4.86)	(6.90)	(5.02)	(5.32)
Lev	0.150***	0.263***	0.151***	0.148***
	(5.24)	(12.53)	(4.22)	(4.09)
Liquid	-0.058	-0.038	-0.085	-0.087
	(-1.15)	(-1.43)	(-1.52)	(-1.54)
Fixas	0.167***	0.139***	0.206***	0.206***
	(3.73)	(4.53)	(3.57)	(3.50)
ETR	-0.008	-0.015*	0.005	0.006
	(-0.49)	(-1.81)	(0.22)	(0.27)
GDP	-0.024	-0.016	-0.119	-0.102
	(-0.37)	(-0.38)	(-1.42)	(-1.25)
Constant	-1.112***	-0.629***	-1.210***	-1.248***
	(-9.79)	(-9.22)	(-10.68)	(-11.09)
行业固定效应	Yes	Yes	Yes	Yes
Obs.	8070	8070	8064	8070
Adj R-squared	0.231	0.352	0.221	0.218

*、**、***分别代表统计检验的显著性水平为0.1、0.05、0.01。

括号内为按公司与年度两个维度经群(cluster)调整的t检验值。

变量界定：
第(1)列的*Longdebt* = 长期借款/(长期借款+一年内到期的长期负债+短期借款)；
第(2)列的*Longdebt* = 长期负债/全部负债；
第(3)、(4)列的*Longdebt* = (长期借款+一年内到期的长期负债)/(长期借款+一年内到期的长期负债+短期借款)；
Risk_roa = 历史7年(含当年)资产报酬率(ROA)的标准差；
Hbankcomp = 1，如果公司所处地区的银行竞争水平高于全部地区的2/3分位数时；0，其他；
Hbankcomp2 = 1，如果公司所处地区的银行竞争水平高于全部地区的3/4分位数时；0，其他；
State = 1，最终控股股东类别为国有控股；0，其他；
Bankcomp = 公司所处地区四大国有商业银行之外的其他银行市场份额；
Size = 总资产的自然对数；
TQ = (股权的市场价值+负债的账面价值)/资产的账面价值；
Sgrow = (当年营业收入－上年营业收入)/上年营业收入，并按(1%，99%)区间进行截尾；
First = 第一大股东持股比例；
ROA = 营业利润/总资产；
Lev = 负债/总资产；
Liquid = (货币资金+短期投资)/总资产；
Fixas = 固定资产合计/总资产；
ETR = 所得税费用/税前利润总额，但如果该值小于0或大于1，则分别取值为0和1；
GDP = (地区当年GDP－地区上年GDP)/地区上年GDP。

回归结果如表9所示。从第(1)列来看，引入变量*Hbankcomp*之后，变量*Bankcomp*变得在1%的水平显著为负，而变量*Hbankcomp*显著为正；从第(2)列来看，标志银行竞争最弱的变量*Bankcomp_bottom*在1%的水平上显著为负，但标志银行竞争较强的变量*Bankcomp_middle*和*Bankcomp_high*都不显著。这表明银行竞争与债务期限之间确实存在非线性关系，只有当银行竞争程度较低时才对债务期限存在显著的负向影响。其原因可能是银行竞争较强时，根据信息基础假说，银行不愿意发放长期贷款，即使竞争程度略有下降，银行也不会改变其信贷倾向，只有当银行竞争程度足够低时，竞争程度的下降才会导致银行发放更多的长期贷款。

(六)本文与Cai *et al.*(2008)的实证结果差异分析[14]

本文与Cai *et al.*(2008)都检验了中国上市公司经营风险对债务期限选择的影响，计量模型也比较接近，但结果却存在差异：本文发现经营风险与债务期限显著正相关，但Cai *et al.*(2008)发现二者之间的相关性并不显著。我们注意到，两篇文献的研究样本所涵盖的行业及期间有所差异(从而可能导致结果出现差异)：Cai *et al.*(2008)只考察了制造业，而本文样本包括金融业之外的全部行业；Cai *et al.*(2008)的样本期间截至2004年，而本文样本期间截至2008年。为了证实这一推断，我们首先按照Cai *et al.*(2008)的样本选择程序，检验2001至2004年的制造业上市公司，[15]然后检验2005至2008年的制造业上市公司，并检验全部样本期间的制造业上市公司；同时，我们也分别检验2001至2004年、2005至2008年、2001至2008年全部非金融业上市公司。

[14] 感谢匿名审稿人提出的此项建议。
[15] Cai *et al.*(2008)的样本期间还包括1999至2000年，但本文样本期间从2001年开始。因此只有2001至2004年是两篇论文共同的样本期。

表 8 经营风险对债务期限的非单调影响

因变量：*Longdebt*	(1)	(2)	(3)	(4)
Risk_roa	0.105	0.386*	0.651***	
	(0.31)	(1.72)	(3.17)	
Risk_roa²	2.289			
	(1.15)			
Hrisk_20%		0.008		
		(0.38)		
Hrisk_33%			-0.020	
			(-1.42)	
Risk_bottom				0.230
				(0.19)
Risk_middle				-0.201
				(-0.34)
Risk_high				0.640***
				(3.26)
State	0.011	0.010	0.011	0.010
	(0.74)	(0.72)	(0.75)	(0.72)
Bankcomp	-0.118*	-0.117*	-0.116*	-0.119*
	(-1.90)	(-1.88)	(-1.87)	(-1.90)
Size	0.068***	0.068***	0.068***	0.068***
	(12.09)	(12.13)	(12.07)	(12.02)
TQ	0.003	0.003	0.003	0.003
	(0.93)	(1.09)	(0.93)	(0.93)
First	-0.020	-0.018	-0.019	-0.018
	(-0.65)	(-0.59)	(-0.64)	(-0.61)
ROA	0.474***	0.473***	0.475***	0.475***
	(5.37)	(5.38)	(5.36)	(5.42)
Lev	0.145***	0.148***	0.145***	0.144***
	(3.91)	(4.08)	(3.95)	(3.91)
Liquid	-0.093	-0.092	-0.094*	-0.094*
	(-1.63)	(-1.63)	(-1.65)	(-1.65)
Fixas	0.205***	0.206***	0.205***	0.205***
	(3.50)	(3.49)	(3.49)	(3.52)
ETR	0.004	0.005	0.002	0.004
	(0.19)	(0.25)	(0.09)	(0.20)
GDP	-0.109	-0.108	-0.110	-0.110
	(-1.33)	(-1.31)	(-1.33)	(-1.34)
Constant	-1.239***	-1.250***	-1.246***	-1.239***
	(-10.82)	(-10.85)	(-10.80)	(-10.65)
行业固定效应	Yes	Yes	Yes	Yes
Obs.	8070	8070	8070	8070
Adj R-squared	0.218	0.217	0.218	0.218

*、**、***分别代表统计检验的显著性水平为0.1、0.05、0.01。

括号内为按公司与年度两个维度经群(cluster)调整的t检验值。

变量界定：

Longdebt =（长期借款+一年内到期的长期负债）/（长期借款+一年内到期的长期负债+短期借款）；

Risk_roa = 历史7年（含当年）资产报酬率(ROA)的标准差；

Hrisk_20% = 1，当*Risk_roa*为最高的1/5时；0，其他；

Hrisk_33% = 1，当*Risk_roa*为最高的1/3时；0，其他；

当*Risk_roa*小于其1/3分位数时，*Risk_bottom*取值等于*Risk_roa*，否则取值为*Risk_roa*的1/3分位数；

当*Risk_roa*小于其1/3分位数时，*Risk_middle*取值为0，当*Risk_roa*处于其1/3分位数与2/3分位数之间时，*Risk_middle*取值为*Risk_roa*减去其1/3分位数，其余情况*Risk_middle*取值为*Risk_roa*的2/3分位数减去其1/3分位数；

当*Risk_roa*小于其2/3分位数时，*Risk_high*取值为0，否则取值为*Risk_roa*减去其2/3分位数。

State = 1，最终控股股东类别为国有控股；0，其他；

Bankcomp = 公司所处地区四大国有商业银行之外的其他银行市场份额；

Size = 总资产的自然对数；

TQ =（股权的市场价值+负债的账面价值）/ 资产的账面价值；

First = 第一大股东持股比例；

ROA = 营业利润/总资产；

Lev = 负债/总资产；

Liquid =（货币资金+短期投资）/总资产；

Fixas = 固定资产合计/总资产；

ETR = 所得税费用/税前利润总额，但如果该值小于0或大于1，则分别取值为0和1；

GDP =（地区当年GDP－地区上年GDP）/地区上年GDP。

检验结果如表10所示，因为对有些子样本按公司与年度两个维度进行群调整时出现非正定矩阵情况而无法实现，我们只按公司进行群调整，并控制年度固定效应。第(1)列为2001至2004年制造业上市公司的回归结果，该样本与Cai *et al.*(2008)非常接近，可以看到，二者在经营风险上的检验结果也是一致的，即经营风险对债务期限的正向影响不显著。但对于2005至2008年制造业上市公司，如第(2)列所示，经营风险变量在5%的水平显著为正；对于全部样本期间的制造业上市公司，如第(3)列所示，经营风险变量也对债务期限存在显著的正向影响。这表明样本期间的不同是导致本文与Cai *et al.*(2008)结果存在差异的原因之一，即只有在2004年之后，制造业上市公司经营风险才对债务期限存在显著的正向影响。

第(4)列为2001至2004年全部非金融业上市公司的回归结果，可以看到经营风险变量在1%的水平显著为正，这表明即使将样本期间限定在2004年之前，但如果样本涵盖了全部非金融业上市公司，经营风险依然对债务期限存在显著的正向影响。同样地，对于2005至2008年或者2001至2008年全部非金融业上市公司，如第(5)、(6)列所示，经营风险变量均显著为正。这表明样本的行业差异也是造成本文结果与Cai *et al.*(2008)存在差异的原因之一。换言之，Cai *et al.*(2008)没有发现经营风险与债务期限之间显著正相关性的另一原因是其仅考察了制造业上市公司。

表9 银行竞争对债务期限的非线性影响

因变量：*Longdebt*	(1)	(2)
Bankcomp	-0.247***	
	(-2.67)	
Hbankcomp	0.029**	
	(2.27)	
Bankcomp_bottom		-0.371***
		(-3.39)
Bankcomp_middle		0.053
		(0.22)
Bankcomp_high		0.078
		(0.54)
State	0.011	0.010
	(0.74)	(0.70)
Risk_roa	0.455***	0.467***
	(3.23)	(3.32)
Size	0.067***	0.067***
	(11.82)	(11.83)
TQ	0.003	0.003
	(0.87)	(0.89)
First	-0.014	-0.015
	(-0.44)	(-0.48)
ROA	0.476***	0.479***
	(5.48)	(5.49)
Lev	0.149***	0.148***
	(4.14)	(4.12)
Liquid	-0.090	-0.087
	(-1.58)	(-1.56)
Fixas	0.208***	0.212***
	(3.51)	(3.63)
ETR	0.008	0.009
	(0.37)	(0.42)
GDP	-0.120	-0.108
	(-1.43)	(-1.30)
Constant	-1.191***	-1.143***
	(-9.40)	(-9.00)
行业固定效应	Yes	Yes
Obs.	8070	8070
Adj R-squared	0.218	0.219

*、**、***分别代表统计检验的显著性水平为0.1、0.05、0.01。
括号内为按公司与年度两个维度经群(cluster)调整的t检验值。

变量界定：

Longdebt =（长期借款+一年内到期的长期负债）/（长期借款+一年内到期的长期负债+短期借款）；

Bankcomp = 公司所处地区四大国有商业银行之外的其他银行市场份额；

Hbankcomp = 1，如果公司所处地区的银行竞争水平高于全部地区的2/3分位数时；0，其他；

当*Bankcomp*小于其1/3分位数时，*Bankcomp_bottom*取值等于*Bankcomp*，否则取值为*Bankcomp*的1/3分位数；

当*Bankcomp*小于其1/3分位数时，*Bankcomp_middle*取值为0，当*Bankcomp*处于其1/3分位数与2/3分位数之间时，*Bankcomp_middle*取值为*Bankcomp*减去其1/3分位数，其余情况*Bankcomp_middle*取值为*Bankcomp*的2/3分位数减去其1/3分位数；

当*Bankcomp*小于其2/3分位数时，*Bankcomp_high*取值为0，否则取值为*Bankcomp*减去其2/3分位数。

State = 1，最终控股股东类别为国有控股；0，其他；

Risk_roa = 历史7年（含当年）资产报酬率(ROA)的标准差；

Size = 总资产的自然对数；

TQ =（股权的市场价值+负债的账面价值）/资产的账面价值；

First = 第一大股东持股比例；

ROA = 营业利润/总资产；

Lev = 负债/总资产；

Liquid =（货币资金+短期投资）/总资产；

Fixas = 固定资产合计/总资产；

ETR = 所得税费用/税前利润总额，但如果该值小于0或大于1，则分别取值为0和1；

GDP =（地区当年GDP－地区上年GDP）/地区上年GDP。

（七）其他稳健性测试

为了检验实证结果的稳定性，我们还尝试如下测试（未列表）：第一，以历史3年或5年（含当年）资产报酬率标准差或主营业务收入标准离差率度量经营风险，或者将财务数据不足5年的观测剔除；第二，在计量模型中控制地区政府干预程度的影响；第三，以销售收入的自然对数度量规模，以净资产收益率度量盈利能力，以流动资产占总资产之比度量资产流动性。我们发现，主要实证结果均保持不变：经营风险与债务期限显著正相关，产权性质与经营风险的交互项显著为负，银行竞争与经营风险的交互项显著为正。由此，本文实证结果具有稳定性。

六、结论

我国企业因过高的短期债务比例而承受的流动性风险问题为各界所广泛关注，它们在债务期限决策中究竟如何考虑流动性风险的影响是一个非常值得探究的议题。本文选择我国2001至2008年非金融业A股上市公司为检验样本，考察经营风险是否影响债务期限，以及这种影响是否因公司产权性质及银行竞争环境的不同而有所差异。

