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行业竞争与公司盈余持续性：基于实物期权理论[1]

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摘要

基于实物期权理论视角，本文以 1999 至 2010 年我国 A 股上市公司为研究样本，实证检验了行业竞争对公司盈余持续性的影响。不同于传统的产业经济学理论，基于实物期权理论的分析表明，行业竞争对公司盈余持续性的影响可能呈现非线性关系，且二者的关系取决于企业的经营效率或盈利机会。研究结果显示：对盈利机会差的公司，清算期权的执行使得公司盈余持续性随着行业竞争的加剧而降低；相反，对盈利机会好的公司，增长期权的执行则能够抵消“盈余均值回转效应”引起的盈余持续性下降，最终使得公司盈余持续性随着行业竞争的加剧而增加。拓展性检验发现，行业竞争对公司盈余持续性的影响还体现在股价变动与会计盈余变动的关系之中（即盈余反应系数）。本文的研究结果表明，行业竞争对管理层执行实物期权的影响体现在公司会计盈余特征上。

关键词：行业竞争、盈余持续性、增长期权、清算期权
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一、 引言

实物期权理论（Real Options Theory）源于金融期权定价理论，是金融期权理论在实物资产期权上的扩展，它最早被用于解决企业投资项目的评估问题，以帮助企业在面临不确定性因素时作出正确的投资决策（Myers, 1977）。为了应对不确定的决策环境，实物投资应该保持一定的灵活性，因此实物期权本质上体现了管理层投资决策的灵活性。已有文献表明，这种投资灵活性在企业进行资源配置过程中具有重要的价值（Robichek and Van Horne, 1967; Dixit and Pindyck, 1994; Trigeorgis, 1996）。Burgstachler and Dichev（1997）、Zhang（2000）等则将实物期权理论直接运用到公司权益价值的研究中，并从理论和实证上验证了实物期权的价值。这些研究为我们认识实物期权在公司价值中的重要作用奠定了坚实的基础。

然而，上述研究有个共同点，大都基于资本市场投资者定价的视角来考察实物期权。不同于以往的研究文献，本文试图从公司基本面的角度来考察管理层执行实物期权的经济后果，这有助于我们更好地理解实物期权的执行时如何影响公司权益定价。其中，盈余持续性作为一项关键的财务信息，在经济决策中具有重要的作用（Ohlson, 1995；孙谦，2010）。首先，盈余持续性在公司权益估值中居于重要地位。其次，盈余持续性增强了财务报告契约作用的发挥。第三，盈余持续性对证券投资实务亦具有指导作用。正如 Penman（2002）指出，剩余收益的增长能力在公司定价分析中尤为值得关注，而盈余持续性对增长的预测具有重要的影响。

正如 Chen *et al.*（2012）指出，不同于金融期权具有详细规定的合约条款和支付矩阵，实物期权由于隐含在企业投资决策过程中，其往往缺乏详细的执行期限、执行价格等信息，支付矩阵亦视期权的具体执行情况而定。[3] 实物期权的这些特性决定了其价值很大程度上取决于执行期权的公司环境（如：制度环境、宏观经济环境、行业环境、治理环境等）。市场竞争作为重要的公司治理机制，可能是提高经济效率最有力的力量之一（Shleifer and Vishny, 1997），它能够有效缓解公司信息不对称和代理问题冲突，进而对管理层起到监督和激励作用。最近，陈信元等（2013）的研究表明，行业竞争有助于提高管理层投资决策的灵活性，从而促使其更好地执行公司的增长与清算期权。[4] 此外，实物期权缺乏明确的合约条款致使其难以直接被观测和量化，这亦限制了我们直接检验实物期权的执行与公司会计盈余的关系。作为替代的方法，我们借助影响实物期权执行的环境变量（如本文考察的行业竞争）间接考察二者之间的关系。

目前，也有一些文献考察了市场结构和会计盈余特征的关系。例如，基于 Ohlson（1995）以及 Feltham and Ohlson（1995, 1996）的线性剩余收益模型，Cheng（2005）

[3] Miller and Park（2002）、夏健明和陈元志（2005）等将金融期权和实物期权的差异归纳为以下几个方面：期权交易场所、不确定性来源、标的资产的市场特性、标的资产价格的确定、执行期限、执行价格、波动率估计、价值漏损等。

[4] 增长期权（Growth Option）是指，当经营比较成功时，公司可以选择继续以现有的商业技术来组织资源或扩大再生产。清算期权（Abandonment Option）是指，当经营比较失败时，公司可以选择对现有资源进行处置或改变其用途，将资源转移到回报率较高的其他领域。

分别从价值创造和价值记录的角度分析了二者是如何影响剩余收益的持续性。研究发现，行业集中度和进入壁垒越高（即行业竞争越不激烈），企业能够获取的经济准租越大，从而剩余收益的持续性越高，即行业竞争与剩余收益持续性呈负相关。然而，Cheng（2005）的研究是建立在线性剩余收益模型基础上，从而得出行业竞争与盈余持续性的关系是线性的。迄今尚未发现有文献从实物期权的角度，考察行业竞争对公司盈余持续性的影响。不同于上述研究文献，基于 Zhang（2000）期权价值模型（考虑了实物期权），行业竞争对盈余持续性的影响可能呈现非线性特征，这增进了我们对行业竞争影响微观企业价值的认识。

本文以 1999 至 2010 年我国 A 股上市公司为研究样本，从实物期权角度考察了行业竞争是如何影响公司盈余持续性的。不同于传统的产业经济学理论，基于实物期权理论的分析表明，行业竞争对公司盈余持续性的影响可能呈现非线性关系，且二者的关系取决于企业的经营效率或盈利机会。对盈利机会差的公司，激烈的行业竞争能够激励管理层更好地执行清算期权，进而降低盈余持续性；对盈利机会好的公司，行业竞争则存在两种相反的效应，一方面可以激励管理层更好地执行增长期权，从而增加盈余持续性，另一方面竞争带来的边际收益递减效应也可能加速会计盈余的均值回转，从而降低盈余持续性。实证结果显示，对盈利机会差的公司，行业竞争降低盈余持续性；对盈利机会好的公司，行业竞争则增加了盈余持续性。这表明，行业竞争有助于公司管理层根据当前盈利机会有效地执行增长与清算期权。此外，拓展性研究还发现，市场投资者能够一定程度上预期到包括行业竞争在内的公司环境因素对管理层执行实物期权的影响，并将这种预期体现在股票价格与会计盈余的关系之中。

本文的研究可能存在以下几个方面的贡献：

首先，本研究丰富和拓展了以往有关实物期权价值的相关文献（Hayn, 1995; Berger *et al.*, 1996; Burgstachler and Dichev, 1997; Zhang, 2000; Biddle *et al.*, 2001; Hao *et al.*, 2011）。他们的一系列研究表明，管理层通过执行增长与清算期权进行灵活决策，有助于提升公司价值。然而，这些研究都是从资本市场投资者定价（公司权益价值）的视角来考察实物期权的执行后果，而缺乏对其他方面的探索。不同于这些研究，本文从公司基本面的角度研究了管理层执行实物期权的经济后果，丰富了现有的研究维度。

其次，本研究拓展了有关市场结构与会计盈余关系的文献（Stigler, 1963; Mueller, 1977; Freeman *et al.*, 1982; Fama and French, 2000; Cheng, 2005; Asthana and Zhang, 2006）。传统的产业经济学理论认为，竞争带来的边际收益递减效应会加速会计盈余的均值回转，从而降低盈余持续性。Cheng（2005）基于线性剩余收益模型，发现激烈的行业竞争降低了剩余收益的持续性。不同于这些研究结论，本文基于 Zhang（2000）期权价值模型（考虑了实物期权），在区分不同盈利机会的公司样本后发现，增长期权的存在会使得好盈利机会公司的盈余持续性随行业竞争的加剧而增加。这意味着，今后我们在考察市场竞争对公司会计盈余的影响时不应忽视实物期

权的作用。

第三，本研究采用了多种指标、多个维度衡量行业竞争程度，丰富和补充了行业竞争指标的计量体系，也有助于我们更加综合全面地考察不同维度竞争指标影响的差异（Karuna, 2007; Ali *et al.*, 2009; Li, 2010）。

最后，本文的研究结论有助于我们更为深入地认识和理解行业竞争对微观经济个体的影响，对企业、市场投资者等利益相关主体具有一定的启示意义。对于企业而言，通过厘清竞争的作用机制，凸显增长与清算期权的执行在公司价值中的重要性，可以更好地指导管理层投资决策。对于市场投资者而言，考察行业竞争如何影响盈余持续性，有助于其更好地预测公司未来盈余，指导证券投资实务，进而优化资本市场的资源配置。

本文其余部分的内容安排如下：第二部分对相关文献进行简要回顾；第三部分是理论分析和研究假说；第四部分为研究设计；第五部分是实证结果及其分析；第六部分是稳健性检验；最后部分为本文的结论和启示。

二、 文献回顾

2.1 实物期权理论与公司价值

实物期权的基本思想在于将金融期权的思维方式引入到实物资产投资中，以帮助企业在面临不确定性因素时作出正确的投资决策，因此，实物期权的价值体现就是公司管理层投资决策灵活性的价值（Myers, 1977）。[5] 在每一时点，公司经营都同时存在清算、持续经营和扩张三种选择权。[6] 当经营比较失败时，公司可以选择对现有资源进行处置或改变其用途，即执行清算期权；当经营比较成功时，公司可以选择继续以现有的商业技术来组织资源或扩大再生产，即执行扩张期权（Hayn, 1995; Berger *et al.*, 1996）。

现有的一类文献直接将实物期权融入到公司权益的定价中，即把公司的权益价值重新表述为：公司权益价值 = 持续经营价值 + 实物期权价值。例如，Burgstachler and Dichev（1997）第一次将实物期权的概念引入到公司权益价值的研究中，并验证了权益价值是净资产和净利润的凸增函数。他们认为存在两种基于实物期权的价值形式，一种是清算价值，即公司选择对现有资源进行处置或改变其用途所带来的价值；另一种是增长价值，即公司继续以现有商业技术来组织资源或扩大再生产带

[5] 对于一项不可逆投资，企业对实物资产的投资可以看作是购买一个权利，以便在未来能以一定价格取得一项实物资产或投资项目，投资引起的沉没成本可视之为期权费用；新的投资行为则可视为期权的执行，期权的执行价格就是企业进一步投资的金额。因而，企业实物资产投资的价值可以应用类似评估一般金融期权的方式来进行评估。

[6] 传统的实物期权理论将企业所拥有的实物期权划分为以下几个主要类型：延迟期权、成长期权、扩张期权、收缩期权、放弃期权、转换期权、复合期权等（Trigeorgis, 1996；陈小悦和杨潜林，1998）。然而，更为一般地，我们可以将其概括为清算、持续经营和扩张三种选择权（靳庆鲁等，2010）。

来的价值。Zhang（2000）延续 Ohlson（1995）、Feltham and Ohlson（1995, 1996）等的研究，从理论上把增长期权和清算期权融入到一个完整的分析框架，首次提出了一个相对完备的权益价值模型。Zhang（2000）的研究表明，企业的投资决策取决于其目前的经营效率，当企业的经营效率较高时，则扩大生产规模，此时权益价值主要由净利润决定；反之则缩小规模，权益价值主要由净资产决定。Biddle *et al.*（2001）的实证研究支持了这一结论。此外，Hao *et al.*（2011）基于 Zhang（2000）的理论模型，考察了增长潜力如何影响公司权益价值与两个基本会计变量（即净资产与净利润）之间的关系。他们的研究结果表明，给定净资产，对于盈利能力较高的公司，增长潜力越大，公司权益价值与净利润之间的联系越紧密，即增长期权价值越大；给定净利润，对于盈利能力较低的公司，增长潜力越大，公司权益价值与净资产之间的联系越即紧密，即清算期权价值越大。

另外一类文献则考察了公司所处的经营环境对管理层执行实物期权的影响，例如经济自由度、市场化进程、宏观经济政策等。Chen *et al.*（2012）考察了不同国家的经济自由度对管理层投资决策和公司增长与清算期权价值的影响，他们的研究发现，经济自由度越高的国家，其管理层投资决策的灵活性越大。进一步的研究表明，经济自由度的提高有助于增加公司增长与清算期权的价值。类似地，靳庆鲁等（2010）以我国 A 股上市公司为样本，考察了不同地区市场化进程对公司增长与清算期权价值的影响。实证研究发现，市场化进程的改善有助于保障公司投资方向的正确性，且对于盈利能力高的公司，市场化进程增加了公司的增长期权价值；而对盈利能力差的公司，市场化进程则增加了公司的清算期权价值。靳庆鲁等（2012）则以我国民营企业为研究对象，从宏观经济政策入手，考察了货币政策对管理层执行增长与清算期权的影响。他们的研究发现，对于高盈利能力公司，宽松的货币政策有助于增长期权的执行，增加公司的增长期权价值；而对于低盈利能力公司，紧缩的货币政策可以促使公司尽快执行清算期权，增加公司的清算期权价值。

2.2 行业竞争与公司实物期权

现代企业制度的一个重要特征是所有权与控制权的分离，并由此产生了股东和经理人之间的代理问题冲突（Jensen and Meckling, 1976）。正如 Shleifer and Vishny（1997）指出，市场竞争作为重要的外部公司治理机制，可能是提高经济效率最有力的力量之一，它能够有效缓解公司信息不对称和代理问题冲突，进而对公司管理层起到监督和激励作用。刘芍佳和李骥（1998）的超产权理论也将市场竞争作为激励的一个基本因素，认为市场竞争给企业创造了“生”与“死”的抉择，迫使其提高效率。Fee and Hadlock（2000）则将有关市场竞争对管理层激励的影响总结为以下五个假说，即信息效应假说、清算威胁假说、管理技术假说、利润最大化假说以及降低成本措施的价值假说。

大量的实证研究表明，竞争在解释资本市场一系列经济现象中具有重要的作用。尤为值得注意的是，最近的一些研究发现，行业竞争影响公司管理层执行实物

期权。例如，Akdoğu and MacKay（2009）考察了市场结构（用赫芬达尔指数衡量行业竞争程度）对实物期权执行的影响。他们发现，较之于竞争性行业，垄断行业公司具有更低的投资与投资机会敏感性和投资速度，这表明公司在面临激烈市场竞争时会在延迟不可逆投资[7]（deferring irreversible investment）与失去投资机会威胁之间进行权衡。基于 1999 至 2010 年我国 A 股上市公司数据，陈信元等（2013）直接考察了行业竞争对公司投资决策的影响，研究结果显示，行业竞争增加了公司投资与投资机会的敏感性，同时减少了投资不足和投资过度行为，使得公司投资决策更好地体现了资本追随盈利机会的经济规律，提高了公司投资效率。根植于行业竞争与公司投资决策的关系，进一步的研究发现，激烈的竞争有助于公司价值更充分地体现增长与清算期权价值。这些结果表明，行业竞争作为重要的公司治理机制，能够对管理层投资决策行为乃至资本配置的效率产生重要影响，使其更加有效地执行增长期权与清算期权。

陈信元等（2013）的研究从资本市场投资者定价的角度为行业竞争影响管理层执行实物期权及其经济后果提供了强而有力的证据。在陈信元等（2013）的基础上，本研究主要从公司基本面的角度，考察行业竞争对管理层执行实物期权的影响是如何体现在公司会计行为上。

2.3 盈余持续性的影响因素

关于盈余持续性的研究一直是近几十年来资本市场研究的热点问题，相关研究文献大致可归为两大类。第一类研究认为，盈余持续性与应计会计密切相关。会计对象的经济本质和现有会计规则都可能使得公司报告的会计盈余及其不同组成部分具有差异化的持续性（Ramakrishnan and Thomas, 1998）。Sloan（1996）认为应计利润和现金流量虽然都是当期盈余的组成项目，但应计会计制度决定了应计利润的估计具有较大的主观性及会计扭曲或信息失真，从而二者在评估未来盈余时具有不同含义，实证结果亦支持了应计利润的持续性显著低于现金流量的持续性。Xie（2001）进一步将应计利润拆解为可操纵性应计利润和正常应计利润两部分，发现应计利润持续性低主要是由可操纵性应计利润引起的，这与管理层在选择会计计量时存在机会主义倾向有关。

第二类研究认为，盈余持续性与某些经济因素有关。例如，Eccles *et al.*（2001）指出连续的盈余增长具有一定的信号作用，这预示着公司具有的竞争优势和保持盈余持续增长的较大可能性，从而这类公司具有更高的盈余持续性。进一步，Ghosh *et al.*（2005）考察了盈余出现连续增长的公司中，“由收入增加带动盈余增长”与“由成本控制带动盈余增长”的两类公司在盈余持续性方面存在的差异，研究发现，前者的盈余持续性显著强于后者。Fairfield *et al.*（2003）则认为应计利润持续性较低

[7] 延迟不可逆转投资是实物期权的一种，即延迟期权。延迟期权是一种看涨期权，它赋予公司在今后某个时刻进行项目投资的权利，当市场环境变化不利时，决策者可以延迟投资。但延迟意味着公司放弃项目早期的现金流，而且可能失去抢先优势。

与企业成长性有关，经济利润率低以及新增投资项目边际回报率递减的交互影响，引起非当期资产负债表账户的增长，将导致应计利润持续性差。最近，Dichev and Tang（2009）和 Skinner and Soltes（2011）则发现公司的盈余波动性和股利支付政策均显著影响盈余持续性。尤为值得关注的是，市场竞争作为影响经济效率的重要力量，亦可能对会计盈余产生重要影响。传统的产业经济学理论表明，竞争的力量会驱使价格向边际成本靠拢，从而加速盈余的均值回转，降低盈余持续性（Stigler, 1963; Mueller, 1977; Porter, 1980）。

三、 理论分析与研究假说

3.1 行业竞争与盈余持续性：基于产业经济学理论

传统的产业经济学理论表明，市场竞争作为影响经济效率的重要力量，会驱使边际收益递减，利润率水平趋于平均，长期来看没有企业能够获取超额利润率（Stigler, 1963; Mueller, 1977; Porter, 1980）。换言之，市场竞争会使得超额利润率趋向于零，公司的盈利能力遵循均值回转，从而降低盈余持续性。已有众多研究文献支持了上述结论（Brooks and Buckmaster, 1976; Freeman *et al.*, 1982; Fama and French, 2000）。

基于 Ohlson（1995）以及 Feltham and Ohlson（1995, 1996）剩余收益模型，Cheng（2005）探讨了剩余收益的影响因素，他主要从价值创造（经济准租）和价值记录（会计稳健性）的角度分析了二者是如何影响剩余收益的持续性。他的实证研究表明，行业集中度和进入壁垒越高（即行业竞争越不激烈），企业能够获取的经济准租越大，从而剩余收益的持续性越高，即行业竞争与剩余收益持续性呈负相关；而会计稳健性则增加了剩余收益的持续性。Asthana and Zhang（2006）指出，理论上企业进行研发投资会给企业带来相反的两种效应，一方面可以为企业积累竞争优势，或提高行业进入壁垒，从而增强剩余收益的持续性；另一方面，研发投资给企业带来更大的经营风险，这将降低剩余收益的持续性。实证检验发现，企业和行业层面的研发投资强度均与剩余收益持续性正相关，支持了研发投资给企业带来的正效应占优于负效应。

综上所述，基于传统的产业经济学理论，激烈的行业竞争可能侵蚀公司所能获取的经济准租，加速会计盈余的均值回转，从而降低盈余持续性。为方便后文表述，我们将这一效应定义为行业竞争的“盈余均值回转效应”。

3.2 行业竞争与盈余持续性：基于实物期权理论

Zhang（2000）基于实物期权的公司权益价值模型表明，公司的实物期权价值主要取决于其经营效率或盈利机会。因此，下文我们区分公司的盈利机会，阐述行业竞争是如何影响公司盈余持续性。

对盈利机会差的公司，选择执行清算期权将变得更具有吸引力（Hayn, 1995;

Berger *et al.*, 1996; Burgstachler and Dichev, 1997）。公司执行清算期权，将资本从低盈利项目中撤出，这有助于公司扭转当前不利的局面，避免其继续毁损价值，从而降低当前盈余的持续性。正如 Hayn（1995）指出，清算期权的存在使得公司的亏损不会永久持续下去，降低了亏损的信息含量，即当前盈余对公司未来业绩的预测能力变差，盈余持续性降低。此外，根据前文的分析，行业竞争作为重要的外部公司治理机制，对管理层起到监督和激励作用，使其更有效地执行清算期权（Akdoğu and MacKay, 2009；陈信元等，2013）。

