



山东工商学院图书馆

The Library Of Shandong Technology and Business University



2023

Academic Frontier  
Information

学科前沿快报

2023年第11期（总第49期）

山东工商学院图书馆

## 目 录

### 主题热点分析

国内企业数字化转型研究分析

..... 本刊编辑部（1）

### 学科前沿研究

内部控制有效性与投资者融资融券行为

..... 罗毅, 蔡璨, 林树等（11）

Achieving carbon neutrality in post COP26 in BRICS, MINT, and G7 economies: The role of financial development and governance indicators

..... Elvis Kwame Ofori, Stephen Taiwo Onifade, Ernest Baba Ali 等（25）

### 优秀文献荐读

数学建模在食品物流管理中的应用——评《食品物流管理》

..... 白雪洁, 许利军（44）

社会系统论视角下实现碳达峰碳中和目标的法律对策

..... 曹明德（45）

基于人工智能的网络安全研究

.....马毅葳 (45)

How does digital finance affect industrial structure upgrading? Evidence from Chinese prefecture-level cities

.....Xiaohang Ren, Gudian Zeng, Giray Gozgor 等 (46)

Towards Innovative Research Approaches to Investigating the Role of Emotional Variables in Promoting Language Teachers' and Learners' Mental Health

.....Ali Derakhshan, Yongliang Wang, Yongxiang Wang 等 (47)

A Survey on Federated Learning Systems: Vision, Hype and Reality for Data Privacy and Protection

.....Qinbin Li, Zeyi Wen, Zhaomin Wu 等 (48)

**主办：** 山东工商学院图书馆

**顾问、审核：** 沙淑欣

**主编：** 董宁

**责任编辑：** 袁嘉蔓

**封面摄影：** 崔洪海

**联系电话：** (0535) 6903615-8216

**本刊网址：** <https://lib.sdtbu.edu.cn/info/1044/2557.htm>



# 主题热点分析

## 国内企业数字化转型研究分析

本刊编辑部

截至2023年11月16日,中国知网(CNKI)共收录“企业数字化转型”核心期刊论文886篇。本文运用电子表格软件Microsoft Excel和可视化软件CiteSpace,从年度发文量、期刊刊载量、主要学者及研究机构、研究热点、研究趋势五大方面对该主题下的核心期刊论文进行了梳理和回顾。以期为用户的选题方向和企业数字化转型研究提供参考。

### 1. 年度发文量分析

年度发文情况是某一领域研究总体发展趋势与成果丰富度的直接表征(张文鹤、文军,2017)。图1为目前国内企业数字化转型研究领域的期刊论文年度发文量总体趋势图。2011年开始有相关期刊论文发表,此后的八年间,年度发文量保持在2篇左右;2020年年度发文量迅速增长至27篇,此后的三年间,年度发文量骤增,分别是2021年(73篇)、2022年(269篇)、2023年(498篇)。总体来看,企业数字化转型研究领域的知识量呈急速增长态势。

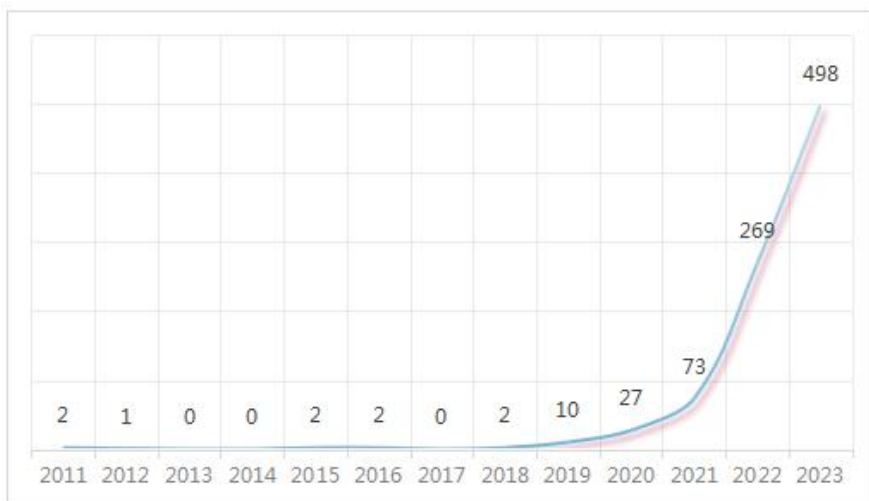


图1 国内企业数字化转型研究年度发文量统计

(截取数据的时间节点:2011.01-2023.11)

## 2. 期刊刊载量分析

期刊的出版数据是作者投稿的重要参考。本文对企业数字化转型主题论文的期刊刊载量进行统计。排名前五位的核心期刊分别是《财会月刊》《科技进步与对策》《经济管理》《企业经济》《财会通讯》《科技管理研究》《商业经济研究》《工业技术经济》《中国软科学》《现代财经(天津财经大学学报)》《当代财经》《技术经济》《财务与会计》《外国经济与管理》《中国工业经济》。

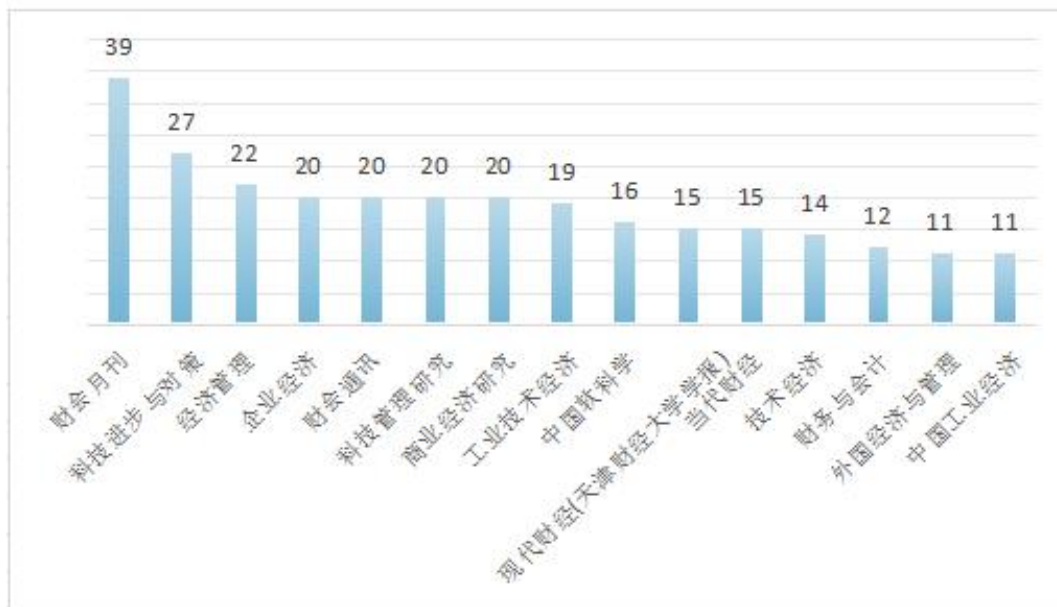


图 2 国内收录企业数字化转型研究的核心期刊（期刊刊载量排名前十位）

（截取数据的时间节点：2011.01-2023.11）

## 3. 主要学者及研究机构分析

近十三年间，该主题的期刊论文作者共计 765 位，对其发文数量进行统计（表 1），88.50%的学者发表过 1 篇期刊论文，9.02%的学者发表过 2 篇期刊论文，2.48%的学者发表过 3 篇以上期刊论文，其中，学者黄大禹（清华大学经济管理学院）、潘艺（中国社会科学院大学研究生院）、申明浩（广东外语外贸大学粤港澳大湾区研究院）发文数量最多；发文量位居第二的学者分别是曾皓（江西财经大学会计学院）、李立威（北京联合大学管理学院）、林川（四川外国语大学国别经济与国际商务研究中心）、苑泽明（天津财经大学会计学院）。

近十三年间，该主题的研究机构共计 186 个，对其发文量进行统计（表 2）：34.41%的机构发表过 1 篇核心期刊论文，18.82%的机构发表过 2 篇核心期刊论文，19.89%的机构发表过 3 篇核心期刊论文，7.53%的机构发表过 4 篇核心期刊论文，

19.35%的机构发表过5篇以上核心期刊论文。其中，广东金融学院金融科技工程技术开发中心的发文数量最多，共计16篇；发文量位居第二的是中国社会科学院工业经济研究所；发文量位居第三的是清华大学经济管理学院。

表1 国内企业数字化转型研究作者发文量统计

发表核心期刊论文数量	人数	占比
1篇	677	88.50%
2篇	69	9.02%
3篇及其以上	19	2.48%
合计	765	100%

（截取数据的时间节点：2011.01-2023.11）

表2 国内企业数字化转型研究机构发文量（≥8）统计

机构名称	发文数量
广东金融学院金融科技工程技术开发中心	16
中国社会科学院工业经济研究所	15
清华大学经济管理学院	14
南开大学经济学院	11
中国人民大学商学院	10
广东外语外贸大学经济贸易学院	10
中央财经大学会计学院	9
厦门大学管理学院	9
华南理工大学工商管理学院	9
广东金融学院行为金融与区域实验室	8
中国农业大学经济管理学院	8
对外经济贸易大学国际商学院	8

（截取数据的时间节点：2011.01-2023.11）

#### 4. 研究热点主题分析

收集 CNKI 中主题相关的期刊论文 886 篇，对其文本格式进行处理后，导入 CiteSpace。设定时间跨度为 2011 年 1 月至 2023 年 11 月，时间切片为 5 年，运行程序，获取关键词的分析数据（如表 4、表 5 所示）。在关键词中心性分析中，频数代表关键词出现的次数，中心性代表数据的重要程度。关键词的频数越高越能反映该词所代表研究方向的热门程度。频数出现较低的关键词具有偶然性。关键词的中心性也是衡量关键词重要性的重要指标，中心性越大越能反映该词所代表研究方向的重要程度，当中心性大于 0.1 时，该关键词的重要程度较高。为保证分析结果得严谨可靠，本文以频数高低顺序为依据，选取频数大于等于 10、中心性大于等于 0.03 的关键词进行罗列，观察该主题的重点研究方向及研究趋势。中心性大于等于 0.03 的关键词按所在年份的升序排列。

表 3 国内企业数字化转型研究高频关键词统计

序号	高频关键词	频数	序号	高频关键词	频数
1	数字经济	83	11	企业绩效	14
2	融资约束	51	12	国有企业	14
3	企业创新	35	13	动态能力	14
4	数字化	27	14	文本分析	13
5	中小企业	23	15	人力资本	11
6	数字技术	21	16	企业价值	11
7	制造企业	20	17	技术创新	10
8	内部控制	20	18	绿色创新	10
9	公司治理	16	19	研发投入	10
10	制造业	15	20	创新能力	10

（截取数据的时间节点：2011.01-2023.11）

表4 国内企业数字化转型研究高中心度关键词统计

序号	高中心度关键词	中心性	年份
1	数字化	0.19	2016
2	数字经济	0.43	2019
3	智能制造	0.03	2019
4	企业创新	0.15	2020
5	数字技术	0.13	2020
6	制造企业	0.11	2020
7	中小企业	0.1	2020
8	企业绩效	0.03	2020
9	动态能力	0.03	2020
10	内部控制	0.08	2021
11	交易成本	0.04	2021
12	国有企业	0.03	2021
13	同群效应	0.03	2021
14	企业价值	0.03	2021
15	文本识别	0.03	2021
16	金融科技	0.03	2021
17	融资约束	0.21	2022
18	技术创新	0.07	2022
19	制造业	0.05	2022
20	人力资本	0.04	2022
21	财务绩效	0.04	2022
22	公司治理	0.03	2022
23	研发投入	0.03	2022



续表 4

24	创新能力	0.03	2022
25	政府补贴	0.03	2022
26	文本挖掘	0.03	2022
27	数字金融	0.05	2023
28	绿色创新	0.04	2023
29	冗余资源	0.04	2023
30	产权性质	0.03	2023
31	代理问题	0.03	2023

(截取数据的时间节点: 2011.01-2023.11)

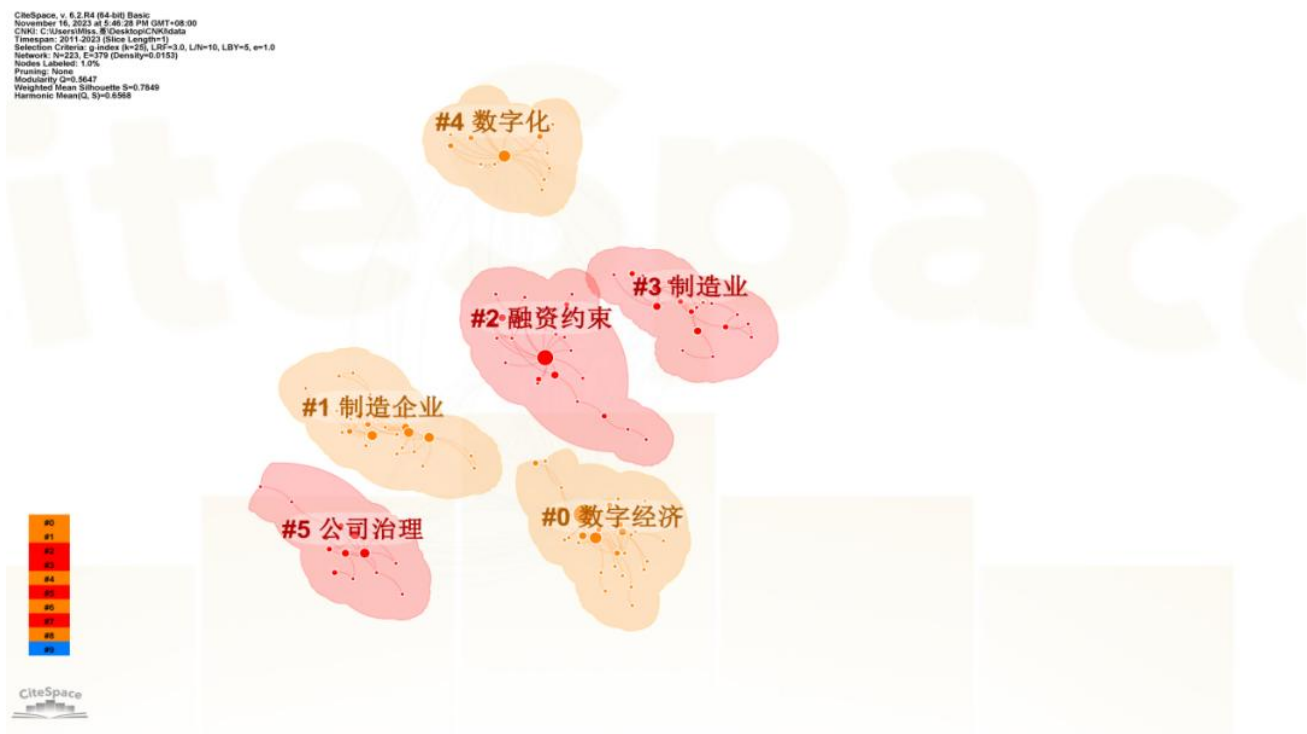


图 3 国内企业数字化转型研究关键词聚类图谱

(截取数据的时间节点: 2011.01-2023.11)