表 10 基于 *Cai et al.*(2008) 的样本期间和行业范围进行调整测试

	制造业			全部行业		
	[2001, 2004]	[2005, 2008]	全部样本	[2001, 2004]	[2005, 2008]	全部样本
因变量：*Longdebt*	(1)	(2)	(3)	(4)	(5)	(6)
Risk_roa	0.196	0.544**	0.440**	0.569***	0.455**	0.452***
	(0.80)	(2.13)	(2.06)	(2.77)	(2.29)	(2.74)
State	0.063***	0.010	0.026*	0.040***	-0.004	0.012
	(3.30)	(0.60)	(1.80)	(2.75)	(-0.26)	(1.01)
Bankcomp	-0.180	0.036	-0.047	-0.274***	-0.117	-0.176**
	(-1.47)	(0.31)	(-0.49)	(-2.67)	(-1.28)	(-2.25)
Size	0.057***	0.063***	0.060***	0.062***	0.071***	0.067***
	(5.12)	(7.39)	(7.73)	(6.68)	(10.54)	(10.65)
TQ	-0.006	0.010	0.004	-0.005	0.008	0.003
	(-0.82)	(1.42)	(0.65)	(-0.74)	(1.42)	(0.64)
First	-0.047	-0.028	-0.026	0.003	-0.037	-0.010
	(-0.92)	(-0.56)	(-0.63)	(0.07)	(-0.89)	(-0.29)
ROA	0.560***	0.516***	0.576***	0.587***	0.415***	0.484***
	(4.43)	(4.61)	(6.08)	(5.49)	(4.55)	(6.29)
Lev	0.168***	0.145**	0.147***	0.176***	0.156***	0.152***
	(2.80)	(2.46)	(2.98)	(3.62)	(3.28)	(3.89)
Liquid	-0.077	0.029	-0.050	-0.082	-0.062	-0.089
	(-0.91)	(0.25)	(-0.62)	(-0.99)	(-0.78)	(-1.44)
Fixas	0.465***	0.227***	0.315***	0.319***	0.138***	0.211***
	(7.19)	(3.80)	(6.09)	(6.22)	(3.04)	(5.46)
ETR	-0.027	0.003	-0.008	-0.004	0.009	0.011
	(-0.74)	(0.09)	(-0.28)	(-0.14)	(0.32)	(0.50)
GDP	-0.320***	0.075	-0.241**	-0.157*	0.162	-0.127
	(-2.65)	(0.39)	(-2.29)	(-1.71)	(1.02)	(-1.57)
Constant	-1.046***	-1.355***	-1.164***	-1.111***	-1.359***	-1.205***
	(-4.46)	(-6.62)	(-6.69)	(-5.66)	(-8.67)	(-9.05)
行业固定效应	Yes	Yes	Yes	Yes	Yes	Yes
年度固定效应	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	2017	2611	4628	3605	4465	8070
Adj R-squared	0.222	0.170	0.184	0.218	0.237	0.218

*、**、*** 分别代表统计检验的显著性水平为 0.1、0.05、0.01。

括号内为按公司经群 (cluster) 调整的 *t* 检验值。

第(1)至(3)列的样本为制造业上市公司，第(4)至(6)为除金融业之外的全部上市公司。
变量界定：
Longdebt =（长期借款+一年内到期的长期负债）/（长期借款+一年内到期的长期负债+短期借款）；
Risk_roa = 历史7年（含当年）资产报酬率(ROA)的标准差；
State = 1，最终控股股东类别为国有控股；0，其他；
Bankcomp = 公司所处地区四大国有商业银行之外的其他银行市场份额；
Size = 总资产的自然对数；
TQ =（股权的市场价值+负债的账面价值）/资产的账面价值；
First = 第一大股东持股比例；
ROA = 营业利润/总资产；
Lev = 负债/总资产；
Liquid =（货币资金+短期投资）/总资产；
Fixas = 固定资产合计/总资产；
ETR = 所得税费用/税前利润总额，但如果该值小于0或大于1，则分别取值为0和1；
GDP =（地区当年GDP－地区上年GDP）/地区上年GDP。

我们发现，公司经营风险与债务期限正相关，并且这种正相关性对于非国有公司与银行竞争较强的环境更为明显。该实证结果支持流动性风险理论，表明我国上市公司在债务期限决策中会考虑流动性风险的影响，但这种影响对非国有公司或者处于银行竞争较强的环境中的上市公司更为明显。本文结果也支持了关于银行市场结构的信息基础假说，即银行处于垄断地位时能够搜集更多的企业信息并与之维持长期信贷关系，进而能够降低信贷准入门槛。本文进一步的测试还表明，对于中国的上市公司样本，经营风险与债务期限之间不存在倒U型非单调关系。

总体而言，本文提供了流动性风险理论的新证据，即在以银行贷款为主要债务融资方式的中国金融市场环境中，流动性风险会影响公司债务期限结构决策，并且这种影响因产权性质与银行竞争环境而异。本文也从流动性风险视角补充了金融市场制度影响公司融资行为的经验文献。最后，本文还提供了关于银行市场结构经济后果的新证据。

我们也注意到，本文提供的关于流动性风险理论的实证证据存在如下局限：一是银行竞争总体上对债务期限的负向影响较弱，二是产权性质变量有时对债务期限存在正向影响。进一步的分析表明这可能是由于银行竞争对债务期限存在非线性影响，而产权性质与债务期限之间的相关性受经营风险及银行竞争环境的影响。对于这种影响的深层原因，值得在未来的研究中予以进一步考察。

参考文献

樊纲、王小鲁、朱恒鹏，2006，《中国市场化指数—各地区市场化相对进程2006年报告》，经济科学出版社。

胡奕明、谢诗蕾，2005，“银行监督效应与贷款定价—来自上市公司的一项经验研究”《管理世界》，第5期，27-36。

江伟、李斌 · 2006，“制度环境、国有产权与银行差别贷款”《金融研究》，第11期，116-126。

卢峰、姚洋，2004，“金融压抑下的法治、金融发展和经济增长”《中国社会科学》，第1期，42-55。

孙铮、刘凤委、李增泉，2005，“市场化程度、政府干预与企业债务期限结构—来自中国上市公司的经验证据”《经济研究》，第5期，52-63。

肖作平，2006，“公司债务期限结构问题研究综述”《证券市场导报》，第11期，70-77。

肖作平，2009，“债务期限结构影响因素和双向效应动态调整模型—来自中国上市公司的经验证据”《管理工程学报》，第3期，142-146。

肖作平、廖理，2007，“大股东、债权人保护和公司债务期限结构选择—来自中国上市公司的经验证据”《管理世界》，第10期，99-113。

辛清泉、林斌、王彦超，2007，“政府控制、经理薪酬与资本投资”《经济研究》，第8期，110-122。

余明桂、潘红波，2008，“政府干预、法治、金融发展和国有企业银行贷款”《金融研究》，第9期，1-22。

袁卫秋，2005，“我国上市公司的债务期限结构—基于权衡思想的实证研究”《会计研究》，第12期，53-58。

周勤、徐捷、程书礼，2006，“中国上市公司规模和债务融资关系的实证研究”《金融研究》，第8期，41-55。

Barclay, M. J. and Smith, C. W. (1995), ‘The maturity structure of corporate debt’, *Journal of Finance* 50 (2): 609-631.

Barnea, A., Haugen, R., and Senbet, L. W. (1981), ‘An equilibrium analysis of debt financing under costly tax arbitrage and agency problems’, *Journal of Finance* 36 (3): 569-581.

Beck, T., Demirgüç-Kunt, A., and Maksimovic, V. (2004), ‘Bank competition and access to finance: International evidence’, *Journal of Money, Credit, and Banking* 36 (3): 627-648.

Berger, A. N., Espinosa-Vega, M. A., Frame, W. S., and Miller, N. H. (2005), ‘Debt maturity, risk, and asymmetric information’, *Journal of Finance* 60 (6): 2895-2923.

Black, S. E. and Strahan, P. E. (2002), ‘Entrepreneurship and bank credit availability’, *Journal of Finance* 57 (6): 2807-2833.

Bonaccorsi di Patti, E. and Giovanni D. (2004), ‘Bank competition and firm creation’, *Journal of Money, Credit and Banking* 36 (2): 225-251.

Brandt, L. and Li, H. (2003), 'Bank discrimination in transition economies: Ideology, information, or incentives?', *Journal of Comparative Economics* 31 (3): 387-413.

Cai, K., Fairchild, R., and Guney, Y. (2008), 'Debt maturity structure of Chinese companies', *Pacific-Basin Finance Journal* 16 (3): 268-297.

Cetorelli, N. and Gambera, M. (2001), 'Banking market structure, financial dependence and growth: International evidence from industry data', *Journal of Finance* 56 (2): 617-648.

Cetorelli, N. and Strahan, P. E. (2006), 'Finance as a barrier to entry: Bank competition and industry structure in local U.S. markets', *Journal of Finance* 61 (1): 437-461.

Degryse H. and Ongena, S. (2008), 'Competition and regulation in the banking sector: A review of the empirical evidence on the sources of bank rents', in Thakor, A. and Boot, A. (eds.), *Handbook of Financial Intermediation and Banking* (Elsevier), 483-554.

Demirgüç-Kunt, A. and Maksimovic, V. (1999), 'Institutions, financial markets, and firm debt maturity', *Journal of Financial Economics* 54 (3): 295-336.

Dennis, S., Nandy, D., and Sharpe, I. G. (2000), 'The determinants of contract terms in bank revolving credit agreements', *Journal of Financial and Quantitative Analysis* 35 (1): 87-110.

Diamond, D. W. (1991a), 'Debt maturity structure and liquidity risk', *Quarterly Journal of Economics* 106 (3): 709-737.

Diamond, D. W. (1991b), 'Monitoring and reputation: The choice between bank loan and directly placed debt', *Journal of Political Economy* 99 (4): 689-721.

Diamond, D. W. and Rajan, R. (2001), 'Banks, short term debt, and financial crises: Theory, policy implications and applications', *Proceedings of Carnegie Rochester Series on Public Policy* 54 (1): 37-71.

Eriksson, T. (1999), 'Executive compensation and tournament theory: Empirical tests on Danish data', *Journal of Labor Economics* 17 (2): 262-280.

Fan, J. P. H., Titman, S., and Twite, G. (2008), 'An International comparison of capital structure and debt maturity choices', Working Paper, Chinese University of Hong Kong, University of Texas at Austin, and Australian National University.

Flannery, M. J. (1986), 'Asymmetric information and risky debt maturity choice', *Journal of Finance* 41 (1): 19-37.

Giannetti, M. (2003), 'Do better institutions mitigate agency problems: Evidence from corporate finance choices', *Journal of Financial and Quantitative Analysis* 38 (1): 185-212

Goyal, V. K. and Wang, W. (2009), 'Debt maturity and asymmetric information: Evidence from default risk changes', Working Paper, Hong Kong University of Science and Technology and Queen's University.

Guzman, M. G. (2000), 'Bank structure, capital accumulation and growth: A simple macroeconomic model'. *Economic Theory* 16 (2): 421-455.

Hannan, T. H. (1991), 'Bank commercial loan markets and the role of market structure: Evidence from surveys of commercial lending'. *Journal of Banking and Finance* 15 (1): 133-149.

Hart, O. and Moore, J. (1994), 'A theory of debt based on the inalienability of human capital', *Quarterly Journal of Economics* 109 (4): 841-879.

Jansen, C. (2007), 'New empirical evidence on the debt maturity choice and the role of credit risk', Working Paper, European Business School.

Jensen, M. C. (1986), 'Agency costs of free cash flow, corporate finance, and takeovers', *American Economic Review* 76 (2): 323-339.

Jiang, G., Lee, C. M. C., and Yue, H. (2010), 'Tunneling through intercorporate loans: The China Experience', *Journal of Financial Economics* 98 (1): 1-20.

Johnson, S. A. (2003), 'Debt maturity and the effects of growth opportunities and liquidity risk on leverage', *Review of Financial Studies* 16 (1): 209-236.

Jong, A. de, Kabir, R., and Nguyen, T. T. (2008), 'Capital structure around the world: The roles of firm-and country-specific determinants', *Journal of Banking and Finance* 32 (9): 1954-1969.

Kane, A., Marcus, A. J., and McDonald, R. L. (1985), 'Debt policy and the rate of return premium to leverage', *Journal of Financial and Quantitative Analysis* 20 (4): 479-499.

Leland, H. E. and Toft, K. B. (1996), 'Optimal capital structure, endogenous bankruptcy, and the term structure of credit spreads', *Journal of Finance* 51 (3): 987-1019.

Marquez, R. (2002), 'Competition, adverse selection, and information dispersion in the banking industry', *The Review of Financial Studies* 15 (3): 901-926.

Martinez Peria, M. and Mody, A. (2004), 'How foreign participation and market concentration impact bank spreads: Evidence from Latin America', *Journal of Money, Credit, and Banking* 36 (3): 511-537.

Mitchell, K. (1993), 'The debt maturity choice: An empirical investigation', *Journal of Financial Research* 16 (4): 309-320.

Morris, J. R. (1992), 'Factors affecting the maturity structure of corporate debt', Working Paper, University of Colorado at Denver.

Myers, S. C. (1977), 'Determinants of corporate borrowing', *Journal of Financial Economics* 5 (2): 147-175.

Myers, S. C. and Rajan, R. G. (1998), 'The paradox of liquidity', *Quarterly Journal of Economics* 113 (3): 733-771.

Ortiz-Molina, H. and Penas, M. F. (2004), 'Lending to small businesses: The role of loan maturity in addressing information problems', Working Paper, Tilburg University.

Pagano, M. (1993), 'Financial markets and growth: An overview', *European Economic Review* 37 (2-3): 613-622.

Petersen, M. A. and Rajan, R. (1995), 'The effect of credit market competition on lending relationships', *Quarterly Journal of Economics* 110 (2): 407-443.

Petersen, M. A. (2009), 'Estimating Standard Errors in Finance Panel Data Sets: Comparing Approaches', *Review of Financial Studies* 22 (1): 435-480.

Rajan, R. (1992), 'Insiders and outsides: The choice between informed and arm's-length debt', *Journal of Finance* 47 (4): 1367-1400.

Sarkar, S. (1999), 'Illiquidity risk, project characteristics, and the optimal maturity of corporate debt', *Journal of Financial Research* 22 (3): 353-370.

Scherr, F. C. and Hulburt, H. M. (2001), 'The debt maturity structure of small firms', *Financial Management* 30 (1): 85-111.

Stohs, M. H. and Mauer, D. C. (1996), 'The determinants of corporate debt maturity structure', *Journal of Business* 69 (3): 279-312.

Titman, S. and Wessels, R. (1988), 'The Determinants of Capital Structure Choice,' *Journal of Finance* 43 (1): 1-19.

2010年12月 第12卷 第4期
中 国 会 计 与 财 务 研 究
China Accounting and Finance Review
Volume 12, Number 4 – December 2010

Operational Risk, Ownership, Banking Competition, and Corporate Debt Maturity Structure: An Empirical Test of the Liquidity Risk Theory*

Guanmin Liao[1], Yiyu Tang[2], and Xi Wu[3]

Abstract

This paper examines the effect of operational risk on the debt maturity structure of Chinese listed companies between 2001 and 2008 to infer whether and how Chinese firms take liquidity risk into account when making debt maturity decisions. We find that (1) the long-term debt ratio increases with corporate operational risk; (2) operational risk has a greater positive effect on debt maturity for non-state-owned enterprises than for state-owned enterprises; and (3) operational risk has a greater positive effect on debt maturity when firms operate in a region with stronger banking competition. These findings suggest that Chinese firms whose debt financing relies mainly on bank loans do consider the role of liquidity risk when making debt maturity decisions, but the consideration differs in the ownership and banking competition environments. The results also indicate that monopolistic banks have stronger incentives to collect company information, contributing to credit access and liquidity risk reduction for the company. This is consistent with Petersen and Rajan (1995) and supports the information-based hypothesis on banking market structure. Furthermore, we do not find an inverted U-shaped, non-monotonic relation between operational risk and debt maturity for Chinese listed companies when additional tests are conducted.