根植于行业竞争与清算期权的关系。对盈利机会差的公司，激烈的行业竞争使得公司被清算或者被兼并的风险显著上升，此时管理层有强烈的动机及时缩减投资规模，更有效地执行清算期权，从而加剧会计盈余的反转，这会减少盈余的持续性。反之，当行业竞争程度较低时，即使经营失败，公司被清算或被兼并的威胁也较小，由于“帝国建筑”等过度投资动机，管理层可能不愿意缩减投资规模，延缓清算期权的执行，盈余反转的速度相对缓慢。为方便后文表述，我们将这一效应定义为行业竞争的“清算期权效应”。此外，基于产业经济学理论的分析表明，行业竞争的“盈余均值回转效应”亦会加速会计盈余的均值回转，从而降低盈余持续性。因此，我们预期，对盈利机会差的公司，行业竞争的“清算期权效应”和“盈余均值回转效应”都将降低盈余持续性。由此，我们提出本文第一个研究假说：

假说 1：对盈利机会差的公司，行业竞争会降低会计盈余持续性。

相反，对盈利机会好的公司，选择执行增长期权将变得更为有利（Burgstachler and Dichev, 1997）。公司执行增长期权，将资本引入到具有更高盈利机会的项目中，使资本追随盈利机会，有助于扩大公司盈利能力，增强当期盈余与未来业绩的关系，从而增加盈余持续性。类似地，前文的分析表明，行业竞争能够提高管理层投资决策的灵活性，促使其更有效地执行增长期权（陈信元等，2013）。

根植于行业竞争与增长期权的关系。对于盈利机会好的公司，激烈的行业竞争可以使增长期权更好地得到执行，增加公司盈余持续性。类似地，为方便后文表述，我们将这一效应定义为行业竞争的“增长期权效应”。另一方面，行业竞争的“盈余均值回转效应”则表明，激烈的行业竞争使得边际收益递减，加速盈余的均值回转，从而降低当前盈余的持续性。此时，行业竞争对公司盈余持续性的最终影响取决于这两种效应的相对大小。由此，我们提出以下两个互为竞争性的假说：

假说 2a：对盈利机会好的公司，如果“增长期权效应”占优于“盈余均值回转效应”，则行业竞争增加会计盈余持续性。

假说 2b：对盈利机会好的公司，如果“盈余均值回转效应”占优于“增长期权效应”，则行业竞争降低会计盈余持续性。

四、 研究设计

4.1 行业竞争程度的衡量

已有产业组织理论表明，市场结构主要受市场集中度、产品差异化、进入和退出壁垒等因素的影响，衡量行业竞争程度的指标主要包括两大类：第一类是衡量市场集中度方面的指标，如行业集中度（CR_n）、赫芬达尔指数（HHI）、熵指数等。第二类是衡量行业竞争结果的指标，如勒纳指数。众多指标中，哪个指标更能有效反映市场结构状况，目前学术界尚无统一定论。Karuna（2007）指出，现有文献对行业竞争的度量大部分采用单一指标，仅从某一侧面反映公司所面临的竞争程度，而忽略行业竞争其它维度可能带来的不同影响（Harris, 1998; Engel *et al.*, 2003）。

借鉴陈信元等（2013）的做法，本文主要采用两种方法来衡量行业竞争程度：（1）借鉴 Li（2010）的方法；（2）传统的 HHI 指数。具体衡量方法如下。

1．借鉴 Li（2010）的方法

Li（2010）选取了 9 个指标，分别从潜在竞争威胁（potential competition）、现存竞争者竞争（existing competition）以及行业盈利水平（industry profitability）三个维度来衡量竞争。类似地，参照陈信元等（2013）的做法，由于我国上市公司的研发数据没有详细披露，本文选取其中 8 个指标来构造行业竞争指标，各指标详细说明如下。

潜在竞争威胁。已往文献表明，行业的固定资产规模（*IND_PPE*）、资本支出（*IND_CPX*）以及市场规模（*IND_MKT*）均与潜在竞争威胁呈负相关。*IND_PPE* 用来衡量行业的进入成本大小，等于某一年度某一行业内所有上市公司加权平均“固定资产、无形资产等净额”的自然对数，其中权重为各上市公司的市场占有率。它反映了新进入者所需的最低资本投资额，数值越大，表示进入成本越高，潜在竞争威胁越小（Karuna, 2007）。类似地，*IND_CPX* 也反映潜在进入者与现存竞争者竞争所需的必要投资，与进入壁垒正相关。其定义为某一年度某一行业内所有上市公司加权平均“购建固定资产、无形资产和其他长期资产支付的现金”的自然对数。此外，Li（2010）指出，一方面，较大的市场规模常常与较高的固定资产规模和资本支出相联系，意味着更高的进入壁垒；另一方面，市场规模大的行业，新进入者给现存经营者带来的负面冲击一般也较小。因此，*IND_MKT* 可能与潜在竞争威胁负相关。我们将 *IND_MKT* 定义为某一年度某一行业内所有上市公司销售收入之和的自然对数。

现存竞争者竞争。传统的衡量市场集中度的指标主要反映了现存竞争者竞争，如前四大公司集中度（*IND_CON4*）、赫芬达尔指数（*IND_HHI*）以及行业内公司数目（*IND_NUM*），集中度高（或行业内公司数目低）的行业一般来说面临更小的现存竞争者竞争。此外，给定单个公司销售额，*IND_NUM* 与市场规模正相关；给定产品价格，更大的市场需求将吸引更多的新进入者，加剧行业竞争（Karuna, 2007）。因此，*IND_MKT* 也可能与现存竞争者竞争正相关。

行业盈利水平。参照以往的文献，我们选取价格成本费用利润率（*IND_MGN*）和总资产收益率（*IND_ROA*）衡量行业盈利水平。其中，*IND_MGN* 等于某一年度某一行业内所有上市公司营业收入总和除以营业成本总和，*IND_ROA* 为行业内所有上市公司净利润总和除以总资产之和。行业盈利水平反映了产品差异化程度或可替代性，它将同时影响公司面临的潜在竞争威胁和现存竞争者竞争。一方面，行业盈利水平是潜在竞争者考虑的重要因素，它反映了潜在进入者进入所能获取的期望收益率，高行业盈利水平将吸引更多的进入者，增加公司的潜在竞争威胁（Darrough and Stoughton, 1990）。另一方面，Bresnahan（1989）发现，高产品差异化的公司受竞争对手竞争策略的影响较小，即公司面临的现存竞争者竞争较小。Nickell（1996）则将行业盈利水平视为公司的“垄断租金”，垄断租金越高，意味着竞争程度越低。因此，高行业盈利水平既可能反映了高潜在竞争威胁，也可能反映了低现存竞争者竞争。

为减少变量个数，我们对这 8 个指标采用主成分分析法（principal component analysis）进行降维处理，通过正交旋转（orthogonal rotation）并根据特征值大于 1 的经验准则选取主分量个数。

我们选取了 1998 至 2009 年所有 A 股上市公司为初始研究样本，剔除所属证监会行业分类信息缺失以及计算行业竞争指标所需财务数据缺失的样本。行业分类我们参照中国证监会 2001 年发布的《上市公司行业分类指引》，制造业（C）采用二级分类，其它行业则采用一级分类，最终将样本分为 22 个行业。首先，我们分年度分行业计算反映竞争程度的 8 个指标，接着对这 8 个指标进行标准化，最后进行主成分分析。

附录 1 报告了主成分分析的结果及各竞争指标的相关系数矩阵。其中，Panel A 列示了相关矩阵的特征值，不难发现，前三个主分量的特征值均大于 1，它们共解释了方差的 88.83%，因此取前三个主分量保留了原始数据绝大部分的信息。Panel B 列示了旋转因子载荷矩阵。根据载荷矩阵系数，前三个主分量分别反映了现存竞争者竞争、潜在竞争威胁以及行业盈利水平。Panel C 则列示了各变量的标准因子得分系数。为了叙述的方便，在后文分析中，我们将 PC1 乘以 -1 计为 *EXIST-COMP*；将 PC2 乘以 -1 计为 *POTENT-COMP*；将 PC3 乘以 -1 计为 *PROFIT-COMP*。因此，*POTENT-COMP*、*EXIST-COMP* 以及 *EXIST-COMP* 的数值越大，表示行业竞争越激烈。Panel D 列示了各竞争指标的相关系数矩阵。这里，*IND_HHI* 与 *POTENT-COMP* 和 *EXIST-COMP* 均显著负相关，表明市场集中度越低，行业竞争越激烈，这与我们的预期一致。

2．HHI 指数

HHI 指数是产业组织理论文献中运用最广泛的竞争指标之一。然而，近年来该指标的有效性不断受到一些学者的质疑（Karuna, 2007; Ali *et al.*, 2009），他们认为当市场结构假定为内生性时，HHI 指数与竞争程度的关系并不明确。但是，市场结构

的形成通常需要一个相对较为长期的过程，短期来看，市场结构仍倾向于外生。因此，HHI 指数或许仍不失为一个简单有效的衡量指标。此外，采用 HHI 指数作为竞争程度的衡量指标也有助于我们与以往的相关研究进行比较。具体，为叙述的方便，我们亦将经标准化后的 *IND_HHI* 指标乘以 -1 计为 *HHI-COMP*。[8] *HHI-COMP* 数值越大，表示行业竞争越激烈。

4.2 研究模型和变量定义

盈余持续性虽已受到学术界和实务界的广泛关注，但如何准确估算盈余持续性仍然是一个具有挑战性的问题。孙谦（2010）回顾了近 30 多年来国内外关于公司盈余持续性的文献发现，目前主要存在以下五种方法计量盈余持续性：①时间序列模型；②利用财务报表信息推断；③线性一阶自回归模型；④利用盈余持续性的影响因素进行估算；⑤利用 Ohlson 模型框架下的信息动力学假说估算。这些方法对数据和信息的要求存在差异，具有各自的优缺点和适用范围。当前，国际主流的方法是使用线性一阶自回归模型（Freeman *et al.*, 1982; Sloan, 1996; Fama and French, 2000; Richardson *et al.*, 2005; Frankel and Litov, 2009），该方法亦在国内得到广泛应用（李刚和夏冬林，2007；彭韶兵和黄益建，2007；张国清和赵景文，2008；徐浩峰等，2011）。因此，我们采用线性一阶自回归模型对本文的研究假说进行检验，基本模型如下：

$$\begin{aligned} E_t = {} & \alpha_0 + \alpha_1 E_{t-1} + \alpha_2 COMPETITION_{t-1} \\ & + \alpha_3 E_{t-1} \times COMPETITION_{t-1} + \gamma \sum CONTROLS \\ & + \lambda \sum E_{t-1} \times CONTROLS + \varepsilon \end{aligned} \qquad (1)$$

这里，E_t 表示第 t 年公司会计盈余，等于净利润除以期末总资产。$COMPETITION_{t\text{-}1}$ 代表了公司第 t-1 年末所属行业竞争程度，本文主要采用两种度量方法，具体计算方法见前文。此外，根据已往文献，我们还在模型（1）中加入了其他一些控制变量（*CONTROLS*），具体定义和分析如下：

$SIZE_{t\text{-}1}$ 为公司规模，等于公司第 t-1 年末总资产的自然对数。一般来说，相对于小规模公司，大公司具有更好的抗风险冲击能力，其盈利能力更加稳定，盈余持续性较好。

$GROWTH_{t\text{-}1}$ 为公司销售收入增长率，衡量了公司的成长性，等于第 t-1 年公司主营业务收入的变动除以期初主营业务收入。根据已有研究结论（Frankel and Litov, 2009），我们预期该变量与盈余持续性呈负相关。

$VOL_{t\text{-}1}$ 为盈余波动性，参照 Dichev and Tang（2009）和 Frankel and Litov（2009）的研究，我们用第 t-5 至 t-1 年公司会计盈余（总资产收益率）的标准差来衡量。一

[8] 由于借鉴 Li（2010）的衡量方法，并采用主成分分析法后得到的三个主分量均为标准化后的变量。为提高变量间的可比性，类似地，我们也先对 HHI 指数进行标准化，然后构造出 *HHI-COMP* 变量。采用原始的 HHI 指数分析得到的结果与本文类似。

方面，高盈余波动性意味着公司所处经营环境的更大不确定性；另一方面，高盈余波动性亦表明公司收入和费用的确认更难以匹配，使得应计盈余的估计误差增大。二者都可能引起公司盈余持续性的下降（Dechow and Dichev, 2002; Dichev and Tang, 2009; Frankel and Litov, 2009）。因此，我们预期 VOL_{t-1} 对盈余持续性的影响为负。

$|ACC_{t-1}|$为应计盈余，等于第 t-1 年公司应计项目金额的绝对值除以期末总资产。Sloan（1996）以及之后的一系列关于应计盈余的研究均表明，较之于现金盈余，应计盈余具有较低的持续性；会计盈余中应计部分比例越高，其持续性越低。因此，为控制应计盈余的这种影响，我们参照 Frankel and Litov（2009）等的研究，在模型中加入了公司应计盈余的绝对值加以控制，我们预期$|ACC_{t-1}|$与盈余持续性负相关。

ΔE_{t-1} 用于衡量公司盈余变动，等于第 t-1 年公司会计盈余的变动，即 $E_{t-1} - E_{t-2}$。已有的研究表明，大的盈余变动容易发生均值回归，因而具有较低的盈余持续性（Brooks and Buckmaster, 1976; Freeman *et al.*, 1982; Fama and French, 2000）。因此，我们在模型中加入该变量也可以在一定程度上控制盈余的均值回转对本文结论的影响。我们预期该变量对盈余持续性负相关。

DIV_{t-1} 反映了公司的股利支付政策，等于第 t-1 年公司支付每股现金股利之和除以期末股价。[9] Skinner and Soltes（2011）通过考察公司股利政策和盈余持续性的关系，发现支付股利的公司具有更高的盈余持续性。因此，我们预期该变量对盈余持续性正相关。

$|SPI_{t-1}|$表示公司非经常性损益项目，等于第 t-1 年公司非经常性损益金额的绝对值除以期末总资产。一般认为，公司非经常性损益持续性较差，根据 Burgstahler *et al.*（2002）、Dechow and Ge（2006）以及 Li（2011）等的研究，我们预期$|SPI_{t-1}|$与盈余持续性呈负相关。

此外，为消除控制变量量纲上的差别以及极端值对盈余持续性可能产生的影响，参照 Frankel and Litov（2009）的研究设计，我们将模型所有的控制变量分年度排序成十组，并依据其所在的组重新赋值为 0 至 9 的整数。最终，得到本文的检验模型具体如下：

$$\begin{aligned} E_t = {} & \alpha_0 + \alpha_1 E_{t-1} + \alpha_2 COMPETITION_{t-1} + \alpha_3 E_{t-1} \times COMPETITION_{t-1} \\ & + \alpha_4 R\_SIZE_{t-1} + \alpha_5 E_{t-1} \times R\_SIZE_{t-1} + \alpha_6 R\_GROWTH_{t-1} \\ & + \alpha_7 E_{t-1} \times R\_GROWTH_{t-1} + \alpha_8 R\_VOL_{t-1} + \alpha_9 E_{t-1} \times R\_VOL_{t-1} \\ & + \alpha_{10} R\_|ACC_{t-1}| + \alpha_{11} E_{t-1} \times R\_|ACC_{t-1}| + \alpha_{12} R\_\Delta E_{t-1} \\ & + \alpha_{13} E_{t-1} \times R\_\Delta E_{t-1} + \alpha_{14} R\_DIV_{t-1} + \alpha_{15} E_{t-1} \times R\_DIV_{t-1} \\ & + \alpha_{16} R\_|SPI_{t-1}| + \alpha_{17} E_{t-1} \times R\_|SPI_{t-1}| + \varepsilon \end{aligned} \quad (2)$$

根据 Burgstachler and Dichev（1997）、Zhang（2000）和 Biddle *et al.*（2001）的

[9] 借鉴 Li（2011）的研究，采用哑变量来衡量公司的股利支付政策得到的结果类似。即当公司该年度支付现金股利时 *DIV* 取值为 1，否则为 0。

研究，我们采用前期的净资产收益率（q_{t-1}）衡量公司的盈利机会，这里 q_{t-1} 等于第 t-1 年公司净利润除以期初净资产。按照公司盈利机会，每年将样本等分为“差盈利机会”和“好盈利机会”组。接下来，我们利用模型（2）分别在两组样本中考察行业竞争对盈余持续性的影响。

根据本文研究假说 1 的分析，我们预期在“差盈利机会”组，交互项 $E_{t-1}\times COMPETITION_{t-1}$ 系数 α_3 显著为负，即行业竞争的“盈余均值回转效应”和“清算期权效应”都将加剧会计盈余发生反转，从而降低会计盈余持续性。类似地，在“好盈利机会”组，如果模型中交互项 $E_{t-1}\times COMPETITION_{t-1}$ 系数 α_3 显著为正，表明行业竞争的“增长期权效应”占优，支持研究假说 2a；反之，如果模型中交互项系数 α_3 显著为负，则表明行业竞争的“盈余均值回转效应”占优，支持研究假说 2b。

表 1 列示了本文主要变量的简单说明。

表 1　主要变量说明

变量符号	变量说明
因变量	
E_t	会计盈余，等于第 t 年公司净利润除以期末总资产
解释变量	
E_{t-1}	公司第 t-1 年会计盈余
POTENT-COMP	借鉴 Li（2010）方法衡量的行业竞争程度，该数值越大，表示潜在竞争威胁越大
EXIST-COMP	借鉴 Li（2010）方法衡量的行业竞争程度，该数值越大，表示现存竞争者竞争越大
PROFIT-COMP	借鉴 Li（2010）方法衡量的行业竞争程度，该数值越大，表示行业盈利能力越差，竞争越激烈
HHI-COMP	用传统的 HHI 指数经标准化后作为行业竞争程度的衡量，该数值越大，表示竞争越激烈
控制变量	
$SIZE_{t-1}$	公司规模，等于第 t-1 年公司期末总资产的自然对数
$GROWTH_{t-1}$	销售收入增长率，等于第 t-1 年公司主营业务收入变动除以期初主营业务收入
VOL_{t-1}	盈余波动性，等于第 t-5 至 t-1 年公司会计盈余或总资产收益率的标准差
$\lvert ACC_{t-1}\rvert$	应计盈余，等于第 t-1 年公司应计项目金额的绝对值除以期末总资产
ΔE_{t-1}	盈余变动，等于第 t-1 年公司会计盈余的变动，即 $E_{t-1}-E_{t-2}$
DIV_{t-1}	股利支付，等于第 t-1 年公司支付每股现金股利之和除以期末股价
$\lvert SPI_{t-1}\rvert$	非经常性损益，等于第 t-1 年公司非经常性损益金额的绝对值除以期末总资产
分组变量	
q_{t-1}	公司盈利机会，等于第 t-1 年公司净利润除以期初净资产

五、 实证结果分析

5.1 样本选择和数据来源

本文选取沪深两市所有 A 股上市公司作为初始研究样本，[10] 考虑到计算模型相关变量所需数据的限制，本文选取的样本期间为 1999 至 2010 年。同时，为了使样本更符合本文的研究需要，我们按以下步骤对初始样本进行了筛选：（1）剔除金融行业公司样本；（2）剔除净资产为负的公司样本；（3）剔除相关变量缺失的公司样本；（4）剔除上市公司数小于 5 的行业样本。表 2 的 Panel A 列示了具体的样本筛选过程。经过上述样本筛选程序后，本文的最终样本包括了 1999 至 2010 年间共 13409 个公司-年度观测。表 2 的 Panel B 则列示了最终样本的行业分布情况。从中可以发现，制造业公司样本占总样本的 58.12%，因此，我们对制造业（C）按中国证监会 2001 年发布的《上市公司行业分类指引》中的二级分类进一步细分为 10 个子类。本文所用数据均来源于 CSMAR（国泰安）数据库。

为了减轻潜在异常值的影响，本文在回归分析中还对所有连续变量在 1%和 99%的水平上分年度进行了 winsorize 极值处理，同时还对回归标准差进行了 White（1980）异方差修正，以及公司层面和年度层面的聚类（cluster）效应调整（Petersen, 2009）。