在关键词聚类图谱（图4）中，共有223个节点，379条连线，网络密度为0.0153，Modularity Q的值为0.5647（大于临界值0.3），说明关键网络的聚类效果良好，Mean Silhouette的值为0.7849（大于临界值0.5），说明聚类效果是合理的。采用对数似然比（LogLikelihood Ratio, LLR）算法，共导出6个关键词聚类，分别是“数字经济”“制造企业”“融资约束”“制造业”“数字化”“公司治理”。结合各聚类中的节点关键词，现对该主题的关键词及相关文献的研究内容进行整合分析。

#### 4.1 企业数字化转型的内涵

企业数字化转型是实现数字技术与实体经济深度融合的纽带，转型的关键在于以实践和问题为导向，加强数字技术在传统企业中的应用，不断提升企业的数字化水平，推动产业数字化发展（赵剑波，2021）。韩佳平（2022）进一步探究了数字化转型的内涵，即传统企业通过利用具有连通性与分析性的数字技术（例如物联网、人工智能等）为企业生产流程和消费者增加价值的过程。杨雅程等（2022）基于资源编排视角，研究了加工制造企业数字化转型的机理。朱秀梅等（2022）探究了企业数字化转型过程中价值链重塑动态演化机制。季良玉（2022）以小熊电器为例，研究了中小制造企业数字化转型中的动态能力演化过程。谭志东等（2022）基于“两化”融合贯标试点的准自然实验，以制造业上市公司为研究对象，从企业现金持有视角间接测度了数字化转型的价值。刘久如（2023）研究了制造业数字化转型的本质、路径、存在误区及政策建议。张广胜等（2023）基于计划行为理论和资源基础理论的双重视角，研究了传统制造企业数字化转型战略形成的机理。沈小滨（2023）总结了数字化转型的三大误区和八个错误。

#### 4.2 企业数字化转型的影响

何帆（2019）采用工具变量法与滞后期回归法，实证检验发现，数字化转型显著提升了实体企业的经济效益。马晔风（2020）基于问卷调查数据，研究发现数字化转型的积极作用主要体现在对企业软实力的影响方面，运营管理和销售相关数字化措施的积极作用最为显著。陈庆江等（2021）通过分析师跟踪网络识别同群群体，并利用面板固定效应模型等方法，考察了企业数字化转型中的同群效应以及这种企业间行为互动的影响因素。张振刚（2021）基于组织变革理论与知识基础观，引入知识管理与企业家导向变量，探讨了企业数字化转型对商业模式创新的影响机制与情境效应。肖红军（2021）基于文本数据挖掘方法，探究企业数字化对企业社会责任表现的影响及其内在机理。车德欣（2021）借助大数据文本分析手段，识别2007-2019年上市企业年报中有关数字化转型的关键词，检验了企业数字化转型对企业融资降成本的影响。倪克金等（2022）研究发现，现阶段数字化转型在国有企业中的效果优于非国有企业；数字化企业能够促进企业成

长,并且数字化转型对头部企业成长的促进作用更大。除此以外,数字化转型对企业韧性(蒋峦等,2022)、债务违约风险(王守海等,2022)、企业全要素生产率(武常岐等,2022)、审计质量(翟华云等,2022)、年报可读性(王海芳等,2022)、股价崩盘风险(林川等,2022)、企业创新(姜英兵、杨伟等,2022)、人力资本结构(陈红等,2022)、融资约束(薛龙等,2023)、真实盈余管理(李涛等,2023)、企业腐败(吴铁骥等,2023)、企业ESG表现(张永冀等,2023)、企业金融化(闵志慧等,2023)均有一定程度的影响。

#### 4.3 企业数字化转型的影响因素

陈玉娇(2021)研究发现,企业数字化转型更多的是“随行就市”(迎合行业制度),而不是“入乡随俗”(迎合地区制度)。卢艳秋等(2021)从过程视角揭示了决策逻辑对企业数字化转型绩效的影响路径,因果决策逻辑和效果决策逻辑都可以通过失败学习提升企业数字化转型绩效。姚小涛等(2022)指出影响企业数字化转型的关键因素分布在个体(团队)、组织和产业三个层面;个体层面包括具有数字领导力的管理者、具备数字化思维的员工和科学合理的数字化转型团队,组织层面包括数字化转型的自主权、匹配的组织设计和有价值的数,产业层面包括新的顾客价值、新的包含数字化特征的生产函数和完善的转型生态体系。除此以外,知识产权保护(周洲等,2022)、内外部动态能力间的协同交互作用(张林刚等,2022)、网络基础设施建设(邱洋冬等,2022)、企业间信任(卢艳秋等,2022)、企业杠杆率(杜金岷等,2022)、营商环境建设(史宇鹏等,2022)、融资方式(张建伟等,2022)、资产专用型(曾雅婷等,2023)、地区大数据发展(李政等,2023)均对企业数字化转型有一定程度的影响。

#### 4.4 具体行业数字化转型的实现路径

出版企业应以营造生态和谐的数字化创新环境为前提,以提升信息能力为核心,以优化企业信息生态构成要素机构关系为保障,寻求企业数字化创新能力提升路径(常嘉玲,2019)。保险企业应从客户交互端、业务运营端以及支持保障端三大层面着手进行变革转型(苗力,2019)。工业企业数字化水平评估的三个维度分别是基础设施、产品全生命周期、生产管控(师丽娟,2020)。刘俊艳(2020)外贸型代工(OEM)企业可从补管理技术短板、育先进管理技术人才、促基础性学科服务社会等方面推进数字化转型(刘俊艳,2020)。制造企业数字化转型应当强调多主体联动,即以企业为主体,建立适应性学习机制;培育数字孪生体工具;由政府或行业协会引导,制造企业参与,构建创新性企业数字化转型的典型模式及路径(胡海波等,2022)。除此以外,胡煜(2020)提出了军工央企数字化转型的路径。赵欣梅(2021)对数字化环保管理系统在石化企业的应用进行了

研究。董晓松(2021)梳理了传统医药制造企业数字化转型的轨迹、特征和阻碍,提炼出数字化转型情境下的权变管理思想。张欣欣(2021)探析我国零售企业数字化转型的框架及方案。王露宁等(2022)研究了大型供应链企业数字化转型的规划与实施路径。任若安等(2022)研究了服装企业数字化转型升级的路径。黄从治等(2022)研究了建筑企业数字化转型面临的挑战和应对策略。张媛等(2022)探讨了制造企业数字化转型过程中如何通过有效的资源编排行为促进价值创造的实现及其演化。

### 5. 企业数字化转型的研究趋势分析

本研究根据突现关键词揭示主题的研究趋势,识别国内高校财商教育研究领域学者在不同历史时段的研究热点及其演变趋势,同时通过追踪研究趋势,识别出需要进一步探索的问题。这里,突现关键词(Burst Term)是指以文献关键词为分析对象,根据词频年度分布情况,利用时间序列突变点识别方法检测出发生突变的时间点,在该时间点出现频次增长率快速增加的关键词。值得说明的是,突现关键词与高频关键词存在差别:突现关键词代表了某个时间点关键词使用频次骤增,其为一个领域一段时间的研究热点,揭示了学者在不同时间点研究方向、研究热点的变换,而高频关键词代表了整个研究时区内出现频次很高的关键词,表明了一个领域长久稳定的研究热点,两种关键词可以不重合。本研究通过参数设置, $\gamma=0.1$ , Minimum Duration=1,共获得25个突现关键词(见图5),根据关键词突现的起止时间,现对该领域的最新研究前沿进行分析。

如图5所示,2022至2023年间的突现关键词依次是政府补贴、人工智能、中介效应、机器学习、公司治理、费用粘性、异质性。加之突发性的延续性特征,我们可以认为,上述突现关键词将成为未来该领域学者重点关注的研究方向。结合该主题相关文献,未来的研究重点可能围绕以下方面展开:企业数字化转型影响因素的作用机理;探究如何从企业数字化转型的价值层面进行全面而综合的评价;拓展现有企业数字化转型的基本理论从而构建新的理论;深入讨论企业数字化转型的过程;基于构建多层次理论体系探究数字化转型在不同层面发挥的影响;立足精细化研究视角深入挖掘数字化转型影响作用发挥的宏观、微观机制和关键边界条件等。

## 学科前沿研究

## 内部控制有效性与投资者融资融券行为

罗毅<sup>1</sup>, 蔡璨<sup>1</sup>, 林树<sup>2</sup>, 李东润<sup>3</sup>

(1.贵州财经大学会计学院 2.南京大学商学院 3.深圳市中兴新云服务有限公司)

**【摘要】**为健全资本市场功能,2010年融资融券制度在中国正式实施。本文基于2010~2019年我国A股市场6497个有效样本,从内部控制视角考察该制度实施以来投资者的融资融券行为。研究发现:上市公司内部控制有效性越高,越易被投资者融资做多;内部控制有效性越低,越易被投资者融券做空。考虑投资者融资做多对融券做空的对冲影响后,内部控制有效性越低的上市公司依然越易被投资者净融券做空。分组检验发现,该现象在上市公司代理成本低、外部审计质量低、注册地社会信任水平低等情况下更为突出。

**【关键词】**内部控制有效性;融资融券;代理成本;外部审计质量;社会信任水平

**【基金资助】**国家自然科学基金项目(项目编号:72362005,71872081);教育部人文社会科学重点研究基地重大课题项目(项目编号:CYD-2020009);南京大学人文社科双一流建设“百层次”科研项目;贵州财经大学年引进人才科研启动项目(项目编号:2021YJ038)

**【原文出处】**《财会月刊》.2023,44(22)

(文中参考文献及注释详见原刊)

## 1. 引言

2010年3月31日,我国资本市场正式启动融资融券交易试点,标志着我国资本市场做空机制的诞生,围绕融资融券这一主题的研究随之如火如荼展开。目前大量学者在研究融资融券对市场定价效率、市场流动性和市场波动性等方面的影响上取得丰硕成果。在融资融券是否改善市场定价效率方面:Chang等(2012)通过实证分析发现,融资融券机制开通提高了市场定价效率;李科等(2014)研究发现,融券机制开通提高了股市的定价效率;李志生等(2015)实证认为,做空机制改善了市场价格发现机制;许红伟和陈欣(2012)认为,在诸多交易条件限制下,我国融资融券制度未能完全发挥提高股市定价效率的作用。在融资融券与市场流动性方面:国外主流研究认为,融券卖空机制对市场流动性具有提升作



用 (Douglas 等, 1987; Woolridge 和 Dickinson, 1994); 国内学者借鉴国外成熟研究方法也认为, 融券卖空机制开通有助于提升市场流动性 (杨德勇和吴琼, 2011; 张斯琪和王敬, 2014)。在融资融券与市场波动性方面: 国外研究认为, 卖空机制加剧了市场波动 (Henry 和 McKenzie, 2006); 针对我国资本市场的研究则认为, 融资融券会平抑股市波动 (李德峰等, 2012)。

在融资融券制度落地实施的近十年里, 伴随《企业内部控制基本规范》等政策的出台, 我国内部控制体系业已形成。当前我国企业内部控制目标演化为五点: 保证经营管理合法合规、资产安全、财务报告及相关信息真实完整、提升经营效率和效果、促进企业实现发展战略。在这一演化进程中, 围绕这五大目标涌现出大量研究成果。在内部控制与经营管理合法合规方面, Altamuro 和 Beatty (2010) 认为, 完善的内部控制抑制了财务造假行为, 同时能显著抑制管理层腐败行为 (周美华等, 2016), 提升企业经营管理合法合规性。在内部控制与资产安全方面, 李万福等 (2012) 研究发现, 存在重大内部控制缺陷的企业更容易陷入财务困境, 这可能与重大内部控制缺陷导致企业资产容易流失有关。在内部控制与财务报告及相关信息真实完整方面, 学者大多认为上市公司加强内部控制体系建设有助于提高其信息披露质量, 有效缓解投资者与公司之间的信息不对称问题 (林斌和刘善敏, 2012; 张瑶和郭雪萌, 2015), 增强上市公司财务报告可靠性和价值相关性, 保证上市公司的财务报告质量 (Doyle 等, 2007; Goh 和 Li, 2011); 同时还有利于降低公司盈余管理程度, 提升公司盈余质量 (佟岩和徐峰, 2013; 刘建伟和郑开焰, 2014; 尹律, 2016; Ying, 2016), 提高会计稳健性 (方红星和张志平, 2012)。在内部控制与提升经营效率和效果方面, 许灿和徐焕章 (2015) 研究发现, 上市公司内部控制越完善、盈利能力越强, 内部控制缺陷越多、经营业绩越差。内部控制有效性的提高有助于提升企业投资效率 (周中胜等, 2016; 池国华等, 2016), 减少大股东资金占用行为, 降低企业的代理成本 (杨雄胜, 2005; 杨德明等, 2010)。另外, 完善内部控制缺陷能降低企业资本成本 (刘中华和梁红玉, 2015)。在内部控制与促进企业实现发展战略方面, 上市公司内部控制信息的披露会对投资者的决策产生显著影响 (Ying, 2016)。提高上市公司内部控制信息披露水平, 能显著降低其未来股价崩盘风险 (叶康涛等, 2015), 该发现与 Ashbaugh-Skaife 等 (2007) 的研究结论一致, 因此上市公司应加强内部控制建设以维护其资本市场地位, 助力企业实现发展战略。

纵观以上研究成果可知, 目前结合中国情境将融资融券与内部控制结合进行研究的文献较少。基于此, 本文选择我国 A 股市场 2010~2019 年被纳入融资融券标的的 6497 个有效样本, 考察内部控制有效性与投资者融资融券行为之间的

关系,发现内部控制有效性越高,越易被投资者融资做多;上市公司内部控制有效性越低,越易被投资者融券做空。考虑投资者融资做多对融券做空的对冲影响后,内部控制有效性水平越低的上市公司,依然越易被投资者净融券做空。该现象在上市公司代理成本低、外部审计质量低、注册地社会信任水平低的情况下更显著。本文可能的贡献在于:其一,为监管层督促上市公司加强内部控制建设,引导投资者树立价值投资理念,发挥融券做空机制震慑效果提供了实证证据。其二,从上市公司内部控制视角考察了投资者的融资融券行为,丰富了内部控制与投资者行为方面的研究文献。