Keywords: Operational Risk, Liquidity Risk, Ownership, Banking Competition, Debt Maturity Structure
CLC code: F230

---

* We appreciate Professor Wayne Yu (the executive editor) and an anonymous reviewer for their insightful comments and suggestions. This study is supported by grants from the Humanities and Social Sciences Research Projects of Ministry of Education (No. 08JC630086), the Beijing Municipal Commission of Education "Joint Construction Project", and the "Project 211" (Phase-3) Fund of the Central University of Finance and Economics, China. Earlier versions of this study were presented at the China Accounting and Finance Research International Symposium 2009 (June 2009, Nanjing) and the 8th International Symposium on Empirical Accounting Research in China (December 2009, Beijing). We thank Professors Zhong Ma, Wenbing Su, and Kai Zhu for their constructive comments. All errors are our own.

1 Associate Professor, School of Accountancy, Central University of Finance and Economics. Email address: liaoguanmin@gmail.com. Correspondence address: South College Road 39, Hai Dian District, Beijing, China (Zip code: 100081).
2 Ph.D. student, School of Accountancy, Central University of Finance and Economics; China CITIC Bank. Email address: tangyiyu@126.com.
3 Associate Professor, School of Accountancy, Central University of Finance and Economics. Email address: snascorwu@yahoo.com.cn.

I. Introduction

Since pushing the world economy into recession, the global financial turmoil resulting from the subprime mortgage crisis in the US has aroused serious concerns among academics and practitioners. Too much short-term debt financing in the economy has been considered one of the culprits. In fact, short-term debt is a double-edged sword for firms. When economic conditions are good, it can reduce their costs of financing. But once the economic climate changes, such as when monetary policy becomes more stringent, firms will undertake high liquidity risks such that they must give up some investment opportunities and suffer great losses because they are unable to roll over their short-term debt. Furthermore, the liquidity risk may cause the whole economic situation to deteriorate (Diamond and Rajan, 2001).

The short-term debt ratio of Chinese firms has been high. Even for listed companies, the long-term debt ratio is only 13 per cent (Fan, Titman, and Twite, 2008). One important theoretical explanation is that in a market with poor investor protection, creditors are inclined to monitor borrower companies using short-term debt since long-term contracts are difficult to enforce (Diamond, 1991b; Rajan, 1992). But how do Chinese firms deal with the associated liquidity risk? How do they consider the effect of liquidity risk when making debt maturity decisions? Is the consideration related to China's particular institutional environment?

The liquidity risk theory provided by Diamond (1991a) points out that issuing short-term debt can convey private information to the market that a firm has a high credit rating on the one hand, but on the other will bring liquidity risk. Therefore, the firm should trade off between the costs and benefits of short-term debt and determine the optimal debt maturity structure. But the liquidity risk resulting from short-term debt may differ according to institutional environment. For example, for state-owned enterprises (SOEs) that can obtain favourable credit and for firms in a financial market with a low credit threshold, liquidity risk is fairly low owing to the convenience in refinancing, and thus its effect on debt maturity decisions is quite small.

Since most Chinese listed companies have no public credit rating information, this study examines the effect of corporate operational risk on debt maturity structure and infers whether Chinese firms consider liquidity risk when making debt maturity decisions. In theory, there are opposing views on the relation between operational risk and debt maturity. The liquidity risk theory (Diamond, 1991a) posits that firms with high operational risk[4] should choose more long-term debt because of the high credit risk.[5] But the contract cost theory (Myers, 1977; Jensen, 1986) and the taxation theory (Kane, Marcus, and McDonald, 1985) argue that these firms should choose short debt maturity because they have higher agency costs or need to adjust their capital structure frequently. Our study finds a positive correlation between operational risk and debt maturity for

[4] For example, Johnson (2003) uses operational risk as the proxy for credit risk.
[5] A firm with the highest risk level is an exception, since it is difficult for such a firm to obtain long-term loans.

Chinese listed companies, which lends support to the liquidity risk theory. It indicates that on average Chinese firms take liquidity risk into account when determining their debt maturity structure.

Furthermore, we examine the effect of corporate ownership and banking competition on the relation between operational risk and debt maturity to infer how the institutional environment affects consideration by Chinese firms of liquidity risk when making debt maturity decisions. We find that operational risk has a smaller effect on debt maturity for SOEs. This indicates that the credit preference for SOEs (Brandt and Li, 2003) can lower liquidity risk, leading to a weaker positive correlation between operational risk and debt maturity. We also find that the effect of operational risk on debt maturity is smaller for firms located in regions with weak banking competition. This indicates that monopolistic banks are more willing to collect corporate information and maintain long-term credit relationships, which can partially reduce the effect of liquidity risk. The results support the information-based hypothesis on banking market structure, but are inconsistent with the structure-performance hypothesis.

Our study makes three main contributions. First, from the perspective of operational risk, we investigate whether and how Chinese listed companies take the effect of liquidity risk into account when making debt maturity decisions, adding new evidence to the liquidity risk theory proposed by Diamond (1991a).

As far as international literature is concerned, the evidence on the liquidity risk theory is inconsistent. Some studies (e.g., Barclay and Smith, 1995; Stohs and Mauer, 1996; Scherr and Hulbert, 2001; Johnson, 2003) find an inverted U-shaped, non-monotonic relation between corporate risk and debt maturity as inferred by the theory. Goyal and Wang (2009) show that the risk of firms issuing short-term (long-term) debt will decrease (increase), supporting the theory's argument that firms signal in ways of short-term debt. But other studies (Mitchell, 1993; Sarkar, 1999; Ortiz-Molina and Penas, 2004) find a negative relation between corporate risk and debt maturity, which contradicts the prediction of liquidity risk theory. Berger *et al.* (2005) find that the relation between risk and debt maturity is consistent with the theoretical prediction only for firms with a lower level of risk. A more recent study (Jansen, 2007) also suggests that the empirical results on the relation between risk and debt maturity may vary with alternative measurements of corporate risk. Therefore, more evidence regarding the liquidity risk theory is warranted.

More importantly, there is a remarkable difference in the financial market between China and Western countries. China's bond market is much less developed, and bank loans play a crucial role in financing for firms. Since banks own more private information, the difference is great in considering corporate risk between bank financing and bond financing (Berger *et al., 2005*). Therefore, it is worth testing the effect of liquidity risk on corporate debt maturity in China's financial market.

Some prior studies examine the determinants of the debt maturity structure of Chinese firms (e.g. Yuan, 2005; Sun, Liu, and Li, 2005; Xiao and Liao, 2007; Xiao, 2009), but they seldom examine the effect of liquidity risk specifically. A more relevant study is Cai *et al.* (2008). Using 259 Chinese firms between 1999 and 2004 (1,554 firm-year observations) in the manufacturing sector as the sample, they find that the effect of operational risk (measured as the standard deviation of earnings) on debt maturity is unstable and sometimes even negative, thus providing little support to the liquidity risk theory. Our sample involves 1,413 Chinese listed companies between 2001 and 2008 in all non-financial sectors, totalling 8,070 firm-year observations. We not only investigate the latest pattern of how Chinese firms choose debt maturity, but also have a much larger sample size. Our results also differ from those in Cai *et al.* (2008). We find a significantly positive correlation between operational risk and debt maturity, and this correlation is affected by corporate ownership and banking competition. Our findings are thus consistent with the liquidity risk theory. We do not, however, find an inverted U-shaped relation, which may be because of the high threshold of the capital market in China.

Second, our study extends prior literature by showing how the financial system affects corporate financing from the perspective of liquidity risk. Prior studies (Demirguc-Kunt and Maksimovic, 1999; Giannetti, 2003; Jong *et al.,* 2008) examine the effect of the financial system on debt financing from the perspective of agency costs rather than liquidity risk. Our empirical results suggest that firms in an environment with weak banking competition degrade the effect of liquidity risk when making financing (debt maturity) decisions.

Third, this study also adds evidence to the literature on the economic consequences of banking market structure. There are two conflicting theories on how this structure affects access to credit for firms. The information-based hypothesis argues that a banking monopoly helps a firm to gain access to credit, but the structure-performance hypothesis holds that banking competition increases the efficiency of the credit market (Beck, Demirguc-Kunt, and Maksimovic, 2004). The empirical evidence is also mixed. Some studies find results consistent with the information-based hypothesis (Petersen and Rajan, 1995; Cetorelli and Gambera, 2001; Bonaccorsi di Patti and Dell'ariccia, 2004), while other results are consistent with the structure-performance hypothesis (Hannan, 1991; Black and Strahan, 2002; Martinez Peria and Mody, 2004; Cetorelli and Strahan, 2006; Degryse and Ongena, 2008). We investigate firms in China where bank loans play a crucial role in financing for firms and find evidence consistent with the fact that monopolistic banks have more incentives to collect corporate information and maintain long-term credit relationships with firms, thus supporting the information-based hypothesis.[6]

---

[6] We note that our study also finds some empirical results inconsistent with the liquidity risk theory. For instance, banking competition overall has only a weak negative effect on debt maturity, and state ownership sometimes even has a significantly positive effect. For more detailed discussions of these results, please refer to the subsequent sections on empirical results, robustness checks, and conclusions.

The rest of the paper is organised as follows. Section II conducts the theoretical analysis. Section III describes the research design. Section IV reports descriptive statistics and the main empirical results. Section V presents the results of robustness checks. Section VI concludes.

II. Theoretical Analysis and Research Questions

2.1 Operational Risk and the Choice of Debt Maturity

Flannery (1986) examines debt maturity under asymmetric information. In his opinion, since a firm owns private information about its prospect under asymmetric information, there is a bias in security pricing between the market and the firm. Moreover, the pricing bias is greater for long-term than for short-term debt. Accordingly, issuing short-term debt conveys the information of high-quality projects and good prospects. Diamond (1991a) further examines the effect of liquidity risk. He points out that issuing short-term debt conveys the private information of high credit ratings, but it also brings higher liquidity risk. The firm may suffer loss in case the short-term debt cannot be rolled over to meet the financial needs of long-term projects. Thus, the firm should trade off between the gains and losses from signalling and liquidity risk when choosing the debt maturity structure. The firm with a high credit risk should usually choose more long-term debt because of its high liquidity risk. But it may be very difficult for the firm with the highest level of credit risk to obtain long-term debt owing to the heavy agency costs of debt, in which case the firm can choose only short-term debt for financing. In sum, Diamond (1991a) infers an inverted U-shaped relation between credit risk and debt maturity.

Operational risk is closely related to credit risk and liquidity risk. The higher the operational risk, the higher the uncertainty of earnings in the future, and the more difficult it will be for firms to repay matured debt, which may lead to loan default, thus increasing credit risk. Furthermore, when short-term debt is due, the performance of firms with high operational risk is less likely to meet the refinancing threshold,[7] making it difficult for the firm to maintain financing for long-term projects. Therefore, Johnson (2003) and other empirical studies on the liquidity risk theory use operational risk as the proxy for credit risk.

According to the liquidity risk theory raised by Diamond (1991a), firms with high operational risk choose long debt maturity because of their high credit risk and liquidity risk. But for firms with the highest-ranked credit risk, short-term debt may be the only way for financing owing to the difficulty in obtaining long-term debt. Johnson (2003) provides evidence of an inverted U-shaped, non-monotonic relation between operational

[7] Although the firm with high operational risk may succeed in financing short-term debt when it shows good performance, once the short-term debt is due, it is less possible for the firm to reach the threshold of a loan, because its performance is more volatile compared with the firm showing the same performance on average but with lower risk.

risk and debt maturity, just as the theory predicts. The relation, however, may not be applicable to Chinese listed companies. Entry into the Chinese capital market is relatively more difficult, and listed companies are of a relatively high quality such that even if their risks are high, they can still obtain long-term debt from banks. Thus, we first examine the linear and monotonic effect of operational risk on debt maturity, and then discuss the possible non-monotonic relation between them in the robustness check.

Moreover, the reason why short-term debt brings liquidity risk is that firms may be unable to roll over such debt to maintain financing for long-term projects. Firms with higher operational risk suffer higher liquidity risk because they are more difficult to refinance. But this pattern may differ among firms with different corporate ownership. Prior studies (e.g., Brandt and Li, 2003; Hu and Xie, 2006) show that, owing to government intervention on bank loan decisions or the implicit guarantee supplied by the government, SOEs can obtain favourable loans, and their loan applications obtain approval more easily. Accordingly, even if SOEs suffer high operational risks, their liquidity risks are as low as those firms with low operational risks. By contrast, for non-SOEs, there is a great difference in liquidity risk between those firms with high operational risks and those with low operational risks, leading to a greater effect of operational risk. To sum up, the positive effect of operational risk on debt maturity can be greater for non-SOEs than for SOEs.

But the prediction according to the contract cost theory or the taxation theory on the correlation between operational risk and debt maturity is opposite that of the liquidity risk theory. The contract cost theory argues that short-term debt urges a firm to supply operating information and cut down free cash flows so as to mitigate agency problems, such as asset substitution, underinvestment, and unjustified disposal of free cash flows (Myers, 1977; Barnea, Haugen, and Senbet, 1981; Jensen, 1986; Hart and Moore, 1995). To decrease debt contract costs, firms with serious agency problems should choose more short-term debt. Firms with high operational risk have greater information asymmetry and more serious agency problems (Ortiz-Molina and Penas, 2004), and so should raise more short-term debt. The taxation theory (Kane, Marcus, and McDonald, 1985) takes tax into consideration. Specifically, the optimal debt maturity structure should weigh between the effects of tax, bankruptcy costs, and debt-issuing expenses on the decision over debt maturity. When a firm's value fluctuates, the firm should adjust its capital structure to what is optimal according to the changes in expected bankruptcy costs. The value of a firm with a higher risk may fluctuate more, and the capital structure needs to be adjusted more frequently. Therefore, the firm should issue more short-term bonds to facilitate the adjustment and then save the adjustment costs. In sum, both the contract cost theory and the taxation theory predict that operational risk is negatively related to debt maturity. Among others, Mitchell (1993) and Ortiz-Molina and Penas (2004) provide evidence that is consistent with such a prediction.