表 2 样本筛选与样本分布

Panel A：样本筛选过程

年度	初始样本	（1）剔除金融行业样本	（2）剔除净资产为负的样本	（3）剔除相关变量缺失样本	（4）剔除上市公司数小于 5 样本	最终样本
1999	923	6	13	206	12	686
2000	1060	7	19	230	2	802
2001	1136	7	29	212	2	886
2002	1200	8	33	143	3	1013
2003	1263	10	42	130	3	1078
2004	1353	10	49	157	4	1133
2005	1358	10	78	91	8	1171
2006	1411	13	92	56	7	1243
2007	1527	31	84	167	3	1242
2008	1602	33	70	206	8	1285
2009	1660	35	77	151	0	1397
2010	1888	39	69	307	0	1473
合计	16381	209	655	2056	52	13409

[10] 由于 2009 年底我国始推出创业板，相关财务数据时间序列较短，且创业板上市公司与主板上市公司在公司特征上差异较大，为使研究样本更符合本文的研究需要，研究样本中不包含创业板上市公司。

Panel B：样本行业分布

行业	数量	百分比	行业	数量	百分比
A 农、林、牧、渔业	242	1.80%	D 电力、煤气及水的生产和供应业	587	4.38%
B 采掘业	216	1.61%	E 建筑业	195	1.45%
C 制造业	7791	58.12%	F 交通运输、仓储业	562	4.19%
-C0 食品、饮料	634	4.73%	G 信息技术业	685	5.11%
-C1 纺织、服装、皮毛	536	4.00%	H 批发和零售贸易	1079	8.05%
-C2 木材、家具	36	0.27%	J 房地产业	857	6.39%
-C3 造纸、印刷	249	1.86%	K 社会服务业	377	2.81%
-C4 石油、化学、塑胶	1557	11.61%	L 传播与文化产业	56	0.42%
-C5 电子	448	3.34%	M 综合类	762	5.68%
-C6 金属、非金属	1251	9.33%			
-C7 机械、设备、仪表	2216	16.53%			
-C8 医药、生物制品	823	6.14%			
-C9 其他制造业	41	0.31%	**合计**	13409	100.0%

5.2 描述性统计分析

表 3 报告了本文主要变量的描述性统计结果。从中我们可以看出，上市公司会计盈余（E_t）的均值（中位数）为 2.34%（3.00%），标准差为 7.72%，这说明样本公司的会计盈余表现出一定的差异。盈余波动性（$VOL_{t\text{-}1}$）和应计盈余（$|ACC_{t\text{-}1}|$）的均值则分别为 3.55%和 6.46%，这与 Dichev and Tang（2009）的结果类似。盈余变动（$\Delta E_{t\text{-}1}$）的均值（中位数）为 -0.49%（-0.27%），这意味着上市公司在样本期间内的会计盈余整体上呈现小幅下降趋势。股利支付（$DIV_{t\text{-}1}$）的均值（中位数）为 0.74%（0.09%），表明我国上市公司股利支付率普遍偏低。总的来说，表 3 结果显示，从各变量的均值、中位数以及标准差来看，其分布特征基本符合正态分布。需要说明的是，本文用于衡量行业竞争程度的几个指标 *POTENT-COMP*、*EXIST-COMP*、*PROFIT-COMP* 以及 *HHI-COMP* 均在行业层面进行了标准化处理。

5.3 主要检验结果

表 4 报告了本文的主要检验结果。[11] 具体，Panel A 的第（1）列我们列示了 *POTENT-COMP* 衡量行业竞争程度时（即 *COMPETITION* = *POTENT-COMP*）模型

[11] 以往众多文献表明，相对于盈利能力差的公司，盈利能力好的公司往往具有更高的盈余持续性。然而本文表 4 的检验结果却发现，模型（2）中 $E_{t\text{-}1}$ 的系数在“好盈利机会”组均小于“差盈利机会”组，并且 $E_{t\text{-}1}$ 的系数大于 1，这主要是因为我们在模型（2）中以交互项的形式加入了其他控制变量。实事上，如果仅考虑最简单的 AR（1）模型，即 $E_t = \alpha_0 + \alpha_1 E_{t-1} + \varepsilon$，我们发现，表示盈余持续性的 α_1 系数在全样本中为 0.6157，在“好盈利机会”组中为 0.7588，而在“差盈利机会”组中则为 0.4136，这与以往的研究发现一致。

表 3 描述性统计

变量	Mean	Std.	Min	Q1	Median	Q3	Max
E_t	0.0234	0.0772	-0.6620	0.0091	0.0300	0.0557	0.2225
E_{t-1}	0.0290	0.0631	-0.2932	0.0102	0.0324	0.0583	0.2204
$SIZE_{t-1}$	21.264	1.0325	19.026	20.557	21.138	21.851	25.421
$GROWTH_{t-1}$	0.2192	0.6086	-0.8252	-0.0317	0.1302	0.3225	6.9147
VOL_{t-1}	0.0355	0.0403	0.0004	0.0111	0.0215	0.0426	0.2693
$\|ACC_{t-1}\|$	0.0646	0.0605	0.0000	0.0211	0.0470	0.0879	0.3896
ΔE_{t-1}	-0.0049	0.0619	-0.3179	-0.0206	-0.0027	0.0102	0.2822
DIV_{t-1}	0.0074	0.0115	0.0000	0.0000	0.0009	0.0111	0.0900
$\|SPI_{t-1}\|$	0.0089	0.0178	0.0000	0.0006	0.0027	0.0086	0.1803
POTENT-COMP	-0.1969	0.8051	-3.5973	-0.7283	-0.1160	0.3836	1.9684
EXIST-COMP	0.7183	0.7956	-2.2881	0.1755	0.8398	1.1616	1.9636
PROFIT-COMP	0.0216	0.9027	-3.0438	-0.3893	0.1405	0.6227	3.2181
HHI-COMP	0.4415	0.6118	-3.9017	0.3719	0.5619	0.7246	1.0182

（2）在全样本的回归结果。我们发现，在控制了公司规模、成长性、盈余波动性、应计盈余、盈余变动、股利支付以及非经常性损益等因素后，交互项 $E_{t-1}\times COMPETITION_{t-1}$ 的系数为负但不显著（对应的系数为 -0.0311，t 统计量为 -1.58），这表明总体来看，行业竞争一定程度上降低了公司盈余持续性。此外，在控制变量中，除了公司规模和盈余变动外，其它控制变量与 E_{t-1} 的交互项在 10%的水平上均显著，且符号与我们的预期一致。

Panel A 的第（2）列报告了基于竞争指标 *POTENT-COMP* 时，对研究假说 1 的检验结果。从中可以发现，在“差盈利机会”样本组，交互项 $E_{t-1}\times COMPETITION_{t-1}$ 系数在 5%的水平上显著为负（系数为 -0.0885，t 统计量为 -2.40）。这表明，对于盈利机会差的公司，行业竞争的“盈余均值回转效应”和“清算期权效应”都将加剧会计盈余发生反转，从而降低盈余持续性，这与本文假说 1 的预期一致。

接下来，Panel A 的第（3）列则报告了基于竞争指标 *POTENT-COMP* 时，对假说 2 的检验结果。回归结果显示，在“好盈利机会”样本组，交互项 $E_{t-1}\times COMPETITION_{t-1}$ 系数在 1%的水平上显著为正（系数为 0.0658，t 统计量为 3.60），这表明行业竞争的“增长期权效应”大于“盈余均值回转效应”，支持了本文的假说 2a。即在企业面临较好的盈利机会时，行业竞争会激励管理层更好地执行增长期权，并且执行增长期权能够抵消均值回转效应，最终增加当前会计盈余的持续性。

类似地，表 4 的 Panel B、Panel C 以及 Panel D 则分别报告了采用 *EXIST-COMP*、*PROFIT-COMP* 和 *HHI-COMP* 衡量行业竞争程度时的检验结果。回归结果显示，在全样本中，交互项 $E_{t-1}\times COMPETITION_{t-1}$ 系数均显著为负，这与 Cheng（2005）的发现一致。除了竞争指标 *EXIST-COMP* 在“好盈利机会”组不显著外，无论采用哪

表 4　行业竞争对公司盈余持续性的影响

因变量:		Panel A: COMPETITION = POTENT-COMP			Panel B: COMPETITION = EXIST-COMP			Panel C: COMPETITION = PROFIT-COMP			Panel D: COMPETITION = HHI-COMP		
E_t		全样本	差盈利机会	好盈利机会	全样本	差盈利机会	好盈利机会	全样本	差盈利机会	好盈利机会	全样本	差盈利机会	好盈利机会
		(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
Constant	?	-0.0487***	-0.0480***	-0.0214***	-0.0512***	-0.0497***	-0.0211***	-0.0478***	-0.0489***	-0.0230***	-0.0505***	-0.0492***	-0.0187***
		(-9.21)	(-8.07)	(-3.48)	(-9.50)	(-8.36)	(-3.37)	(-9.14)	(-8.21)	(-3.70)	(-9.40)	(-8.35)	(-2.95)
E_{t-1}	+	1.3379***	1.8675***	0.9935***	1.3718***	1.9039***	0.9974***	1.3402***	1.9188***	1.0558***	1.3707***	1.9276***	0.9769***
		(16.66)	(9.85)	(11.73)	(16.41)	(9.82)	(11.51)	(16.93)	(10.04)	(12.28)	(16.56)	(10.07)	(11.24)
$COMPETITION_{t-1}$	?	0.0021	0.0019	-0.0040***	0.0031**	0.0027**	-0.0012	0.0070***	0.0066***	0.0011	0.0034*	0.0043**	-0.0060***
		(1.64)	(1.53)	(-3.02)	(2.57)	(2.30)	(-0.98)	(6.39)	(5.74)	(0.86)	(1.96)	(2.39)	(-4.20)
E_{t-1}×$COMPETITION_{t-1}$	**+/-**	**-0.0311**	**-0.0885****	**0.0658*****	**-0.0471****	**-0.0762****	**0.0170**	**-0.0310***	**-0.1138*****	**0.0576*****	**-0.0603****	**-0.2037*****	**0.0546*****
		(-1.58)	**(-2.40)**	**(3.60)**	**(-2.50)**	**(-2.45)**	**(0.99)**	**(-1.85)**	**(-4.21)**	**(3.11)**	**(-2.48)**	**(-3.25)**	**(3.03)**
R_SIZE_{t-1}	?	0.0003	0.0004	0.0003	0.0002	0.0004	0.0004	0.0002	0.0005	0.0004	0.0002	0.0003	0.0003
		(0.68)	(1.07)	(0.54)	(0.59)	(1.00)	(0.81)	(0.61)	(1.40)	(0.86)	(0.56)	(0.95)	(0.66)
E_{t-1}×R_SIZE_{t-1}	-	0.0028	-0.0051	0.0016	0.0032	-0.0024	-0.0013	0.0009	-0.0073	-0.0056	0.0028	-0.0029	-0.0007
		(0.43)	(-0.49)	(0.24)	(0.49)	(-0.23)	(-0.18)	(0.14)	(-0.71)	(-0.80)	(0.44)	(-0.28)	(-0.11)
R_GROWTH_{t-1}	?	0.0018***	0.0016***	0.0007	0.0018***	0.0016***	0.0007	0.0017***	0.0015***	0.0008*	0.0018***	0.0016***	0.0007
		(5.15)	(3.97)	(1.40)	(5.04)	(3.92)	(1.59)	(5.01)	(3.80)	(1.68)	(5.12)	(3.95)	(1.58)
E_{t-1}×R_GROWTH_{t-1}	-	-0.0127**	-0.0324***	0.0020	-0.0121**	-0.0298***	0.0003	-0.0117**	-0.0307***	0.0002	-0.0128**	-0.0304***	0.0003
		(-2.21)	(-3.51)	(0.29)	(-2.08)	(-3.11)	(0.04)	(-2.03)	(-3.32)	(0.04)	(-2.21)	(-3.22)	(0.05)
R_VOL_{t-1}	?	0.0005	-0.0004	0.0009**	0.0005	-0.0005	0.0009*	0.0006*	-0.0002	0.0010**	0.0005	-0.0005	0.0009*
		(1.55)	(-0.92)	(1.98)	(1.38)	(-1.04)	(1.88)	(1.74)	(-0.42)	(2.07)	(1.40)	(-1.10)	(1.88)

表 4　行业竞争对公司盈余持续性的影响（续）

因变量:		Panel A: COMPETITION = POTENT-COMP			Panel B: COMPETITION = EXIST-COMP			Panel C: COMPETITION = PROFIT-COMP			Panel D: COMPETITION = HHI-COMP		
E_t		全样本	差盈利机会	好盈利机会	全样本	差盈利机会	好盈利机会	全样本	差盈利机会	好盈利机会	全样本	差盈利机会	好盈利机会
		(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
$E_{t-1}\times R\_VOL_{t-1}$	-	-0.0286***	-0.0524***	-0.0272***	-0.0281***	-0.0499***	-0.0266***	-0.0302***	-0.0609***	-0.0295***	-0.0283***	-0.0489***	-0.0264***
		(-5.09)	(-3.23)	(-4.18)	(-4.98)	(-3.01)	(-4.01)	(-5.39)	(-3.73)	(-4.51)	(-5.02)	(-2.96)	(-3.99)
$R\_\|ACC_{t-1}\|$	?	0.0032***	0.0024***	0.0012***	0.0032***	0.0025***	0.0011***	0.0031***	0.0024***	0.0010**	0.0032***	0.0024***	0.0011***
		(9.33)	(5.97)	(2.84)	(9.47)	(6.11)	(2.61)	(9.22)	(5.98)	(2.40)	(9.38)	(5.92)	(2.68)
$E_{t-1}\times R\_\|ACC_{t-1}\|$	-	-0.0578***	-0.0780***	-0.0217***	-0.0582***	-0.0797***	-0.0209***	-0.0581***	-0.0797***	-0.0210***	-0.0579***	-0.0781***	-0.0214***
		(-9.84)	(-5.64)	(-3.65)	(-9.94)	(-5.73)	(-3.42)	(-9.97)	(-5.76)	(-3.45)	(-9.88)	(-5.64)	(-3.52)
$R\_\Delta E_{t-1}$	?	0.0006*	0.0008**	0.0008	0.0006*	0.0008**	0.0008*	0.0006*	0.0008**	0.0008*	0.0006*	0.0008**	0.0008*
		(1.87)	(2.08)	(1.62)	(1.90)	(2.01)	(1.71)	(1.77)	(2.02)	(1.82)	(1.94)	(2.07)	(1.66)
$E_{t-1}\times R\_\Delta E_{t-1}$	-	-0.0004	-0.0400***	-0.0081	-0.0003	-0.0377***	-0.0089	0.0004	-0.0377***	-0.0097	-0.0004	-0.0379***	-0.0081
		(-0.10)	(-4.35)	(-1.24)	(-0.06)	(-4.23)	(-1.35)	(0.09)	(-4.13)	(-1.50)	(-0.11)	(-4.30)	(-1.23)
R_DIV_{t-1}	?	0.0029***	0.0054***	0.0009*	0.0030***	0.0052***	0.0010**	0.0029***	0.0055***	0.0012**	0.0029***	0.0051***	0.0010**
		(7.18)	(7.58)	(1.86)	(7.25)	(7.27)	(2.01)	(7.22)	(8.01)	(2.41)	(7.24)	(7.13)	(1.98)
$E_{t-1}\times R\_DIV_{t-1}$	+	0.0034	-0.0608***	0.0211***	0.0027	-0.0556**	0.0193***	0.0029	-0.0635***	0.0144**	0.0027	-0.0513**	0.0196***
		(0.50)	(-2.63)	(3.13)	(0.39)	(-2.38)	(2.80)	(0.43)	(-2.82)	(2.05)	(0.39)	(-2.19)	(2.85)
$R\_\|SPI_{t-1}\|$	?	0.0010**	0.0007**	-0.0002	0.0010***	0.0007**	-0.0002	0.0010***	0.0006*	-0.0002	0.0010***	0.0007**	-0.0002
		(2.56)	(2.00)	(-0.42)	(2.70)	(2.05)	(-0.49)	(2.60)	(1.82)	(-0.45)	(2.70)	(2.07)	(-0.50)
$E_{t-1}\times\|R\_SPI_{t-1}\|$	-	-0.0321***	-0.0394***	-0.0124**	-0.0321***	-0.0402***	-0.0123**	-0.0310***	-0.0367***	-0.0117**	-0.0323***	-0.0415***	-0.0123**
		(-4.90)	(-3.82)	(-2.02)	(-4.94)	(-3.89)	(-2.06)	(-4.88)	(-3.72)	(-2.03)	(-4.94)	(-3.99)	(-2.06)
N		13,409	6,701	6,708	13,409	6,701	6,708	13,409	6,701	6,708	13,409	6,701	6,708
Adj-R^2		0.3166	0.1540	0.3377	0.3173	0.1539	0.3357	0.3212	0.1602	0.3454	0.3170	0.1552	0.3370

注：***、**、*分别表示在1%、5%和10%的水平上统计显著，括号内为t统计量。t值已经过White（1980）异方差修正，并考虑公司层面和年度层面的聚类（cluster）效应（Petersen, 2009）。

个指标来衡量行业竞争，其结果均与 Panel A 类似。总体来看，表 4 的结果表明，对盈利机会差的公司，行业竞争会促使管理层执行清算期权，降低盈余持续性；而对盈利机会好的公司，行业竞争则会激励管理层更好地执行增长期权，从而增加会计盈余持续性，这些结果支持了本文的假说 1 和假说 2a。本文的研究从公司基本面角度为行业竞争影响公司管理层执行实物期权及其经济后果提供了证据，行业竞争有助于管理层更有效地执行增长与清算期权，进而反映到公司会计盈余特征上。

5.4 拓展性分析

前文的实证结果表明，行业竞争会影响公司管理层执行增长与清算期权，进而影响会计盈余持续性。然而，已有众多文献表明，盈余持续性是影响盈余反应系数（earnings response coefficient，简称 ERC）的最重要的因素之一（Kormendi and Lipe, 1987; Easton and Zmijewski, 1989; Collins and Kothari, 1989）。[12] 根据市场有效性假说，资本市场上的投资者应该能够识别行业竞争对公司会计盈余的影响，进而将其反映在股价变动与会计盈余变动的关系中（即 ERC）。因此，作为拓展性分析，我们进一步考察行业竞争与 ERC 的关系，这有助于我们从另一侧面印证行业竞争对公司盈余持续性的影响。我们预期，对盈利机会差的公司，行业竞争对清算期权的促进作用，会削弱股价变动与会计盈余变动之间的关联度，从而降低 ERC；相反，对盈利机会好的公司，由于行业竞争对增长期权的促进作用会加强股价变动与会计盈余变动之间的关系，从而表现为提高 ERC。借鉴 Francis and Ke（2006）、Ng *et al.*（2008）等的研究设计，我们采用如下的模型（3）来检验行业竞争与 ERC 之间的关系：

$$\begin{aligned} CAR_t = {} & \alpha_0 + \alpha_1 UE_t + \alpha_2 COMPETITION_t \\ & + \alpha_3 UE_t \times COMPETITION_t + \gamma \sum CONTROLS \\ & + \lambda \sum UE_t \times CONTROLS + \varepsilon \end{aligned} \tag{3}$$

这里，CAR_t 表示第 t 年公司盈余公告日前后三天的经市场收益率调整的累积非正常收益率，即 *CAR* [-1, 1]。UE_t 表示公司第 t 年的未预期盈余，等于（$EPS_t - EPS_{t-1}$）/$PRICE_t$。借鉴 Francis and Ke（2006），Ng *et al.*（2008）等的模型，我们在模型（3）中还加入了其他一些控制变量。例如，公司规模（*SIZE*）、成长性（*GROWTH*）、盈余波动性（*VOL*）、杠杆比率（*LEVERAGE*）、贝塔系数（*BETA*）、收益率波动性（*STDRET*）和非经常性损益（*SPI*）等。其中，$LEVERAGE_t$ 等于第 t 年公司总负债除以总资产；$STDRET_t$ 为第 t 年公司盈余公告日前[-95, -6]股票日收益率的标准差；$BETA_t$ 则由第 t 年公司股票月收益率计算得。其他变量定义同前面的模型（1）。根据前文的分析，如果本文的研究假说 1 成立，我们预期在“差盈利机会”组模型（3）