## 2. 理论分析与研究假设

信息经济学认为,交易的经济主体之间普遍存在着信息不对称的问题,从而引致事前阶段逆向选择和事后阶段道德风险行为。信息不对称是资本市场的显著特征,其影响着投资者的决策行为,内部控制作为上市公司治理机制的重要组成部分,其五大目标的落实有利于缓解这种信息不对称,充分保护投资者的利益。大量研究表明,有效的内部控制能够抑制管理层的盈余操纵行为(Bell和Carcello,2000),降低企业财务舞弊的可能性(Hermanson,2000;梅丹和王瑞雪,2011),提高公司的盈余质量(Singer和You,2011;范经华等,2013;佟岩和徐峰,2013;Ying,2016;尹律,2016)。有效的内部控制能帮助企业减少经营过程中的错误和问题,保证上市公司的财务报告具有更高质量,进而保护投资者的利益(Doyle等,2007)。Altamuro和Beatty(2010)研究发现,有效的内部控制能抑制财务造假行为,增强企业现金流的稳定性和盈余持续性。内部控制具有在公司内部实现权力制衡和保障财务报告信息质量的作用,从而降低公司代理成本(杨雄胜,2005)。有效的内部控制也能通过减少大股东的资金占用行为,以降低公司代理成本(杨德明等,2010)。方红星和张志平(2012)研究发现,上市公司内部控制越有效,其会计稳健性越强。另外,内部控制有效性的提高还有助于提升企业投资效率(周中胜等,2016;池国华等,2016)。周美华等(2016)研究发现,内部控制有效性能显著抑制管理层的腐败行为,从而提升公司价值。林斌和刘善敏(2012)研究发现,内部控制有效性越高,证券分析师之间的分歧和偏差越少,分析师的盈余预测越准确,且分析师会做出更为乐观的预测,从而有利于吸引投资者关注。张瑶和郭雪萌(2015)研究发现,上市公司内部控制信息有效性提高有助于其在资本市场获益。

以上研究表明:有效的内部控制可以向投资者传递公司治理规范、经营合法合规、盈利前景良好、信息披露质量较高等积极信息,从而赢得投资者青睐。2010年我国资本市场开通融资融券业务后,其融资做多功能能够助力投资者加码投资



释放这类积极信号的公司。因此本文提出如下假设：

**假设 1：上市公司内部控制有效性越高，其股票越易被投资者融资做多。**

2010 年至今，浑水等做空机构先后“狙击”做空绿诺科技、嘉汉林业、新东方、奇虎 360、恒大地产、辉山乳业等中概股，导致其市值蒸发，严重者甚至被交易所停牌或摘牌。这些在美国与中国香港资本市场被做空的中概股普遍存在公司治理不善、财务造假、信息披露不规范等内部控制缺陷，因此遭到做空机构先后“狙击”，给中小投资者带来巨额损失。Ashbaugh-Skaife 等（2007）研究发现，内部控制缺陷加剧了上市公司财务风险，导致上市公司股价下跌，且内部控制缺陷越严重，股价跌幅越大。内部控制缺陷还会损害上市公司盈利能力，内部控制缺陷越严重，上市公司的盈利能力越差（许灿和徐焕章，2015）。Feng 等（2009）研究发现，内部控制有效性不足的企业，其管理层在决策时参考的内部报告可能存在较多错误，从而损害企业价值。与此同时，上市公司内部控制缺陷会抬高其资本成本（刘中华和梁红玉，2015）。Goh 和 Li（2011）研究发现，上市公司存在越多的内部控制缺陷，其会计信息质量越差，会导致投资者撤资。刘建伟和郑开焰（2014）发现，上市公司内部控制存在缺陷时，其盈余质量更差。李万福等（2012）研究发现，存在重大内部控制缺陷的企业更容易陷入财务困境。

以上研究说明较低的内部控制有效性将恶化企业经营绩效，加大其陷入财务困境的概率。在 2010 年融资融券开通前的资本市场，对于只能单边做多的投资者，投资于这样的上市公司无疑会遭遇滑铁卢。然而 2010 年开通融资融券业务后，这样的上市公司对投资者来说从烫手山芋变成了致富机遇。Chang 等（2012）研究认为，融资融券提高了市场定价效率；李科等（2014）证明在融券做空制度下，被高估的股票价格能够得到有效平抑；李志生等（2015）研究发现，融资融券开通后，融券做空机制改善了市场价格发现机制。以上研究表明，融券卖空机制能够发挥快速修正市场定价的功能，使内部控制有效性低的公司股价回归到正常水平，投资者把握融券卖空机遇可以获取巨额利润。因此本文提出如下假设：

**假设 2：上市公司内部控制有效性越低，其股票越易被投资者融券做空。**

现实中公司往往同时存在融资和融券业务。尽管刘焯等（2016）研究发现，融资融券余额的变动没有显著增加市场的波动性及暴涨暴跌的频率，融资融券交易对股市波动没有影响；但徐长生和马克（2017）的研究表明，市场进入牛市后，融资融券交易导致标的股票价格被高估，加剧了融资融券标的股票价格的波动性。倪晓然和朱玉杰（2017）研究发现，卖空压力对企业风险行为的负向影响在治理水平较低的企业中更为显著。陈康和刘琦（2018）研究发现，融资融券使股价融

入了更多有利于管理层投资决策的信息。另外,融资融券对投资—股价敏感性的影响在机构投资者比例高、流动性高、处于新兴行业的这类管理层反馈效应更强的股票组中更显著。陈建和曾世强(2018)研究发现,乐观情绪和悲观情绪都会加剧股票波动;融资融券交易制度的引入弱化了投资者情绪对股票波动的影响,提升了市场效率。以上研究表明,融资融券会共同诱发各种各样的经济后果,在假设1和假设2中,本文将研究视野前置,探讨了内部控制有效性对融资融券的不同影响:融资给投资者带来的心理冲击通常趋于正面,而融券给投资者带来的心理冲击通常趋于负面,且同等情况下负向的影响比正向的影响更能冲击投资者的心理。在考察融资融券作为经济后果的净影响时,本文提出如下假设:

**假设3: 考虑投资者融资做多对融券做空的对冲影响后,上市公司内部控制有效性越低,其股票依然越易被投资者净融券做空。**

### 3. 研究设计

#### 3.1 样本数据及来源

本文选取2010~2019年被纳入融资融券标的的A股上市公司作为研究样本,采用实证分析法研究上市公司内部控制有效性与投资者融资融券行为的关系。内部控制有效性数据来源于迪博公司发布的上市公司内部控制指数;融资融券数据、股票特征数据来源于国泰安数据库。对原始数据进行了如下处理:剔除金融保险类公司;剔除ST、\*ST公司;剔除数据存在缺失的上市公司;对所有连续变量进行上下1%的缩尾处理。根据上述步骤,最终得到6497个年度—公司样本。

#### 3.2 变量定义与模型构建

##### 3.2.1 被解释变量

被解释变量分为融资做多程度(Bull)、融券做空程度(Short)、净融券做空程度(D<sub>SB</sub>)。由于我国资本市场发展较晚,融资融券机制启动时间较短,相关研究还较少。在融资做多程度度量方面,本文以上市公司年度所有交易日融资买入金额的自然对数来衡量其被融资做多程度。在融券做空程度度量方面,发达资本市场的相关研究通常以年度累计融券卖出规模这一指标来衡量(Dechow等,2001;Desai等,2006)。本文借鉴张会丽等(2016)的做法,以上市公司年度内所有交易日融券卖出股数的自然对数来衡量上市公司被投资者融券做空的程度。具体来说,以上市公司年度所有交易日融券卖出股数除以该股当年流通股总数得到相对融券做空程度,以上市公司年度所有交易日融资买入金额除以该股当年流通股总金额得到相对融资做多程度,以相对融券做空程度与相对融资做

多程度之差来度量净融券做空程度。

### 3.2.2 解释变量和控制变量

解释变量为内部控制有效性（EIC）。借鉴已有文献（李万福等，2012；佟岩和徐峰，2013；林斌等，2014）的做法，基于迪博公司发布的上市公司内部控制指数，以该指数除以1000构建指标EIC来度量上市公司内部控制有效性。该值越大，表明上市公司内部控制有效性越高，该值的取值范围为0到1。

参考前人的相关研究，本文对以下因素进行控制：大股东持股比例，以上市公司第一大股东所持股份比例衡量；公司规模，采用上市公司年末总资产的自然对数来度量；财务杠杆，等于上市公司年末总负债除以年末总资产；流通股总市值，等于上市公司年末流通个股总数与年收盘价乘积的自然对数；市净率，等于上市公司年末收盘价/（所有者权益年末值÷实收资本年末值）；现金流动能力，以上市公司经营活动产生的现金流量净额除以年初总资产衡量；上市年数，是指上市公司IPO年份至统计年份的年数；股权性质，当上市公司股权性质为“国有”时取1，否则取0。同时对年份和行业进行控制。变量定义如表1所示。

表1 变量定义

类型	名称	符号	定义说明
被解释变量	融资做多程度	Bull	上市公司年度所有交易日融资买入金额的自然对数
	融券做空程度	Short	上市公司年度所有交易日融券卖出股数的自然对数
	净融券做空程度	D_SB	上市公司相对融券做空程度与相对融资做多程度之差
解释变量	内部控制有效性	EIC	迪博（DIBOR）上市公司内部控制指数/1000
控制变量	大股东持股比例	Top1hold	上市公司第一大股东持股比例
	公司规模	Size	上市公司年末总资产的自然对数
	财务杠杆	Lev	上市公司年末总负债/年末总资产
	流通股总市值	MV	上市公司年末流通市值的自然对数

续表 1

控制变量	市净值	PB	上市公司年末收盘价/(所有者权益年末值÷实收资本年末值)
	现金流动能力	CF	上市公司经营活动产生的现金流量净额/年初总资产
	上市年数	Age	上市公司 IPO 年份至统计年份的年数
	股权性质	State	上市公司为“国有”取 1, 否则取 0

### 3.2.3 模型构建

上市公司内部控制有效性越高, 其股票越易被投资者融资做多。本文设计研究模型 (1) 检验上市公司内部控制有效性对其股票被融资做多的影响:

$$Bull_{i,t} = \beta_0 + \beta_1 EIC_{i,t} + \sum \beta_n Controls_{i,t} + \varepsilon_{i,t} \quad (1)$$

其中:  $Bull_{i,t}$  是上市公司  $i$  在  $t$  年被融资做多程度, 该指标值越大, 表明上市公司  $i$  在  $t$  年被融资做多的程度越强烈;  $EIC_{i,t}$  是上市公司  $i$  在  $t$  年的内部控制有效性, 该指标值越大, 表明上市公司  $i$  在  $t$  年的内部控制有效性越高, 内部控制越有效;  $Controls_{i,t}$  控制了上市公司  $i$  在  $t$  年的大股东持股比例、公司规模、财务杠杆、流通股总市值、市净率、现金流动能力、上市年数、股权性质、行业、年份等方面的特征。如果  $\beta_1$  显著为正, 说明内部控制有效性越高的上市公司, 其股票越易被投资者融资做多, 假设 1 成立。

上市公司内部控制有效性越低, 其股票越易被投资者融券做空。本文设计研究模型 (2) 检验上市公司内部控制有效性对其股票被融券做空的影响:

$$Short_{i,t} = \beta_0 + \beta_1 EIC_{i,t} + \sum \beta_n Controls_{i,t} + \varepsilon_{i,t} \quad (2)$$

其中:  $Short_{i,t}$  是上市公司  $i$  在  $t$  年被融券做空程度, 该指标值越大, 上市公司  $i$  在  $t$  年被融券做空的程度越严重;  $EIC_{i,t}$  是上市公司  $i$  在  $t$  年的内部控制有效性, 该指标值越小, 上市公司  $i$  在  $t$  年的内部控制有效性水平越低, 内部控制越无效;  $Controls_{i,t}$  控制了上市公司  $i$  在  $t$  年的大股东持股比例、公司规模、财务杠杆、流通股总市值、市净率、现金流动能力、上市年数、股权性质、行业、年份等方面的特征。如果  $\beta_1$  显著为负, 说明内部控制有效性越低的上市公司,

其股票越易被投资者融券做空，假设 2 成立。

考虑投资者融资做多对融券做空的对冲影响后，上市公司内部控制有效性越低，其股票依然越易被投资者净融券做空。本文设计研究模型（3）来检验上市公司内部控制有效性对其股票被净融券做空的影响：

$$D\_SB_{i,t} = \beta_0 + \beta_1 EIC_{i,t} + \sum \beta_n Controls_{i,t} + \varepsilon_{i,t} \quad (3)$$

其中： $D\_SB_{i,t}$ 是上市公司  $i$  在  $t$  年被净融券做空程度，该指标值越大，上市公司  $i$  在  $t$  年被净融券做空的程度越严重； $EIC_{i,t}$ 是上市公司  $i$  在  $t$  年的内部控制有效性，该指标值越小，上市公司  $i$  在  $t$  年的内部控制有效性水平越低，内部控制越无效； $Controls_{i,t}$ 控制了上市公司  $i$  在  $t$  年的大股东持股比例、公司规模、财务杠杆、市净率、现金流动能力、上市年数、股权性质、行业、年份等方面的特征。如果  $\beta_1$  显著为负，说明考虑融资做多对融券做空的对冲影响后，内部控制有效性越低的上市公司，其股票依然越易被投资者净融券做空，假设 3 成立。

## 4. 实证分析

### 4.1 描述性统计

表 2 为主要变量的描述性统计结果。为体现相关变量的经济意义，在接下来的分析中将 Bull、Short、Size 和 MV 根据表 2 中的对数结果进行了经济还原。融资做多程度 Bull 的结果说明，样本上市公司股票年度平均融资买入金额为 4603119211 元，最大融资买入金额为 74197774989 元，最小融资买入金额为 18811896 元，表明样本股票年度融资买入金额的差异较大，与标准差的数值契合，且均值 4603119211 元略小于中位数 5401810435 元，说明超过一半的股票在年度融资买入金额上超过均值。融券做空程度 Short 的结果说明，样本上市公司股票年度平均融券卖出数量为 3722850 股，最大融券卖出数量为 536190464 股，最小融券卖出数量为 11103 股，表明样本上市公司股票年度融券卖出数量的差异较大，与标准差的数值契合，且均值 3722850 股略小于中位数 4368805 股，说明超过一半的上市公司股票在年度融券卖出数量上超过均值 3722850 股。净融资做空程度  $D\_SB$  的结果说明，我国资本市场的投资者依然习惯于融资做多，对融券做空比较谨慎，我国投资者的融券做空投资理念还在不断培育中。内部控制有效性指标 EIC 的结果说明，样本公司的内部控制有效性水平存在巨大差异，均值略低于中位数且二者均在 0.7 以下，表明大部分样本上市公司的内部控制有效性水平一般。控制变量方面，样本上市公司大股东平均持股为 36.4%，平均总资产为

13286309751元，平均资产负债率为47.8%，平均流通股总市值为12512575306元，平均市净率为3.033，经营活动现金净流量占总资产的比重平均为6%，上市年龄平均为14.01年，国有企业占比为54.6%，以上8项控制变量均值说明能被纳入融资融券标的的上市公司，其资产状况相对良好，上市年龄较长，且国有企业占半壁江山。