2.2 Banking Competition, Liquidity Risk, and Debt Maturity

There are two conflicting hypotheses (i.e., the information-based vs. the structure-performance hypotheses) concerning how the banking market structure affects a firm's accessibility to loans (Beck, Demirguc-Kunt, and Maksimovic, 2004). The former hypothesis suggests that when competition is weak, the monopolistic bank prefers to invest in the bank-firm relationship. It will collect more information on the firm, have more incentive to supply loans, and maintain longer credit relationships (Petersen and Rajan, 1995). Given that the competition from other banks is weak, the monopolistic bank does not have to worry about the future loss of customers; instead, it has a stronger motivation in collecting information to seize information rent, provide more favourable terms to new firms, and require higher loan interest rates when the debtors grow stronger. In contrast, banks are less likely to implement the above credit strategy in a highly competitive credit market, because firms have many borrowing choices. Marquez (2002) shows that when the banking market structure is concentrated, the special information on firms collected by banks is also fairly concentrated, which can alleviate the problem of information asymmetry. So firms can obtain loans more easily in an environment with weak banking competition. From other perspectives, such as the borrower's dependence on trade credit financing and firm growth, a number of studies (e.g., Petersen and Rajan, 1995; Cetorelli and Gambera, 2001; Bonaccorsi di Patti and Dell'ariccia, 2004) provide rich empirical evidence that a concentrated banking credit market can decrease the threshold of borrowers' access to credit. In a China-based study, Yu and Pan (2008) find that listed companies obtain more long-term loans in a market with weak banking competition.

By contrast, the hypothesis of structure performance based on the traditional organisation theory holds that the monopolistic bank will take full use of its monopoly advantage, seize excessive rent, and enact unfair credit terms, such as paying low deposit interest rates but requiring high loan rates (Pagano, 1993), and issuing loans by ration, leading to credit rationing (Guzman, 2000). That is, the monopolistic market structure makes it harder for firms to obtain loans. A number of studies (e.g., Hannan, 1991; Black and Strahan, 2002; Martinez, Peria, and Mody, 2004; Cetorelli and Strahan, 2006; Degryse and Ongena, 2008) find evidence that the competition among banks helps firms to obtain loans from the perspectives of loan interest rates, new firm financing, and industry structure.

If the information-based hypothesis is valid, the bank has a strong motivation to maintain a long-term credit relationship with firms when competition among banks is weak; a firm can then easily obtain access to long-term loans; in other words, banking competition is negatively related to a firm's debt maturity. Furthermore, no matter how great the operational risk, it is easy for the firm to renew its matured short-term debt. Thus, the positive effect of operational risk on debt maturity is weak. By contrast, when competition among banks is strong, the bank's motivation to supply long-term loans is

weak, and bank loan renewals become difficult. Particularly, it is more difficult for firms with high operational risk to renew bank loans, because the effect of operational risk on liquidity risk is greater, and its positive effect on debt maturity grows stronger. In sum, the information-based hypothesis predicts that the positive effect of operational risk on debt maturity will be stronger in an environment with strong banking competition.

According to the structure-performance hypothesis, however, stronger banking competition is more favourable for a firm to obtain loans. When banking competition is strong, the firm finds it easy to obtain long-term loans, meaning there is a positive correlation between banking competition and a firm's debt maturity. Furthermore, no matter how great the operational risk, it is easier for the firm to renew its matured short-term debt; the effect of operational risk on the debt maturity decision is then weak. Overall, the structure-performance hypothesis predicts that the positive effect of a firm's operational risk on debt maturity will be weaker under strong banking competition.

2.3 Research Questions

In line with the above discussion, we raise three research questions as follows:

RQ1: Does the long-term debt ratio increase with operational risk?

RQ2: Is the positive effect of operational risk on the long-term debt ratio greater for non-SOEs than for SOEs?

RQ3: Does the positive effect of operational risk on the long-term debt ratio increase when banking competition is stronger?

III. Research Design

3.1 Data Sources and Sample Selection

We collect the financial data of listed companies from the CSMAR database; from the CCER database we collect ownership, the proportion of shares held by the largest shareholder, and industrial sector data; and we manually collect banking competition data and GDP growth data. We select Chinese A-share listed companies (excluding financial institutions) between 2001 and 2008 as the sample.[8] The original sample contains 10,768 firm-year observations. We begin by extracting a sub-sample based on the following filtering criteria. First, we exclude 1,249 observations with incomplete historical financial data for the previous three years (including the current year).[9] Second, we drop 616 observations without bank loans or with missing information on loans. Third, we remove 833 observations with incomplete data for our model variables. Finally, our sample consists of 8,070 firm-year observations.

---

[8] Banking competition data before 2001 are unavailable to us.

[9] In our research design, we need at least three years of historical financial data to measure operational risk.

3.2 Model and Variables

This paper uses the following basic regression model:

$$\begin{aligned} Longdebt = {} & \beta_0 + \beta_1 Risk + \beta_2 State \times Risk + \beta_3 State + \beta_4 Hbankcomp \times Risk \\ & + \beta_5 Bankcomp + \beta_6 Size + \beta_7 TQ + \beta_8 First + \beta_9 Roa + \beta_{10} Lev \\ & + \beta_{11} Liquid + \beta_{12} Fixas + \beta_{13} ETR + \beta_{14} GDP + \lambda IND + \varepsilon \end{aligned} \quad (1)$$

3.2.1 Dependent Variable

The dependent variable *Longdebt* is the long-term debt ratio. We use this debt ratio as the proxy for debt maturity. The long-term debt due within one year is in fact long-term capital raised in the past, so we take it as part of the long-term debt. The formula of this variable is: *Longdebt* = (long-term debt + long-term debt due within one year)/(long-term debt + long-term debt due within one year + short-term debt).

3.2.2 Experimental Variables

(i) Operational Risk

Risk in the model represents operational risk. Since most Chinese listed companies do not have public information on credit ratings, we are not able to provide direct evidence on the liquidity risk theory by examining the effect of credit risk on debt maturity. Instead, referring to Johnson (2003) and Cai *et al.* (2008), we examine the effect of operational risk on debt maturity to infer the effect of liquidity risk.

We use two approaches to measure operational risk: the first refers to Johnson (2003) and uses the standard deviation of *ROA* (Return on Assets, *Risk_roa*) over the past seven years (including the current year); the second refers to Eriksson (1999) and uses the standard deviation coefficient of revenue (*Risk_sales*) also over the past seven years (including the current year), of which the coefficient is calculated as the standard deviation divided by the mean of sales. If there are less than seven but more than three years of financial data, we calculate the variable in terms of effective data. According to the liquidity risk theory, a firm with high operational risk will choose more long-term debt, leading us to predict that the estimated coefficient on operational risk will be positive. In contrast, according to the contract cost theory or the taxation theory, a firm with high operational risk will choose more short-term debt, leading us to predict that the estimated coefficient on operational risk will be negative.

(ii) Ownership

We use the interaction between ownership and operational risk as *State*×*Risk* to test the effect of ownership on the correlation between operational risk and debt maturity. *State* is a dummy variable indicating a state-owned enterprise (SOE). Under the liquidity risk theory, we predict that the interaction will be negative. But under the contract cost theory and the taxation theory, it is hard to compare the adjustment costs of capital

structure and the contract costs of firms with different ownership structure, and so we do not predict the effect of corporate ownership on the correlation between operational risk and debt maturity.

We also control for the direct effect of ownership on debt maturity. We make two opposite predictions on the effect. On the one hand, SOEs have access to more favourable credit and can obtain long-term loans more easily owing to administrative intervention or the implicit guarantee provided by the government, and thus they have longer debt maturity (Jiang and Li, 2006). On the other hand, SOEs also have lower liquidity risk and tend to choose shorter debt maturity.

(iii) Banking Competition

Referring to Lu and Yao (2004), we measure banking competition (*Bankcomp*) as the market shares of loans of banks other than the four largest state-owned banks in the region (province, autonomous region, or municipality) where the company is located. The greater the variable, the stronger is the competition. We introduce the interaction between banking competition and operational risk (*Hbankcomp*×*Risk*). *Hbankcomp* is a dummy variable indicating strong banking competition (coded 1 when the variable *Bankcomp* of the province is among the top one-third of all provinces, and 0 otherwise). We also control for the direct effect of banking competition on debt maturity. According to the above theoretical analysis, the information-based hypothesis predicts that the estimated coefficient on banking competition will be negative, and that on the interaction term *Hbankcomp*×*Risk* will be positive. But predictions under the structure-performance hypothesis are reversed: the former will be positive, and the latter will negative.

3.2.3 Control Variables

We follow prior literature (e.g., Barclay and Smith, 1995; Cai *et al.,* 2008) to include control variables as follows:

1. Firm size (*Size* = the natural logarithm of total assets). As for larger firms, since their information disclosure is more transparent such that their agency costs are lower, the bank would like to supply long-term loans, and therefore the firm can obtain long-term loans at lower cost (Titman and Wessels, 1988). Thus, according to the contract cost theory, the larger the firm, the longer the debt maturity. Prior studies (Barclay and Smith, 1995; Stohs and Mauer, 1996) find that firm size is positively related to debt maturity.

2. Growth opportunity (*TQ* = (market value of equity + book value of liabilities)/ book value of assets). Future growth opportunity may raise two kinds of agency problems: one is underinvestment (Myers, 1977) and the other over-investment (Hart and Moore, 1995). Short-term debt can relieve the former problem, whereas long-term debt can restrain the latter. Xin *et al.* (2007) show that the problem of over-investment is serious in Chinese listed companies. That is, compared with underinvestment, over-

investment is more popular in China. Consequently, the more growth opportunities for Chinese listed companies, the longer the debt maturity. We adopt Tobin's Q to measure a firm's growth opportunity. Cai *et al.* (2008) find that Tobin's Q is positively associated with the debt maturity of Chinese listed companies but is not significant in most instances.

3. Shares held by the largest shareholder (*First* = ratio of the number of shares held by the largest shareholder to the total number of shares). Jiang *et al.* (2010) show that a highly concentrated ownership structure will lead to the serious problems of entrenchment. According to the contract cost theory, the proportion of shares held by the largest shareholder is negatively related to debt maturity.

4. Profitability (*ROA* = operating income/total assets). Following the contract cost theory, the more profitable a firm is, the less monitoring the bank requires, and the more conveniently the firm can obtain long-term loans. Thus, profitability is positively related to debt maturity. But in line with information asymmetry and the liquidity risk theory, a firm with high profitability will be motivated to convey its positive information through issuing short-term debts (Flannery, 1986). Moreover, such a firm also has lower liquidity risk and tends to choose more short-term debt. So the liquidity risk theory leads to a prediction that profitability will be negatively related to debt maturity. Prior studies (Sun, Liu, and Li, 2005; Cai *et al.,* 2008; Fan, Titman, and Twite, 2008) find that profitability is positively related to debt maturity.

5. Financial leverage (*Lev* = total liabilities/total assets). According to the contract cost theory, financial leverage is negatively related to debt maturity, because the agency costs resulting from underinvestment are also high when the financial leverage is high (Dennis *et al.,* 2000). It is difficult for banks to recall loans, and they tend to supply short-term loans to strengthen monitoring. But according to the liquidity risk theory, a firm with high financial leverage will have greater liquidity risk and will be motivated to choose more long-term debt. Leland and Toft (1996) find that firms with high financial leverage do indeed tend to choose more long-term debt. Morris (1992) furthermore takes the bankruptcy risk into account and argues that a firm with higher leverage may use more long-term debt.

6. The liquidity of assets (*Liquid* = (cash + short-term investment)/total assets). The stronger the liquidity of a firm's assets, the lower the liquidity risk, and so the firm should choose more short-term debt according to the liquidity risk theory. Myers and Rajan (1998) argue that the collateral value of liquid assets is low and can be easily transferred, whereas it is hard to obtain long-term debt for the firm with excessively liquid assets. Thus, the liquidity of assets is negatively related to debt maturity. Unlike Cai *et al.* (2008), who use the current ratio as a proxy for the liquidity of assets, we use a different measure. When the current ratio is used, the denominator is current liabilities, while the dependent variable of the model is the ratio of long-term debt to total debt. Because the difference between total debt and long-term debt is nearly equivalent to current liabilities, the current ratio has a mechanically positive association with the long-

term debt ratio and may not be suitable for examining the theoretical relation between assets liquidity and debt maturity.

7. Fixed assets to total assets ratio (*Fixas* = fixed assets/total assets). Following the principle of matching maturity between assets and liabilities (Hart and Moore, 1994), debt maturity should increase parallel with the increase in assets maturity, indicating a positive correlation between fixed assets to the total assets ratio and debt maturity. Prior studies (Barclay and Smith, 1995; Fan, Titman, and Twite, 2008; Sun, Liu, and Li, 2005) provide empirical evidence that is consistent with the prediction.

8. Effective tax rate (*ETR* = income tax expense/profit before tax). According to the taxation theory (Kane, Marcus, and McDonald, 1985), a high tax rate brings more tax shield benefits to the firm, and more short-term debts are raised because of their relatively low interest rates and costs of capital structure adjustment. Thus, the effective tax rate is negatively related to debt maturity. We use the average tax rate as a proxy for the effective tax rate. But if the calculated average tax rate is less than 0 or greater than 1, we require the tax rate to be 0 or 1, respectively.

9. Regional economic growth (*GDP* = (current year's GDP – previous year's GDP)/previous year's GDP) and industry fixed effect (*IND*). Regional economic growth and industry characteristics have great influence on corporate finance. The industry classification is based on the *Industry Classification Guide for Listed Companies* published by the China Securities Regulatory Commission. Manufacturing industries are classified by the first two-digit industry code (composed of one letter and one digit), while other industries are classified by the first letter.

IV. Empirical Analyses

4.1 Summary Statistics

Table 1 reports the descriptive statistics. SOEs account for 72 per cent of overall sample observations. There are 3,417 observations (42 per cent) in the region with strong banking competition. The mean (median) of the long-term debt ratio (*Longdebt*) is 28.4 per cent (19.3 per cent), and both are greater for SOEs, which suggests that state ownership has a favourable effect on a firm's access to long-term debt. The long-term debt ratio of firms operating in the region with strong banking competition is greater. This may be because banking competition helps a firm to obtain access to long-term debt, but may also be because corporate characteristics differ between regions. For example, the size of firms in the region with strong banking competition is significantly larger,[10] and a larger firm can more easily obtain access to long-term debt.

[10] The mean of firm size (*Size*) in regions with strong and weak banking competition is 21.57 and 21.26, respectively. The t-test shows that the difference is significant at the 1 per cent level.

A firm's growth (*TQ*), profitability (*ROA*), and financial leverage (*Lev*) all have serious outliers, so we winsorise these at the 1st and 99th percentiles. Note the significant differences in financial ratios and ownership concentration among firms with different ownership structures and under different banking competition environments; thus, we need to control for them in the regression model.