[12] Kormendi and Lipe（1987）、Easton and Zmijewski（1989）以及 Collins and Kothari（1989）等的研究发现，决定盈余反应系数的四个主要因素是：盈余持续性，系统性风险，增长机会和无风险利率。

中交互项 $UE_t \times COMPETITION_t$ 系数 α_3 显著为负。类似地，如果本文的研究假说 2a 成立，我们预期在“好盈利机会”组模型（3）中交互项 $UE_t \times COMPETITION_t$ 系数 α_3 显著为正。即行业竞争对公司盈余持续性的影响体现在股价变动与会计盈余变动的关系中。

表 5 提供了拓展性分析的检验结果。[13] 其中，第（1）列报告了全样本的结果，我们发现交互项 $UE_t \times COMPETITION_t$ 的系数均显著为负，这与表 4 全样本的结果相吻合；第（2）列则报告了“差盈利机会”组的回归结果，交互项 $UE_t \times COMPETITION_t$ 的系数均在 1%或 5%的水平上显著为负，即行业竞争降低了公司的 ERC，这与研究假说 1 一致；第（3）列是“好盈利机会”组的回归结果，发现除 *PROFIT-COMP* 外，其他几个指标衡量行业竞争时模型（4）的系数 α_3 均显著为正，即行业竞争提高了公司的 ERC，这支持了研究假说 2a。因此，总体来看，公司的盈余反应系数呈现出与盈余持续性类似的特征，这进一步支持了本文发现的公司盈余持续性的变化可能与行业竞争相关，夯实了本文的主要研究结论。

六、 稳健性检验

为使本文的研究结论更为稳健，本节还对主要研究结果进行了多种形式的敏感性检验，具体如下。

6.1 改变模型控制变量的形式

在前文的主要检验部分，为消除控制变量极端值可能对研究结论造成的潜在影响，参照 Frankel and Litov（2009）的研究设计，本文对模型所有的控制变量进行了分组排序（rank）处理。然而，这种处理方法也存在一些不足，它是以牺牲一部分原控制变量的精度为代价。此外，本文已对所有连续变量在 1%和 99%的水平上进行了极值处理，这在一定程度上亦能够减轻控制变量极端值对研究结论可能产生的影响。因此，我们也对模型控制变量采用原值的形式，重新检验本文主要假说。模型具体如下：

$$\begin{aligned} E_t = {} & \alpha_0 + \alpha_1 E_{t-1} + \alpha_2 COMPETITION_{t-1} + \alpha_3 E_{t-1} \times COMPETITION_{t-1} \\ & + \alpha_4 SIZE_{t-1} + \alpha_5 E_{t-1} \times SIZE_{t-1} + \alpha_6 GROWTH_{t-1} \\ & + \alpha_7 E_{t-1} \times GROWTH_{t-1} + \alpha_8 VOL_{t-1} + \alpha_9 E_{t-1} \times VOL_{t-1} \\ & + \alpha_{10} |ACC_{t-1}| + \alpha_{11} E_{t-1} \times |ACC_{t-1}| + \alpha_{12} \Delta E_{t-1} \\ & + \alpha_{13} E_{t-1} \times \Delta E_{t-1} + \alpha_{14} DIV_{t-1} + \alpha_{15} E_{t-1} \times DIV_{t-1} \\ & + \alpha_{16} |SPI_{t-1}| + \alpha_{17} E_{t-1} \times |SPI_{t-1}| + \varepsilon \end{aligned} \quad (4)$$

[13] 需要注意的是，表 5 结果显示 UE_t 系数本身不显著，这主要是因为我们在模型（3）中以交互项的形式加入了其他控制变量。若不包含交互项控制变量，UE_t 系数在全样本中均显著为正，且差盈利机会组的 UE_t 系数小于好盈利机会组的 UE_t 系数，这与王化成等（2004）的基本研究结论一致。

表 5　行业竞争对盈余反应系数的影响

因变量:	Panel A: *COMPETITION = POTENT-COMP*			Panel B: *COMPETITION = EXIST-COMP*			Panel C: *COMPETITION = PROFIT-COMP*			Panel D: *COMPETITION = HHI-COMP*		
CAR [-1, 1]	全样本	差盈利机会	好盈利机会	全样本	差盈利机会	好盈利机会	全样本	差盈利机会	好盈利机会	全样本	差盈利机会	好盈利机会
	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
UE_t	0.0244	-0.0063	-0.0036	0.0491	-0.0275	0.0370	0.0293	-0.0018	0.0097	0.0508	-0.0328	0.0661
	(0.35)	(-0.08)	(-0.03)	(0.71)	(-0.24)	(0.44)	(0.42)	(-0.02)	(0.08)	(0.73)	(-0.28)	(0.77)
$COMPETITION_t$	0.0012*	0.0014	0.0003	0.0001	0.0003	-0.0012	-0.0001	-0.0006	0.0002	0.0005	0.0023	-0.0018*
	(1.93)	(1.56)	(0.44)	(0.08)	(0.35)	(-1.49)	(-0.18)	(-0.80)	(0.26)	(0.65)	(1.65)	(-1.87)
UE_t×$COMPETITION_t$	**-0.0227****	**-0.0295****	**0.0448****	**-0.0279****	**-0.0425*****	**0.0578****	**-0.0248*****	**-0.0289*****	**-0.0190**	**-0.0402***	**-0.0843*****	**0.0761*****
	(-2.21)	**(-2.46)**	**(2.13)**	**(-2.35)**	**(-3.42)**	**(2.13)**	**(-3.04)**	**(-3.29)**	**(-0.88)**	**(-1.95)**	**(-3.38)**	**(2.64)**
Σ*CONTROLS*	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
ΣUE_t×*CONTROLS*	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	13,137	6,565	6,572	13,137	6,565	6,572	13,137	6,565	6,572	13,137	6,565	6,572
Adj-R^2	0.0079	0.0094	0.0025	0.0077	0.0096	0.0029	0.0078	0.0091	0.0024	0.0075	0.0101	0.0031

注：***、**、*分别表示在 1%、5%和 10%的水平上统计显著，括号内为 t 统计量。t 值已经过 White（1980）异方差修正，并考虑公司层面和年度层面的聚类（cluster）效应（Petersen, 2009）。

表 6 报告了相应的检验结果。限于篇幅，我们仅列示了关键变量部分的回归结果（其他稳健性检验类似）。具体，表 6 的 Panel A、Panel B、Panel C 和 Panel D 分别报告了采用 *POTENT-COMP*、*EXIST-COMP*、*PROFIT-COMP* 以及 *HHI-COMP* 衡量行业竞争程度时的检验结果。我们发现，表 6 的回归结果与表 4 基本类似，主要结论不发生变化。

6.2 改变盈利机会的分组

前文的分析中，我们以样本公司的盈利机会（q_{t-1}）是否大于中位数作为分组的依据，当 q_{t-1} 小于中位数时，记为“差盈利机会”组；当 q_{t-1} 大于等于中位数时，记为“好盈利机会”组。为考察本文的主要结论是否受不同分组划分的影响，我们考虑以下分组方法：每年按 q_{t-1} 的大小将样本等分为三组，取最高组（即 Top 33%）记为“好盈利机会”组，取最低组（即 Bottom 33%）记为“差盈利机会”组。然后，我们利用模型（2）重新对研究假说进行检验。表 7 报告了相应的检验结果。与前文表 4 回归结果类似，在“差盈利机会”组交互项 $E_{t-1}\times COMPETITION_{t-1}$ 系数均显著为负，而在“好盈利机会”组交互项 $E_{t-1}\times COMPETITION_{t-1}$ 系数均显著为正，进一步支持了本文的研究假说 1 和假说 2a。

6.3 改变行业竞争程度的衡量

除了本文所用的衡量行业竞争程度的方法外，Karuna（2007）从产品的差异化、市场规模以及进入成本三个维度来衡量行业竞争。为了增强本文研究结论的可靠性，我们也采用该方法来衡量竞争程度。[14] 为叙述的方便，我们分别将“产品的差异化”和“进入成本”指标乘以 -1，并将最终得到的三个指标分别计为 *DIFF*、*MKTSIZE* 以及 *ENTCOST*，该数值越大，表示行业竞争越激烈。

表 8 报告了相应的检验结果。我们发现，对研究假说 1 的检验结果显示，在“差盈利机会”组，除了 *COMPETITION* = *MKTSIZE* 时交互项 $E_{t-1}\times COMPETITION_{t-1}$ 系数不显著外，*DIFF* 和 *ENTCOST* 衡量的竞争指标与 E_{t-1} 的交互项在 5%水平上均显著为负，基本支持了研究假说 1。此外，对本文假说 2 的检验则发现，在“好盈利机会”组，Karuna（2007）方法衡量的竞争指标与 E_{t-1} 的交互项均在 1%或 5%水平上显著为正，支持了研究假说 2a。因此，总体来看，改变竞争指标的衡量并未使本文主要结论发生实质性变化，这说明前文所用两种方法衡量的行业竞争程度指标的结果是合理稳健的。

[14] 参照 Karuna（2007）的定义，本文将这三个指标定义如下：产品的差异化，等于某一年度某一行业内所有上市公司营业收入总和除以营业成本总和；市场规模，等于某一年度某一行业内所有上市公司营业收入之和的自然对数；进入成本，等于某一年度某一行业内所有上市公司加权平均“固定资产、无形资产等净额”的自然对数，其中权重为各上市公司的市场占有率。与前文一致，我们在行业层面对三个指标进行了标准化处理。

表 6　改变模型控制变量的形式

因变量:	Panel A: COMPETITION = POTENT-COMP		Panel B: COMPETITION = EXIST-COMP		Panel C: COMPETITION = PROFIT-COMP		Panel D: COMPETITION = HHI-COMP	
E_t	差盈利机会	好盈利机会	差盈利机会	好盈利机会	差盈利机会	好盈利机会	差盈利机会	好盈利机会
	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
E_{t-1}	1.4819**	0.5296	1.4627**	0.6162*	1.6246**	0.9785**	1.5173**	0.5820
	(2.39)	(1.45)	(2.32)	(1.65)	(2.57)	(2.52)	(2.46)	(1.56)
$COMPETITION_{t-1}$	0.0018	-0.0036***	0.0025**	-0.0010	0.0065***	0.0009	0.0040**	-0.0053***
	(1.46)	(-2.70)	(2.07)	(-0.82)	(5.69)	(0.76)	(2.21)	(-3.77)
E_{t-1}×$COMPETITION_{t-1}$	**-0.0819****	**0.0629*****	**-0.0758****	**0.0139**	**-0.1164*****	**0.0592*****	**-0.2010*****	**0.0460*****
	(-2.21)	**(3.67)**	**(-2.47)**	**(0.78)**	**(-4.07)**	**(3.57)**	**(-3.21)**	**(2.61)**
$\sum CONTROLS$	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
$\sum UE_t$×$CONTROLS$	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	6,701	6,708	6,701	6,708	6,701	6,708	6,701	6,708
Adj-R^2	0.1381	0.3601	0.1382	0.3582	0.1447	0.3675	0.1394	0.3592

注：***、**、*分别表示在 1%、5%和 10%的水平上统计显著，括号内为 t 统计量。t 值已经过 White（1980）异方差修正，并考虑公司层面和年度层面的聚类（cluster）效应（Petersen, 2009）。

表 7　改变盈利机会的分组

因变量:	Panel A: *COMPETITION = POTENT-COMP*		Panel B: *COMPETITION = EXIST-COMP*		Panel C: *COMPETITION = PROFIT-COMP*		Panel D: *COMPETITION = HHI-COMP*	
E_t	Bottom 33%	Top 33%	Bottom 33%	Top 33%	Bottom 33%	Top 33%	Bottom 33%	Top 33%
	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
E_{t-1}	1.6650***	1.0165***	1.6915***	1.0070***	1.7360***	1.0696***	1.7254***	0.9783***
	(6.04)	(10.17)	(6.06)	(9.89)	(6.18)	(10.45)	(6.22)	(9.48)
$COMPETITION_{t-1}$	0.0023	-0.0038**	0.0011	-0.0028*	0.0066***	0.0016	0.0016	-0.0092***
	(1.38)	(-2.16)	(0.66)	(-1.72)	(4.70)	(0.89)	(0.70)	(-4.66)
E_{t-1}×$COMPETITION_{t-1}$	**-0.0837***	**0.0652*****	**-0.0840****	**0.0336***	**-0.1148*****	**0.0532****	**-0.2172*****	**0.0822*****
	(-1.88)	**(3.06)**	**(-2.40)**	**(1.66)**	**(-3.71)**	**(2.44)**	**(-2.99)**	**(3.76)**
$\Sigma CONTROLS$	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
ΣUE_t×$CONTROLS$	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	4,465	4,469	4,465	4,469	4,465	4,469	4,465	4,469
Adj-R^2	0.1127	0.3298	0.1124	0.3276	0.1200	0.3388	0.1139	0.3299

注：***、**、*分别表示在 1%、5%和 10%的水平上统计显著，括号内为 t 统计量。t 值已经过 White（1980）异方差修正，并考虑公司层面和年度层面的聚类（cluster）效应（Petersen, 2009）。

表 8　借鉴 Karuna（2007）的方法衡量行业竞争程度

因变量：	Panel A: *COMPETITION = ENTCOST*		Panel B: *COMPETITION = MKTSIZE*		Panel C: *COMPETITION = DIFF*	
E_t	差盈利机会	好盈利机会	差盈利机会	好盈利机会	差盈利机会	好盈利机会
	(1)	(2)	(1)	(2)	(1)	(2)
E_{t-1}	1.8683***	0.9894***	1.8522***	1.0237***	1.8880***	1.0333***
	(9.86)	(11.58)	(9.65)	(12.06)	(9.94)	(11.81)
$COMPETITION_{t-1}$	0.0011	-0.0035***	-0.0012	-0.0058***	0.0052***	0.0003
	(0.88)	(-2.61)	(-0.90)	(-3.29)	(5.28)	(0.24)
E_{t-1}×$COMPETITION_{t-1}$	**-0.0827****	**0.0522*****	**-0.0018**	**0.0887*****	**-0.0977*****	**0.0417****
	(-2.20)	**(2.97)**	**(-0.05)**	**(3.19)**	**(-4.26)**	**(2.38)**
$\sum CONTROLS$	Yes	Yes	Yes	Yes	Yes	Yes
$\sum UE_t$×$CONTROLS$	Yes	Yes	Yes	Yes	Yes	Yes
N	6,701	6,708	6,701	6,708	6,701	6,708
Adj-R^2	0.1537	0.3368	0.1518	0.3370	0.1571	0.3397

注：***、**、*分别表示在 1%、5%和 10%的水平上统计显著，括号内为 t 统计量。t 值已经过 White（1980）异方差修正，并考虑公司层面和年度层面的聚类（cluster）效应（Petersen, 2009）。

6.4 内生性问题

一方面，市场结构既可能是影响管理层执行实物期权的原因；另一方面，参照Li（2010）的方法衡量的行业竞争指标又涉及价格成本费用利润率和总资产收益率等反映企业盈利水平的指标，这使得管理层执行实物期权的结果又可能影响市场结构。因此，市场结构可能不完全是外生的，由此导致的内生性问题可能影响本文结论的可靠性。为此，我们也使用 1998 至 2009 年所有年度竞争指标的平均值作为行业竞争程度的代理变量。回归结果显示，本文的主要研究结论并未发生实质性变化。

七、 结论与研究局限

7.1 研究结论及启示

本文以 1999 至 2010 年我国 A 股上市公司为研究样本，从实物期权角度考察了行业竞争对公司盈余持续性的影响。基于实物期权理论的分析表明，行业竞争对公司盈余持续性的影响可能呈现非线性关系，且二者的关系取决于企业的经营效率或盈利机会。对盈利机会差的公司，执行清算期权变得更为有利，行业竞争能够激励管理层更好地执行清算期权，从而降低盈余持续性；并且行业竞争的“盈余均值回转效应”亦将加速会计盈余的反转，这也将降低公司盈余持续性。相反，对盈利机会好的公司，行业竞争则存在两种相反的效应，一方面可以激励管理层更好地执行增长期权，从而增加盈余持续性，另一方面竞争带来的边际收益递减效应也可能加速会计盈余的均值回转，从而降低盈余持续性。实证结果显示，对盈利机会差的公司，行业竞争降低盈余持续性；对盈利机会好的公司，行业竞争的“增长期权效应”能够抵消“盈余均值回转效应”带来的盈余持续性下降，最终使得公司盈余持续性随着行业竞争的加剧而增加。拓展性检验发现，行业竞争对公司盈余持续性的影响还体现在股价变动与会计盈余变动的关系之中，发现盈余反应系数呈现出与盈余持续性类似的特征。

本文的研究结果表明，行业竞争能够激励公司管理层更好地执行增长与清算期权，并且该影响体现在公司会计盈余特征上。本文的经验证据有助于我们从公司基本面的角度来理解行业竞争影响管理层执行实物期权及其经济后果。同时，基于实物期权理论探讨行业竞争与公司盈余持续性的关系，能够帮助投资者更好地理解公司会计盈余特征及制定投资决策，以利于他们正确评估公司价值。

7.2 研究局限

（1）行业竞争程度难以准确衡量。本文虽采用了多种方法、从多个维度来衡量竞争程度，以尽可能增强衡量指标的有效性，然而，目前学术界对于哪个指标更能有效反映市场结构状况尚无定论。本文所用行业竞争指标均基于上市公司样本计算得到，尚未考虑到非上市公司样本的影响，从而上市公司样本的行业代表性可能

影响本文结论。

（2）公司多元化经营可能影响行业竞争指标的有效性，进而影响本文结论。由于我国上市公司披露的行业分部报告信息并不完全（仅包含项目收入、成本以及利润等信息），这限制了我们基于公司行业分部报告层面计算行业竞争程度指标。实际上，对于多元化经营企业，仅按证监会行业分类可能并不能准确刻画公司所处竞争环境。

（3）对于研究假说 1，我们难以准确区分行业竞争降低差盈利机会公司的盈余持续性是由“清算期权效应”还是“盈余均值回转效应”引起的。正如前文的理论分析，对盈利机会差的公司，两种效应都将导致公司盈余持续性的降低。

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附录 1 主成分分析结果

Panel A：相关矩阵的特征值

Principal Components	Eigenvalue	Difference in Eigenvalue	Variance Explained	Cumulative Variance
PC1	2.9435	0.1826	36.79%	36.79%
PC2	2.7609	1.3585	34.51%	71.30%
PC3	1.4024	0.9797	17.53%	88.83%
PC4	0.4227	0.1921	5.28%	94.12%
PC5	0.2307	0.0910	2.88%	97.00%
PC6	0.1397	0.0714	1.75%	98.75%
PC7	0.0683	0.0364	0.85%	99.60%
PC8	0.0319		0.40%	100.0%

Raw Variables	**Panel B：旋转因子载荷矩阵**			**Panel C：标准因子得分系数**		
	PC1	PC2	PC3	PC1	PC2	PC3
IND_PPE	9.47%	95.33%	16.66%	0.0446	0.3784	-0.0420
IND_CPX	13.48%	94.76%	16.11%	0.0596	0.3776	-0.0468
IND_MKT	-59.21%	74.33%	3.72%	-0.2055	0.2954	-0.0532
IND_HHI	85.47%	34.09%	9.99%	0.3163	0.1457	-0.0360
IND_CON4	95.99%	9.13%	1.65%	0.3548	0.0552	-0.0572
IND_NUM	-84.62%	25.90%	-4.25%	-0.3044	0.0984	-0.0172
IND_MGN	2.38%	7.95%	93.51%	-0.0423	-0.1042	0.5719
IND_ROA	6.79%	18.75%	90.66%	-0.0223	-0.0537	0.5356

Panel D：相关系数矩阵

	IND_PPE	*IND_CPX*	*IND_MKT*	*IND_HHI*	*IND_CON4*	*IND_NUM*	*IND_MGN*	*IND_ROA*
IND_PPE		0.9650	0.6140	0.3617	0.1605	0.1138	0.2666	0.2952
		(<.0001)	(<.0001)	(<.0001)	(0.0107)	(0.0714)	(<.0001)	(<.0001)
IND_CPX		1.0000	0.5846	0.3882	0.1926	0.0705	0.2439	0.3105
			(<.0001)	(<.0001)	(0.0021)	(0.2646)	(<.0001)	(<.0001)
IND_MKT			1.0000	-0.2039	-0.4878	0.6736	0.0614	0.1583
				0.0011	(<.0001)	(<.0001)	(0.3321)	(0.0119)
IND_HHI				1.0000	0.8708	-0.5208	0.1054	0.2596
					(<.0001)	(<.0001)	(0.0950)	(<.0001)
IND_CON4					1.0000	-0.7065	0.0485	0.1028
						(<.0001)	0.4438	0.1037
IND_NUM						1.0000	-0.0598	-0.0120
							0.3449	0.8498
IND_MGN							1.0000	0.7369
								(<.0001)
POTENT-COMP	-0.9533	-0.9476	-0.7433	-0.3409	-0.0913	-0.2591	-0.0795	-0.1875
	(<.0001)	(<.0001)	(<.0001)	(<.0001)	(0.1482)	(<.0001)	(0.2085)	(0.0028)
EXIST-COMP	-0.0947	-0.1348	0.5921	-0.8547	-0.9599	0.8462	-0.0238	-0.0679
	(0.1338)	(0.0324)	(<.0001)	(<.0001)	(<.0001)	(<.0001)	(0.7073)	(0.2832)
PROFIT-COMP	-0.1666	-0.1611	-0.0372	-0.0999	-0.0165	0.0425	-0.9351	-0.9066
	(0.0081)	(0.0104)	(0.5571)	(0.1136)	(0.7942)	(0.5016)	(<.0001)	(<.0001)

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Industry Competition and Earnings Persistence: Empirical Tests Based on Real Options Theory[1]

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Abstract

Using A-share listed companies in China from 1999 to 2010, this paper investigates the influence of industry competition on earnings persistence from the perspective of the real options theory. Different from the traditional industrial economics theory, analyses based on the real options theory show that the influence of industry competition on earnings persistence may be nonlinear and that the relationship between the two may vary with the firm's operating efficiency or profitability. Our empirical results show that for companies with low profitability, intense industry competition can encourage management to

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exercise abandonment options more effectively, thereby reducing the persistence of earnings; in contrast, for companies with high profitability, intense industry competition can encourage management to exercise growth options more effectively and offset the mean reverting effect, thus increasing the persistence of earnings. Additional tests illustrate that the influence of industry competition on earnings persistence is also reflected in the relationship between stock price changes and earnings changes, that is, the earnings response coefficient. Overall, this paper suggests that the influence of industry competition on the execution of real options is reflected in the earnings pattern.