表2 描述性统计

变量	样本量	均值	中位数	最小值	最大值	标准差
Bull	6497	22.25	22.41	16.75	25.03	1.458
Short	6497	15.13	15.29	9.315	20.10	2.243
D_SB	6497	-0.694	-0.439	-3.547	-0.001	0.733
EIC	6497	0.672	0.677	0.319	0.912	0.089
Top1hold	6497	0.364	0.347	0.078	0.751	0.160
Size	6497	23.31	23.15	20.78	27.15	1.329
Lev	6497	0.478	0.487	0.075	0.869	0.199
MV	6497	23.25	23.15	21.50	26.10	0.913
PB	6497	3.033	2.290	0.517	13.82	2.448
CF	6497	0.060	0.057	-0.179	0.295	0.080
Age	6497	14.01	14.50	2.083	26.25	6.356
State	6497	0.546	1.000	0.000	1.000	0.498

#### 4.2 主效应回归分析

表3列(1)显示，控制样本上市公司大股东持股比例(Top1hold)、公司规模(Size)、年份(Year)、行业(Industry)等因素后，内部控制有效性越高的上市公司，其股票越易被投资者融资做多，假设1被证实成立。列(2)显示，控制样本上市公司大股东持股比例(Top1hold)、公司规模(Size)、年份(Year)、行业(Industry)等因素后，内部控制有效性越低的上市公司，其股票越易被投资者融券做空，假设2被证实成立。列(3)显示，控制样本上市公司大股东持股比例(Top1hold)、公司规模(Size)、年份(Year)、行业(Industry)

等因素后,即便考虑融资做多对融券做空的对冲影响,内部控制有效性越低的上市公司,其股票依然越易被投资者净融券做空,假设3被验证。

表3 主效应回归结果

变量	(1)	(2)	(3)
	Bull	Short	D_SB
EIC	0.361** (2.27)	-0.725** (-2.50)	-0.246** (-2.41)
Toplhold	-1.324*** (-11.93)	-1.591*** (-7.25)	0.797*** (11.95)
Size	-0.021 (-0.60)	0.174*** (2.63)	0.198*** (15.65)
Lev	-0.025 (-0.21)	0.179 (0.78)	-0.280*** (-4.02)
MV	0.629*** (17.01)	1.114*** (16.16)	
PB	-0.001 (-0.13)	-0.139*** (-7.37)	0.023*** (4.08)
CF	-0.546*** (-3.04)	-1.179*** (-3.47)	0.503*** (4.32)
Age	0.014*** (4.82)	0.033*** (5.94)	-0.002 (-1.36)
State	0.104*** (2.80)	0.168*** (2.22)	-0.069*** (-2.89)
Year	YES	YES	YES
Industry	YES	YES	YES
Cons	5.864*** (12.13)	-16.679*** (-18.67)	-4.971*** (-17.24)
N	6497	6497	6497
Adj. R2	0.679	0.533	0.480

注:括号内数字为t值;\*\*\*、\*\*和\*表示在1%、5%和10%的水平上显著。下同。



### 4.3 分组检验

上述研究表明,上市公司内部控制有效性会对投资者的融资融券行为产生影响。接下来,本文将探究上述发现是否在不同的情况下存在差异。具体而言,本文从代理成本、外部审计质量、社会信任水平三个角度进行考察。

#### 4.3.1 基于代理成本视角

已有研究显示,作为代理人的企业内部控制人相对其他利益相关者具有信息优势(徐寿福和徐龙炳,2015)。因此当企业委托代理成本较高时,内部控制人利用信息优势损害公司和其他股东利益的机会主义行为将变得更为频繁(李善民等,2009)。最糟糕的情况是内部控制人凌驾于控制之上,导致内部控制无法发挥应有的作用。投资者因为识别到这一风险,对代理成本高的上市公司的内部控制缺乏信任,在融资融券决策时不考虑其内部控制有效性,只在代理成本低的上市公司中才将其作为影响融资融券决策的参考因素。

借鉴前人的研究,本文采用两权分离度衡量样本公司的代理成本,两权分离度越高,企业的代理成本越高。根据样本上市公司两权分离度均值(1)将样本上市公司分为代理成本低、代理成本高两组,分组回归的结果如表4所示。在代理成本低的组别中,融资做多程度(Bull)、融券做空程度(Short)、净融券做空程度(D\_SB)三项回归系数与基本回归分析结果一致。而在代理成本高的一组,以上三项回归系数均不显著。这说明内部控制有效性对投资者融资融券行为产生的影响只限于代理成本低的上市公司,当上市公司代理成本高时,投资者识别到内部控制人凌驾于内部控制之上的行为,投资者此时的融资融券决策不会参考上市公司的内部控制有效性。

表4 代理成本分组检验结果

变量	代理成本低			代理成本高		
	Bull	Short	D_SB	Bull	Short	D_SB
EIC	0.499*** (2.61)	-0.659* (-1.83)	-0.394*** (-3.15)	0.315 (1.12)	-0.637 (-1.24)	-0.127 (-0.76)
Controls	YES	YES	YES	YES	YES	YES
Cons	5.912*** (10.55)	-15.980*** (-15.66)	-5.029*** (-14.85)	5.656*** (5.77)	-18.209*** (-10.41)	-4.815*** (-10.43)
N	4166	4166	4166	2011	2011	2011
Adj. R <sup>2</sup>	0.676	0.545	0.488	0.695	0.511	0.480



### 4.3.2 基于外部审计质量视角

已有研究显示,外部审计在一定条件下能发挥外部治理的作用(吕伟和林昭呈,2007)。高质量的外部审计可以有效提高公司的会计信息质量,进而提高资本市场的资源配置效率(周中胜,2008)。而高质量的外部审计服务只有大型会计师事务所才有能力和意愿提供(王玉等,2018),即大型会计师事务所的独立性更高、专业胜任能力更强,因此能够提供更高质量的审计服务。当上市公司由大型会计师事务所提供审计服务时,投资者因为信任大型会计师事务所的独立性和专业胜任能力,更关注外部审计结果,而忽视上市公司的内部控制有效性。只有当外部审计质量欠佳时,投资者才会参考上市公司内部控制有效性来进行融资融券决策。

借鉴已有研究,本文采用样本公司是否由国际四大会计师事务所提供年报审计服务来衡量样本上市公司的外部审计质量。由国际四大会计师事务所提供年报审计服务的样本上市公司为外部审计质量高组,由非国际四大会计师事务所提供年报审计服务的样本上市公司为外部审计质量低组,基于此将所有样本上市公司分为外部审计质量低、外部审计质量高两组。分组回归结果如表5所示:在外部审计质量低的组别中,融资做多程度(Bull)、融券做空程度(Short)、净融券做空程度(D\_SB)三项回归系数与基本回归分析结果一致;而在外部审计质量高的组别中,以上三项回归系数与基本回归分析的实证结果不一致。这说明上市公司内部控制有效性对投资者融资融券行为产生的影响只限于外部审计质量低的上市公司,当外部审计质量高时投资者更关注外部高质量审计服务机构提供的审计结果,投资者此时的融资融券决策会忽视上市公司的内部控制有效性。

表5 外部审计质量分组检验结果

变量	外部审计质量低			外部审计质量高		
	Bull	Short	D_SB	Bull	Short	D_SB
EIC	0.368** (2.18)	-0.773** (-2.47)	-0.292*** (-2.63)	0.348 (0.87)	-0.041 (-0.06)	0.457** (2.18)
Controls	YES	YES	YES	YES	YES	YES
Cons	5.768*** (10.26)	-17.116*** (-14.97)	-5.449*** (-15.79)	2.770** (2.02)	-17.901*** (-9.70)	-2.374*** (-4.67)
N	5517	5517	5517	828	828	828
Adj. R <sup>2</sup>	0.669	0.491	0.471	0.743	0.723	0.531

### 4.3.3 基于社会信任水平视角

已有研究显示，非正式制度与正式制度一样会对经济决策、市场资源配置和经济效率产生决定性作用。处于转轨经济的国家其正式制度不健全，非正式制度的决定性作用尤为突出。而作为非正式制度的社会信任，在促进经济增长、提高社会效率、提升正式制度治理效能、改善公司信息透明度、缓解信息不对称方面效果显著（道格拉斯，1994）。我国幅员辽阔、区域差别大，因此各地区的社会信任水平存在较大差异。与成熟资本市场相比，我国资本市场起步晚，处于快速发展期，正式制度不健全，非正式制度在资本市场运行中发挥着重要作用。研究显示，我国的地区社会信任水平影响着企业的投资决策、高管薪酬业绩敏感性、外部投资者对公司股权制衡的需求等（潘越等，2009；林钟高等，2014；雷光勇等，2015）。原因在于：社会信任作为一种非正式约束，具有一定的奖惩机制特征，当企业所在地区的社会信任水平越高时，这种奖惩机制对企业管理层和员工的约束力越强，此时投资者对企业更信任，融资融券决策时会更关注与社会信任相关的信息而忽视内部控制有效性。当企业所在地的社会信任水平越低时，这种奖惩机制对企业管理层和员工的约束力越弱，此时投资者的融资融券决策才会重视内部控制有效性。因此，上市公司内部控制有效性与投资者融资融券行为之间的关系会因企业所在地社会信任水平的不同而不同。

借鉴钱先航和曹春方（2013）、董淑兰等（2018）的研究，本文选择中国管理科学研究院诚信评价研究中心编制的“中国城市商业信用环境指数”来度量地区社会信任水平，该指数值越高，表明归属地的社会信任水平越高。根据样本公司地址将地区社会信任指数与样本公司进行匹配<sup>(2)</sup>，根据地区社会信任指数中位数将样本公司划分为社会信任水平低和社会信任水平高两组。分组回归的结果如表6所示，对比社会信任水平低、高两组的三项回归系数发现，社会信任水平低的组别的实证结果与基本回归分析的实证结果更为一致。这说明内部控制有效性对投资者融资融券行为产生的影响在社会信任水平低的地区更为突出，上市公司注册地的社会信任水平较高时，投资者的融资融券行为更关注地区社会信任的相关信息而忽视上市公司内部控制有效性。

表6 社会信任水平分组检验结果

变量	社会信任水平低			社会信任水平高		
	Bull	Short	D_SB	Bull	Short	D_SB

续表 6

EIC	0.124 (0.57)	-0.994** (-2.43)	-0.245* (-1.75)	0.604** (2.52)	-0.376 (-0.91)	-0.223 (-1.42)
Controls	YES	YES	YES	YES	YES	YES
Cons	4.824*** (7.85)	-17.852*** (-12.60)	-4.952*** (-12.60)	6.348*** (8.58)	-16.068*** (-14.26)	-5.141*** (-12.54)
N	3256	3256	3256	3131	3131	3131
Adj. R <sup>2</sup>	0.680	0.511	0.480	0.686	0.569	0.477

#### 4.4 稳健性检验

为应对反向因果导致的内生性问题,本文分别采用解释变量滞后一期、解释变量和控制变量滞后一期两种方式重新回归,发现内部控制有效性越高的上市公司,其股票越易被投资者融资做多。为应对遗漏变量引起的内生性问题,本文采用倾向得分匹配法(PSM)对样本进行一对一匹配,用匹配后的样本重新回归后三个主假设依然成立。本文还剔除了股市震荡期的样本重新回归,发现上市公司内部控制有效性越高,其股票越易被投资者融资做多;考虑融资做多对融券做空的对冲影响后,上市公司内部控制有效性越低,其股票越易被投资者净融券做空。限于篇幅,稳健性检验结果未予列示,留存备索。

### 5. 结论与建议

#### 5.1 结论

本文选择我国A股市场2010~2019年被纳入融资融券标的公司的6497个有效样本,考察样本上市公司内部控制有效性水平与投资者融资融券行为之间的关系。研究发现:上市公司内部控制有效性越高,越易被投资者融资做多;上市公司内部控制有效性越低,越易被投资者融券做空。在考虑融资做多对融券做空的对冲影响后,上市公司内部控制有效性越低,依然越易被投资者净融券做空。进一步研究后发现,本文的主效应还会因上市公司代理成本、外部审计质量、上市公司注册地社会信任水平的不同而存在异质性。

#### 5.2 建议

结合以上研究发现,本文提出以下几点建议:第一,上市公司应加强其内部

控制建设以提高内部控制有效性,这样才有利于上市公司提升市场价值,防范被大幅融券做空的风险。第二,上市公司需要采取一系列措施降低上市公司的代理成本,只有当上市公司不存在严重的代理问题时,内部控制建设的成效才能得到投资者的信任,进而影响其投资决策行为。第三,当内部控制建设成效无法赢得投资者信任时,上市公司可考虑通过购买高质量的外部审计服务等方式进行替代,因为如果公司拥有高质量的外部审计服务,投资者在决策时会更重视外部审计质量而忽视上市公司的内部控制有效性。第四,监管层要积极落实2022年财政部、证监会联合印发的《关于进一步提升上市公司财务报告内部控制有效性的通知》,加大监管力度、创新监管方式以提升上市公司的内部控制有效性,以期为投资者营造一个健康有序、能充分发挥资源优化配置功能的资本市场。

学科前沿快报

## Achieving carbon neutrality in post COP26 in BRICS, MINT, and G7 economies: The role of financial development and governance indicators

Elvis Kwame Ofori<sup>a</sup>, Stephen Taiwo Onifade<sup>b</sup>, Ernest Baba Ali<sup>c</sup>,  
Andrew Adewale Alola<sup>d, g, h</sup>, Jin Zhang<sup>e, f</sup>

(a Zhengzhou University, School of Management Engineering, Management Science and Engineering,  
100 Kexue Blvd, Zhongyuan District, Zhengzhou, Henan, China

b Faculty of Economics and Administrative Sciences, Department of International Trade & Logistics,  
KTO Karatay University, Konya, Turkey

c Department of Environmental Economics, Ural Federal University, Russia

d Centre for Research on Digitalization and Sustainability, Inland Norway University of Applied  
Sciences, Norway

e Center for Energy, Environment & Economy Research, Zhengzhou University, Zhengzhou, 450001,  
China

f School of Public Policy and Management, Tsinghua University, Beijing, 100084, China

g Faculty of Economics, Administrative and Social Sciences, Nisantasi University, Istanbul, Turkey

h Department of Economics and Finance, South Ural State University, Chelyabinsk, Russia)

**Abstract:** Pledges and commitments from governments of wealthy nations were made at the COP26 Glasgow summit, thereby rejuvenating hope among nations to confront the climate change challenge. Thus, the study examines the complementarity of financial development and carbon emissions, while accounting for the conditional influence of good governance under three disaggregated indicators-economic, institutional, and political governance for the BRICS, MINT, and the G7 economies. First, the study reveals that financial development depending on the adopted indicator has mixed effects on environmental pollution levels. Specifically, financial development triggers the highest pollution effect via domestic credit to the private sector compared to foreign direct investments, while financial development index reduces environmental pollution. Secondly, economic governance promotes environmental quality by reducing environmental pollution through quality regulation. Third, institutional governance through weaker rule of laws induces pollution, while the control of corruption antagonizes pollution levels. Furthermore, only the voice of accountability supports the pollution-mitigating effect of political governance. On a bloc-to-bloc comparative analysis, governance effectiveness promotes environmental pollution in all the three economic blocs albeit at different magnitudes while the voice of accountability exerts a significant desirable impact on pollution only in the G7 countries. Lastly, renewable energy and trade liberalization exerts a negative and positive influence on environmental degradation respectively.