Table 2 reports the correlation matrix of the main variables in the model. Divided at the diagonal blank line, the lower left part of the table reports simple correlation coefficients, while the upper right part reports partial correlation coefficients. The dependent variable is the long-term debt ratio (*Longdebt*) and is significantly related to most independent variables. *Longdebt* is positively related to *Risk_sales*, which is consistent with the prediction of the liquidity risk theory. In view of the simple correlation coefficients, *Longdebt* is negatively related to *Risk_roa*, which is opposite to the prediction of liquidity risk theory; however, if we focus on the partial correlation coefficient, *Longdebt* is positively related to *Risk_roa*, which is consistent with this theory. We interpret these findings as follows: *Risk_roa* is negatively related to firm size (the simple correlation coefficient reaches -0.3, which is significant at the 1 per cent level), whereas firm size is positively related to *Longdebt* (the simple correlation coefficient is 0.32).

We also conduct the following tests (untabulated). First, we regress *Longdebt* on *Risk_roa* (controlling only for the industry fixed effect), and find that the estimated coefficient on *Risk_roa* is significantly negative ($p < 0.01$), which is similar to the simple correlation coefficient. But once *Size* is introduced into the model, the coefficient on *Risk_roa* becomes positive and significant at the 1 per cent level. The test indicates that the correlation between debt maturity and operational risk is influenced by firm size, and that the simple correlation coefficient between *Longdebt* and *Risk_roa* may not represent their true correlation. Thus, multiple regression analysis is warranted.

4.2 Multiple Linear Regressions

4.2.1 Operational Risk, Ownership, and Debt Maturity Structure

Firstly, we examine the effect of operational risk on debt maturity and the difference in this effect between two types of ownership. Table 3 reports the results. In Columns (1) and (2), *Risk_roa* is used as a proxy for operational risk, and in Columns (3) and (4) *Risk_sales* serves as the proxy. Columns (2) and (4) introduce the interaction term between ownership and operational risk. We cluster the standard errors of estimated coefficients by firm and year because of the problems of heteroscedasticity and autocorrelation of panel data (Petersen, 2009).

Table 1 Summary Statistics

	Overall Sample						By Ownership					By Banking Competition				
							Non-state-owned		State-owned			Weak		Strong		
	Obs.	Mean	Median	Std.	Min	Max	Obs.	Mean	Obs.	Mean	t-test	Obs.	Mean	Obs.	Mean	t-test
Longdebt	8070	0.284	0.193	0.295	0.000	1.000	2258	0.236	5812	0.302	-9.15***	4653	0.274	3417	0.297	-3.58***
Risk_roa	8070	0.041	0.028	0.037	0.000	0.281	2258	0.048	5812	0.038	11.25***	4653	0.040	3417	0.042	-2.24**
Risk_sales	8070	0.417	0.370	0.252	0.010	3.179	2258	0.455	5812	0.402	8.49***	4653	0.406	3417	0.431	-4.38***
State	8070	0.720	1.000	0.449	0.000	1.000						4653	0.722	3417	0.718	0.45
Bankcomp	8070	0.487	0.488	0.081	0.027	0.677	2258	0.486	5812	0.488	-1.25	4653	0.436	3417	0.557	-99.23***
Size	8070	21.393	21.302	1.020	16.704	27.346	2258	21.043	5812	21.529	-19.68***	4653	21.260	3417	21.574	-13.79***
TQ	8070	2.029	1.621	1.223	0.871	7.669	2258	2.196	5812	1.965	7.67***	4653	2.016	3417	2.048	-1.16
First	8070	0.397	0.377	0.166	0.000	0.852	2258	0.319	5812	0.427	-27.23***	4653	0.409	3417	0.380	7.67***
ROA	8070	0.028	0.031	0.072	-0.304	0.201	2258	0.023	5812	0.030	-3.67***	4653	0.028	3417	0.027	0.56
Lev	8070	0.268	0.258	0.154	0.003	0.714	2258	0.283	5812	0.261	5.75***	4653	0.273	3417	0.260	3.84***
Liquid	8070	0.145	0.124	0.099	0.000	0.786	2258	0.146	5812	0.144	0.59	4653	0.148	3417	0.141	3.05***
Fixas	8070	0.308	0.282	0.184	0.000	0.960	2258	0.265	5812	0.325	-13.32***	4653	0.309	3417	0.307	0.49
ETR	8070	0.202	0.169	0.178	0.000	1.000	2258	0.195	5812	0.204	-1.98**	4653	0.204	3417	0.198	1.5
GDP	8070	0.166	0.172	0.052	-0.093	0.497	2258	0.170	5812	0.165	3.64***	4653	0.157	3417	0.179	-18.85***

*, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

Variable definitions:

Longdebt = (long-term debt + long-term debt due within one year)/(long-term debt + long-term debt due within one year + short-term debt);

Risk_roa = standard deviation of ROA over the past seven years (including the current year);

Risk_sales = standard deviation coefficient of sales over the past seven years (including the current year);

State = 1 when the ultimate controller is the government or a state-owned enterprise, and 0 otherwise;

Bankcomp = market shares of loans of banks other than the four largest state-owned banks in the province where the company is located;

Size = natural logarithm of the book value of total assets;

TQ = (market value of equity + book value of debt)/book value of total assets;

First = ratio of the number of shares held by the largest shareholder to the total number of shares;

ROA = operating income/total assets;

Lev = total liabilities/total assets;

Liquid = (cash + short-term investments)/total assets;

Fixas = total fixed assets/total assets;

ETR = income tax expense/profit before tax, but the value is required to be 0 or 1 if the raw value is less than 0 or greater than 1;

GDP = (current year's GDP of the province where the company is located – previous year's GDP of the province where the company is located)/previous year's GDP of the province where the company is located).

Banking competition is strong when the *Bankcomp* of the province is among the top one-third of all provinces, and weak otherwise.

Table 2 Correlation Matrix

	Longdebt	*Risk_roa*	*Risk_sales*	*State*	*Bankcomp*	*Size*	*TQ*	*First*	*ROA*	*Lev*	*Liquid*	*Fixas*	*ETR*	*GDP*
Longdebt		0.052***	0.038***	0.034***	-0.033***	0.233***	0.008	-0.003	0.122***	0.103***	-0.051***	0.147***	0.010	-0.024**
Risk_roa	-0.060***		0.241***	-0.052***	0.041***	-0.152***	0.222***	0.035***	-0.326***	0.004	-0.061***	-0.022**	-0.092***	0.008
Risk_sales	0.076***	0.194***		-0.060***	0.001	0.151***	0.061***	-0.051***	0.181***	0.092***	-0.034***	-0.146***	-0.005	0.067***
State	0.101***	-0.124***	-0.094***		-0.002	0.143***	0.017	0.240***	-0.090***	-0.079***	0.014	0.103***	0.024**	-0.036***
Bankcomp	0.018	0.003	0.046***	0.014		0.220***	0.049***	-0.086***	-0.057***	-0.102***	-0.035***	0.008	0.050***	0.193***
Size	0.316***	-0.290***	0.108***	0.214***	0.197***		-0.343***	0.148***	0.188***	0.118***	0.009	0.018	-0.076***	0.035***
TQ	-0.095***	0.279***	0.084***	-0.085***	-0.033***	-0.375***		0.027**	0.196***	-0.009	0.030***	-0.011	-0.101***	-0.018**
First	0.082***	-0.093***	-0.052***	0.290***	-0.052***	0.205***	-0.037***		0.085***	-0.073***	0.002	0.046***	-0.024**	-0.036***
ROA	0.149***	-0.380***	0.103***	0.041***	0.010	0.252***	0.039***	0.163***		-0.363***	0.123***	0.113***	0.182***	0.008
Lev	0.115***	0.148***	0.061***	-0.064***	-0.055***	0.041***	-0.085***	-0.115***	-0.386***		-0.188***	0.106***	0.057***	-0.005
Liquid	-0.117***	-0.124***	-0.011	-0.007	-0.030***	-0.020*	0.058***	0.029***	0.219***	-0.315***		-0.307***	-0.008	-0.017
Fixas	0.223***	-0.073***	-0.119***	0.147***	0.015	0.136***	-0.081***	0.097***	0.044***	0.154***	-0.331***		-0.039***	0.024**
ETR	0.032***	-0.183***	-0.011	0.022**	0.035***	0.046***	-0.103***	0.001	0.207***	-0.038***	0.039***	-0.011		-0.003
GDP	0.000	0.011	0.085***	-0.041***	0.213***	0.077***	-0.030***	-0.051***	0.013	0.003	-0.031***	0.018	0.005	

*, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

Divided at the diagonal blank line, the lower left part of the table reports simple correlation coefficients, and the upper right part reports partial correlation coefficients.

Variable definitions:

Longdebt = (long-term debt + long-term debt due within one year)/(long-term debt + long-term debt due within one year + short-term debt);

Risk_roa = standard deviation of ROA over the past seven years (including the current year);

Risk_sales = standard deviation coefficient of sales over the past seven years (including the current year);

State = 1 when the ultimate controller is the government or a state-owned enterprise, and 0 otherwise;

Bankcomp = market shares of loans of banks other than the four largest state-owned banks in the province where the company is located;

Size = natural logarithm of the book value of total assets;

TQ = (market value of equity + book value of debt)/book value of total assets;

First = ratio of the number of shares held by the largest shareholder to the total number of shares;

ROA = operating income/total assets;

Lev = total liabilities/total assets;

Liquid = (cash + short-term investments)/total assets;

Fixas = total fixed assets/total assets;

ETR = income tax expense/profit before tax, but the value is required to be 0 or 1 if the raw value is less than 0 or greater than 1;

GDP = (current year's GDP of the province where the company is located – previous year's GDP of the province where the company is located)/previous year's GDP of the province where the company is located).

In Columns (1) to (4), the estimated coefficients of operational risk (*Risk_roa or Risk_sales*) are all significantly positive ($p < 0.01$ in three regressions and < 0.10 in one regression). Note that the result of *Risk_roa* is quite different from the simple correlation coefficient in Table 2, indicating that when controlling for such factors as firm size, operational risk measured as *Risk_roa* has a positive effect on debt maturity. The result suggests that it is difficult for the firm with high operational risk to renew its matured short-term debt, leading to high liquidity risk, so the firm tends to choose more long-term debt in order to decrease liquidity costs. The finding supports the liquidity risk theory but not the contract cost or the taxation theories.

The interaction term between ownership and operational risk, State×*Risk_roa* or *State*×*Risk_sales*, is significantly negative at the 5 per cent level, which indicates that the credit preference enjoyed by SOEs with high operational risk can lower their liquidity risk, resulting in a smaller effect of operational risk on debt maturity. The finding is consistent with the prediction of the liquidity risk theory.

The coefficient on the dummy variable *State* is positive, but only significant when the interaction term between ownership and operational risk is introduced. We also conduct additional tests as follows (not tabulated). We equally divide the full sample into three sub-samples by *Risk_roa* and then run the regressions respectively. In the sub-sample with low risk, *State* is significantly positive at the 1 per cent level, while in the sub-sample with medium risk, *State* is no longer significant, and in the sub-sample with high risk, it even turns opposite. This suggests that only when operational risk is low can state ownership positively affect debt maturity; when operational risk turns high, the effect becomes negative. The reason could be the existence of the two opposing effects. On the one hand, the credit preference for SOEs can help them obtain access to more long-term debt; on the other, SOEs normally have a lower level of liquidity risk and tend to choose more short-term debt. When operational risk is high, state ownership can help to decrease a firm's high liquidity risk, and the incentive to choose short-term debt becomes stronger, which may offset the convenience of SOEs in obtaining long-term debt. Consequently, there is no significant effect of state ownership on debt maturity. But when operational risk is low, liquidity risk is also low, and state ownership has little effect on reducing liquidity risk (and thus little effect on the incentive for short-term debt financing). Under such circumstances, the convenience provided by state ownership in accessing long-term debt plays a dominant role, and it has a significantly positive effect on debt maturity.

The coefficient on banking competition, *Bankcomp*, is significantly negative, which supports the information-based hypothesis on banking market structure. When banking competition is weak, banks are less concerned about the loss of customers and have stronger incentive to collect firm information and maintain long credit relationships by supplying more long-term loans.

As for control variables, firm size (*Size*) is positively related to long-term debt, which is consistent with Barclay and Smith (1995) and supports the contract cost

theory. This indicates that large firms can obtain more long-term loans owing to their low agency costs. The coefficient on firm growth (*TQ*) is positive, which may indicate serious agency problems of over-investment in Chinese listed companies, so the firm with a lot of growth opportunities should choose more long-term debt. Nevertheless, the result is not statistically significant. The estimated coefficient on the shares held by the largest stockholder (*First*) is negative, which is consistent with the prediction but also not significant.

Firm profitability (*ROA*) is significantly positively related to the long-term debt ratio, which is consistent with findings in Cai *et al.* (2008) and Fan, Titman, and Twite (2008), but differs from the prediction of the information asymmetry theory. This shows that firms with high profitability do not need to convey positive information by issuing short-term debt; meanwhile, they can more easily obtain long-term debt because of a lower demand for bank monitoring. The reason may be that China's bond market is so undeveloped that banks are the main creditors; since banks own much private information on firms, there is little need for firms to signal (Cai *et al.,* 2008). Financial leverage (*Lev*) is significantly positive, implying that the firm with high leverage has higher liquidity risk and so chooses longer debt maturity. This is consistent with the liquidity risk theory rather than the contract cost theory. Liquidity of assets (*Liquid*) is negatively related to debt maturity and is significant at the 10 per cent level, as shown in Columns (3) and (4), suggesting that the firm with more liquid assets has lower liquidity risk and is more likely to choose a higher short-term debt ratio, in accordance with the liquidity risk theory.

The ratio of fixed assets to total assets (*Fixas*) is significantly positive, which is consistent with the principle of matching maturity between assets and liabilities (Barclay and Smith, 1995). The effective tax rate (*ETR*) is not significant, and the signs are inconsistent among the four regressions, suggesting that the tax rate may not be an important factor when the debt maturity structure is determined. Regional economic growth is also not statistically significant.

4.2 Banking Competition, Operational Risk, and Debt Maturity Structure

Next, we study whether or how banking competition affects the correlation between operational risk and debt maturity. First, we introduce the interaction term between banking competition and operational risk (*Hbankcomp*×*Risk*). Second, we divide the full sample into two groups by banking competition and run regressions separately. We define strong banking competition when the variable of *Hbankcomp* equals 1, and weak banking competition otherwise. Table 4 reports the results. Columns (1) and (4) report the regression results for the full sample, Columns (2) and (5) for the sub-sample with strong banking competition, and Columns (3) and (6) for the sub-sample with weak banking competition. In Columns (1) to (3), *Risk_roa* is used as a proxy for operational risk, and in Columns (4) to (6), *Risk_sales* is used as the proxy.