Keywords**:** Industry Competition, Earnings Persistence, Growth Option, Abandonment Option
CLC Codes**:** F23, F27, F830

I. Introduction

The real options theory is an application of the financial options theory on physical assets which introduces financial market rules into enterprise strategy decision-making to help management make better investment decisions under uncertainties (Myers, 1977). In order to cope with uncertain decision-making environments, investments should maintain some type of flexibility. Therefore, real options in essence reflect the flexibility in management's investment decisions which increases firm value during the resource allocation process (Robichek and Van Horne, 1967; Dixit and Pindyck, 1994; Trigeorgis, 1996). Burgstachler and Dichev (1997) and Zhang (2000) apply the real options theory directly in research on corporate equity valuation and prove the value of real options theoretically and empirically. These studies play an important role in helping us to better understand the value of real options in corporate valuation.

However, the above mentioned studies mainly investigate real options from the perspective of market pricing. Different from the prior literature, this paper investigates the economic consequences of real option execution from the perspective of fundamental accounting attributes; this will help us to better understand how exercising real options influences equity valuation. Earnings persistence, one of the key pieces of financial information, plays a significant role in financial decisions (Ohlson, 1995; Sun, 2010). Firstly, equity valuation relies on earnings persistence. Secondly, earnings persistence enhances the contract role of financial statements. Lastly, investors rely on earnings persistence to make investment decisions. As Penman (2002) points out, equity valuation analysis should attach more importance to the growth of residual income, and earnings persistence plays an important role in predicting this growth.

Chen *et al.* (2012) point out that unlike financial options with exogenously specified decision rights and pay-offs, real options are usually implied in the decision-making process, and thus there is a lack of detailed information, such as the time to exercise and the exercise price.[3] These features mean that the value of real options depends largely on the company's operating environments, including the macroeconomic, industry, and governance environments. Product market competition, as an important corporate governance mechanism, may be one of the most powerful forces in improving economic efficiency (Shleifer and Vishny, 1997). It can efficiently mitigate information asymmetry and agency problems, thus having a supervisory and incentive effect on management. A recent study by Chen *et al.* (2013) finds that industry competition contributes to improving management's flexibility in investment decision-making, thereby leading to the more efficient exercise of growth and abandonment options.[4] In addition, since real options lack detailed contract terms, they are difficult to observe and quantify directly, and this imposes some constraints on directly examining the relationship between the exercise of real options and earnings pattern. In this paper, we use environmental variables or industry competition measures to indirectly investigate the relationship between these two factors.

Some papers have examined the relationship between market structure and earnings pattern. For example, on the basis of the linear residual income model (RIM) proposed by Ohlson (1995) and Feltham and Ohlson (1995, 1996), Cheng (2005) analyses the impact of value-creation (economic rents) and value-recording (conservatism accounting) processes on the persistence of residual income. He finds that with higher industry concentration and industry-level barriers to entry, that is, less competition, enterprises can acquire more economic rents; in other words, industry competition is negatively correlated with the persistence of residual income. However, Cheng's (2005) findings are based on Ohlson's linear RIM. So far, we have not found any literature that investigates the influence of industry competition on earnings persistence from the perspective of real options. Different from the prior literature, Zhang's (2000) valuation model, which takes real options into consideration, indicates that industry competition may nonlinearly influence earnings persistence. This finding improves our knowledge of how industry competition influences the valuation of micro entities.

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[3] Miller and Park (2002) and Xia and Chen (2005) summarise the difference between financial options and real options in terms of the following aspects: exchange of options, sources of uncertainty, market of underlying assets, underlying asset price, time to exercise, exercise price, volatility, and value leakage.

[4] Growth option is the choice of continuing to use existing technology to organise resources or expanding existing assets in place when the firm's current activities are successful. Abandonment option is the choice of disposing of existing resources or changing the use of existing resources into other areas with better returns when the firm's operating performance declines.

This paper investigates how industry competition influences earnings persistence from the perspective of the real options theory using A-share listed companies in China from 1999 to 2010. Empirical tests based on the real options theory indicate a nonlinear relation between industry competition and earnings persistence, which is different from the traditional industrial economics theory. In addition, their relationship depends on the operating efficiency or profitability opportunities of companies. Specifically, for companies with low profitability, intense industry competition encourages management to exercise abandonment options more effectively, while for companies with high profitability, industry competition has two opposite effects on earnings persistence. On the one hand, it can encourage management to exercise growth options to expand, thereby increasing earnings persistence, and on the other hand, diminishing marginal returns brought by industry competition may also accelerate the mean reverting effect of earnings, thus reducing earnings persistence. The empirical results show that for companies with low (high) profitability, intense industry competition reduces (increases) earnings persistence. Collectively, our findings suggest that industry competition can help management exercise growth and abandonment options more effectively according to current profitability opportunities. Moreover, additional tests also illustrate that investors' expectations can incorporate part of the influence of environmental factors (e.g. industry competition) on management's exercise of real options and that those expectations are reflected in the relationship between stock prices and accounting earnings.

Our paper makes the following contributions to the literature.

First, it enriches and expands the literature on the value of real options (Hayn, 1995; Berger *et al.*, 1996; Burgstachler and Dichev, 1997; Zhang, 2000; Biddle *et al.*, 2001; Hao *et al.*, 2011). The existing literature shows that management's flexibility in exercising growth and abandonment options helps to enhance the value of the company. However, prior studies have mainly examined the economic consequences of real option execution from the perspective of market pricing. Different from those studies, this paper investigates the economic consequences of real option execution from the perspective of fundamental accounting attributes, which enriches the existing research dimensions.

Second, this paper extends the literature on the relationship between industry competition and accounting earnings (Stigler, 1963; Mueller, 1977; Freeman *et al.*, 1982; Fama and French, 2000; Cheng, 2005; Asthana and Zhang, 2006). The traditional industrial economics theory suggests that intense industry competition may accelerate the mean reverting of earnings, thus reducing earnings persistence. Using the linear RIM, Cheng (2005) finds that intense industry competition reduces the persistence of residual income. Different from those studies, we follow Zhang's (2000) real-option-based valuation model and conditions on profitability opportunities and find that growth options

can increase earnings persistence for companies with good profitability opportunities as industry competition becomes increasingly intensified. This indicates that the value of real options should not be neglected when we study the influence of industry competition on earnings pattern.

Third, our study employs a set of industry competition measures from different dimensions, which enriches the existing measurement system. Moreover, it can help us investigate the different influence of various competition measures more comprehensively (Karuna, 2007; Ali *et al.*, 2009; Li, 2010).

Finally, our empirical results will be useful to stakeholders such as enterprises and investors, helping them to better understand how industry competition influences microeconomic entities. For enterprises, clarifying the mechanism of industry competition and highlighting the importance of exercising growth and abandonment options to firm value can guide management through investment decision-making. For investors, examining how industry competition influences earnings persistence will help to better forecast future earnings and help them in making resource allocation decisions.

The remainder of the paper proceeds as follows: Section II briefly reviews the related literature; Section III develops our hypotheses; Section IV describes the research design; Section V reports the empirical results; Section VI provides the robustness tests; and the last section concludes the paper.

II. Literature Review

2.1 Real Options Theory and Company Valuation

The basic idea of real options lies in introducing the framework of financial options into physical asset investments to help enterprises make better investment decisions under uncertainties. Therefore, the value of real options in essence reflects the value of flexibility in management's investment decisions (Myers, 1977).[5] At any time, a company has three options, namely, liquidation, continuing operations, and expansion.[6] When operating performance declines, the company can choose to dispose or change the

[5] An irreversible investment in physical assets can be regarded as an enterprise's purchase of an option which allows it to obtain physical assets or investment projects at a certain price in the future. Then, sunk costs caused by the investment can be regarded as the expense of option, reinvestment can be considered as exercising the option, and the exercise price is the amount of reinvestment. Therefore, we can evaluate the value of investment in physical assets using valuation models similar to those used for valuing financial options.

[6] The traditional real options theory classifies the real options owned by enterprises as follows: defer option, growth option, expand option, contract option, abandonment option, switch option, and compound option (Trigeorgis, 1996; Chen and Yang, 1998). More generally, we can summarise options into three types: abandonment option, continuing operation option, and growth option (Jin *et al.*, 2010).

use of its existing resources, that is, exercise abandonment options; when operating performance improves, the company can choose to continue using existing technology to organise resources or to expand assets in place, that is, exercise expansion or growth options (Hayn, 1995; Berger *et al.*, 1996).

One strand of literature directly incorporates real options into equity valuation and defines equity value as the value of continuing operations plus the value of real options. For example, Burgstachler and Dichev (1997) were among the first to introduce real options into valuation studies, and they show empirically that equity valuation is a convex function of book value and earnings. They argue that there are two types of value based on real options: one is the value of liquidation, namely the value brought by a company's disposal of or changing the use of unprofitable operations; the other is the value of expansion, namely the value brought by a company's continued use of existing technology to organise resources or expand existing assets. To extend the research of Ohlson (1995) and Feltham and Ohlson (1995, 1996), Zhang (2000) theoretically integrates growth and abandonment options into a complete valuation framework for the first time and develops a relatively comprehensive equity valuation model. Zhang (2000) shows that corporate investment decisions depend on current operating efficiency. When operations are efficient, a company is likely to expand its production scale and earnings are the more important determinant of equity value. Otherwise, the company is more likely to exercise abandonment options and book value becomes the more important determinant of equity value. The empirical results of Biddle *et al.* (2001) are consistent with the relations found by Zhang (2000). In addition, on the basis of Zhang's (2000) theoretical model, Hao *et al.* (2011) investigate the effect of growth opportunities on the relation between equity value and accounting variables (book value and earnings). They show that given book value, growth increases the slope of the relation between equity value and earnings for high-profitability firms (i.e. increases the value of growth options) and that given earnings, growth increases the slope of the relation between equity value and book value for low-profitability firms (i.e. increases the value of abandonment options).

Another strand of literature examines the influence of enterprise operating environment on management's real option implementation, such as the degree of economic freedom, marketisation process, and macroeconomic policies. Chen *et al.* (2012) investigate the impact of economic freedom on management's investment decisions and the value of growth and abandonment options across countries. They find that the flexibility in management's investment decisions is greater in countries with greater economic freedom. Furthermore, greater economic freedom enhances the value of growth and abandonment options. Similarly, using A-share listed companies in China, Jin

et al. (2010) examine the influence of the marketisation process across provinces on the value of growth and abandonment options. The empirical results indicate that improvements in marketisation help to ensure proper investment direction. In addition, for high-profitability companies, the marketisation process increases the value of growth options; for low-profitability companies, it increases the value of abandonment options. From the perspective of macroeconomic policy, Jin *et al.* (2012) take private firms in China as the sample and investigate the influence of monetary policy on management's exercise of growth and abandonment options. They find that loose monetary policy increases the value of growth options for high-profitability companies while tightened monetary policy increases the value of abandonment options for low-profitability companies.

2.2 Industry Competition and Real Options

An important feature of the modern enterprise system is the separation of ownership and control rights, which leads to agency conflicts between shareholders and managers (Jensen and Meckling, 1976). Shleifer and Vishny (1997) point out that market competition, as an important external corporate governance mechanism, may be one of the most powerful forces in improving economic efficiency which can effectively mitigate information asymmetry and agency problems, thus having a supervisory and incentive effect on management. Going beyond the property rights theory, Liu and Li (1998) also consider competition as a basic factor for managerial incentives. They argue that competition can create a choice for enterprises, whether to continue or to liquidate, and thus force them to improve operating efficiency. Fee and Hadlock (2000) summarise the influence of product market competition on managerial incentives in the following five hypotheses: the information hypothesis, the threat of liquidation hypothesis, the managerial technology hypothesis, the profit maximisation hypothesis, and the value of cost reduction hypothesis.

A great deal of the prior literature suggests that competition plays an important role in the explanation of economic phenomena in the capital market. More importantly, some recent studies find that industry competition affects management's exercise of real options. For example, Akdoğu and MacKay (2009) examine (using the Herfindahl-Hirschman Index as a measure of industry concentration) how market structure affects the exercise of real options. They find that companies in monopolistic industries exhibit lower investment-q sensitivity and are slower to invest than companies in competitive industries, suggesting that companies might do a trade-off between deferring irreversible investment and the threat of losing investment opportunities in the

face of intense competition.[7] Using A-share data from 1999 to 2010, Chen *et al.* (2013) directly investigate how industry competition influences managerial investment decision-making. They find that intense industry competition increases the sensitivity of companies to investment opportunities and constrains both under-investment and over-investment. This result is consistent with the suggestion that industry competition enables companies to make investments according to the economic laws of capital following profitability, thus improving investment efficiency. Based on the relationship between industry competition and investment flexibility, further tests illustrate that intense competition increases the equity value of growth and abandonment options. These findings indicate that industry competition, as an important mechanism of corporate governance, plays a major role in the process of investment decision-making and the efficiency of resource allocation, thus making management exercise growth and abandonment options more effectively.

Chen *et al.* (2013) provide evidence to support the influence of industry competition on management's exercise of real options and the corresponding economic consequences from the perspective of market pricing. Different from Chen *et al.* (2013), this paper explores how the impact of industry competition on management's exercise of real options influences earnings pattern from the perspective of corporate fundamentals.

2.3 Determinants of Earnings Persistence

Earnings persistence has consistently been a hot topic in capital market research in recent decades. The related literature can be roughly classified into two categories. One strand of literature suggests that earnings persistence should be closely related to accrual accounting. Both the economic nature of the accounting objectives and the existing accounting standards could lead to different persistence in financial report earnings and their components (Ramakrishna and Thomas, 1998). Sloan (1996) argues that although accruals and cash flow are components of current earnings, the accrual accounting system determines that accrual estimates suffer greater subjectivity and accounting distortion. The empirical results also support the argument that the accrual component of earnings is less persistent than the cash flow component of earnings. Xie (2001) further decomposes total accruals into discretionary accruals and normal accruals and finds that the low persistence of accruals is due largely to discretionary accruals stemming from managerial discretion.

[7] Deferring irreversible investment, which is also called a delay option, is one type of real options. A delay option can be regarded as a call option, and it offers a company the right to make investments at some time in the future. When the market environment changes adversely, decision-makers can delay investments. However, delaying an investment project also means that the company gives up early cash flow and may lose the project.

Another strand of literature argues that earnings persistence is determined by economic factors. For example, Eccles *et al.* (2001) point out that sustained increases in earnings may signal that a company has some type of competitive advantage and a higher probability of maintaining growth. Thus, such companies tend to have higher earnings persistence. Furthermore, Ghosh *et al.* (2005) investigate the difference between two types of companies with sustained increases in earnings, namely revenue-supported increases in earnings and cost-reduction increases in earnings. They find that companies with revenue-supported increases in earnings have more persistent earnings. Fairfield *et al.* (2003) argue that the low persistence of the accrual component of earnings is related to low growth. The interaction of diminishing marginal returns on investments and economic profit margins leads to growth in long-term net operating assets, thus reducing persistence of accruals. Recently, Dichev and Tang (2009) and Skinner and Soltes (2011) have found that a company's earnings volatility and dividend policy significantly affect earnings persistence. What is noteworthy is that market competition, as an important force affecting economic efficiency, also has a significant impact on accounting earnings. The traditional industrial economics theory suggests that competition can drive prices down to marginal costs so as to accelerate the mean reverting of earnings and reduce earnings persistence (Stigler, 1963; Mueller, 1977; Porter, 1980).

III. Theoretical Analysis and Hypothesis Development

3.1 Industry Competition and Earnings Persistence: Analysis Based on the Industrial Economics Theory

The traditional industry economics theory suggests that market competition, as an important force influencing economic efficiency, will drive companies' diminishing marginal returns and bring their profitability close to the industry average. In the long run, no company would be able to obtain excess profit margins (Stigler, 1963; Mueller, 1977; Porter, 1980). In other words, competition can drive excess profit margins down to zero so that companies' profitability follows the mean reverting of earnings, thus reducing earnings persistence. A great deal of the prior literature supports the above conclusions (Brooks and Buckmaster, 1976; Freeman *et al.*, 1982; Fama and French, 2000).

On the basis of the linear RIM proposed by Ohlson (1995) and Feltham and Ohlson (1995, 1996), Cheng (2005) investigates the determinants of residual income by analysing the impact of value-creation (economic rents) and value-recording (conservatism accounting) processes on the persistence of residual income. The empirical tests show that the higher the industry concentration and industry-level barriers to entry

(i.e. less competition), the more economic rents enterprises can obtain, and thus the higher residual income persistence will be; that is to say, industry competition is negatively correlated with residual income persistence. Meanwhile, conservatism accounting increases residual earnings persistence. Asthana and Zhang (2006) point out that, theoretically, research and development (R&D) investments can have two opposite effects on enterprises. On the one hand, R&D investments can help enterprises accumulate competitive advantage or increase industry entry barriers, thus enhancing earnings persistence; on the other hand, they can also increase the business risk of enterprises, which will reduce the persistence of earnings. Empirical results show that firms' and industries' R&D intensities are both positively correlated with persistence of earnings, supporting the argument that the positive effect on earnings persistence caused by R&D's effectiveness in mitigating competition dominates the negative effect brought by the great risk involved in R&D projects.

In summary, according to the traditional industrial economics theory, intense industry competition could erode the economic rents that enterprises can obtain and accelerate the mean reverting of earnings, thereby reducing earnings persistence. For convenience, we hereinafter define this effect as the mean reverting effect of industry competition.

3.2 Industry Competition and Earnings Persistence: Analysis Based on the Real Options Theory

Zhang's (2000) real-options-based valuation model shows that the value of real options depends largely on the company's operating efficiency or profitability opportunities. Therefore, we distinguish between companies by their profitability opportunities and discuss how industry competition can influence earnings persistence.