**Keywords:** Environmental sustainability, Carbon neutrality, Financial Development, Governance MINT-BRICS-G7

**Source:** Journal of Cleaner Production Volume 387, 10 February 2023, 135853

**DOI:** 10.1016/j.jenvman.2022.117125

**Link:**

<https://webofscience.clarivate.cn/wos/woscc/full-record/WOS:000917268000001>

(文中参考文献及注释详见原刊)

## 1. Introduction

Currently, countries are increasingly being confronted with climate change issues, thus compelling governments around the globe to devise new measures for addressing the global menace. However, the problem has compounded over the past couple of decades. Since the first Conference of Parties (COP) in 1992, there have been three decades of climate negotiations, yet the frequency and severity of adverse climate consequences are still rising (Hill, 2021; Singh et al., 2021; Wang et al., 2021). Based on the continual commitment to improving environmental quality by governments, the Paris agreement accord was recently reaffirmed in Glasgow. The COP26 occurred at a critical time when extensive decarbonization is being demanded. Post covid, countries are engaged in economic recovery strategies, including contextualizing resource utilization under sustainable envelopes. However, there are still lingering pertinent questions that need to be answered such as “Do thriving financial markets and financial institutions harm the environment as they arguably aid development?”

Moreover, a recent climate change assessment has underlined the grave risks that climate change, global warming, and the related severe weather events pose to the globe, necessitating further investigations (Stern, 2022; Tao et al., 2022). Along with avoiding them and reducing them, offsetting carbon emissions is a crucial step in comprehensive climate action (Wang et al., 2022). Carbon neutrality has the potential to significantly reduce global warming, end the global energy crisis, and also improve air quality and human health. Achieving this may be considered an industrial revolution and a significant turning point in the history of humanity (Wang et al., 2020). Whether carbon neutrality is possible in the context of the existing energy system is still unknown. Hence four (4) policy framework threads support the contributions of this article: (i) the primary motivations for concentrating on and exploring three major economic blocs; (ii) broadening the scope of the financial development-carbon emissions link; (iii) assessing the significance of governance quality in enhancing environmental protection; and (iv) addressing identified gaps in the literature. The remainder of this section further expatiates the motivation of this study to the extant literature as outlined earlier.

First, most economies in BRICS, MINT, and the G71 economies are developed and linked with significant environmental deterioration. However, since production processes primarily rely on fossil fuels, mitigating carbon dioxide emissions in these economies seems unattainable (Emblemsvåg, 2022; Alola et al., 2021; Kaya et al., 2019; Alola and Onifade, 2022). In this regard, ascertaining how financial development (FD) and governance quality affect national environment quality is prudent within these advanced economies. Second, the outcomes of the limited studies on the nexus between FD and carbon emission have also been contradictory (Forson et al., 2017; Gossel, 2018; Krifa-Schneider et al., 2022). However, suggestions to improve funding mechanisms and promote financial cooperation to achieve the financial targets for sustainable green energy projects continue to motivate the activities of BRICS, MINT, and G7 nations among others. Another front of the argument suggests that the increase in financial growth has led to the growth of energy usage, thus, generating environmental concerns. Third, the role of governance can not be discounted under the framework of environmental Protection. Thus, the pollution-haven hypothesis showed that lax environmental regulations in the host nation might encourage additional foreign direct investment from businesses seeking to avoid expensive compliance with regulatory requirements in their home countries (Akram et al., 2022; Bouzahzah, 2022). This makes the involvement of good

governance an essential tool to check financial development and promote sustainable development. However, it is often an ignored factor in the environmental quality debate. Additionally, institutional quality is critical to prompt the adoption of green energy sources, green investment, and friendly global commerce (Lin et al., 2019). When governmental organizations properly execute environmental laws and regulations, institutional quality promotes ecological quality.

In the contemporary world, a polluted environment is often seen as a major barrier to sustainable economic growth. Several studies have noted that environmental quality improvement is still necessary to achieve sustainable development (Zafar et al., 2020; Bekun et al., 2022; Gyamfi et al., 2022; Onifade and Alola, 2022). Additionally, the works of Usman et al. (2020) and Zafeiriou et al. (2022) support the idea that financial development (FD) and institutional mandates might be a catalyst for environmental protection. However, this remains a research gap since there is a lack of solid empirical data. Additionally, to best of the our knowledge, no research has been conducted to contrast this occurrence within the context of the three economic blocs (i.e. BRICS, MINT & G7).

Following the motivation of the study outlined above, three (3) strands of research gaps are identified: First, despite the expanding body of knowledge, it is still unclear whether financial development has a good or adverse impact on environmental deterioration. Second, this study broadens the scope of FD by expanding the proxies of financial development. Importantly, the current analysis uses a relatively new FD measure developed by the International Monetary Fund (IMF) in addition to two proxies from the world bank to provide a wholesome outlook on FD. Additionally, among the numerous innovative approaches, it is crucial to consider the role of the government in various policy alternatives when developing an environmental plan for mitigating carbon emissions. In closing this gap, this study would moderate the impact of good governance in mitigating the adverse effect or otherwise of financial development on the environment. In deepening the moderation effect, the study uses subset categories of governance metrics that would better inform policy engagement as espoused by (Omri and Ben Mabrouk, 2020). The last shortcoming in the literature is often the scope of the investigation which is either country-specific or solely on economic blocs. However, this work bridges this gap through a comparative analysis of the three major economic blocs mentioned earlier. Thus, this work opens up an important step toward addressing the ongoing financing disparity between mitigation

and adaptation initiatives arising from the discussion at cop26 (Mountford et al., 2021). Moreover, this study demonstrates the effectiveness of governance in mitigating the harmful influence of financial boom on ecosystems.

The remainder of the paper is dedicated to the following sections: section 2 discusses theories underpinning the work, section 3 elaborates on the method to be used to test the hypothesis, section 4 presents the results and discusses its relevance, and section 5 concludes and renders policy recommendations.

## **2. The theoretical underpinnings and empirical literature**

The interest of researchers, academics, economists, and policymakers in financial development (FD) has increased significantly in recent decades (Huang et al., 2021; Lei et al., 2022). Due to the technical dissemination it creates, many studies have considered FD a positive factor for an economy (Nguyen et al., 2022; Ren et al., 2022; Ilham et al., 2022). The propensity of FD's to enable robust economic expansion makes them an intermediate factor in environmental sustainability under the framework of the environmental Kuznets curve (Jakada et al., 2022; Onifade, 2022; Usman and Balsalobre-Lorente, 2022). For a country to flourish both economically and socially, a thriving financial sector is crucial. It is also critical to assess how FD affects the environment. Several research exists on the relationship between FD and environmental quality, however, the findings are conflicting. Most often, FD is measured using domestic credit to the private sector, liquid liabilities, and deposited money (bank assets) as a percentage of GDP (Bilgili et al., 2020; Usman and Balsalobre-Lorente, 2022). According to the first body of research, FD considerably improves environmental sustainability by halting environmental deterioration. For example, Tamazian et al. (2009) and Zoaka et al. (2022) looked at how FD affected carbon emissions in the BRICS economies. The former discovered that by lowering carbon emissions, FD improves environmental quality. FD and environmental degradation were shown to have a favorable association, according to (Jalil and Feridun, 2011) and (Tang et al., 2022). Salahuddin and Alam (2015) discovered that FD has a moderating impact on carbon emissions in China (Dogan and Seker, 2016). also looked at the relationship between FD and environmental quality in 23 different nations. They discovered that FD promotes environmental quality by reducing environmental degradation using the FMOLS and DOLS methodology.



However, the complexity has been in how financial development is described and conformity for policy implementation. Some studies (Onyeisi et al., 2018; Patterson et al., 2017) define financial development as the ratio of domestic credit to the private sector to GDP. It is estimated that an increase in bank loans to the private sector adds to sectoral growth and output expansion. However, how businesses use this resource to supply through banks is critical. The influence of bank loans on carbon emissions has been described in two ways in extant literature. According to Nasir et al., domestic loan to the private sector negatively influences carbon emissions and increases pollution levels (Nasir et al., 2019). This infers exploitation of the natural resource for profiteering at the expense of the customer being exposed to pollution. Other studies ascertain a positive cohesion between bank capital injection into an economy and carbon emission since it instigates a green economy. A green economy follows the principle of the environmental Kuznets curve and abates carbon emissions.

A newly incorporated financial development is the FD index by IMF (Svirydzenka, 2016). It offers governments a comprehensive way to benchmark numerous aspects of their financial systems. However, it has not brought closure to the contradictory results on the FD-carbon (Iorember et al., 2020; Nathaniel, 2021; Shobande and Ogbeifun, 2022).

Another school of thought relates FD to the market openness to foreign direct investment (FDI), and this phenomenon associates it with contrary implications on the environment. Foreign direct investment, a component of FD, delivers cash, cutting-edge technology, and managerial expertise to a host nation, thereby advancing economic development and technological advancement (Rehman and Islam, 2022). Additionally, investments from multinational corporations typically create jobs for citizens of the host country. This boosts economic activities, with a resultant negative impact on the environment. Also, such economic expansions thrive on energy consumption, predominately fossil fuel. On the contrary, some academics argue that financial development may spur eco-friendly technical innovation (Hyun, 2022; Usman et al., 2022; Zhang et al., 2022). They observe that FD strives for a less polluted environment by providing eco-friendly items and promoting sustainability of regional, national, and global development. This phenomenon has sparked academic interest in determining the impacts of FD on the environment and their many consequences. In the case of France, Shahbaz et al. (2018) identified FDI as the

primary source of environmental damage (Kiviyiro and Arminen, 2014). found that the influence of FDI on the Sub-Saharan area is neither favorable nor adverse, leaving a substantial imprint. These studies omitted the critical financial growth and development variable with good governance indicators, which could help produce more robust outcomes.

A more robust competitive landscape is often coupled with solid governance or an enabling environment. While economic considerations remain the most important determinants of their financial development, variables dictating a welcoming FDI landscape are also important in the multinational corporation (MNC) decision process. As a result, these FDI scholarships have emerged.

The first strand emphasizes how institutions as a subset of governance affect foreign direct investment. Institutional regimes are the laws and values that guide and control people's behavior in an economy. They are thought of as national factors. As a result, they could influence the “rules of the game” for MNC operations and influence foreign investments. Additionally, the integrity of local markets is ensured by property rights, political stability, openness, and the absence of (or low levels of) corruption. Therefore, good institutions impact the likelihood of foreign investors receiving returns on their investments. Also, a buoyant economy thrives on a reliable set of rules of law. This makes the role of governance an essential component for stimulating financial development in a country. To this end, Krifa-Schneider and Matei (2010), studying 33 developing countries, concluded that political stability induces financial development–FDI inflow. This was further endorsed by (Yakubu et al., 2021) and (Gao et al., 2022) for Egypt and China respectively.

Corruption, on the other hand, hinders financial progress. Corruption is often related to institutional weaknesses and is cited as a critical factor affecting FDI flows (Gossel, 2018; Appiah et al., 2022; Onody et al., 2022). In two competing perspectives, the role of corruption is called into doubt. On the one hand, corruption is seen as a “lubricant element” that might help to unblock any capital flow issues and therefore serves to “oil the wheels,” allowing a relative attractiveness of FDI in an economy. On the other hand, corruption is a barrier that raises the expenses of MNCs and hence deters investors by acting as “sand in the wheels” of the economy. The next section addresses the debates around these two ideas.

Reviewing the relevance of governance to sustainable development is motivated by two main factors, namely, (i) the contemporary concern related to the pollution of the environment; (ii) poor governance issues connected with the management of the policy syndrome of environmental pollution; The factors are expanded chronologically in the subsequent paragraphs.

The first strand is predicated on poor governance strategy towards the transition to clean energy or accessing the policy implementation of the environmental Kuznets curve, which is also predicated on the prospect of accelerating growth to abate pollution under key metrics, *Ceteris paribus*. The Second strand highlights the need for governments to make policy decisions to direct resources into clean energy exploration and develop a green finance playbook. Given contemporary environmental protection requirements, environmental governance policies must be significantly revised to go beyond agreements and summits to include concrete actions like funding environmental projects.

In conclusion, FD may improve a country's economic growth and minimize the consequences of acute poverty and economic inequity, but it can have adverse implications on environmental quality and thus must be investigated (Ozturk and Ullah, 2022). Hence our study tries to understand this relationship to better inform policy decisions. The study is motivated by the current discussion on financial development and the paucity of empirical information on the critical relationship between financial inclusion, governance indicators, and environmental sustainability. The current work tries to fill this vacuum in the literature by offering numerous contributions. The study looks into the influence of financial inclusion on climate change and the role of good governance in mitigating it. The paper also considers the question of model uniformity. Finally, the analysis offers relevant policy implications for maintaining environmental sustainability and achieving financial success in three comparative economic blocs.

### **3. Methodology**

The pledge made by developed nations to provide emerging nations with \$100 billion annually fell short when they arrived in Glasgow. The Glasgow conclusion reiterates the commitment while expressing “regret” and exhorts wealthy nations to immediately meet the US\$100 billion aim. Developed nations expressed confidence that the goal would be reached by 2023. It was what Mark Carney dubbed a

“watershed” second. He claimed that prior to today, there was not enough money in the globe to finance the transformation. “We draw the line right here, right now. The \$130 trillion is more than required to achieve a net-zero worldwide transition. He continued by saying that a portion of this wealth will be set aside for emerging and developing economies. This serves as a basis for this study to empirically substantiate events before and post COP26.

To analyze the impact of the different characteristics of financial development and governance quality, among other control variables, on CO2 emissions from 1996 to 2020, the multivariate regression model which draws its motivation from earlier works (Awan and Azam, 2022; Azam et al., 2022) were used. We, therefore, specify the model 1 based on the considerations above.

$$\ln Co_{2it} = a_0 + a_1 \ln FDI_{it} + a_2 \ln DCP_{it} + a_3 FDV + a_4 RQ_{it} + a_5 GE_{it} + a_6 Rul_{it} + a_7 CC + a_8 VOA_{it} + a_9 PS_{it} + a_{10} REN_{it} + a_{11} TR_{it} + a_{12} Y_{it} + \beta_{it} \quad 1$$

The first model denotes the full sample and all variables without distinctions, where  $i = 1, \dots, 18$  indicates the targeted populace and  $t = 1996, \dots, 2020$  represents the period that was covered and  $\beta$  is the residuals. Furthermore, due to the distinction between the role and category of governance indexes, further investigation will be done, taking cognizance of their respective roles without the influence of other governance indexes. Therefore, model 1 consists of governance indices proxied by economic governance (Asongu and Odhiambo, 2020), institutional governance (Zhang and Kim, 2022), and political governance (Patterson et al., 2017). Also, due to resource restrictions of the world's climate change, renewable energy, trade, and economic growth have become key feedstock for the financial development of various countries. It is, therefore, imperative that the amount of renewable energy in the current period increases per the level of development in the previous period. This is expected to boost trade and economic growth under the auspices of financial development. As a result, the FD-CO2 nexus would be controlled in all models using these variables as shown in models 2 to 4.

$$\ln Co_{2it} = a_0 + a_1 \ln FDI_{it} + a_2 \ln DCP_{it} + a_3 FDV + a_4 RQ_{it} + a_5 GE_{it} + a_6 REN_{it} + a_7 TR_{it} + a_8 Y_{it} + \beta_{it} \quad 2$$

$$\ln Co_{2it} = a_0 + a_1 \ln FDI_{it} + a_2 \ln DCP_{it} + a_3 FDV + a_4 Rul_{it} + a_5 CC_{it} + a_6 REN_{it} + a_7 TR_{it} + a_8 Y_{it} + \beta_{it} \quad 3$$

$$\ln Co_{2it} = a_0 + a_1 \ln FDI_{it} + a_2 \ln DCP_{it} + a_3 FDV + a_4 VOA_{it} + a_5 PS_{it} + a_6 REN_{it} + a_7 TR_{it} + a_8 Y_{it} + \beta_{it} \quad 4$$

Thus, Equation (2) tests if economic governance mediates the relationship between financial progress and carbon neutrality, Equation (3) tests if institutional governance mediates the relationship between financial progress and carbon neutrality, while

Equation (4) tests if political governance mediates the relationship between financial progress and carbon neutrality.