The results in Columns (1) and (4) show that the coefficients on the interaction term between banking competition and operational risk (*Hbankcomp*×*Risk_roa* or *Hbankcomp*×*Risk_sales*) are positive and significant at the 1 per cent level. Furthermore, as shown in Columns (2) and (3), the marginal effect of *Risk_roa*, indicating operational risk on debt maturity, is 0.675 when firms operate in a region with strong banking competition, but 0.329 when banking competition is weak, which reaches only half the former. As Columns (5) and (6) show, the marginal effect of *Risk_sales*, indicating operational risk on debt maturity, is 0.079 and significant at the 1 per cent level when firms are located in the region with strong banking competition, but 0.01 and not statistically significant for weak competition. The findings indicate that when the firm is located in a region with strong banking competition, the positive effect of operational risk on debt maturity is larger and more statistically significant; this is consistent with the liquidity risk theory and also supports the information-based hypothesis on banking market structure. When this structure is concentrated, competition among banks is weak. Since banks are less concerned about the loss of customers, monopolistic banks have great incentive to collect enterprise information to seize information rents and help emerging enterprises, and then ask for high loan rates when the enterprise matures. This credit strategy, however, does not apply to banks operating in a region with intense banking competition.

Banking competition has a significantly negative effect on debt maturity, which is consistent with the information-based hypothesis. The coefficient of the dummy variable *State*, indicating state ownership, is significantly positive for firms operating in a region with weak banking competition, and negative otherwise. We still conduct the following tests:[11] introducing the interaction term between state ownership and banking competition *State*×*Bankcomp*, we find that it is significantly negative at the 1 per cent level. Equally dividing the whole sample into four groups by the variable *Bankcomp*, we find that the dummy *State* is significantly positive for the group with the weakest banking competition, but that with the exacerbation of competition, it becomes insignificant, and even significantly negative for the group with the strongest competition. This indicates the presence of a substituting effect on reducing liquidity risk between banking competition and state ownership. When firms operate in a region with weak banking competition, they face low liquidity risk because of the convenient access to credit,[12] and there is no need for state ownership to reduce liquidity risk. Thus, the convenience that state ownership helps obtain access to long-term debt plays a dominant role, and SOEs have a higher long-term debt ratio. But for firms located in a region with strong banking competition, as access to credit becomes more difficult, firms face high liquidity risk, and state ownership has a great effect on reducing it; therefore, the debt maturity of SOEs is shorter instead. This finding is consistent with the liquidity risk theory. As to other control variables, the signs and significance levels are similar to those in Table 3.

[11] Some results are reported in Table 6 in the section on robustness checks.
[12] This is based on the information-based hypothesis on banking market structure.

Table 3 The Effect of Operational Risk and Ownership on Choice of Debt Maturity Structure

Dependent variable: *Longdebt*	(1)	(2)	(3)	(4)
Risk_roa	0.456***	0.716***		
	(3.26)	(3.95)		
State×Risk_roa		-0.429**		
		(-2.09)		
Risk_sales			0.038*	0.087***
			(1.69)	(2.80)
State×Risk_sales				-0.074**
				(-2.25)
State	0.010	0.029*	0.010	0.042**
	(0.72)	(1.81)	(0.70)	(2.09)
Bankcomp	-0.117*	-0.118*	-0.108*	-0.105*
	(-1.88)	(-1.89)	(-1.71)	(-1.66)
Size	0.068***	0.068***	0.064***	0.065***
	(12.09)	(12.22)	(11.35)	(11.52)
TQ	0.003	0.003	0.005*	0.005*
	(1.03)	(0.93)	(1.66)	(1.68)
First	-0.018	-0.021	-0.014	-0.017
	(-0.61)	(-0.71)	(-0.46)	(-0.57)
ROA	0.472***	0.473***	0.381***	0.389***
	(5.36)	(5.32)	(4.65)	(4.69)
Lev	0.147***	0.146***	0.145***	0.147***
	(4.06)	(4.02)	(3.90)	(3.93)
Liquid	-0.092	-0.089	-0.099*	-0.097*
	(-1.62)	(-1.54)	(-1.74)	(-1.72)
Fixas	0.205***	0.206***	0.206***	0.208***
	(3.49)	(3.49)	(3.50)	(3.55)
ETR	0.005	0.005	-0.002	-0.003
	(0.23)	(0.24)	(-0.09)	(-0.16)
GDP	-0.108	-0.106	-0.115	-0.106
	(-1.31)	(-1.30)	(-1.47)	(-1.36)
Constant	-1.249***	-1.266***	-1.176***	-1.211***
	(-10.84)	(-11.16)	(-10.25)	(-10.64)
Industry Fixed Effect	Yes	Yes	Yes	Yes
Obs.	8070	8070	8070	8070
Adj. R-squared	0.217	0.218	0.216	0.217

*, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

T-statistics clustered by firm and year are reported in the parentheses.
Variable definitions:
Longdebt = (long-term debt + long-term debt due within one year)/(long-term debt + long-term debt due within one year + short-term debt);
Risk_roa = standard deviation of ROA over the past seven years (including the current year);
Risk_sales = standard deviation coefficient of sales over the past seven years (including the current year);
State = 1 when the ultimate controller is the government or a state-owned enterprise, and 0 otherwise;
Bankcomp = market shares of loans of banks other than the four largest state-owned banks in the province where the company is located;
Size = natural logarithm of the book value of total assets;
TQ = (market value of equity + book value of debt)/book value of total assets;
First = ratio of the number of shares held by the largest shareholder to the total number of shares;
ROA = operating income/total assets;
Lev = total liabilities/total assets;
Liquid = (cash + short-term investments)/total assets;
Fixas = total fixed assets/total assets;
ETR = income tax expense/profit before tax, but the value is required to be 0 or 1 if the raw value is less than 0 or greater than 1;
GDP = (current year's GDP of the province where the company is located – previous year's GDP of the province where the company is located)/previous year's GDP of the province where the company is located).

V. Robustness Checks

5.1 Alternative Estimation Methods

In the main regressions, we cluster the t-statistics by firm and year. Referring to Petersen (2009), we also try clustering them only by firm and controlling for the year fixed effects. Moreover, we adopt the random-effect model and the fixed-effect model. Table 5 reports the sensitivity test results. We control for the year fixed effects, and t-statistics are clustered by firm in Columns (1) and (2); Columns (3) and (4) report the estimation results of the random-effect model, and Columns (5) and (6) the results of the fixed-effect model. We find that all results remain unchanged. Specifically, the variable *Risk_roa* as the proxy for operational risk is significantly positive, the interaction terms between state ownership and operational risk are significantly negative in five of the six regressions, and those between banking competition and operational risk are significantly positive in all six regressions.

Table 4 The Effect of Operational Risk and Banking Competition on Debt Maturity Structure Choice

	Overall Sample	Strong Competition	Weak Competition	Overall Sample	Strong Competition	Weak Competition
Dependent variable: *Longdebt*	(1)	(2)	(3)	(4)	(5)	(6)
Risk_roa	0.225	0.675***	0.329*			
	(1.34)	(3.63)	(1.66)			
Hbankcomp×Risk_roa	0.514***					
	(3.87)					
Risk_sales				0.002	0.079***	0.010
				(0.09)	(3.23)	(0.45)
Hbankcomp×Risk_sales				0.083***		
				(3.71)		
Bankcomp	-0.211***			-0.263***		
	(-3.25)			(-3.44)		
State	0.011	-0.024	0.032***	0.010	-0.022	0.031***
	(0.74)	(-1.55)	(2.75)	(0.77)	(-1.46)	(2.66)
Size	0.068***	0.072***	0.064***	0.063***	0.065***	0.062***
	(12.15)	(11.39)	(7.66)	(10.96)	(10.81)	(7.39)
TQ	0.003	-0.000	0.003	0.004	0.002	0.005
	(0.89)	(-0.18)	(0.55)	(1.35)	(0.99)	(0.94)
First	-0.016	-0.054	0.003	-0.013	-0.051	0.005
	(-0.53)	(-1.17)	(0.08)	(-0.44)	(-1.13)	(0.12)
ROA	0.477***	0.415***	0.519***	0.387***	0.284***	0.456***
	(5.46)	(3.54)	(5.87)	(4.83)	(2.81)	(6.10)
Lev	0.151***	0.153***	0.167***	0.147***	0.144***	0.168***
	(4.22)	(3.49)	(4.06)	(3.97)	(3.10)	(4.13)
Liquid	-0.090	0.055	-0.178***	-0.094*	0.051	-0.186***
	(-1.60)	(0.64)	(-3.05)	(-1.66)	(0.59)	(-3.18)
Fixas	0.206***	0.156**	0.249***	0.211***	0.163**	0.247***
	(3.46)	(2.22)	(4.43)	(3.53)	(2.26)	(4.30)
ETR	0.006	-0.015	0.003	0.001	-0.024	-0.002
	(0.29)	(-0.56)	(0.13)	(0.04)	(-0.91)	(-0.11)
GDP	-0.118	0.178	-0.264***	-0.123	0.150	-0.259***
	(-1.42)	(1.15)	(-4.04)	(-1.50)	(1.01)	(-3.97)
Constant	-1.209***	-1.465***	-1.192***	-1.082***	-1.324***	-1.152***
	(-10.37)	(-9.93)	(-6.72)	(-8.63)	(-9.39)	(-6.51)
Industry Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	8070	3417	4653	8070	3417	4653
Adj. R-squared	0.219	0.243	0.217	0.219	0.242	0.215

*, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

T-statistics clustered by firm and year are reported in the parentheses.
Variable definitions:
Longdebt = (long-term debt + long-term debt due within one year)/(long-term debt + long-term debt due within one year + short-term debt);
Risk_roa = standard deviation of ROA over the past seven years (including the current year);
Risk_sales = standard deviation coefficient of sales over the past seven years (including the current year);
State = 1 when the ultimate controller is the government or a state-owned enterprise, and 0 otherwise;
Bankcomp = market shares of loans of banks other than the four largest state-owned banks in the province where the company is located;
Hbankcomp = 1 when the Bankcomp of the province is among the top one-third of all provinces, and 0 otherwise;
Size = natural logarithm of the book value of total assets;
TQ = (market value of equity + book value of debt)/book value of total assets;
First = ratio of the number of shares held by the largest shareholder to the total number of shares;
ROA = operating income/total assets;
Lev = total liabilities/total assets;
Liquid = (cash + short-term investments)/total assets;
Fixas = total fixed assets/total assets;
ETR = income tax expense/profit before tax, but the value is required to be 0 or 1 if the raw value is less than 0 or greater than 1;
GDP = (current year's GDP of the province where the company is located – previous year's GDP of the province where the company is located)/previous year's GDP of the province where the company is located.

5.2 Partitions by Banking Competition

In the previous section, we divide the full sample into two sub-samples based on *Hbankcomp* and run regressions separately. We find that operational risk is always significantly positively correlated with debt maturity, but the correlation is lower for firms located in a region with weak banking competition. Thus, we predict that when banking competition becomes very weak, the correlation may no longer be significant. To test this conjecture, we divide the full sample into four sub-samples by the variable *Bankcomp*. Since a non-positive definite matrix will occur in some sub-samples when clustering t-statistics by both firm and year, we cluster them only by firm but control for the year fixed effects. Table 6 reports the results. As shown in Column (4), for firms located in a region with the strongest banking competition, the positive effect of operational risk on debt maturity is greatest. Columns (1) and (2), however, show that this effect is no longer significant for those firms in a region with weaker competition. The result strongly supports both the liquidity risk theory and the information-based hypothesis. A concentrated banking market structure can thus reduce a firm's liquidity risk and greatly decrease the positive effect of operational risk on debt maturity.

Table 5 Alternative Estimation Methods

	Year Fixed-Effect Model		Random-Effect Model		Firm Fixed-Effect Model	
Dependent variable: *Longdebt*	(1)	(2)	(3)	(4)	(5)	(6)
Risk_roa	0.505**		0.367**		0.355**	
	(2.25)		(2.38)		(1.99)	
State×Risk_roa	-0.415		-0.352**		-0.382**	
	(-1.63)		(-2.11)		(-1.99)	
Hbankcomp×Risk_roa	0.442**		0.396***		0.328***	
	(2.36)		(3.48)		(2.73)	
Risk_sales		0.051		0.024		-0.003
		(1.44)		(1.07)		(-0.11)
State×Risk_sales		-0.071*		-0.065***		-0.051*
		(-1.73)		(-2.59)		(-1.79)
Hbankcomp×Risk_sales		0.076***		0.038***		0.028*
		(3.42)		(2.73)		(1.95)
State	0.030*	0.042**	0.029**	0.038***	0.031**	0.030*
	(1.85)	(2.09)	(2.40)	(2.71)	(2.02)	(1.76)
Bankcomp	-0.237***	-0.280***	-0.211***	-0.202***	-0.239**	-0.237**
	(-2.92)	(-3.45)	(-3.06)	(-2.88)	(-2.24)	(-2.21)
Size	0.068***	0.064***	0.067***	0.062***	0.059***	0.054***
	(10.77)	(10.06)	(13.08)	(12.19)	(7.29)	(6.66)
TQ	0.002	0.006	0.004	0.007**	0.005	0.007*
	(0.49)	(1.24)	(1.33)	(2.09)	(1.39)	(1.92)
First	-0.014	-0.014	0.051*	0.057**	0.106***	0.118***
	(-0.42)	(-0.39)	(1.92)	(2.15)	(2.94)	(3.28)
ROA	0.486***	0.403***	0.263***	0.233***	0.185***	0.178***
	(6.33)	(5.70)	(5.58)	(5.09)	(3.64)	(3.60)
Lev	0.152***	0.151***	0.110***	0.115***	0.087***	0.094***
	(3.92)	(3.89)	(4.43)	(4.61)	(2.92)	(3.19)
Liquid	-0.086	-0.092	-0.058*	-0.066**	-0.053	-0.058
	(-1.39)	(-1.51)	(-1.73)	(-1.97)	(-1.41)	(-1.55)
Fixas	0.210***	0.216***	0.129***	0.132***	0.068**	0.072**
	(5.44)	(5.55)	(5.51)	(5.61)	(2.38)	(2.50)
ETR	0.011	0.005	0.004	0.001	0.006	0.003
	(0.52)	(0.22)	(0.26)	(0.04)	(0.38)	(0.20)
GDP	-0.130	-0.134	-0.082	-0.071	-0.081	-0.065
	(-1.61)	(-1.64)	(-1.53)	(-1.32)	(-1.46)	(-1.17)
Constant	-1.199***	-1.112***	-1.178***	-1.094***	-0.854***	-0.765***
	(-9.02)	(-8.24)	(-10.53)	(-9.68)	(-4.25)	(-3.74)
Industry Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	8070	8070	8070	8070	8070	8070
R-squared	0.224	0.224	0.217	0.216	0.069	0.068

*, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

T-statistics clustered by firm are reported in the parentheses in Columns (1) and (2), unadjusted z-statistics are reported in the parentheses in Columns (3) and (4); and unadjusted t-statistics are reported in the parentheses in Columns (5) and (6).
Overall R-squared is reported in Columns (3)-(6).
Variable definitions:
Longdebt = (long-term debt + long-term debt due within one year)/(long-term debt + long-term debt due within one year + short-term debt);
Risk_roa = standard deviation of ROA over the past seven years (including the current year);
Risk_sales = standard deviation coefficient of sales over the past seven years (including the current year);
State = 1 when the ultimate controller is the government or a state-owned enterprise, and 0 otherwise;
Hbankcomp = 1 when the Bankcomp of the province is among the top one-third of all provinces, and 0 otherwise;
Bankcomp = market shares of loans of banks other than the four largest state-owned banks in the province where the company is located;
Size = natural logarithm of the book value of total assets;
TQ = (market value of equity + book value of debt)/book value of total assets;
First = ratio of the number of shares held by the largest shareholder to the total number of shares;
ROA = operating income/total assets;
Lev = total liabilities/total assets;
Liquid = (cash + short-term investments)/total assets;
Fixas = total fixed assets/total assets;
ETR = income tax expense/profit before tax, but the value is required to be 0 or 1 if the raw value is less than 0 or greater than 1;
GDP = (current year's GDP of the province where the company is located – previous year's GDP of the province where the company is located)/previous year's GDP of the province where the company is located.