For companies with low profitability opportunities, exercising abandonment options becomes more attractive (Hayn, 1995; Berger *et al.*, 1996; Burgstachler and Dichev, 1997). A company can choose to put its resources to a better alternative use by exercising abandonment options, which would help to reverse the adverse situation and avoid destroying value thereafter, thereby reducing the current earnings persistence. As Hayn (1995) points out, abandonment options prevent losses lasting forever and reduce the information content of losses; that is to say, the ability of current earnings to predict future performance becomes worse and thus earnings persistence decreases. In addition, according to the above analysis, industry competition, as an important corporate governance mechanism, imposes a supervisory and incentive effect on management to make them more effective in exercising abandonment options (Akdoğu and MacKay, 2009; Chen *et al.*, 2013).

According to the relationship between industry competition and abandonment

options, intense industry competition will increase the risk of being liquidated and merged for companies with low profitability opportunities. In such situations, management have a strong incentive to reduce investments timely and exercise abandonment options more effectively, which will accelerate the mean reverting effect of earnings and thus reduce earnings persistence. Conversely, a company faces fewer threats of liquidation or takeover when industry competition is low. Since management have incentives to grow their firm beyond the optimal size, like building an empire in the firm, they tend to over-invest and may not be willing to cut the investment scale. They do not exercise abandonment options in time, and the mean-reverting speed is relatively slow. For convenience, we hereinafter define this effect as the abandonment option effect of industry competition. In addition, analyses based on the industrial economics theory show that the mean reverting effect of industry competition will also accelerate the mean reverting of earnings, thus reducing earnings persistence. We expect that for companies with low profitability opportunities, both the abandonment option and the mean reverting effects of industry competition will reduce earnings persistence. Therefore, we put forward the first hypothesis of this paper:

H1: Intense industry competition will decrease earnings persistence for companies with low profitability opportunities.

In contrast, exercising growth options is more favourable for companies with high profitability opportunities (Burgstachler and Dichev, 1997). By just allowing capital to follow profitability, a company would continue to apply its current business technology to its resources by exercising growth options, which would help to expand its profitability, and the relationship between earnings and future performance would become stronger, thus increasing earnings persistence. Similarly, the above analysis shows that industry competition can improve the flexibility of management's investment decisions, prompting them to exercise growth options more effectively (Chen *et al.*, 2013).

According to the relationship between industry competition and growth options, intense industry competition can make management exercise growth options more effectively for companies with high profitability opportunities, thereby increasing earnings persistence. For convenience, we hereinafter define this effect as the growth option effect of industry competition. However, the mean reverting effect of industry competition shows that intense industry competition also drives companies' diminishing marginal returns and accelerates the mean reverting of earnings, thus reducing current earnings persistence. A positive association between industry competition and earnings persistence would indicate a stronger growth option effect. Conversely, a negative association would suggest a stronger mean reverting effect that reduces earnings

persistence. Thus, we propose the following two competing hypotheses:

H2a: If the growth option effect dominates the mean reverting effect, intense industry competition would increase earnings persistence for companies with high profitability opportunities.

H2b: If the mean reverting effect dominates the growth option effect, intense industry competition would decrease earnings persistence for companies with high profitability opportunities.

IV. Research Design

4.1 Measures of Industry Competition

The theory of industrial organisation indicates that market structure is mainly driven by market concentration, product differentiation, and industry barriers. Indicators of industry competition can be categorised into two groups: The first group, which includes the index of industry concentration (CR_n), the Herfindahl-Hirschman Index (HHI), and the Entropy Index, shows the degree of market concentration; the second one, which includes the Lerner Index, measures the results of industry competition. However, there is still no consensus in academia on which index can reflect the market structure more effectively. Karuna (2007) points out that much of the prior research has been based on a single measure of competition which only reflects the degree of industry competition from one particular dimension and thus ignores the impacts of other dimensions of competition (Harris, 1998; Engel *et al.*, 2003).

Following Chen *et al.* (2013), we employ the following two methods to measure the degree of industry competition: (1) Li's (2010) approach; (2) the HHI.

1. Li's (2010) approach

Li (2010) employs nine proxies to measure industry competition from three dimensions, namely, competition from potential entrants, competition from existing rivals, and industry profitability. Since the R&D information of listed companies in China is not disclosed in detail, we use eight proxies to construct an index of industry competition (excluding R&D) following Chen *et al.* (2013). The details of each of the three dimensions are discussed below.

Proxies for competition from potential entrants. Prior literature shows that industry-average size of plant, property, and equipment (*IND_PPE*), capital expenditures (*IND_CPX*), and market size (*IND_MKT*) are likely to be negatively associated with potential competition. *IND_PPE* is widely used to measure the setup costs required to

enter the industry; it is equal to the natural logarithm of the weighted average net value of plant, property, and equipment (PP&E) for all listed firms in the same industry, weighted by each firm's market share in that industry. It reflects the minimum investment required for new entrants. The greater the value, the higher the entrance cost and the less potential competition there will be (Karuna, 2007). Similarly, *IND_CPX* also reflects the necessary investments potential entrants have to make in order to compete with average existing rivals, and it is also positively related to entry barrier. *IND_CPX* is calculated as the natural logarithm of the weighted average of cash paid to acquire fixed assets, intangible assets, and other long-term assets of all listed firms in an industry. Li (2010) argues that, on the one hand, larger market size is usually associated with a high entry barrier as industries with large sales are usually associated with heavy investment in either PP&E or capital expenditures, and on the other hand, entry is also less harmful to the incumbent operating in a product market with higher demand. Therefore, *IND_MKT* is likely to be negatively associated with potential competition. We define *IND_MKT* as the natural logarithm of aggregate industry sales.

Proxies for competition from existing rivals. Traditional measures of industry concentration, namely the four-firm concentration ratio (*IND_CON4*), the Herfindahl-Hirschman Index (*IND_HHI*), and the total number of firms operating in an industry (*IND_NUM*), capture the competition among existing rivals as highly concentrated industries or industries with fewer firms typically face lower existing competition. In addition, given sales for a company, aggregate sales are positively associated with *IND_NUM* in the market; given price, large market demand attracts more entrants, which will in turn lead to more firms competing in the same industry (Karuna, 2007). Therefore, *IND_MKT* is also likely to be positively associated with existing competition.

Industry profitability. We select price-cost margin (*IND_MGN*) and return on assets (*IND_ROA*) to measure industry profitability: *IND_MGN* is calculated as industry aggregate sales divided by industry aggregate operating costs and *IND_ROA* as industry aggregate net income divided by industry aggregate total assets. Industry profitability reflects the extent of product differentiation or substitutability, which will effect potential competition and existing competition. On the one hand, industry profitability is an important factor for potential entrants to consider as it reflects the perceived benefits of entering the market. High profitability will attract more entrants into the industry, thus increasing potential competition (Darrough and Stoughton, 1990). On the other hand, Bresnahan (1989) argues that firms respond less to competitive moves by rivals when their products are more distinct: that is, profitability is likely to be negatively associated with existing competition. Nickell (1996) considers industry profitability as "monopoly

rents": that is, the higher the monopoly rents, the lower the degree of competition. As a result, high industry profitability is likely to reflect high potential competition or low existing competition.

To reduce the number of variables, we conduct principal component analysis on the above eight variables. We select components using the orthogonal rotation method and require the eigenvalues to be greater than one.

We select all of the Chinese listed companies from 1998 to 2009 as the initial sample and eliminate sample firms with incomplete financial data or industry classification information. We refer to the "Industry Classification Guidance for Listed Companies" published by the China Securities Regulatory Commission (CSRC) in 2001 for industry classification criteria. For the manufacturing industry (C), we adopt a two-digit code category; a one-digit code category is used for other industries. The final sample is divided into 22 industries. We first calculate eight proxies to measure industry competition by year and industry and then standardise each proxy; finally, we conduct a principal component analysis.

The results of the principal component analysis are reported in Appendix 1. Panel A shows that the first three principal components have eigenvalues greater than one and account for approximately 88.83 per cent of the total variance, thus capturing most of the original information. Panel B illustrates the rotation factor pattern. We find that the first three principal components reflect competition from existing rivals, competition from potential entrants, and industry profitability, respectively. The standardised scoring coefficients of each variable are reported in Panel C. In the following analysis, we use the negative of PC1, denoted as *EXIST-COMP*, to measure competition from existing rivals; the negative of PC2, denoted as *POTENT-COMP*, to measure competition from potential entrants; and the negative of PC3, denoted as *PROFIT-COMP*, to measure industry profitability. Larger values of *EXIST-COMP*, *POTENT-COMP*, and *PROFIT-COMP* suggest higher industry competition. Panel D reports the correlation coefficient matrix of each competition proxy. As we expected, *IND_HHI* is both significantly negatively correlated with *POTENT-COMP* and *EXIST-COMP*, indicating that the lower the industry concentration, the higher the competition.

2. Herfindahl-Hirschman Index

The HHI is the most widely used proxy for competition in the industrial organisation literature. However, in recent years, the effectiveness of the HHI has been questioned by some scholars (Karuna, 2007; Ali *et al.*, 2009). These scholars argue that when market structure is assumed to be endogenous, it is not clear whether low HHI values capture low or high competition. Since the formation of market structure is usually a relatively long process, thus market structure tends to be exogenous in the short term. Therefore,

the HHI may still be a simple and effective measure of competition. In addition, using the HHI as a measure of industry competition also helps us to make comparisons with prior research. In order to make comparisons, we denote the negative of standardised *IND_HHI* as *HHI-COMP*; a larger value of *HHI-COMP* indicates a higher level of competition.[8]

4.2 Model Specification and Variable Definition

Although earnings persistence has received extensive attention from academics and practitioners, how to accurately measure earnings persistence remains a challenging problem. Sun (2010) reviews the literature on earnings persistence from the past 30 years and finds that there are five main methods for measuring earnings persistence: (1) time series model; (2) inference based on financial statements information; (3) linear first-order autoregressive model; (4) estimate based on influential factors on earnings persistence; (5) estimate based on linear information dynamics proposed by Ohlson (1995). Each method has its own requirements on the types of data and information, and each has its own advantages, disadvantages, and applicable contexts. Among these methods, the linear first-order autoregressive model is the most widely used in international studies (Freeman *et al.*, 1982; Sloan, 1996; Fama and French, 2000; Richardson *et al.*, 2005; Frankel and Litov, 2009) and also in China (Li and Xia, 2007; Peng and Huang, 2007; Zhang and Zhao, 2008; Xu *et al.*, 2011). Therefore, we adopt this method, which is specified below, to test our hypotheses:

$$\begin{aligned} E_t = {} & \alpha_0 + \alpha_1 E_{t-1} + \alpha_2 COMPETITION_{t-1} \\ & + \alpha_3 E_{t-1} \times COMPETITION_{t-1} + \gamma \sum CONTROLS \\ & + \lambda \sum E_{t-1} \times CONTROLS + \varepsilon \end{aligned} , \quad (1)$$

where E_t is earnings, which is equal to net income divided by total assets at the end of the fiscal year t, and $COMPETITION_{t-1}$ represents the degree of competition for the industry the company belongs to. We employ two methods to measure industry competition; detailed description of the methodologies are given above. In addition, we also include several control variables (*CONTROLS*) documented in prior research in Model (1). The details of each variable are discussed below.

$SIZE_{t-1}$ measures firm size, defined as the natural logarithm of total assets at the end of the fiscal year t-1. Compared to small firms, large firms usually have better risk-taking

[8] Following Li (2010), the three principal components obtained from the principal component analysis are standardised. To improve the comparability among the competition measures, we also standardise HHI and denote the negative of the standardised *IND_HHI* as *HHI-COMP*. However, the results are qualitatively the same using the original HHI index as a proxy for industry competition.

ability, more stable profitability, and thus higher earnings persistence.

$GROWTH_{t-1}$ measures the growth opportunity, which is equal to the percentage change in sales from year t-2 to year t-1. Consistent with the prior literature (Frankel and Litov, 2009), we expect $GROWTH_{t-1}$ to be negatively correlated with earnings persistence.

VOL_{t-1} is the volatility of earnings. Following Dichev and Tang (2009) and Frankel and Litov (2009), we use the standard deviation of return on assets from year t-5 to year t-1 to measure VOL_{t-1}. On the one hand, higher volatility indicates that the operating environment of the company is more uncertain; on the other hand, it also shows that it is more difficult to match revenues with the expenses of a company, increasing the estimation error of the accrual component of earnings. Both can lead to less persistent earnings (Dechow and Dichev, 2002; Dichev and Tang, 2009; Frankel and Litov, 2009). Therefore, we expect the impact of VOL_{t-1} on earnings persistence to be negative.

$|ACC_{t-1}|$ is total accruals, defined as the absolute value of the accrual component of earnings divided by the total assets at the end of the fiscal year t-1. Sloan (1996) and a subsequent series of studies on accruals indicate that the accrual component of earnings has lower persistence than the the cash flow component of earnings. The higher the proportion of the accrual component of earnings, the lower earnings persistence will be. Following Frankel and Litov (2009), we include $|ACC_{t-1}|$ in Model (1) to control for the influence of accruals, and we expect it to be negatively associated with earnings persistence.

ΔE_{t-1} measures change in accounting performance, defined as the change in earnings in year t-1 (i.e. $E_{t-1} - E_{t-2}$). Prior studies have documented that a large change in earnings tends to experience mean reversion and thus has low earnings persistence (Brooks and Buckmaster, 1976; Freeman *et al.*, 1982; Fama and French, 2000). Our model also includes ΔE_{t-1} to control for the effect of mean reversion. We expect ΔE_{t-1} to be negatively correlated with earnings persistence.

DIV_{t-1} indicates dividend payment, which is equal to the sum of the cash dividend per share divided by the closing price at the end of the fiscal year t-1.[9] Skinner and Soltes (2011) investigate the relationship between dividend policy and earnings persistence and find that companies paying dividends have higher earnings persistence. Similarly, we expect DIV_{t-1} to be positively correlated with earnings persistence.

$|SPI_{t-1}|$ represents special items, defined as the absolute value of special items divided by total assets at the end of the fiscal year t-1. Generally speaking, special items have low earnings persistence. In line with Burgstahler *et al.* (2002), Dechow and Ge

[9] Following Li (2011), we also employ an indicator variable to measure dividend payment (*DIV* is equal to 1 if the company pays cash dividends, and 0 otherwise) and obtain similar results.

(2006), and Li (2011), we expect $|SPI_{t-1}|$ to be negatively correlated with earnings persistence.

In addition, in order to reduce the effect of the dimension and extreme value of the control variables on earnings persistence, we rank each control variable into deciles 0-9 following Frankel and Litov (2009). The final empirical model is as follows:

$$\begin{aligned} E_t = {} & \alpha_0 + \alpha_1 E_{t-1} + \alpha_2 COMPETITION_{t-1} + \alpha_3 E_{t-1} \times COMPETITION_{t-1} \\ & + \alpha_4 R\_SIZE_{t-1} + \alpha_5 E_{t-1} \times R\_SIZE_{t-1} + \alpha_6 R\_GROWTH_{t-1} \\ & + \alpha_7 E_{t-1} \times R\_GROWTH_{t-1} + \alpha_8 R\_VOL_{t-1} + \alpha_9 E_{t-1} \times R\_VOL_{t-1} \\ & + \alpha_{10} R\_|ACC_{t-1}| + \alpha_{11} E_{t-1} \times R\_|ACC_{t-1}| + \alpha_{12} R\_\Delta E_{t-1} \\ & + \alpha_{13} E_{t-1} \times R\_\Delta E_{t-1} + \alpha_{14} R\_DIV_{t-1} + \alpha_{15} E_{t-1} \times R\_DIV_{t-1} \\ & + \alpha_{16} R\_|SPI_{t-1}| + \alpha_{17} E_{t-1} \times R\_|SPI_{t-1}| + \varepsilon \end{aligned} \tag{2}$$

Following Burgstachler and Dichev (1997), Zhang (2000), and Biddle *et al.* (2001), we adopt the return on equity (q_{t-1}) of year t-1 to measure company's profitability opportunity; q_{t-1} is defined as the net income divided by book value at the beginning of the fiscal year t-1. We divide the sample into low profitability and high profitability groups according to the median value of q_{t-1} and employ Model (2) to investigate the influence of industry competition on earnings persistence in each group.

According to H1, we expect the coefficient of $E_{t-1} \times COMPETITION_{t-1}$ to be significantly negative in the low profitability group, indicating that both the mean reverting and abandonment options effects of industry competition will accelerate the mean reverting of earnings and thus reduce earnings persistence. Similarly, a significantly positive coefficient of $E_{t-1} \times COMPETITION_{t-1}$ in the high profitability group would suggest that the growth options effect of industry competition dominates, thus supporting H2a. Conversely, a significantly negative coefficient of $E_{t-1} \times COMPETITION_{t-1}$ in the high profitability group would indicate that the mean reverting effect of industry competition dominates, thus supporting H2b.

Table 1 summarises the definitions of the main variables used in this paper.

V. Empirical Results and Analysis

5.1 Sample Selection and Data Source

We select all of the A-share listed companies on the Shanghai and Shenzhen Stock Exchange as the initial sample.[10] Due to data requirements, the sample period ranges

[10] Since the Growth Enterprise Market (GEM) board began at the end of 2009 in China, the time series of financial data is limited. Moreover, the characteristics of companies listed on the GEM board are significantly different from those on the Main board. Therefore, we exclude the companies on the GEM board.

Table 1 Variable Definitions

Variable	Variable Definition
Dependent variable:	
E_t	Earnings of year t, which is equal to net income divided by total assets at the end of the fiscal year t.
Independent variables:	
$E_{t\text{-}1}$	Earnings of year t-1, which is equal to net income divided by total assets at the end of the fiscal year t-1.
POTENT-COMP	Industry competition from potential entrants, defined as the negative of PC2 from the principal component analysis of eight competition proxies (Li, 2010). The greater the value, the higher the potential competition.
EXIST-COMP	Industry competition from existing rivals, defined as the negative of PC1 from the principal component analysis of eight competition proxies (Li, 2010). The greater the value, the higher the existing competition.
PROFIT-COMP	Industry competition from product substitutability, defined as the negative of PC3 from the principal component analysis of eight competition proxies (Li, 2010). The greater the value, the worse industry profitability is and thus the higher the competition will be.
HHI-COMP	Herfindahl-Hirschman Index, defined as the negative of the standardised HHI (i.e. the sum of the squared market share of all firms in an industry). A large value of *HHI-COMP* indicates higher industry competition.
Control variables:	
$SIZE_{t\text{-}1}$	Firm size, defined as the natural logarithm of total assets at the end of the fiscal year t-1.
$GROWTH_{t\text{-}1}$	Growth opportunity, defined as the percentage change in sales from year t-2 to year t-1.
$VOL_{t\text{-}1}$	Earnings volatility, defined as the standard deviation of return on assets from year t-5 to year t-1.
$\lvert ACC_{t\text{-}1}\rvert$	Total accruals, defined as the absolute value of the accrual component of earnings divided by total assets at the end of the fiscal year t-1.
$\Delta E_{t\text{-}1}$	Change in earnings, defined as the change in earnings in year t-1, i.e. $E_{t\text{-}1} - E_{t\text{-}2}$.
$DIV_{t\text{-}1}$	Dividend payments, defined as the sum of cash dividend per share divided by the closing price at the end of the fiscal year t-1.
$\lvert SPI_{t\text{-}1}\rvert$	Special items, defined as the absolute value of special items divided by total assets at the end of the fiscal year t-1.
Grouping variable:	
$q_{t\text{-}1}$	Profitability opportunity, defined as the net income divided by book value at the beginning of fiscal year t-1.

from 1999 to 2010. Meanwhile, we apply the following process to refine our sample: First, we exclude the firms in financial industry; second, we discard the sample with negative book value; third, we eliminate sample firms with missing data; and fourth, we delete industries with less than five member firms. Panel A of Table 2 illustrates the sample selection process. After these procedures, we obtain 13,409 firm-year observations from 1999 to 2010. Panel B of Table 2 reports the distribution of the sample by industry. We find that the manufacturing industry accounts for 58.12 per cent of the total sample. Referring to the "Industry Classification Guidance for Listed Companies" published by the CSRC in 2001, we further categorise the manufacturing industry into 10 industries according to the two-digit code category. All of the data in this paper are obtained from the China Stock Market and Accounting Research (CSMAR) database.

To reduce the effect of potential outliers, we winsorise all continuous variables at the 1st and 99th percentiles by year. We also correct for standard errors, heteroscedasticity (White, 1980), and cross-sectional and time-series correlation using a two-way cluster at the firm and year levels (Petersen, 2009).