### 3.1. Data

We obtained data from the World Development Indicators (WDI), the International Monetary Fund (IMF), and the World Governance Indicators (WGI). The starting period is chosen based on the data available for governance indicators. The definition and origin of the variables are listed in Table 1. Given that a balanced panel data is employed for the study, missing values especially for the governance indicators were computed by using linear interpolation. This computation approach essentially helps in estimating possible intermediate observations between available data values through a straight line between two available adjacent values (Meijering, 2002; Cox, 2005).

Variable	Variable Indicators	Index	Source
Environment Quality	CO2 Emissions Per Capita	CO2	WDI
Financial Development (FD)	Financial Development Index	FDI	IMF
	Domestic Credit To Private Sector As % Of GDP	DCP	WDI
Foreign Direct Investment	FDV	WDI	
Economic Governance	Regulation Quality	RQ	WDI
	Government Effectiveness	GE	WDI
Institutional Governance	Rule Of Law	RUL	WDI
	Control Of Corruption	CC	WDI
Political Governance	Voice And Accountability	VOA	WDI
	Political Stability	PS	WDI
Energy Source	Renewable Energy	REN	WDI
Trade Liberalizations	Trade percentage of GDP	TR	WDI
Economic Growth	GDP Per Capita (GDP)	Y	WDI

#### 3.1.1. Dependent variable

In governmental and intellectual circles, concerns about the earth's sustainability have gained increasing clout, especially considering the COPS' 26 reports that found no carbon dioxide emissions (CO<sub>2</sub>) reduction. The ecosystem continually suffers from the adverse effect of carbon emissions. Making it imperative to broaden policy formation. Hence our work uses Carbon emissions as a proxy for environmental degradation with the prospect of further understanding how financial development within economies can help abate the phenomenon.

#### 3.1.2. Independent variables

**Financial Development:** The Glasgow Financial Alliance for Net Zero revealed at the start of the COP26 Finance Day that it had persuaded over 450 companies from 45 nations to pledge to move their economies toward net-zero emissions. The companies

oversee more than \$130 trillion in private capital in total. This indicates the importance of fostering fiscal development within an economy targeted to reduce global emissions because a crucial campaign would require capital. Thus, following the works of Omri et al. (2021), we use two proposed variables, namely, the financial development index (FDI), and domestic credit to the private sector as % of GDP (DCPS) as proxies for financial development. The data for these variables were compiled from The WDI and IMF online databases.

**Governance quality:** The degree of climate remediation and sustainability is determined by the efficacy of a country's governance system and its quality. The model also includes a policy variable for governance quality, which works in conjunction with financial development to cut CO<sub>2</sub> emissions. As predictors of CO<sub>2</sub> emissions, the research considers six indicators of good governance identified in Table 1. For detailed information on the six indicators of governance, see table 12 in the Appendix. These indicators are divided into three categories: institutional governance, political governance, and economic governance. Good governance is likely to reduce carbon emissions.

### **3.1.3. Control variables**

Three different factors were employed to regulate the relationship between FD and CO<sub>2</sub>. Our model considers financial development as a promoter of clean energy investments, which has the potential to offset some pollution from emissions. The majority of this advanced economics' industrialization objective, which frequently equates to environmental destruction, might be reduced by increased trade openness. Additionally, trade openness facilitates simple access to renewable energy sources or adopting technological innovations that may be environmentally favorable. Economic expansion is also considered to identify how it mediates this relationship.

## **3.2. Econometric modeling and procedures**

Based on the above-discussed arguments, we propose the following model to examine the influence of the various aspects of financial development and governance quality, among other control variables, on CO<sub>2</sub> emissions in BRICS, MINT, and G7 over the period 1996 - 2020. We adopt the time series model of (Omri et al., 2021) and transform it into a panel data model to suit our study.

To ensure the viability of our data and model framework, a series of preliminary tests are considered. (a) We used the sample adequacy test to test the chosen data reliability and viability to represent enough threshold for analysis. We also used a scree plot to represent the graphical normality of the data; (b) the CD test was performed to investigate the cross-sectional dependence effect among the variables. In other words, the CD test examines the spill-over effect among countries; (c) We applied the 2 s-generation unit root tests. This is because applying the first-generation panel unit root may yield spurious estimates; (d) the Westerlund cointegration was

then used. The latter was to ascertain the plausibility of long-run estimation. The cointegration examines the possibility of long-run association among variables. High correlation coefficients between independent factors and dependent variables may indicate multicollinearity difficulties in the model. As a result, we constructed a correlation matrix to check for such deficiency. We performed the long-run parameter estimations after the rigorous preliminary testing. The pool OLS-fixed model was then used to test the central hypothesis, and Prais – Winsten regression with panel-corrected standard error estimation was used for the comparison analysis. This was done with the understanding that heteroskedasticity and autocorrelation in Panel Data needed to be corrected.

#### 4. Results and discussion

Prior to the estimation of the main results of the study, a series of pre-estimation procedures were performed to ascertain the suitability of the dataset for the model estimation. To begin with, we performed the Kaiser-Meyer-Olkin (KMO) test and Bartlett's sphericity test (BS) to investigate the importance of the study variables as proposed by the determining factors of CO2 emissions (Table 2). The results presented in Table 2 reveal that the estimated outcomes are within acceptable ranges. Fig. 1 presents the scree plot for the principal component analysis (PCA) and it supports that the independent variables are relevant in determining the dependent variables of the study.

Table 2. Test of sampling adequacy.	
KMO and Bartlett's test	
Kaiser–Meyer–Olkin measure of sampling adequacy	0.844
<b>Bartlett test of sphericity</b>	
Chi-square	6246.343
Degrees of freedom	78
p-value	0

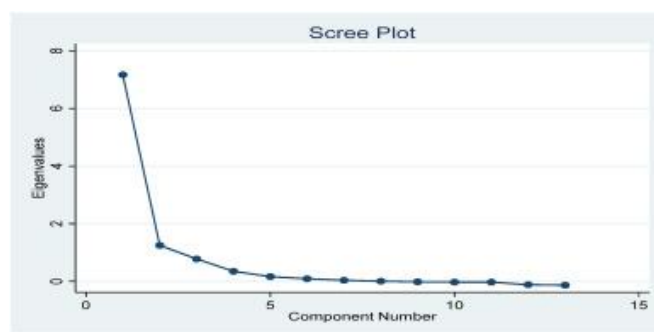


Fig. 1. Scree plot of PCA.

Further, we present the descriptive statistics in Table 3. The results as shown in Table 3 and presented for the full sample, as well as each of the economic blocs considered in this study. Subsequently, we performed the pairwise correlation analysis to determine multicollinearity



intensity. The result reveals statistical significance among all the variables under consideration. The result also shows that majority of the correlation relationship between the independent variables and CO2 emissions is negative with a few positive interactions (see Table 4).

Table 3. Description of Data for full Sample BRICS, MINT AND G7.

Variable	InCo2	InFDI	InDCP	InFDV	InRG	InGE	InRUL	InCC	InVOA	InPS	InREN	InTR	InY
<b>Full sample</b>													
Obs.	400	400	400	388	400	400	400	400	400	400	400	399	399
Mean	-0.843	0.926	5.987	0.425	1.244	1.241	1.143	1.213	1.07	0.707	2.595	4.975	31.117
Std. Dev.	0.728	0.086	0.136	0.989	0.244	0.261	0.318	0.312	0.365	0.542	0.996	0.11	0.106
Min	-2.214	0.745	5.735	-6.394	0.528	0.574	0.381	0.535	-0.084	-1.6	-0.159	4.726	31.038
Max	0.793	1.063	6.283	2.544	1.628	1.605	1.565	1.664	1.467	1.342	4.486	5.265	31.543
<b>BRICS</b>													
Obs.	125	125	125	125	125	125	125	125	125	125	125	125	125
Mean	-0.106	0.893	5.965	0.595	1.076	1.096	0.956	1.029	0.835	0.58	2.828	4.936	31.102
Std. Dev.	0.681	0.036	0.109	0.72	0.112	0.117	0.151	0.158	0.434	0.26	0.973	0.094	0.086
Min	-1.572	0.821	5.796	-1.584	0.903	0.817	0.584	0.697	-0.084	-0.106	1.115	4.726	31.039
Max	0.793	0.963	6.216	1.681	1.348	1.389	1.177	1.354	1.257	1.009	3.985	5.115	31.438
<b>MINT</b>													
Obs.	100	100	100	95	100	100	100	100	100	100	100	99	100
Mean	-0.799	0.822	5.838	0.417	1.041	0.988	0.824	0.908	0.859	0.106	3.245	4.993	31.054
Std. Dev.	0.301	0.043	0.049	0.73	0.19	0.202	0.19	0.175	0.187	0.597	0.84	0.086	0.01
Min	-1.558	0.745	5.735	-2.602	0.528	0.574	0.381	0.535	0.109	-1.6	2.193	4.77	31.038
Max	-0.29	0.911	5.974	1.383	1.267	1.223	1.115	1.193	1.104	0.857	4.486	5.265	31.075
<b>G7</b>													
Obs.	175	175	175	168	175	175	175	175	175	175	175	175	174
Mean	-1.394	1.009	6.087	0.302	1.481	1.488	1.46	1.518	1.359	1.141	2.056	4.992	31.164
Std. Dev.	0.368	0.034	0.095	1.242	0.084	0.101	0.101	0.126	0.047	0.116	0.791	0.126	0.126
Min	-2.214	0.891	5.913	-6.394	1.267	1.159	1.142	1.148	1.263	0.78	-0.159	4.748	31.063
Max	-0.658	1.063	6.283	2.544	1.628	1.605	1.565	1.664	1.467	1.342	3.125	5.224	31.543

Table 4. Pairwise correlation matrix.

	InCo2	InFDI	InDCP	InFDV	InRG	InGE	InRUL	InCC	InVOA	InPS	InREN	InTR	InY
InCo2	1												
InFDI	-0.466***	1											
InDCP	-0.198***	0.812***	1										
InFDV	0.022	-0.004	-0.104*	1									
InRG	-0.535***	0.857***	0.664***	0.0234	1								
InGE	-0.423***	0.864***	0.746***	-0.000	0.945***	1							
InRUL	-0.511***	0.876***	0.716***	-0.064	0.932***	0.950***	1						
InCC	-0.517***	0.858***	0.724***	-0.008	0.950***	0.959***	0.973***	1					
InVOA	-0.531***	0.802***	0.326***	-0.118*	0.744***	0.680***	0.764***	0.740***	1				
InPS	-0.325***	0.765***	0.654***	0.008	0.810***	0.845***	0.789***	0.807***	0.559***	1			
InREN	0.063	-0.542***	-0.473***	0.038	-0.547***	-0.557***	-0.438***	-0.448***	-0.239***	-0.511***	1		
InTR	-0.005	0.093	-0.102*	0.232***	0.243***	0.213***	0.125*	0.147**	0.0999*	0.118*	-0.156**	1	
InY	-0.143**	0.513***	0.647***	0.013	0.345***	0.406***	0.381***	0.359***	0.0306	0.318***	-0.271***	-0.348***	1

\*p < 0.05, \*\*p < 0.01, \*\*\*p < 0.001.

### 4.1. The cross-sectional dependence and unit root test

As part of the estimation procedure, the CD test was performed to examine the spill-over effect between our variables of interest to this study. Evidence of cross-sectional dependence among the study variables is an indication of the fact that a change in any of the variables in one country could affect those in another country. Given that the estimated variables of the CD test are statistically significant, we conclude that cross-sectional dependence exists in the dataset (Table 5). Further, we performed the unit root test to investigate the order of integration of the dataset (Table 5). The results reveal that all variables are stationary at the first difference, indicating that the variables are all of the order I(1). We then proceed to investigate the slope



confidence and the cointegration among variables. The results are presented in Table 6, Table 7 respectively.

Table 5. CD test and panel unit root test.

	Breusch-Pagan LM	CIPS(0)	CIPS (1)	CADF(o)	CADF (1)
InCo2	1700.994***	-1.373	-4.027***	0.867	-4.739***
InFDI	1316.180***	-2.946***	-5.275***	-5.634***	-9.648***
InDCP	1339.706***	-1.895	-3.229***	-4.642*	-4.642***
InFDV	186.1991***	-3.038***	-3.038***	-1.350*	-9.609***
InRG	490.895***	-1.382	-4.357***	1.949	-5.262***
InGE	967.775***	-1.370	-4.775***	2.563	-7.617***
InRUL	585.209***	-1.433	-4.220***	1.329	-7.098***
InCC	698.472***	-0.949	-3.482***	1.933	-4.486***
InVOA	550.528***	-1.862	-3.699***	-0.515	-4.192***
InPS	579.959***	-2.214**	-5.018***	-0.837	-7.829***
InREN	1615.873***	-0.584	-4.057***	5.133	-4.640***
InTR	1092.973***	-1.703	-3.815***	-1.236	-5.649***
InY	2376.843***	-2.428***	-4.691***	-0.506	-5.841***

Note: \*p < 0.05, \*\*p < 0.01, \*\*\*p < 0.001.

Table 6. Westerlund homogenous slope.

	Delta	P-value
	35.932***	0.000
adj.	48.016***	0.000

Westerlund Cointegration test

Statistic	Value	z-value	P-value
Gt	-2.820***	4.64	0.000
Ga	-10.405**	2.398	0.008
Pt	-11.497***	5.74	0.000
Pa	-8.916***	4.222	0.000

Note: \*p < 0.05, \*\*p < 0.01, \*\*\*p < 0.001.

## 4.2. Long-run empirical analysis

The study employed the fixed effects model to investigate the environmental nexus between FD, government, and CO2 emissions for the full sample following the result displayed in Table 7. Given that all the variables are log-transformed, the estimated outcomes can be interpreted as elasticities or expressed in terms of percentages. To ensure that we ascertain the exact impact of governance indicators on environmental pollution, we disaggregate the government indicator into economic, institutional, and political governance.