5.3 Alternative Measures of Some Key Variables

We try to measure the long-term debt ratio as the ratio of long-term bank loans to total bank loans or the ratio of long-term liabilities to total liabilities. In addition, we use sales growth (*Sgrow*) as a proxy for firm growth,[13] and define the region as that with strong banking competition when the variable *Bankcomp* of the region is in the top quarter of all regions. We report only the results for *Risk_roa*, indicating operational risk (the results for *Risk_sales* are quite similar). As Table 7 shows, the main results are generally stable. Specifically, operational risk is significantly positive in three of the four regressions, the interaction term between ownership and operational risk is significantly negative in all regressions, and that between banking competition and operational risk is significantly positive in all regressions. Table 7 shows that the empirical findings do not qualitatively change when alternative measures of some important variables are used.

[13] Some argue that Tobin's Q is unable to measure the growth of Chinese listed companies effectively because the stock markets in China are not developed enough.

Table 6 Further Partitioning by Banking Competition

	Group 1 (the weakest)	Group 2	Group 3	Group 4 (the strongest)
Dependent variable: *Longdebt*	(1)	(2)	(3)	(4)
Risk_roa	0.159	0.372	0.610**	0.672**
	(0.56)	(1.48)	(2.39)	(2.27)
State	0.040**	0.037**	0.020	-0.057***
	(2.06)	(2.25)	(1.12)	(-2.60)
Size	0.069***	0.067***	0.071***	0.075***
	(4.91)	(6.78)	(7.38)	(8.46)
TQ	0.009	0.002	0.009	-0.007
	(0.94)	(0.16)	(1.19)	(-0.81)
First	-0.035	0.018	0.022	-0.074
	(-0.65)	(0.36)	(0.39)	(-1.27)
ROA	0.421***	0.547***	0.349**	0.512***
	(3.07)	(4.20)	(2.57)	(3.97)
Lev	0.215***	0.139**	0.086	0.195***
	(3.67)	(2.32)	(1.27)	(3.02)
Liquid	-0.103	-0.223***	-0.066	0.094
	(-1.20)	(-2.61)	(-0.56)	(0.83)
Fixas	0.221***	0.280***	0.201***	0.160**
	(3.39)	(4.80)	(2.98)	(2.49)
ETR	0.000	0.025	0.013	-0.042
	(0.01)	(0.76)	(0.29)	(-0.96)
GDP	-0.195	-0.543***	-0.184	0.492**
	(-1.15)	(-3.26)	(-1.01)	(2.07)
Constant	-1.283***	-1.282***	-1.381***	-1.543***
	(-4.21)	(-5.83)	(-6.15)	(-7.72)
Industry Fixed Effect	Yes	Yes	Yes	Yes
Year Fixed Effect	Yes	Yes	Yes	Yes
Obs.	2029	2014	2058	1969
Adj R-squared	0.200	0.243	0.212	0.268

*, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

T-statistics clustered by firm are reported in the parentheses.
Firms are equally divided into four groups by banking competition of the province where the firm is located.
Variable definitions:
Longdebt = (long-term debt + long-term debt due within one year)/(long-term debt + long-term debt due within one year + short-term debt);
Risk_roa = standard deviation of ROA over the past seven years (including the current year);
State = 1 when the ultimate controller is the government or a state-owned enterprise, and 0 otherwise;
Size = natural logarithm of the book value of total assets;
TQ = (market value of equity + book value of debt)/book value of total assets;
First = ratio of the number of shares held by the largest shareholder to the total number of shares;
ROA = operating income/total assets;
Lev = total liabilities/total assets;
Liquid = (cash + short-term investments)/total assets;
Fixas = total fixed assets/total assets;
ETR = income tax expense/profit before tax, but the value is required to be 0 or 1 if the raw value is less than 0 or greater than 1;
GDP = (current year's GDP of the province where the company is located – previous year's GDP of the province where the company is located)/previous year's GDP of the province where the company is located.

5.4 The Non-Monotonic Effect of Operational Risk on Debt Maturity

Diamond (1991a) argues that an inverted U-shaped relation exists between credit risk and debt maturity since it is difficult for firms with the highest level of credit risk to obtain access to long-term debt (which is needed badly from the perspective of liquidity risk). We test the non-monotonic effect of operational risk on debt maturity by three methods. First, we introduce the square of operational risk into the model. Second, we introduce a dummy variable indicating a firm with high risk into the model, and we define a firm as one with high risk when the variable *Risk_roa* is among the top one-fifth or one-third of all firms (*Hrisk_20%* and *Hrisk_33%*, respectively). Third, we conduct a spline analysis by splitting operational risk into three ranks (*Risk_bottom*, *Risk_middle*, and *Risk_high*). In this analysis, *Risk_bottom* is equal to *Risk_roa* when the *Risk_roa* of the firm is among the bottom one-third of all firms, and is equal to the first tertile of *Risk_roa* otherwise. *Risk_middle* is equal to 0 when the *Risk_roa* of the firm is in the bottom one-third of all firms, equal to the difference between *Risk_roa* and its first tertile when the *Risk_roa* of the firm is among the middle one-third of all firms, and equal to the difference between the first tertile and the second tertile of *Risk_roa* otherwise. *Risk_high* is equal to 0 when the *Risk_roa* of the firm is among the bottom two-thirds of all firms, and equal to the difference between *Risk_roa* and its second tertile otherwise.

Table 7 Alternative Measures of Some Important Variables

	Longdebt = long-term debt/all debt	*Longdebt* = long-term liabilities/ all liabilities	Growth = sales growth	*Hbankcomp* Defined on the basis of the top 1/4
Dependent variable: *Longdebt*	(1)	(2)	(3)	(4)
Risk_roa	0.320**	0.033	0.498**	0.593***
	(2.16)	(0.37)	(2.46)	(3.08)
State×Risk_roa	-0.372**	-0.228**	-0.441**	-0.418**
	(-2.24)	(-2.18)	(-2.13)	(-2.01)
Hbankcomp×Risk_roa	0.360***	0.144**	0.496***	
	(2.95)	(1.99)	(3.78)	
Hbankcomp2×Risk_roa				0.335**
				(2.45)
State	0.028**	0.018**	0.030*	0.029*
	(2.20)	(2.31)	(1.86)	(1.78)
Bankcomp	-0.204***	-0.149***	-0.207***	-0.176***
	(-4.02)	(-4.35)	(-3.17)	(-2.74)
Size	0.060***	0.033***	0.068***	0.068***
	(11.57)	(10.11)	(11.98)	(12.31)
TQ	0.001	-0.002		0.003
	(0.33)	(-1.61)		(1.07)
Sgrow			0.004	
			(1.04)	
First	-0.024	-0.016	-0.019	-0.021
	(-0.93)	(-0.97)	(-0.62)	(-0.69)
ROA	0.457***	0.297***	0.474***	0.472***
	(4.86)	(6.90)	(5.02)	(5.32)
Lev	0.150***	0.263***	0.151***	0.148***
	(5.24)	(12.53)	(4.22)	(4.09)
Liquid	-0.058	-0.038	-0.085	-0.087
	(-1.15)	(-1.43)	(-1.52)	(-1.54)
Fixas	0.167***	0.139***	0.206***	0.206***
	(3.73)	(4.53)	(3.57)	(3.50)
ETR	-0.008	-0.015*	0.005	0.006
	(-0.49)	(-1.81)	(0.22)	(0.27)
GDP	-0.024	-0.016	-0.119	-0.102
	(-0.37)	(-0.38)	(-1.42)	(-1.25)
Constant	-1.112***	-0.629***	-1.210***	-1.248***
	(-9.79)	(-9.22)	(-10.68)	(-11.09)
Industry Fixed Effect	Yes	Yes	Yes	Yes
Obs.	8070	8070	8064	8070
Adj R-squared	0.231	0.352	0.221	0.218

*, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

T-statistics clustered by firm and year are reported in the parentheses.
Variable definitions:
Column (1): *Longdebt* = long-term debt/(long-term debt + long-term debt due within one year + short-term debt);
Column (2): *Longdebt* = long-term liabilities/all liabilities;
Columns (3) and (4): *Longdebt* = (long-term debt + long-term debt due within one year)/(long-term debt + long-term debt due within one year + short-term debt);
Risk_roa = standard deviation of ROA over the past seven years (including the current year);
Hbankcomp = 1 when the Bankcomp of the province is among the top one-third of all provinces, and 0 otherwise;
Hbankcomp2 =1 when the Bankcomp of the province is among the top one-quarter of all provinces, and 0 otherwise;
State = 1 when the ultimate controller is the government or a state-owned enterprise, and 0 otherwise;
Bankcomp = market shares of loans of banks other than the four largest state-owned banks in the province where the company is located;
Size = natural logarithm of the book value of total assets;
TQ = (market value of equity + book value of debt)/book value of total assets;
Sgrow = (current year's sales − previous year's sales)/previous year's sales;
First = ratio of the number of shares held by the largest shareholder to the total number of shares;
ROA = operating income/total assets;
Lev = total liabilities/total assets;
Liquid = (cash + short-term investments)/total assets;
Fixas = total fixed assets/total assets;
ETR = income tax expense/profit before tax, but the value is required to be 0 or 1 if the raw value is less than 0 or greater than 1;
GDP = (current year's GDP of the province where the company is located – previous year's GDP of the province where the company is located)/previous year's GDP of the province where the company is located.

Table 8 reports the results for *Risk_roa* as a proxy for operational risk (the results for *Risk_sales* are similar). We find that the square of *Risk_roa* is not statistically significant in Column (1), the dummy variable indicating the firm with high risk is also not significant in Columns (2) and (3), and only *Risk_high* is significantly positive while both *Risk_bottom* and *Risk_middle* are not significant in Column (4). We conclude that there is no inverted U-shaped relation between credit risk and debt maturity for Chinese listed companies; rather, there is a significantly positive correlation between them only for firms with high risk. A possible explanation is that it is difficult for firms to list on the Chinese capital market, and firms in our sample are relatively superior in that they can obtain long-term debt from banks even though they are firms with high risk. Therefore, we do not observe any inverted U-shaped relation as predicted by Diamond (1991a).

Table 8 The Non-Monotonic Effect of Operational Risk on Debt Maturity

Dependent variable: *Longdebt*	(1)	(2)	(3)	(4)
Risk_roa	0.105	0.386*	0.651***	
	(0.31)	(1.72)	(3.17)	
$Risk\_roa^2$	2.289			
	(1.15)			
Hrisk_20%		0.008		
		(0.38)		
Hrisk_33%			-0.020	
			(-1.42)	
Risk_bottom				0.230
				(0.19)
Risk_middle				-0.201
				(-0.34)
Risk_high				0.640***
				(3.26)
State	0.011	0.010	0.011	0.010
	(0.74)	(0.72)	(0.75)	(0.72)
Bankcomp	-0.118*	-0.117*	-0.116*	-0.119*
	(-1.90)	(-1.88)	(-1.87)	(-1.90)
Size	0.068***	0.068***	0.068***	0.068***
	(12.09)	(12.13)	(12.07)	(12.02)
TQ	0.003	0.003	0.003	0.003
	(0.93)	(1.09)	(0.93)	(0.93)
First	-0.020	-0.018	-0.019	-0.018
	(-0.65)	(-0.59)	(-0.64)	(-0.61)
ROA	0.474***	0.473***	0.475***	0.475***
	(5.37)	(5.38)	(5.36)	(5.42)
Lev	0.145***	0.148***	0.145***	0.144***
	(3.91)	(4.08)	(3.95)	(3.91)
Liquid	-0.093	-0.092	-0.094*	-0.094*
	(-1.63)	(-1.63)	(-1.65)	(-1.65)
Fixas	0.205***	0.206***	0.205***	0.205***
	(3.50)	(3.49)	(3.49)	(3.52)
ETR	0.004	0.005	0.002	0.004
	(0.19)	(0.25)	(0.09)	(0.20)
GDP	-0.109	-0.108	-0.110	-0.110
	(-1.33)	(-1.31)	(-1.33)	(-1.34)
Constant	-1.239***	-1.250***	-1.246***	-1.239***
	(-10.82)	(-10.85)	(-10.80)	(-10.65)
Industry Fixed Effect	Yes	Yes	Yes	Yes
Obs.	8070	8070	8070	8070
Adj. R-squared	0.218	0.217	0.218	0.218

*, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

T-statistics clustered by firm and year are reported in the parentheses.
Variable definitions:
Longdebt = (long-term debt + long-term debt due within one year)/(long-term debt + long-term debt due within one year + short-term debt);
Risk_roa = standard deviation of ROA over the past seven years (including the current year);
Hrisk_20% = 1 when the *Risk_roa* of the firm is in the top one fifth of all firms, and 0 otherwise;
Hrisk_33% = 1 when the *Risk_roa* of the firm is in the top one-third of all firms, and 0 otherwise;
Risk_bottom = *Risk_roa* when the *Risk_roa* of the firm is in the bottom one-third of all firms, and equals the first tertile of *Risk_roa* otherwise.
Risk_middle = 0 when the *Risk_roa* of the firm is in the bottom one-third of all firms, equals the difference between *Risk_roa* and its first tertile when the *Risk_roa* of the firm is in the middle one-third of all firms, and equals the difference between the first and second tertile of *Risk_roa* otherwise.
Risk_high = 0 when the *Risk_roa* of the firm is in the bottom two-thirds of all firms, and equals the difference between *Risk_roa* and its second tertile otherwise.
State = 1 when the ultimate controller is the government or a state-owned enterprise, and 0 otherwise;
Bankcomp = market shares of loans of banks other than the four largest state-owned banks in the province where the company is located;
Size = natural logarithm of the book value of total assets;
TQ = (market value of equity + book value of debt)/book value of total assets;
First = ratio of the number of shares held by the largest shareholder to the total number of shares;
ROA = operating income/total assets;
Lev = total liabilities/total assets;
Liquid = (cash + short-term investments)/total assets;
Fixas = total fixed assets/total assets;
ETR = income tax expense/profit before tax, but the value is required to be 0 or 1 if the raw value is less than 0 or greater than 1;
GDP = (current year's GDP of the province where the company is located – previous year's GDP of the province where the company is located)/previous year's GDP of the province where the company is located.