Table 2 Sample Selection and Distribution

Panel A: Sample Selection

Year	Initial sample	(1) Excluding sample in financial industry	(2) Excluding sample with negative book value	(3) Excluding sample with missing data	(4) Excluding industries with less than 5 firms	(5) Final sample
1999	923	6	13	206	12	686
2000	1,060	7	19	230	2	802
2001	1,136	7	29	212	2	886
2002	1,200	8	33	143	3	1,013
2003	1,263	10	42	130	3	1,078
2004	1,353	10	49	157	4	1,133
2005	1,358	10	78	91	8	1,171
2006	1,411	13	92	56	7	1,243
2007	1,527	31	84	167	3	1,242
2008	1,602	33	70	206	8	1,285
2009	1,660	35	77	151	0	1,397
2010	1,888	39	69	307	0	1,473
Total	16,381	209	655	2,056	52	13,409

Panel B: Sample Distribution by Industry					
Industry	Num.	%	Industry	Num.	%
A. Farming, forestry, animal husbandry, and fishing	242	1.80	D. Electricity, gas, and water production and supply	587	4.38
B. Mining	216	1.61	E. Construction	195	1.45
C. Manufacturing	7791	58.12	F. Transportation and warehousing	562	4.19
-C0. Food and beverage	634	4.73	G. Information technology	685	5.11
-C1. Textile, apparel, and fur	536	4.00	H. Wholesale and retail trades	1079	8.05
-C2. Lumber and furniture	36	0.27	J. Real estate	857	6.39
-C3. Paper and printing	249	1.86	K. Social services	377	2.81
-C4. Petroleum, chemical, rubber, and plastics	1557	11.61	L. Communication	56	0.42
-C5. Electronics	448	3.34	M. Comprehensive	762	5.68
-C6. Metal and non-metals	1251	9.33			
-C7. Machinery, equipment, and instruments	2216	16.53			
-C8. Medicine and biological products	823	6.14			
-C9 Other manufacturing	41	0.31	**Total**	13409	100.0

5.2 Descriptive Statistics

Table 3 reports the descriptive statistics for the main variables. We find that the mean (median) value of E_t is 2.34 per cent (3.00 per cent) and the standard deviation is 7.72 per cent, which indicates that earnings vary across firms. The mean values of VOL_{t-1} and $|ACC_{t-1}|$ are 3.55 per cent and 6.46 per cent, respectively. These results are similar to those of Dichev and Tang (2009). The mean (median) value of ΔE_{t-1} is -0.49 per cent (-0.27 per cent), which suggests that the accounting performance of listed companies was slightly on a downward trend during the sample period. The mean (median) value of DIV_{t-1} is 0.74 per cent (0.09 per cent), indicating that the dividend payout ratio of listed companies is very low in China. In addition, Table 3 illustrates that all of the variables are likely to follow a normal distribution. It should be noted that the measures of industry competition (i.e. *POTENT-COMP*, *EXIST-COMP*, *PROFIT-COMP*, and *HHI-COMP*) are standardised at the industry level.

Table 3 Descriptive Statistics

Variables	Mean	Std.	Min	Q1	Median	Q3	Max
E_t	0.0234	0.0772	-0.6620	0.0091	0.0300	0.0557	0.2225
E_{t-1}	0.0290	0.0631	-0.2932	0.0102	0.0324	0.0583	0.2204
$SIZE_{t-1}$	21.264	1.0325	19.026	20.557	21.138	21.851	25.421
$GROWTH_{t-1}$	0.2192	0.6086	-0.8252	-0.0317	0.1302	0.3225	6.9147
VOL_{t-1}	0.0355	0.0403	0.0004	0.0111	0.0215	0.0426	0.2693
$\|ACC_{t-1}\|$	0.0646	0.0605	0.0000	0.0211	0.0470	0.0879	0.3896
ΔE_{t-1}	-0.0049	0.0619	-0.3179	-0.0206	-0.0027	0.0102	0.2822
DIV_{t-1}	0.0074	0.0115	0.0000	0.0000	0.0009	0.0111	0.0900
$\|SPI_{t-1}\|$	0.0089	0.0178	0.0000	0.0006	0.0027	0.0086	0.1803
POTENT-COMP	-0.1969	0.8051	-3.5973	-0.7283	-0.1160	0.3836	1.9684
EXIST-COMP	0.7183	0.7956	-2.2881	0.1755	0.8398	1.1616	1.9636
PROFIT-COMP	0.0216	0.9027	-3.0438	-0.3893	0.1405	0.6227	3.2181
HHI-COMP	0.4415	0.6118	-3.9017	0.3719	0.5619	0.7246	1.0182

5.3 Empirical Results

Table 4 reports the main results of this paper.[11] Specifically, column (1) provides the regression results of Model (2) for the full sample where industry competition is measured by *POTENT-COMP*. Controlling for firm size, growth opportunity, earnings volatility, total accruals, change in earnings, dividend policy, and special terms, the coefficient of $E_{t-1}\times COMPETITION_{t-1}$ is negative but not significant (with a coefficient of -0.0311 and a *t*-statistic of -1.58), suggesting that intense industry competition reduces earnings persistence for the full sample. In addition, except for firm size and change in earnings, the interaction terms of the control variables and E_{t-1} are significant at the 10 per cent level, and the signs on the coefficients are consistent with our predictions.

Column (2) of Panel A reports the results pertaining to H1 obtained by adopting *POTENT-COMP* to measure industry competition. We find that the coefficient of $E_{t-1}\times COMPETITION_{t-1}$ is significantly negative at the 5 per cent level (with a coefficient of 0.0885 and a *t*-statistic of 2.40) for the low profitability group. The result indicates that for companies with low profitability, both the mean reverting and abandonment options

[11] Prior literature shows that the company with high profitability tends to have higher earnings persistence than the company with low profitability. However, our results in Table 4 illustrate that the coefficients of E_{t-1} in the high profitability group are less than those of the low profitability group and the coefficient of E_{t-1} is greater than 1; this is mainly because we add other control variables in the form of interaction terms into Model (2). Actually, considering the simple AR (1) model (i.e. $E_t = \alpha_0 + \alpha_1 E_{t-1} + \varepsilon$), the coefficient of α_1 which represents earnings persistence is 0.6157 for the full sample, 0.7588 for the high profitability group, and 0.4136 for the low profitability group; these results are consistent with previous research.

effects of industry competition will accelerate the mean reverting of earnings and thus reduce earnings persistence, which is consistent with H1.

Column (3) of Panel A reports the results pertaining to H2 obtained by adopting *POTENT-COMP* to measure industry competition. The result shows that for the high profitability group, the coefficient of $E_{t-1}\times COMPETITION_{t-1}$ is significantly positive at the 1 per cent level (with a coefficient of 0.0658 and a *t*-statistic of 3.60), suggesting that the growth options effect of industry competition is greater than the mean reverting effect, supporting H2a. In other words, intense industry competition will motivate management to exercise growth options more effectively and offset the mean reverting effect for high profitability enterprises and eventually increase the persistence of earnings.

Similarly, Panels B, C, and D of Table 4 report the results where industry competition is measured by *EXIST-COMP*, *PROFIT-COMP*, and *HHI-COMP*, respectively. These results show that in the full sample, the coefficients of $E_{t-1}\times COMPETITION_{t-1}$ are significantly negative, which is consistent with Cheng (2005). No matter which proxy is used to measure industry competition, the results are similar to those in Panel A except that the results for the high profitability group are not significant when using *EXIST-COMP* to measure competition. Overall, the results in Table 4 illustrate that for low profitability companies, industry competition will encourage management to exercise abandonment options more effectively and thus reduce earnings persistence. In contrast, for companies with high profitability, industry competition will encourage management to exercise growth options more effectively, thereby increasing earnings persistence. These results qualitatively support H1 and H2a. Our study provides evidence from the perspective of fundamental accounting attributes which supports the prediction that the influences of industry competition on management's exercise of real options will be reflected in the earnings pattern. In other words, industry competition helps management to exercise growth and abandonment options more effectively and thus affects earnings persistence.

5.4 Additional Analysis

The above empirical results indicate that industry competition will encourage management to exercise growth and abandonment options, thus affecting earnings persistence. In addition, much of the prior research has shown that earnings persistence is one of the most important factors that determine the earnings response coefficient (ERC) (Kormendi and Lipe, 1987; Easton and Zmijewski, 1989; Collins and Kothari, 1989).[12] According to the market efficiency hypothesis, investors should be able to identify the

[12] Kormendi and Lipe (1987), Easton and Zmijewski (1989), and Collins and Kothari (1989) suggest that the four main factors that determine ERC are earnings persistence, systemic risk, growth opportunity, and risk-free rate.

Table 4 Influence of Industry Competition on Earnings Persistence

Dependent variable: E_t		Panel A: *COMPETITION = POTENT-COMP*			Panel B: *COMPETITION = EXIST-COMP*			Panel C: *COMPETITION = PROFIT-COMP*			Panel D: *COMPETITION = HHI-COMP*		
		Full sample	Low profitability	High profitability	Full sample	Low profitability	High profitability	Full sample	Low profitability	High profitability	Full sample	Low profitability	High profitability
		(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
Constant	?	-0.0487***	-0.0480***	-0.0214***	-0.0512***	-0.0497***	-0.0211***	-0.0478***	-0.0489***	-0.0230***	-0.0505***	-0.0492***	-0.0187***
		(-9.21)	(-8.07)	(-3.48)	(-9.50)	(-8.36)	(-3.37)	(-9.14)	(-8.21)	(-3.70)	(-9.40)	(-8.35)	(-2.95)
E_{t-1}	+	1.3379***	1.8675***	0.9935***	1.3718***	1.9039***	0.9974***	1.3402***	1.9188***	1.0558***	1.3707***	1.9276***	0.9769***
		(16.66)	(9.85)	(11.73)	(16.41)	(9.82)	(11.51)	(16.93)	(10.04)	(12.28)	(16.56)	(10.07)	(11.24)
$COMPETITION_{t-1}$	?	0.0021	0.0019	-0.0040***	0.0031**	0.0027**	-0.0012	0.0070***	0.0066***	0.0011	0.0034*	0.0043**	-0.0060***
		(1.64)	(1.53)	(-3.02)	(2.57)	(2.30)	(-0.98)	(6.39)	(5.74)	(0.86)	(1.96)	(2.39)	(-4.20)
E_{t-1}×$COMPETITION_{t-1}$	**+/-**	**-0.0311**	**-0.0885****	**0.0658*****	**-0.0471****	**-0.0762****	**0.0170**	**-0.0310***	**-0.1138*****	**0.0576*****	**-0.0603****	**-0.2037*****	**0.0546*****
		(-1.58)	**(-2.40)**	**(3.60)**	**(-2.50)**	**(-2.45)**	**(0.99)**	**(-1.85)**	**(-4.21)**	**(3.11)**	**(-2.48)**	**(-3.25)**	**(3.03)**
R_SIZE_{t-1}	?	0.0003	0.0004	0.0003	0.0002	0.0004	0.0004	0.0002	0.0005	0.0004	0.0002	0.0003	0.0003
		(0.68)	(1.07)	(0.54)	(0.59)	(1.00)	(0.81)	(0.61)	(1.40)	(0.86)	(0.56)	(0.95)	(0.66)
E_{t-1}×R_SIZE_{t-1}	-	0.0028	-0.0051	0.0016	0.0032	-0.0024	-0.0013	0.0009	-0.0073	-0.0056	0.0028	-0.0029	-0.0007
		(0.43)	(-0.49)	(0.24)	(0.49)	(-0.23)	(-0.18)	(0.14)	(-0.71)	(-0.80)	(0.44)	(-0.28)	(-0.11)
R_GROWTH_{t-1}	?	0.0018***	0.0016***	0.0007	0.0018***	0.0016***	0.0007	0.0017***	0.0015***	0.0008*	0.0018***	0.0016***	0.0007
		(5.15)	(3.97)	(1.40)	(5.04)	(3.92)	(1.59)	(5.01)	(3.80)	(1.68)	(5.12)	(3.95)	(1.58)
E_{t-1}×R_GROWTH_{t-1}	-	-0.0127**	-0.0324***	0.0020	-0.0121**	-0.0298***	0.0003	-0.0117**	-0.0307***	0.0002	-0.0128**	-0.0304***	0.0003
		(-2.21)	(-3.51)	(0.29)	(-2.08)	(-3.11)	(0.04)	(-2.03)	(-3.32)	(0.04)	(-2.21)	(-3.22)	(0.05)
R_VOL_{t-1}	?	0.0005	-0.0004	0.0009**	0.0005	-0.0005	0.0009*	0.0006*	-0.0002	0.0010**	0.0005	-0.0005	0.0009*
		(1.55)	(-0.92)	(1.98)	(1.38)	(-1.04)	(1.88)	(1.74)	(-0.42)	(2.07)	(1.40)	(-1.10)	(1.88)
E_{t-1}×R_VOL_{t-1}	-	-0.0286***	-0.0524***	-0.0272***	-0.0281***	-0.0499***	-0.0266***	-0.0302***	-0.0609***	-0.0295***	-0.0283***	-0.0489***	-0.0264***
		(-5.09)	(-3.23)	(-4.18)	(-4.98)	(-3.01)	(-4.01)	(-5.39)	(-3.73)	(-4.51)	(-5.02)	(-2.96)	(-3.99)

Table 4 Influence of Industry Competition on Earnings Persistence (Continued)

Dependent variable: E_t		Panel A: *COMPETITION = POTENT-COMP*			Panel B: *COMPETITION = EXIST-COMP*			Panel C: *COMPETITION = PROFIT-COMP*			Panel D: *COMPETITION = HHI-COMP*		
		Full sample	Low profitability	High profitability	Full sample	Low profitability	High profitability	Full sample	Low profitability	High profitability	Full sample	Low profitability	High profitability
		(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
$R\_\|ACC_{t-1}\|$	?	0.0032***	0.0024***	0.0012***	0.0032***	0.0025***	0.0011***	0.0031***	0.0024***	0.0010**	0.0032***	0.0024***	0.0011***
		(9.33)	(5.97)	(2.84)	(9.47)	(6.11)	(2.61)	(9.22)	(5.98)	(2.40)	(9.38)	(5.92)	(2.68)
$E_{t-1}\times R\_\|ACC_{t-1}\|$	-	-0.0578***	-0.0780***	-0.0217***	-0.0582***	-0.0797***	-0.0209***	-0.0581***	-0.0797***	-0.0210***	-0.0579***	-0.0781***	-0.0214***
		(-9.84)	(-5.64)	(-3.65)	(-9.94)	(-5.73)	(-3.42)	(-9.97)	(-5.76)	(-3.45)	(-9.88)	(-5.64)	(-3.52)
$R\_\Delta E_{t-1}$	?	0.0006*	0.0008**	0.0008	0.0006*	0.0008**	0.0008*	0.0006*	0.0008**	0.0008*	0.0006*	0.0008**	0.0008*
		(1.87)	(2.08)	(1.62)	(1.90)	(2.01)	(1.71)	(1.77)	(2.02)	(1.82)	(1.94)	(2.07)	(1.66)
$E_{t-1}\times R\_\Delta E_{t-1}$	-	-0.0004	-0.0400***	-0.0081	-0.0003	-0.0377***	-0.0089	0.0004	-0.0377***	-0.0097	-0.0004	-0.0379***	-0.0081
		(-0.10)	(-4.35)	(-1.24)	(-0.06)	(-4.23)	(-1.35)	(0.09)	(-4.13)	(-1.50)	(-0.11)	(-4.30)	(-1.23)
R_DIV_{t-1}	?	0.0029***	0.0054***	0.0009*	0.0030***	0.0052***	0.0010**	0.0029***	0.0055***	0.0012**	0.0029***	0.0051***	0.0010**
		(7.18)	(7.58)	(1.86)	(7.25)	(7.27)	(2.01)	(7.22)	(8.01)	(2.41)	(7.24)	(7.13)	(1.98)
$E_{t-1}\times R\_DIV_{t-1}$	+	0.0034	-0.0608***	0.0211***	0.0027	-0.0556**	0.0193***	0.0029	-0.0635***	0.0144**	0.0027	-0.0513**	0.0196***
		(0.50)	(-2.63)	(3.13)	(0.39)	(-2.38)	(2.80)	(0.43)	(-2.82)	(2.05)	(0.39)	(-2.19)	(2.85)
$R\_\|SPI_{t-1}\|$	?	0.0010**	0.0007**	-0.0002	0.0010***	0.0007**	-0.0002	0.0010***	0.0006*	-0.0002	0.0010***	0.0007**	-0.0002
		(2.56)	(2.00)	(-0.42)	(2.70)	(2.05)	(-0.49)	(2.60)	(1.82)	(-0.45)	(2.70)	(2.07)	(-0.50)
$E_{t-1}\times\|R\_SPI_{t-1}\|$	-	-0.0321***	-0.0394***	-0.0124**	-0.0321***	-0.0402***	-0.0123**	-0.0310***	-0.0367***	-0.0117**	-0.0323***	-0.0415***	-0.0123**
		(-4.90)	(-3.82)	(-2.02)	(-4.94)	(-3.89)	(-2.06)	(-4.88)	(-3.72)	(-2.03)	(-4.94)	(-3.99)	(-2.06)
N		13,409	6,701	6,708	13,409	6,701	6,708	13,409	6,701	6,708	13,409	6,701	6,708
Adj-R^2		0.3166	0.1540	0.3377	0.3173	0.1539	0.3357	0.3212	0.1602	0.3454	0.3170	0.1552	0.3370

Note: *t*-statistics are presented in parentheses below the coefficients and are corrected for heteroscedasticity (White, 1980) and cross-sectional and time-series correlation using a two-way cluster at the firm and year levels (Petersen, 2009). ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively. All variables are as defined in Table 1.

influence of industry competition on earnings persistence and then incorporate it in the relationship between stock price change and earnings change (i.e. ERC). Therefore, as an additional test, we further investigate the influence of industry competition on ERC. It will be helpful to confirm the influence of industry competition on earnings persistence from the perspective of investors. We therefore expect that for companies with low profitability, the influence of industry competition on abandonment options will reduce ERC; in contrast, for companies with high profitability, the positive effect of industry competition on growth options will improve ERC. Following Francis and Ke (2006) and Ng *et al.* (2008), we employ the following Model (3) to investigate the relationship between industry competition and ERC:

$$\begin{aligned} CAR_t = {} & \alpha_0 + \alpha_1 UE_t + \alpha_2 COMPETITION_t \\ & + \alpha_3 UE_t \times COMPETITION_t + \gamma \sum CONTROLS \\ & + \lambda \sum UE_t \times CONTROLS + \varepsilon \end{aligned} , \quad (3)$$

where *CAR* is defined as the market-adjusted cumulative abnormal return over a 3-day window around the earnings announcement date (i.e. *CAR* [-1, 1]) and UE_t represents the unexpected earnings of the company in year *t*, which is equal to $(EPS_t - EPS_{t-1})/Price_t$. Following Francis and Ke (2006) and Ng *et al.* (2008), we also include other control variables in Model (3): for example, firm size (*SIZE*), growth opportunity (*GROWTH*), earnings volatility (*VOL*), financial leverage (*LEVERAGE*), market beta (*BETA*), volatility of stock return (*STDRET*), and special items (*SPI*). *LEVERAGE* is defined as the ratio of total liabilities to total assets. *STDRET* represents the standard deviation of daily stock returns over a 90-day window ending 6 days prior to the earnings announcement date (i.e. [-95, -6]). *BETA* is calculated from monthly stock returns over a 12-month window using the capital asset pricing model. Other variables are as defined in Model (1). Consistent with H1, we expect that the coefficient of $UE_t \times COMPETITION_t$ in Model (3) will be significantly negative for the low profitability group. Similarly, consistent with H2a, we expect that the coefficient of $UE_t \times COMPETITION_t$ in Model (3) will be significantly positive for the high profitability group. In other words, the influence of industry competition on earnings persistence will be reflected in the market reaction to changes in earnings.

Table 5 provides the results of the additional tests.[13] Specifically, each panel of column (1) reports the results for the full sample. We find that the coefficients of

[13] It should be noted that in Table 5, the coefficients of UE_t are not significant, mainly because we add other control variables in the form of interaction terms to Model (3). If the interaction terms of the control variables are not included, the coefficients of UE_t are significantly positive for the full sample and the coefficients of UE_t for the low profitability group are less than those for the high profitability group, which is consistent with the findings of Wang *et al.* (2004).