A number of interesting findings are presented in Table 7. The first strand of results reveals that financial development has a mixed effect on environmental pollution. Specifically, the financial development index shows a negative effect on environmental pollution, and this ranges from 4.58% to 6.20% at a 1% level of

significance. This outcome provides contrary evidence to the results of Omri et al. (2021). However, a closer look at the impact of the other two indicators of financial development reveals contrary evidence such that financial development is also seen to exert a significant positive effect on environmental pollution. The latter assertion is supported by the positive impact of domestic credit to the private sector on environmental pollution with impacts ranging from 2.55% to 3.97%. This implies that a percentage increase in domestic credit to the private sector aggravates environmental pollution by 2.55% – 3.97%. Similarly, foreign direct investment as an indicator of FD corresponds positively with a relatively small increment in environmental pollution, as the result suggested that a 1% increase in foreign direct investment will account for between 0.06% and 0.07% increase in environmental pollution. These strands of evidence thus support the conclusion of Omri et al. (2021).

Table 7. Fixed effect results of the full sample using CO2 as the dependent variable.

Variable	Governance		Economic Governance		Institutional Governance			Political Governance		
	Gov	EG	RG	GE	IG	RUL	CC	PG	VOA	PS
InFDI	-5.066*** (-5.47)	-4.576*** (-5.83)	-4.518*** (-5.95)	-7.115*** (-7.52)	-6.197*** (-8.74)	-5.770 6*** (-7.72)	-5.425*** (-6.56)	-6.638*** (-5.13)	-6.524*** (-7.51)	-8.044*** (-6.61)
InDCP	2.971*** (-5.00)	2.580*** (-4.76)	3.133*** (-5.4)	3.565*** (-6.28)	3.971*** (-7.48)	3.340*** (-5.42)	3.764*** (-6.81)	2.549*** (-5.59)	2.604*** (-4.08)	3.160*** (-6.31)
InFDV	0.059* (-1.78)	0.0476 (-1.28)	0.0455 (-1.24)	0.043 (-1.12)	0.068** (-2.14)	0.024 (-0.62)	0.047 (-1.43)	0.017 (-0.46)	0.019 (-0.46)	0.0462 (-1.21)
InRG	-2.496*** (-3.02)	-3.0761*** (-4.35)	-2.0016*** (-8.15)							
InGE	1.558*** (-2.81)	1.3175** (-2.13)		-1.054*** (-5.91)						
InRUL	0.581** (-2.57)				0.971** (-2.71)	-1.038*** (-18.43)				
InCC	-1.568** (-2.46)				-2.182*** (-5.36)		-1.329*** (-10.13)			
InVOA	0.0596 (-0.47)							-0.570*** (-12.56)	-0.554*** (-11.38)	
InPS	0.2457 (-1.54)							0.0508 (-0.25)		-0.057 (-0.29)
InREN	-0.166*** (-5.32)	-0.208*** (-8.47)	-0.215*** (-6.74)	-0.194*** (-5.29)	-0.160*** (-5.47)	-0.146*** (-4.49)	-0.151*** (-5.07)	-0.143*** (-7.25)	-0.147*** (-4.71)	-0.172*** (-5.88)
InTR	1.078*** (-3.52)	1.1611*** (-3.91)	1.313*** (-4.43)	1.099** (-2.67)	0.9054*** (-2.85)	0.8528** (-2.37)	0.9077** (-2.69)	0.518 (-1.44)	0.5223 (-1.5)	0.7233* (-1.86)
InY	-0.361 (-1.59)	-0.2098 (-0.54)	-0.1927 (-0.58)	-0.030 (-0.09)	-0.6023* (-2.06)	-0.2347 (-0.74)	-0.5128* (-1.91)	-0.5293* (-1.83)	-0.5532 (-1.55)	0.0219 (-0.07)
Constant	-5.469 (-0.71)	-8.579 (-0.73)	-12.915 (-1.43)	-18.326* (-1.74)	-2.707 (-0.31)	-10.869 (-1.18)	-4.923 (-0.61)	4.879 (-0.51)	5.196 (-0.51)	-15.286 (-1.52)
No. of Observations	386	386	386	386	386	386	386	386	386	386
R-Squared	0.512	0.491	0.473	0.401	0.454	0.415	0.447	0.408	0.408	0.372
F Statistic	725.171	586.053	497.312	394.309	433.077	635.853	518.473	2770.063	2531.94	475.064

Note \* 0.10 \*\* 0.05 \*\*\* 0.01 t stat in parenthesis.

The second strand of empirical evidence reveals that economic governance promotes environmental quality by reducing environmental pollution through quality regulation. As seen in Table 7, a percentage increase in regulatory quality will cause an increase in environmental quality following a reduction in carbonemission of between 2.00% and 3.08% at a 1% level of significance. On the other hand, economic governance may also lead to environmental pollution via the channel of poor governance depending on governance effectiveness. From the results, a percentage increase in governance effectiveness will result in a corresponding increase in environmental pollution of between 1.05% and 1.56%. Third, the result established that the effect of institutional governance on environmental pollution depends on the type of indicator under consideration. Explicitly, rule of law was found to exert a significant positive impact on environmental pollution with a range between 0.58%

and 1.04% while the coefficient of control of corruption suggests a decreasing effect on environmental pollution, with a range of 1.33% - 2.18% at a 1% level of significance. Regarding the fourth strand of empirical evidence, the result suggests that political governance only mitigates environmental pollution when the voice of accountability is given credence in the governance system of a country. Thus, the estimated outcome for voice and accountability posits a significant negative effect on environmental pollution.

Finally, the outcome for the control variables indicates a negative influence of renewable energy and economic growth on environmental pollution. A percentage increase in renewable energy and economic growth will account for a decrease in environmental pollution by between 0.14% to 0.22% and 0.51% - 0.60% respectively. This finding points to the undeniable beneficial environmental roles of renewable energy which have been emphasized and supported in many other extant empirical studies (Balsalobre-Lorente et al., 2018; Erdoğan et al., 2021; Balsalobre-Lorente et al., 2022; Gyamfi et al., 2021; Erdoğan et al., 2022; Ali and Amfo, 2021; Ali et al., 2022; Ali et al., 2022; Radmehr et al., 2022). The outcome of economic growth, on the other hand, contradicts the findings of (Ali and Amfo, 2021; Ali and Anufriev, 2020; Ali et al., 2022; Radmehr et al., 2022). However, trade liberalization on the other hand exerts a positive impact on pollution. Trade liberalization accounts for an increase in the environmental deterioration of about 0.85% - 1.31% with every percentage increase in trade levels. Thus, the results further corroborate the environmental challenges that have been increasingly induced by rising trade in our globalizing world as supported by several studies (Alola, 2019; Balsalobre-Lorente and Leitão, 2020).

### 4.3. Comparative analysis of the three economic blocs

Table 8, Table 9, Table 10 present the comparative analysis of the impact between our variables of interest on environmental pollution among the three economic blocs (BRICS, MINT, and G7 economies). The results from Table 8 show the comparative analysis between the three economic blocs for economic governance. The result reveals that the impact of political governance on environmental pollution varies from one economic bloc to the other. Indeed, financial development index exerts a negative impact on environmental pollution in BRICS and G7 economies without any statistical impact in MINT economies. Additionally, domestic credit to the private sector aggravates environmental pollution in two of the three blocs (BRICS and MINT) without any significant impact in the G7 countries. On the other hand, foreign direct investment only impacts negatively BRICS countries. For economic governance, the results reveal that regulatory quality exerts a negative impact on environmental pollution in BRICS countries while impacting positively on pollution in G7 nations. On the contrary, governance effectiveness promotes environmental pollution in all the three economic blocs albeit at different magnitudes.

Table 8. Prais-Winsten comparative analysis of economic governance on financial development-Carbon emission nexus:Dependent

Categorized	BRICS			MINT			G7		
	Economic Governance			Economic Governance			Economic Governance		
	EG	RG	GE	EG	RG	GE	EG	RG	GE
InFDI	-5.413*** (-6.41)	-5.779*** (-6.59)	-6.535*** (-6.81)	-1.146 (-1.28)	0.168 (-0.27)	-1.175 (-1.31)	-1.085** (-2.21)	-1.104** (-2.11)	-0.747** (-2.20)
InDCP	1.937*** (-4.55)	2.510*** (-6.24)	1.410*** (-3.11)	1.298* (-1.91)	-0.200 (-0.29)	1.323* (-1.95)	-0.084 (-0.25)	0.026 (-0.07)	-0.047 (-0.19)
InFDV	-0.026 (-1.48)	-0.033* (-1.73)	-0.047** (-2.20)	-0.019 (-0.98)	-0.017 (-1.25)	-0.021 (-1.10)	0.000 (-0.09)	0.001 (-0.29)	0.000 (-0.03)
InRG	-1.641*** (-4.07)	-1.191*** (-3.36)		-0.145 (-0.59)	0.030 (-0.17)		0.07 (-0.35)	0.355* (-1.8)	
InGE	1.016*** (-2.61)		0.345 (-0.84)	1.143*** (-3.31)		1.093*** (-3.23)	0.619*** (-3.03)		0.289* (-1.93)
InREN	-0.274*** (-6.74)	-0.259*** (-6.55)	-0.246*** (-6.41)	0.008 (-0.08)	-0.240*** (-3.13)	0.026 (-0.26)	-0.07 (-1.38)	-0.082 (-1.62)	-0.154*** (-3.59)
InTR	1.967*** (-4.65)	2.047*** (-4.55)	2.752*** (-5.22)	0.700** (-2.44)	0.433** (-1.96)	0.702** (-2.44)	-0.359 (-1.32)	-0.281 (-1.01)	-0.164 (-0.77)
InY	-1.769*** (-3.95)	-1.656*** (-3.67)	-0.594 (-1.39)	-16.714*** (-3.79)	-19.856*** (-4.75)	-16.509*** (-3.74)	0.532** (-2.52)	0.574*** (-2.74)	0.327 (-1.34)
Constant	39.950*** (-3.00)	33.549** (-2.53)	2.563 (-0.2)	507.126*** (-3.75)	615.522*** (-4.83)	500.466*** (-3.7)	-15.491** (-2.15)	-17.331** (-2.43)	-8.899 (-1.27)
No. of Observations	125	125	125	94	94	94	167	167	167
R-Squared	0.656	0.642	0.653	0.278	0.269	0.273	0.72	0.704	0.754
F Statistic									

Note \* 0.10 \*\* 0.05 \*\*\* 0.01 t stat in parenthesis.

Table 9. Prais-Winsten comparative analysis of Political governance on financial development -carbon emission nexus.

Categorized	BRICS			MINT			G7		
	Political Governance			Political Governance			Political Governance		
	PG	VOA	PS	PG	VOA	PS	PG	VOA	PS
InFDI	-6.094*** (-6.23)	-6.434*** (-5.65)	-6.260*** (-7.59)	-0.629 (-0.64)	0.053 (-0.07)	-0.462 (-0.49)	-0.953* (-1.66)	-0.957* (-1.91)	-0.995* (-1.92)
InDCP	2.989*** (-7.2)	1.702*** (-6.31)	2.991*** (-7.19)	1.768** (-2.23)	0.287 (-0.39)	1.372* (-1.86)	0.12 (-0.35)	0.089 (-0.26)	0.015 (-0.04)
InFDV	-0.035* (-1.76)	-0.052** (-2.25)	-0.031* (-1.68)	-0.045** (-1.99)	-0.021 (-1.35)	-0.041* (-1.89)	0.002 (-0.42)	0.002 (-0.50)	0.001 (-0.24)
InVOA	-0.066 (-0.52)	-0.047 (-0.37)		0.154 (-0.94)	-0.092 (-0.60)		1.646*** (-3.86)	1.065*** (-2.8)	
InPS	-0.708*** (-4.41)		-0.701*** (-4.39)	0.144*** (-2.64)		0.117** (-2.25)	0.512*** (-3.39)		0.311** (-2.38)
InREN	-0.241*** (-5.17)	-0.233*** (-5.12)	-0.253*** (-6.25)	-0.135* (-1.80)	-0.241*** (-3.37)	-0.165** (-2.30)	-0.024 (-0.51)	-0.080 (-1.62)	-0.070 (-1.44)
InTR	1.966*** (-4.3)	2.705*** (-5.16)	1.958*** (-4.26)	0.695** (-2.3)	0.494** (-2.04)	0.650** (-2.24)	-0.528* (-1.89)	-0.319 (-1.20)	-0.228 (-0.88)
InY	-1.618** (-2.34)	-0.854 (-1.28)	-1.3783*** (-3.45)	-19.764*** (-4.43)	-19.792*** (-4.61)	-18.887*** (-4.32)	0.801*** (-4.13)	0.667*** (-3.51)	0.740*** (-3.61)
Constant	29.306 (-1.39)	9.437 (-0.45)	21.991* (-1.81)	599.993*** (-4.41)	610.564*** (-4.67)	575.395*** (-4.31)	-26.303*** (-3.97)	-21.492*** (-3.34)	-22.648*** (-3.26)
No. of Observations	125	125	125	94	94	94	167	167	167
R-Squared	0.719	0.648	0.716	0.214	0.225	0.192	0.692	0.711	0.707
F Statistic									

Note \* 0.10 \*\* 0.05 \*\*\* 0.01 t stat in parenthesis.



Table 10. Prais–Winsten regression comparative analysis of institutional governance on financial development –carbon emission nexus.

Categorized	BRICS			MINT			G7		
	Institutional Governance			Institutional Governance			Institutional Governance		
	IG	RUL	CC	IG	RUL	CC	IG	RUL	CC
InFDI	-5.382*** (-6.00)	-5.617*** (-6.05)	-6.415*** (-6.87)	-0.324 (-0.34)	-0.194 (-0.23)	-0.135 (-0.15)	-1.186*** (-2.40)	-0.797** (-2.11)	-0.764** (-2.31)
InDCP	1.538*** (-3.26)	0.934*** (-2.88)	2.221*** (-4.35)	1.018 (-1.41)	0.894 (-1.27)	0.768 (-1.08)	-0.141 (-0.40)	-0.088 (-0.30)	-0.040 (-0.17)
InFDV	-0.000 (-0.05)	-0.005 (-0.34)	-0.047** (-2.17)	-0.027 (-1.37)	-0.026 (-1.41)	-0.024 (-1.34)	0.001 (-0.25)	0.001 (-0.28)	0.000 (-0.11)
InRUL	1.469*** (-3.92)	1.205*** (-3.49)		-0.021 (-0.09)	-0.036 (-0.16)		0.068 (-0.25)	0.218 (-1.14)	
InCC			-0.472 (-2.17)	0.025 (-0.1)		-0.012 (-0.06)	0.583*** (-2.67)		0.207 (-1.54)
InREN	-0.377*** (-6.99)	-0.413*** (-8.26)	-0.210*** (-3.93)	-0.227*** (-2.74)	-0.233*** (-2.87)	-0.228*** (-3.11)	-0.063 (-1.20)	-0.142*** (-3.13)	-0.162*** (-3.75)
InTR	1.8629*** (-4.46)	2.0529*** (-4.64)	2.4982*** (-4.92)	0.5721* (-1.89)	0.5469* (-1.94)	0.5287* (-1.89)	-0.4345 (-1.53)	-0.200 (-0.84)	-0.1526 (-0.74)
InY	-0.8149 (-1.48)	-0.3437 (-0.63)	-1.0857** (-2.21)	-20.1085*** (-4.34)	-20.3295*** (-4.43)	-20.2503*** (-4.67)	0.5842*** (-2.72)	0.4444* (-1.89)	0.2955 (-1.14)
Constant	12.1709 (-0.75)	-0.0812 (-0.00)	14.921 (-1.06)	615.8793*** (-4.33)	623.5432*** (-4.44)	621.8317*** (-4.69)	-16.2561** (-2.19)	-12.9660* (-1.69)	-8.8494 (-1.07)
No. of Observations	125	125	125	94	94	94	167	167	167
R-Squared	0.603	0.604	0.642	0.152	0.166	0.18	0.722	0.752	0.747
F Statistic									

Note \* 0.10 \*\* 0.05 \*\*\* 0.01 t stat in parenthesis.