5.5 The Nonlinear Effect of Banking Competition on Debt Maturity

Table 3 indicates that although the variable *Bankcomp* is negative, it is significant only at the 10 per cent level, possibly because of the nonlinear effect of banking competition on debt maturity. We investigate the possible nonlinear relationship in two ways. First, we introduce a dummy variable *Hbankcomp*, indicating strong banking competition, into the model. Second, we conduct a spline analysis by splitting the banking competition into three ranks (*Bankcomp_bottom*, *Bankcomp_middle*, and *Bankcomp_high*). In this analysis, *Bankcomp_bottom* is equal to *Bankcomp* when the *Bankcomp* of the firm is among the bottom one-third of all firms, and equal to the first tertile of *Bankcomp* otherwise. *Bankcomp_middle* is equal to 0 when the *Bankcomp* of the firm is among the bottom one-third of all firms, equal to the difference between *Bankcomp* and its first tertile when the *Bankcomp* of the firm is among the middle one-third of all firms, and equal to the difference between the first and second tertile of *Bankcomp*

otherwise. *Bankcomp_high* is equal to 0 when the *Bankcomp* of the firm is among the bottom two-thirds of all firms, and equal to the difference between *Bankcomp* and its second tertile otherwise.

Table 9 reports the results. Column (1) shows that once the dummy *Hbankcomp* is introduced, the variable *Bankcomp* turns negative and significant at the 1 per cent level, whereas *Hbankcomp* is significantly positive. Column (2) indicates that *Bankcomp_bottom* is negative and significant at the 1 per cent level. But *Bankcomp_middle* and *Bankcomp_high* are not significant. This implies a nonlinear relationship between bank competition and debt maturity, and the correlation between them is significantly negative only when banking competition is weak. The reason may be that when banking competition is very strong, banks are not willing to supply long-term loans, and they will not change their intention to provide credit even if the competition decreases slightly; only when the competition is weak enough will the decrease in competition lead to more long-term loans supplied by banks.

5.6 An Analysis of the Difference between the Current Study and Cai *et al.* (2008)[14]

Both our study and Cai *et al*. (2008) test the effect of operational risk on the debt maturity of Chinese listed companies using similar econometric models, but the results differ. Our study finds a significantly positive relation between operational risk and debt maturity, whereas Cai *et al*. (2008) find that the correlation is not significant. The difference in results may derive from the differences in industries and periods covered by the sample between the two studies. Specifically, Cai *et al*. (2008) cover only the manufacturing sector, but our study includes all industries excluding the financial sector. Moreover, the sample period of Cai *et al*. (2008) goes up to 2004, whereas that of our paper goes up to 2008. To reconcile the results between these two studies, we first follow the sample selection process in Cai *et al*. (2008) by limiting the sample within listed companies in the manufacturing sector to between 2001 and 2004.[15] We then use a sample of listed companies in the same sector between 2005 and 2008, and finally we use a sample of listed companies in the same sector between 2001 and 2008. Meanwhile, we also investigate all listed companies excluding financial institutions during the periods from 2001 to 2004, from 2005 to 2008, and from 2001 to 2008, respectively.

[14] We appreciate the anonymous reviewer for this suggestion.

[15] The sample period of Cai et al. (2008) also covers 1999 to 2000. Our paper, however, starts the sample period from 2001 owing to the lack of bank competition data prior to that year. In other words, only the period from 2001 to 2004 overlaps our study and Cai et al. (2008).

Table 9 The Nonlinear Effect of Banking Competition on Debt Maturity

Dependent variable: *Longdebt*	(1)	(2)
Bankcomp	-0.247***	
	(-2.67)	
Hbankcomp	0.029**	
	(2.27)	
Bankcomp_bottom		-0.371***
		(-3.39)
Bankcomp_middle		0.053
		(0.22)
Bankcomp_high		0.078
		(0.54)
State	0.011	0.010
	(0.74)	(0.70)
Risk_roa	0.455***	0.467***
	(3.23)	(3.32)
Size	0.067***	0.067***
	(11.82)	(11.83)
TQ	0.003	0.003
	(0.87)	(0.89)
First	-0.014	-0.015
	(-0.44)	(-0.48)
ROA	0.476***	0.479***
	(5.48)	(5.49)
Lev	0.149***	0.148***
	(4.14)	(4.12)
Liquid	-0.090	-0.087
	(-1.58)	(-1.56)
Fixas	0.208***	0.212***
	(3.51)	(3.63)
ETR	0.008	0.009
	(0.37)	(0.42)
GDP	-0.120	-0.108
	(-1.43)	(-1.30)
Constant	-1.191***	-1.143***
	(-9.40)	(-9.00)
Industry Fixed Effect	Yes	Yes
Obs.	8070	8070
Adj. R-squared	0.218	0.219

*, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

T-statistics clustered by firm and year are reported in the parentheses.
Variable definitions:
Longdebt = (long-term debt + long-term debt due within one year)/(long-term debt + long-term debt due within one year + short-term debt);
Bankcomp = market shares of loans of banks other than the four largest state-owned banks in the province where the company is located;
Hbankcomp = 1 when the *Bankcomp* of the province is among the top one-third of all provinces, and 0 otherwise;
Bankcomp_bottom = *Bankcomp* when the *Bankcomp* of the firm is among the bottom one-third of all firms, and equals the first tertile of *Bankcomp* otherwise;
Bankcomp_middle = 0 when the Bankcomp of the firm is among the bottom one-third of all firms, equals the difference between *Bankcomp* and its first tertile when the *Bankcomp* of the firm is among the middle one-third of all firms, and equals the difference between the first tertile and second tertile of *Bankcomp* otherwise;
Bankcomp_high = 0 when the *Bankcomp* of the firm is among the bottom two-thirds of all firms, and equals the difference between *Bankcomp* and its second tertile otherwise;
State = 1 when the ultimate controller is the government or a state-owned enterprise, and 0 otherwise;
Risk_roa = standard deviation of *ROA* over the past seven years (including the current year);
Size = natural logarithm of the book value of total assets;
TQ = (market value of equity + book value of debt)/book value of total assets;
First = ratio of the number of shares held by the largest shareholder to the total number of shares;
ROA = operating income/total assets;
Lev = total liabilities/total assets;
Liquid = (cash + short-term investments)/total assets;
Fixas = total fixed assets/total assets;
ETR = income tax expense/profit before tax, but the value is required to be 0 or 1 if the raw value is less than 0 or greater than 1;
GDP = (current year's GDP of the province where the company is located – previous year's GDP of the province where the company is located)/previous year's GDP of the province where the company is located.

Table 10 reports the results. Since a non-positive definite matrix will occur in some sub-samples when clustering t-statistics by both firm and year, we cluster them only by firm but control for the year fixed effects. Column (1) reports the regression results for the manufacturing listed companies between 2001 and 2004. The sample is close to that of Cai *et al*. (2008), and we find that the results for operational risk are also similar; that is, the positive effect of operational risk on debt maturity is not significant. But for the sample between 2005 and 2008, as seen in Column (2), the coefficient of operational risk is significantly positive at the 5 per cent level. In Column (3), the sample period covers 2001 to 2008, and the operational risk still has a significantly positive effect on debt maturity, indicating that the difference in sample period is one cause for the different results. Specifically, operational risk has a significantly positive effect on the debt maturity of Chinese manufacturing listed companies after 2004.

Table 10 Comparison with Cai *et al*. (2008)

	Manufacturing Sector			All Sectors		
	[2001, 2004]	[2005, 2008]	Overall	[2001, 2004]	[2005, 2008]	Overall
Dependent variable: *Longdebt*	(1)	(2)	(3)	(4)	(5)	(6)
Risk_roa	0.196	0.544**	0.440**	0.569***	0.455**	0.452***
	(0.80)	(2.13)	(2.06)	(2.77)	(2.29)	(2.74)
State	0.063***	0.010	0.026*	0.040***	-0.004	0.012
	(3.30)	(0.60)	(1.80)	(2.75)	(-0.26)	(1.01)
Bankcomp	-0.180	0.036	-0.047	-0.274***	-0.117	-0.176**
	(-1.47)	(0.31)	(-0.49)	(-2.67)	(-1.28)	(-2.25)
Size	0.057***	0.063***	0.060***	0.062***	0.071***	0.067***
	(5.12)	(7.39)	(7.73)	(6.68)	(10.54)	(10.65)
TQ	-0.006	0.010	0.004	-0.005	0.008	0.003
	(-0.82)	(1.42)	(0.65)	(-0.74)	(1.42)	(0.64)
First	-0.047	-0.028	-0.026	0.003	-0.037	-0.010
	(-0.92)	(-0.56)	(-0.63)	(0.07)	(-0.89)	(-0.29)
ROA	0.560***	0.516***	0.576***	0.587***	0.415***	0.484***
	(4.43)	(4.61)	(6.08)	(5.49)	(4.55)	(6.29)
Lev	0.168***	0.145**	0.147***	0.176***	0.156***	0.152***
	(2.80)	(2.46)	(2.98)	(3.62)	(3.28)	(3.89)
Liquid	-0.077	0.029	-0.050	-0.082	-0.062	-0.089
	(-0.91)	(0.25)	(-0.62)	(-0.99)	(-0.78)	(-1.44)
Fixas	0.465***	0.227***	0.315***	0.319***	0.138***	0.211***
	(7.19)	(3.80)	(6.09)	(6.22)	(3.04)	(5.46)
ETR	-0.027	0.003	-0.008	-0.004	0.009	0.011
	(-0.74)	(0.09)	(-0.28)	(-0.14)	(0.32)	(0.50)
GDP	-0.320***	0.075	-0.241**	-0.157*	0.162	-0.127
	(-2.65)	(0.39)	(-2.29)	(-1.71)	(1.02)	(-1.57)
Constant	-1.046***	-1.355***	-1.164***	-1.111***	-1.359***	-1.205***
	(-4.46)	(-6.62)	(-6.69)	(-5.66)	(-8.67)	(-9.05)
Industry Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	2017	2611	4628	3605	4465	8070
Adj. R-squared	0.222	0.170	0.184	0.218	0.237	0.218

*, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

T-statistics clustered by firm are reported in the parentheses.
The estimated results for listed companies in the manufacturing sector are reported in Columns (1) to (3), and the estimated results for all listed companies in non-financial sectors are reported in Columns (4) to (6).
Variable definitions:
Longdebt = (long-term debt + long-term debt due within one year)/(long-term debt + long-term debt due within one year + short-term debt);
Risk_roa = standard deviation of ROA over the past seven years (including the current year);
State = 1 when the ultimate controller is the government or a state-owned enterprise, and 0 otherwise;
Bankcomp = market shares of loans of banks other than the four largest state-owned banks in the province where the company is located;
Size = natural logarithm of the book value of total assets;
TQ = (market value of equity + book value of debt)/book value of total assets;
First = ratio of the number of shares held by the largest shareholder to the total number of shares;
ROA = operating income/total assets;
Lev = total liabilities/total assets;
Liquid = (cash + short-term investments)/total assets;
Fixas = total fixed assets/total assets;
ETR = income tax expense/profit before tax, but the value is required to be 0 or 1 if the raw value is less than 0 or greater than 1;
GDP = (current year's GDP of the province where the company is located – previous year's GDP of the province where the company is located)/previous year's GDP of the province where the company is located.

Column (4) reports the regression results for all listed companies excluding financial institutions between 2001 and 2004. We find that the variable indicating operational risk is positive and significant at the 1 per cent level. This implies that even if the sample period covers the years before 2004, operational risk still has a significantly positive effect on debt maturity for the sample including all listed companies (excluding financial institutions). Similarly, as shown in Columns (5) and (6), for the non-financial listed companies between 2005 and 2008 or between 2001 and 2008, the variables indicating operational risk are all significantly positive, implying that the difference in industry also contributes to the different results between our paper and Cai *et al*. (2008). In other words, the second reason that Cai *et al*. (2008) fail to find a significantly positive correlation is that they investigate only listed companies in the manufacturing sector.

5.7 Other Robustness Checks

To investigate the robustness of our main findings, we also try other tests as follows (results are untabulated): (1) we adopt the standard deviation of *ROA* or the standard deviation coefficient of sales over the past three or five years (including the current year) to measure operational risk, or else remove observations missing *ROA* or sales over the past five years; (2) we control for the effect of government intervention in the model; (3) we use the natural logarithm of sales as a proxy for firm size, *ROE* as a proxy for profitability, and the ratio of liquid assets to total assets as a proxy for liquidity of assets. In all these alternative specifications, our main empirical results are robust. Specifically, operational risk is significantly positively related to debt maturity, the interaction term between ownership and operational risk is significantly negative, and the interaction term between banking competition and operational risk is significantly positive.

VI. Conclusion

Concern is widespread over the liquidity risk resulting from the excessively high short-term debt ratios of Chinese firms. It is thus worth exploring how liquidity risk is taken into account when firms make debt maturity decisions. Using a sample of A-share listed companies in non-financial sectors between 2001 and 2008, we investigate whether operational risk affects debt maturity, and whether the effect differs in ownership and banking competition.

We find that corporate operational risk is positively correlated with debt maturity, and the correlation is stronger for non-state-owned enterprises and firms in a region with intense banking competition. The results suggest that Chinese listed companies consider the effect of liquidity risk when they make debt maturity decisions, and that the effect is larger for non-state-owned enterprises and for firms facing intense banking competition, thus supporting the liquidity risk theory. Our results also support the information-based hypothesis that monopolistic banks have more incentives to collect corporate information and are more willing to maintain long-term credit relationships with firms, thus lowering the long-term loan threshold. The additional tests also do not show an inverted U-shaped, non-monotonic relation between operational risk and debt maturity for Chinese listed companies.

In sum, this paper provides evidence supporting the liquidity risk theory. Liquidity risk has an effect on corporate debt maturity decisions in the Chinese financial market, where bank loans serve as the main financing method, but the effect differs in corporate ownership and banking competition. The paper also adds evidence to the study on how the financial system affects corporate financing from the perspective of liquidity risk. Lastly, the paper provides new evidence on the economic consequences of banking market structure.

There are two caveats on the evidence of liquidity risk theory as follows. First, there is on the whole only a weak negative effect of banking competition on debt maturity. Second, state ownership sometimes has a positive effect on debt maturity. The additional analyses show a nonlinear effect of banking competition on debt maturity. It would, however, be worth exploring more specific causes of the effect in the future.

References

Please refer to pp. 33-36.