Table 5 The Influence of Industry Competition on Earnings Response Coefficient

Dependent variable: *CAR* [-1,1]	**Panel A: *COMPETITION = POTENT-COMP***			**Panel B: *COMPETITION = EXIST-COMP***			**Panel C: *COMPETITION = PROFIT-COMP***			**Panel D: *COMPETITION = HHI-COMP***		
	Full sample	Low profitability	High profitability	Full sample	Low profitability	High profitability	Full sample	Low profitability	High profitability	Full sample	Low profitability	High profitability
	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
UE_t	0.0244	-0.0063	-0.0036	0.0491	-0.0275	0.0370	0.0293	-0.0018	0.0097	0.0508	-0.0328	0.0661
	(0.35)	(-0.08)	(-0.03)	(0.71)	(-0.24)	(0.44)	(0.42)	(-0.02)	(0.08)	(0.73)	(-0.28)	(0.77)
$COMPETITION_t$	0.0012*	0.0014	0.0003	0.0001	0.0003	-0.0012	-0.0001	-0.0006	0.0002	0.0005	0.0023	-0.0018*
	(1.93)	(1.56)	(0.44)	(0.08)	(0.35)	(-1.49)	(-0.18)	(-0.80)	(0.26)	(0.65)	(1.65)	(-1.87)
UE_t×$COMPETITION_t$	**-0.0227****	**-0.0295****	**0.0448****	**-0.0279****	**-0.0425*****	**0.0578****	**-0.0248*****	**-0.0289*****	**-0.0190**	**-0.0402***	**-0.0843*****	**0.0761*****
	(-2.21)	**(-2.46)**	**(2.13)**	**(-2.35)**	**(-3.42)**	**(2.13)**	**(-3.04)**	**(-3.29)**	**(-0.88)**	**(-1.95)**	**(-3.38)**	**(2.64)**
∑*CONTROLS*	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
∑UE_t×*CONTROLS*	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	13,137	6,565	6,572	13,137	6,565	6,572	13,137	6,565	6,572	13,137	6,565	6,572
Adj-R^2	0.0079	0.0094	0.0025	0.0077	0.0096	0.0029	0.0078	0.0091	0.0024	0.0075	0.0101	0.0031

Note: *t*-statistics are presented in parentheses below the coefficients and are corrected for heteroscedasticity (White, 1980) and cross-sectional and time-series correlation using a two-way cluster at the firm and year levels (Petersen, 2009). ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively. All variables are as defined in Table 1.

$UE_t \times COMPETITION_t$ are all significantly negative, which is consistent with the results for the full sample in Table 4. Each panel of column (2) reports the results for companies with low profitability. The results show that the coefficients of $UE_t \times COMPETITION_t$ are significantly negative at the 1 per cent or 5 per cent level, indicating that industry competition reduces the ERC, thus supporting H1. Similarly, each panel of column (3) illustrates the results for companies with high profitability. Except for *PROFIT-COMP* in Panel C, the coefficients of $UE_t \times COMPETITION_t$ based on other measures of industry competition in Model (4) are significantly positive. These results indicate that industry competition improves ERC, which is consistent with H2a. Overall, the ERC shows a similar pattern to earnings persistence, which further supports the finding of this paper that change in earnings persistence may be related to industry competition.

VI. Robustness Tests

To provide additional assurance of the robustness of our results, we also perform the following sensitivity tests.

6.1 Alternative Measures of Control Variables

In the above analyses, we ranked control variables into deciles 0-9 following Frankel and Litov (2009) to reduce the effect of the extreme value of control variables. However, this method also sacrifices part of the precision of the original control variables. In addition, we winsorised all of the continuous variables at the 1st and 99th percentiles, which reduces the effect of potential outliers. Therefore, we also replicate our main hypotheses with the original value of the control variables. The alternative model specification is as follows:

$$\begin{aligned} E_t = {} & \alpha_0 + \alpha_1 E_{t-1} + \alpha_2 COMPETITION_{t-1} + \alpha_3 E_{t-1} \times COMPETITION_{t-1} \\ & + \alpha_4 SIZE_{t-1} + \alpha_5 E_{t-1} \times SIZE_{t-1} + \alpha_6 GROWTH_{t-1} \\ & + \alpha_7 E_{t-1} \times GROWTH_{t-1} + \alpha_8 VOL_{t-1} + \alpha_9 E_{t-1} \times VOL_{t-1} \\ & + \alpha_{10} |ACC_{t-1}| + \alpha_{11} E_{t-1} \times |ACC_{t-1}| + \alpha_{12} \Delta E_{t-1} \\ & + \alpha_{13} E_{t-1} \times \Delta E_{t-1} + \alpha_{14} DIV_{t-1} + \alpha_{15} E_{t-1} \times DIV_{t-1} \\ & + \alpha_{16} |SPI_{t-1}| + \alpha_{17} E_{t-1} \times |SPI_{t-1}| + \varepsilon \end{aligned} \quad (4)$$

Table 6 reports the corresponding results. For simplicity, we only provide the regression results of key variables (the other robustness tests are similar). Specifically, Panels A, B, C, and D in Table 6 report the results obtained by adopting *POTENT-COMP*, *EXIST-COMP*, *PROFIT-COMP*, and *HHI-COMP* respectively to measure the degree of industry competition. We find that the results in Table 6 are similar to those in Table 4 and the main conclusions still hold.

Table 6 Alternative Measures of Control Variables

	Panel A:		**Panel B:**		**Panel C:**		**Panel D:**	
Dependent variable:	***COMPETITION = POTENT-COMP***		***COMPETITION = EXIST-COMP***		***COMPETITION = PROFIT-COMP***		***COMPETITION = HHI-COMP***	
E_t	Low profitability	High profitability	Low profitability	High profitability	Low profitability	High profitability	Low profitability	High profitability
	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
E_{t-1}	1.4819**	0.5296	1.4627**	0.6162*	1.6246**	0.9785**	1.5173**	0.5820
	(2.39)	(1.45)	(2.32)	(1.65)	(2.57)	(2.52)	(2.46)	(1.56)
$COMPETITION_{t-1}$	0.0018	-0.0036***	0.0025**	-0.0010	0.0065***	0.0009	0.0040**	-0.0053***
	(1.46)	(-2.70)	(2.07)	(-0.82)	(5.69)	(0.76)	(2.21)	(-3.77)
E_{t-1}×$COMPETITION_{t-1}$	**-0.0819****	**0.0629*****	**-0.0758****	**0.0139**	**-0.1164*****	**0.0592*****	**-0.2010*****	**0.0460*****
	(-2.21)	**(3.67)**	**(-2.47)**	**(0.78)**	**(-4.07)**	**(3.57)**	**(-3.21)**	**(2.61)**
$\sum CONTROLS$	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
$\sum UE_t \times CONTROLS$	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	6,701	6,708	6,701	6,708	6,701	6,708	6,701	6,708
Adj-R^2	0.1381	0.3601	0.1382	0.3582	0.1447	0.3675	0.1394	0.3592

Note: *t*-statistics are presented in parentheses below the coefficients and are corrected for heteroscedasticity (White, 1980) and cross-sectional and time-series correlation using a two-way cluster at the firm and year levels (Petersen, 2009). ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively. All variables are as defined in Table 1.

Table 7 Alternative Classification of Profitability Opportunity

	Panel A:		**Panel B:**		**Panel C:**		**Panel D:**	
Dependent variable:	***COMPETITION = POTENT-COMP***		***COMPETITION = EXIST-COMP***		***COMPETITION = PROFIT-COMP***		***COMPETITION = HHI-COMP***	
E_t	Bottom 33%	Top 33%	Bottom 33%	Top 33%	Bottom 33%	Top 33%	Bottom 33%	Top 33%
	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
E_{t-1}	1.6650***	1.0165***	1.6915***	1.0070***	1.7360***	1.0696***	1.7254***	0.9783***
	(6.04)	(10.17)	(6.06)	(9.89)	(6.18)	(10.45)	(6.22)	(9.48)
$COMPETITION_{t-1}$	0.0023	-0.0038**	0.0011	-0.0028*	0.0066***	0.0016	0.0016	-0.0092***
	(1.38)	(-2.16)	(0.66)	(-1.72)	(4.70)	(0.89)	(0.70)	(-4.66)
E_{t-1}×$COMPETITION_{t-1}$	**-0.0837***	**0.0652*****	**-0.0840****	**0.0336***	**-0.1148*****	**0.0532****	**-0.2172*****	**0.0822*****
	(-1.88)	**(3.06)**	**(-2.40)**	**(1.66)**	**(-3.71)**	**(2.44)**	**(-2.99)**	**(3.76)**
$\sum CONTROLS$	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
$\sum UE_t \times CONTROLS$	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	4,465	4,469	4,465	4,469	4,465	4,469	4,465	4,469
Adj-R^2	0.1127	0.3298	0.1124	0.3276	0.1200	0.3388	0.1139	0.3299

Note: *t*-statistics are presented in parentheses below the coefficients and are corrected for heteroscedasticity (White, 1980) and cross-sectional and time-series correlation using a two-way cluster at the firm and year levels (Petersen, 2009). ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively. All variables are as defined in Table 1.

Table 8 Karuna's (2007) Approach to Measuring Industry Competition

	Panel A:		**Panel B:**		**Panel C:**	
Dependent variable:	***COMPETITION = ENTCOST***		***COMPETITION = MKTSIZE***		***COMPETITION = DIFF***	
E_t	Low profitability	High profitability	Low profitability	High profitability	Low profitability	High profitability
	(1)	(2)	(1)	(2)	(1)	(2)
E_{t-1}	1.8683***	0.9894***	1.8522***	1.0237***	1.8880***	1.0333***
	(9.86)	(11.58)	(9.65)	(12.06)	(9.94)	(11.81)
$COMPETITION_{t-1}$	0.0011	-0.0035***	-0.0012	-0.0058***	0.0052***	0.0003
	(0.88)	(-2.61)	(-0.90)	(-3.29)	(5.28)	(0.24)
E_{t-1}×$COMPETITION_{t-1}$	**-0.0827****	**0.0522*****	**-0.0018**	**0.0887*****	**-0.0977*****	**0.0417****
	(-2.20)	**(2.97)**	**(-0.05)**	**(3.19)**	**(-4.26)**	**(2.38)**
$\sum CONTROLS$	Yes	Yes	Yes	Yes	Yes	Yes
$\sum UE_t \times CONTROLS$	Yes	Yes	Yes	Yes	Yes	Yes
N	6,701	6,708	6,701	6,708	6,701	6,708
Adj-R^2	0.1537	0.3368	0.1518	0.3370	0.1571	0.3397

Note: *t*-statistics are presented in parentheses below the coefficients and are corrected for heteroscedasticity (White, 1980) and cross-sectional and time-series correlation using a two-way cluster at the firm and year levels (Petersen, 2009). ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively. All variables are as defined in Table 1.

6.2 Alternative Classification of Profitability Opportunity

In the above analyses, we divided the sample into two groups according to the median value of $q_{t\text{-}1}$. Companies with $q_{t\text{-}1}$ less than the median value of the sample were classified as the low profitability group, while the others were classified as the high profitability group. In order to examine whether the main conclusion is affected by different classification criteria, we employ an alternative classification of profitability opportunity. Specifically, $q_{t\text{-}1}$ is first sorted on the basis of magnitude into three groups by year, and then we denote the highest group (i.e. top 33 per cent) as high profitability and the lowest group (i.e. bottom 33 per cent) as low profitability. We re-examine our main hypotheses using Model (2). Table 7 reports the regression results. Similar to Table 4, the coefficient of $E_{t\text{-}1}\times COMPETITION_{t\text{-}1}$ is significantly negative in the low profitability group and significantly positive in the high profitability group, providing further support for H1 and H2a.

6.3 Alternative Measures of Industry Competition

Apart from the measures of industry competition used in the above, Karuna (2007) develops competition measures based on three dimensions including product differentiation, market size, and entry costs. To enhance the robustness of our results, we also employ Karuna's (2007) approach to measure industry competition.[14] Specifically, we denote the negative of "Product Differentiation" as *DIFF*, the negative of "Market Size" as *MKTSIZE*, and the "Entry Costs" as *ENTCOST*, respectively. Larger values of *DIFF*, *MKTSIZE*, and *ENTCOST* suggest higher competition.

Table 8 reports the results. Firstly, from the re-test results of H1 based on the low profitability group in column (1), we find that except in the case of using *MKTSIZE* to measure competition in Panel B where the coefficient of $E_{t\text{-}1}\times COMPETITION_{t\text{-}1}$ is insignificant, the coefficients of $E_{t\text{-}1}\times COMPETITION_{t\text{-}1}$ are significantly negative at the 5 per cent level in Panels A and C, where *ENTCOST* and *DIFF* are used to measure industry competition respectively. These results qualitatively support H1. Secondly, from the re-test results of H2 based on the high profitability group in column (2), we find that the coefficients of $E_{t\text{-}1}\times COMPETITION_{t\text{-}1}$ are significantly positive at the 1 per cent or 5 per cent level for Karuna's (2007) competition measures, which supports H2a. Overall, there is no material change in the main results using alternative measures of industry

[14] Following Karuna (2007), we define the three dimensions of competition as follows: Product Differentiation is calculated as industry aggregate sales divided by industry aggregate operating costs; Market Size is measured as the natural logarithm of aggregate industry sales; Entry Costs is calculated as the natural logarithm of the weighted average net value of PP&E for all listed companies in the sample industry, weighted by each firm's market share in this industry. Consistent with above analyses, we also standardise the three dimensions of competition at the industry level.

competition, which also suggests that the two methods we used (Li's (2010) approach and the HHI) to measure industry competition are valid.

6.4 Endogeneity Problem

On the one hand, market structure influences management's exercise of real options and reflects fundamental accounting attributes; on the other hand, Li's (2010) competition measures include proxies for profitability, such as *IND_MGA* and I*ND_ROA*, which may make the economic consequences of management's exercise of real options affect the market structure. Therefore, market structure may not be exogenous, and the resulting endogenous issues may affect the reliability of conclusions. To diminish the endogeneity problem, we employ the average value of annual competition from 1998 to 2009 as the proxy for industry competition. The results are qualitatively the same.

VII. Conclusion and Limitations

7.1 Conclusions and Implications

Using A-share listed companies in China from 1999 to 2010, this paper examines the influence of industry competition on earnings persistence from the perspective of the real options theory. The real options theory suggests that the influence of industry competition on earnings persistence may be nonlinear. Moreover, the relationship may vary with operating efficiency or profitability opportunity. For companies with low profitability, exercising abandonment options becomes more attractive and industry competition can encourage management to exercise abandonment options more effectively, thereby reducing earnings persistence. In addition, the mean reverting effect of industry competition will also accelerate the reversal of earnings, thus reducing earnings persistence. In contrast, industry competition has two opposite effects for companies with high profitability. On the one hand, it can motivate management to exercise growth options, thereby increasing earnings persistence; on the other hand, diminishing marginal returns caused by intense industry competition may also accelerate the mean reverting of earnings, thus reducing earnings persistence. The empirical results show that intense industry competition reduces earnings persistence for companies with low profitability and increases earnings persistence for those with high profitability, suggesting that the growth option effect of industry competition will offset the mean reverting effect. Additional tests reveal that the influence of industry competition on earnings persistence is also reflected in the relationship between stock price change and earnings change. In other words, the ERC shows a similar pattern to earnings persistence.

The results of this paper indicate that intense industry competition can motivate

management to exercise growth and abandonment options more effectively and thus affect earnings persistence. Our empirical evidence helps us to understand how industry competition influences management to exercise real options and its economic consequences from the perspective of fundamental accounting attributes. Moreover, examining the relationship between industry competition and earnings persistence on the basis of real options theory will be useful in helping investors to better understand earnings patterns and valuations and further guide investment decision-making.

7.2 Limitations

(1) Issues of industry competition measures. We employ a set of industry competition measures from different dimensions to improve the effectiveness of the measures as much as possible. However, there is still no consensus in the literature as to which measure can reflect the market structure more effectively. In this paper, we calculate competition measures on the basis of listed companies, without considering the influence of private companies. Therefore, the industry representative of listed companies may affect the conclusions of this paper.

(2) Diversification may affect the effectiveness of industry competition measures. Since industry segment reports disclosed by listed companies are incomplete (mainly contain revenues, operating costs, and profits), this limits us to measuring industry competition on the basis of segment-level data. Moreover, the CSRC industry classification may not accurately reflect the competitive environment of diversified enterprises.

(3) It is hard to distinguish whether the finding that industry competition reduces the earnings persistence of low profitability companies is due to the abandonment option effect or the mean reverting effect in our H1. As indicated in the above theoretical analysis, for companies with low profitability, both effects would lead to a reduction in earnings persistence.

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Appendix 1 Principal Components Analysis Results

Panel A: Eigenvalues of Correlation Matrix

Principal Components	Eigenvalue	Difference in Eigenvalue	Variance Explained	Cumulative Variance
PC1	2.9435	0.1826	36.79%	36.79%
PC2	2.7609	1.3585	34.51%	71.30%
PC3	1.4024	0.9797	17.53%	88.83%
PC4	0.4227	0.1921	5.28%	94.12%
PC5	0.2307	0.0910	2.88%	97.00%
PC6	0.1397	0.0714	1.75%	98.75%
PC7	0.0683	0.0364	0.85%	99.60%
PC8	0.0319		0.40%	100.0%

Raw Variables	Panel B: Rotated Factor Pattern			Panel C: Standardised Scoring Coefficients		
	PC1	PC2	PC3	PC1	PC2	PC3
IND_PPE	9.47%	95.33%	16.66%	0.0446	0.3784	-0.0420
IND_CPX	13.48%	94.76%	16.11%	0.0596	0.3776	-0.0468
IND_MKT	-59.21%	74.33%	3.72%	-0.2055	0.2954	-0.0532
IND_HHI	85.47%	34.09%	9.99%	0.3163	0.1457	-0.0360
IND_CON4	95.99%	9.13%	1.65%	0.3548	0.0552	-0.0572
IND_NUM	-84.62%	25.90%	-4.25%	-0.3044	0.0984	-0.0172
IND_MGN	2.38%	7.95%	93.51%	-0.0423	-0.1042	0.5719
IND_ROA	6.79%	18.75%	90.66%	-0.0223	-0.0537	0.5356

Panel D: Correlation Matrix

	IND_PPE	*IND_CPX*	*IND_MKT*	*IND_HHI*	*IND_CON4*	*IND_NUM*	*IND_MGN*	*IND_ROA*
IND_PPE		0.9650	0.6140	0.3617	0.1605	0.1138	0.2666	0.2952
		(<.0001)	(<.0001)	(<.0001)	(0.0107)	(0.0714)	(<.0001)	(<.0001)
IND_CPX			1.0000	0.5846	0.3882	0.1926	0.0705	0.2439	0.3105
				(<.0001)	(<.0001)	(0.0021)	(0.2646)	(<.0001)	(<.0001)
IND_MKT				1.0000	-0.2039	-0.4878	0.6736	0.0614	0.1583
					0.0011	(<.0001)	(<.0001)	(0.3321)	(0.0119)
IND_HHI					1.0000	0.8708	-0.5208	0.1054	0.2596
						(<.0001)	(<.0001)	(0.0950)	(<.0001)
IND_CON4						1.0000	-0.7065	0.0485	0.1028
							(<.0001)	0.4438	0.1037
IND_NUM							1.0000	-0.0598	-0.0120
								0.3449	0.8498
IND_MGN								1.0000	0.7369
									(<.0001)
POTENT-COMP	-0.9533	-0.9476	-0.7433	-0.3409	-0.0913	-0.2591	-0.0795	-0.1875
	(<.0001)	(<.0001)	(<.0001)	(<.0001)	(0.1482)	(<.0001)	(0.2085)	(0.0028)
EXIST-COMP	-0.0947	-0.1348	0.5921	-0.8547	-0.9599	0.8462	-0.0238	-0.0679
	(0.1338)	(0.0324)	(<.0001)	(<.0001)	(<.0001)	(<.0001)	(0.7073)	(0.2832)
PROFIT-COMP	-0.1666	-0.1611	-0.0372	-0.0999	-0.0165	0.0425	-0.9351	-0.9066
	(0.0081)	(0.0104)	(0.5571)	(0.1136)	(0.7942)	(0.5016)	(<.0001)	(<.0001)