With regards to the role of political governance in mitigating environmental pollution, the result in Table 9 suggests that the voice of accountability only exerts a significant impact on pollution in G7 countries with no significant impact recorded in BRICS and MINT economies. On the contrary, whereas political stability mitigates pollution in BRICS economies, it deteriorates the environment in both MINT and G7 countries. Finally, the comparative analysis for institutional governance as shown in Table 10 reveal that rule of law only exerts a positive impact on pollution in the BRICS economies, whereas the coefficient of control on corruption suggests no significant effect on environmental pollution for all economic blocs. Regardless, the coefficient of overall institutional governance suggests a negative effect on pollution in BRICS economies but a positive impact in G7 nations.

## 5. Conclusion and policy implication

### 5.1. Conclusion

This study investigates the financial development-government nexus from an environmental perspective across BRICS, MINT, and G7 economies. A comparative analysis of the variations in environmental impact was also examined across the three economic blocs by employing robust approaches to examine the panel dataset spanning 1996 to 2020. The outcome of the study is summarized into three strands. The first strand of the empirical outcome of this study reveals that financial development exerts mixed effects on environmental pollution when financial development index, domestic credit to the private sector, and foreign direct investment are considered. Specifically, the result revealed that the highest pollution-triggering effect is more visible from domestic credit to the private sector with lesser pollution impacts observed from foreign direct investment. On the other hand, the financial development index shows a cushioning effect on environmental

pollution. The second strand of empirical evidence reveals that economic governance promotes environmental quality by reducing environmental pollution through quality regulations. However, on the other hand, economic governance aggravates environmental pollution through non-effective governance systems. Thirdly, the environmental impacts of institutional governance are dependent on the type of indicator. We obtained pollution-inducing evidence for the weaker rule of law, while the control of corruption cushions pollution level. Regarding the fourth strand of empirical evidence, the result suggests that political governance only mitigates environmental pollution when the voice of accountability is given credence in the governance system of a country. Furthermore, the comparative bloc-to-bloc analysis shows that governance effectiveness promotes environmental pollution in all the three economic blocs albeit at different magnitudes while the voice of accountability only exerts a significant desirable impact on pollution in G7 countries with no significant impact recorded in BRICS and MINT economies.

## 5.2. Policy implication

Following the findings, some recommendations for policymakers of these economic blocs stand out. It is imperative to note that the mixed effect of financial development as made evident by its proxies both in the full sample and the individual economic blocs have some policy relevance. First, the mitigating effect of the financial development index on environmental pollution, both in the full sample and the individual economic blocs suggest that countries with higher financial development index have higher environmental quality. From the foregoing, it is important for policymakers to incorporate financial development strategies into national environmental policy instruments, especially for those in MINT countries. Second, the positive effect of domestic credit to the private sector on environmental pollution is an indication that such credit facilities to the private sector should be prioritized by policymakers of all the three economic blocs. That is such credit facilities should be limited to private entities that are environmentally conscious and have incorporated environmental mitigation strategies into their operations. This is to ensure that such credit facilities do not support operations that antagonize environmental quality.

Furthermore, the outcome of economic governance creates sufficient grounds for the following policy recommendations. First, the positive effect of regulatory quality on positive environmental externalities in the full sample is an indication that governments and global policymakers must strengthen global governance systems with regard to global environmental regulations via the incorporation of environmental regulations into mainstream governance structures of global organizations and institutions. With regards to the individual economic blocs, the mitigating effect of regulatory quality in BRICS countries is an indication that regulatory quality improves environmental quality. It is thus recommended that policymakers of MINT and G7 countries must toughen their environmental control

and regulations to discourage the growth of environmentally detrimental investment havens. Also, it is highly recommended that the economic blocs should put in place and strengthen any existing policy frameworks to ensure better accountability in environmental project execution and the public administrations for environmental gains. This is much more crucial especially for the MINT and BRICS economies as the voice of accountability only exerts a significant desirable impact on pollution only in the G7 nations.

Thirdly, considering the negative impact of renewable energy use on pollution levels across the three blocs the authority needs to leverage renewable energy production for a better environment by investing more in renewable technologies and providing adequate support for more research to further develop their renewable energy production capacity. Lastly, the three blocs must be conscious of the pollution-triggering effect of trade, and the authority need to ensure that fair trade deals are negotiated with trading partners in view of ecological protection and overall sustainability of the environment.

学科前沿快报

## 优秀文献荐读

**题名:** 数学建模在食品物流管理中的应用——评《食品物流管理》

**作者:** 白雪洁<sup>1</sup>, 许利军<sup>2</sup>

**机构:** 1. 河北农业大学理学院 2. 保定市农业局畜牧站

**摘要:** 食品物流管理作为现代食品供应链管理的重要组成部分, 对于确保食品质量、安全和高效流通至关重要。现代供应链通常涉及多个环节, 包括采购、生产、仓储、配送等。由于食品性质特殊(易腐、需求波动等), 食品供应链更为复杂, 需要进行更精细的物流管理。数学建模则为食品物流管理提供了工具, 能够帮助企业优化物流决策。由傅莉萍编著、清华大学出版社出版的《食品物流管理》一书, 介绍了食品物流的概念、活动和价值, 强调了食品物流的安全、质量和管理的的重要性, 并在此基础上系统分析了食品供应链各个环节的管理和运营, 包括食品采购管理、库存管理、保藏、包装、冷却与冻结技术、流通加工、仓储管理、冷链运输及配送管理等。该书旨在帮助读者了解食品供应链各个环节的运作原理和管理方法, 以确保食品的质量、安全和高效分发, 对于从事食品行业和供应链管理的人士具有重要实用价值。

**关键词:** 数学建模; 食品物流管理; 应用

**原文出处:** 食品安全质量检测学报. 2023, 14(19)



**文章链接:**

[https://kns.cnki.net/kcms2/article/abstract?v=IVku9qtM8H-J6E9KwCu6BIP9xFfu1TWzcWaqo79aRIIiPQROAhznarAdGjS68wTPT-Ibx\\_7WXYRywpHQnlN-\\_rScAknTDq7ywLgqTnwsNPSiFvHICSCFh\\_p0lngFQNoonhbYGVOM-DyI=&uniplatform=NZKPT&language=CHS](https://kns.cnki.net/kcms2/article/abstract?v=IVku9qtM8H-J6E9KwCu6BIP9xFfu1TWzcWaqo79aRIIiPQROAhznarAdGjS68wTPT-Ibx_7WXYRywpHQnlN-_rScAknTDq7ywLgqTnwsNPSiFvHICSCFh_p0lngFQNoonhbYGVOM-DyI=&uniplatform=NZKPT&language=CHS)

**题 名:** 社会系统论视角下实现碳达峰碳中和目标的法律对策

**作 者:** 曹明德

**机 构:** 滁州学院经济与管理学院

**摘 要:** 双碳目标的实现路径需要从政策表达转译为法律规范。气候变化问题的复杂性特征、双碳法律体系的系统性特征、我国社会治理改革积累的经验,以及社会系统论自身的方法论优势,决定了社会系统论是考察、形塑双碳法律体系的最佳理论工具。在社会系统论的视角下,我国既有的气候变化法制体系存在一定缺陷:综合性应对气候变化法缺位、双碳法律体系碎片化和不均衡,专项立法低碳化程度不足,以及政治和法律两种系统之间的结构耦合存在异化;规制工具上未充分实现管制控制规制与多元主体自我组织规制的协同;气候公正转型与能源正义在立法中整体表现不足。为了完善双碳法律体系,不仅应当遵循社会系统论的双重转译逻辑,以双碳目标为引领及时制定综合性应对气候变化法,还应当以重点领域为抓手有序健全双碳目标相关单行法律,尤其是气候公正转型补偿法律制度。同时,还应当注重促进政治系统和法律系统的良性结构耦合,并充分尊重双碳法律体系的功能有限性。

**关键词:** 碳达峰碳中和;社会系统论;双碳法律体系;应对气候变化法

**原文出处:** 中国法学. 2023(05)

**文章链接:**

[https://kns.cnki.net/kcms2/article/abstract?v=IVku9qtM8H8vF174Y3Kk16eyCFS-5tFCFUh4oWizOe4wHz920oV8aWg8je8RK1290rXWqr-Ni4351Pt6r7Ni7rEDCfGr6oN68-0M7-mt3EdnHCsa5-c5dLHmN4\\_YigqEXxfQ9B1x0KE=&uniplatform=NZKPT&language=CHS](https://kns.cnki.net/kcms2/article/abstract?v=IVku9qtM8H8vF174Y3Kk16eyCFS-5tFCFUh4oWizOe4wHz920oV8aWg8je8RK1290rXWqr-Ni4351Pt6r7Ni7rEDCfGr6oN68-0M7-mt3EdnHCsa5-c5dLHmN4_YigqEXxfQ9B1x0KE=&uniplatform=NZKPT&language=CHS)

**题 名:** 基于人工智能的网络安全研究

**作 者:** 马毅葳

**机 构:** 南京师范大学物理科学与技术学院

**摘要:**人工智能技术使得网络安全体系更加完善,抵御安全风险的能力更强。针对人工智能时代网络安全面临网络攻击越来越智能化、多元化、隐蔽性高、危害性大的特点,对网络安全的基础层、中间层和应用层进行功能需求分析。从人工智能的网络安全预警,防火墙,数据加密,机器学习等方面建立网络安全防御体系,提高网络安全保障。

**关键词:**人工智能;网络安全;防御体系

**原文出处:**网络安全技术与应用. 2023(11)

**文章链接:**

[https://kns.cnki.net/kcms2/article/abstract?v=IVku9qtM8H8J1Z0NamjLMWzJnj4-ZqLgQgLJpYasxra8D4GjvsmzekeuQjl\\_bgceqA82bGyPcLKR7ysdTVc3WitHFUn9lO4gtG7gBT6zbSyoqqg5tW4LnIWVvHIkMWOkh0DaubnPg=&uniplatform=NZKPT&language=CHS](https://kns.cnki.net/kcms2/article/abstract?v=IVku9qtM8H8J1Z0NamjLMWzJnj4-ZqLgQgLJpYasxra8D4GjvsmzekeuQjl_bgceqA82bGyPcLKR7ysdTVc3WitHFUn9lO4gtG7gBT6zbSyoqqg5tW4LnIWVvHIkMWOkh0DaubnPg=&uniplatform=NZKPT&language=CHS)

**Title:**

*How does digital finance affect industrial structure upgrading? Evidence from Chinese prefecture-level cities*

**Author:**

Xiaohang Ren<sup>1</sup>, Gudian Zeng<sup>1</sup>, Giray Gozgor<sup>2,3,4,\*</sup>

**Institution:**

1. School of Business, Central South University, Changsha, China;
2. School of Management, University of Bradford, Bradford, United Kingdom;
3. Faculty of Political Sciences, Istanbul Medeniyet University, Istanbul, Turkey;
4. Adnan Kassar School of Business, Lebanese American University, Beirut, Lebanon)

**Abstract:**

Digital finance is playing an increasingly prominent role in economic development. This paper examines the impact of digital finance on industrial structure upgrading based on panel data from 289 Chinese prefecture-level cities from 2011 to 2020. The paper adopts fixed effects, mediating effects, and spatial econometric models and the findings are as follows. First, digital finance development significantly boosts industrial structure upgrading in Chinese cities. The evidence remains valid after various robustness tests. Second, digital finance and industrial structure

upgrading exhibit positive spatial spillover effects. Third, digital finance indirectly affects industrial structure upgrading through innovation, entrepreneurship and the structure of household consumption channels. Fourth, the influence of digital finance is more significant in cities with more developed economies, less financialization and lower income inequality. Finally, among the sub-indicators of digital finance, the breadth of coverage plays the most significant role, inspiring policymakers and financial institutions to speed up the digitalization infrastructure in backward areas.

**Keywords:**

Digital finance Industrial structure upgrading Local government attention Spatial spillover effect Mechanism analyses

**Source:**

Journal of Environmental Management Volume 330 (2023) 117125

**Link:**

<https://webofscience.clarivate.cn/wos/woscc/full-record/WOS:000918479800001>

**Title:**

*Towards Innovative Research Approaches to Investigating the Role of Emotional Variables in Promoting Language Teachers' and Learners' Mental Health*

**Author:**

Ali Derakhshan<sup>1</sup>, Yongliang Wang<sup>2,\*</sup>, Yongxiang Wang<sup>2,\*</sup>, José Luis Ortega-Martín<sup>3</sup>

**Institution:**

1. Department of English Language and Literature, Faculty of Humanities and Social Sciences, Golestan University, Gorgan, 15759- 49138, Iran
2. School of Foreign Languages and Cultures, Nanjing Normal University, Nanjing, 210023, China
3. Department of Didactics of Language and Literature, Faculty of Education, University of Granada, Granada, 18071, Spain

**Abstract:**

The adequacy of language education largely depends on the favorable and unfavorable emotions that teachers and students experience throughout the education process. Simply said, emotional factors play a key role in improving the

quality of language teaching and learning. Furthermore, these emotional factors also promote the well-being of language teachers and learners and place them in a suitable mental condition. In view of the favorable impact of emotional factors on the mental health of language teachers and learners, many educational scholars around the world have studied these factors, their background, and their pedagogical consequences. Nonetheless, the majority of previous studies have employed traditional research methods in assessing these variables and their influences on language teachers' and learners' mental health. Because of the complex and dynamic quality of emotional factors, traditional research approaches often fail to evaluate these factors and their dynamic, non-linear connections with teachers' and learners' mental health and well-being. Accordingly, some novel research approaches are required to measure the dynamicity and complexity of emotional factors in language education settings. To address this call, the current state-of-the-art conceptual article seeks to provide new insights for investigating emotional factors and their potential impact on language teachers' and learners' mental states. This study also intends to offer a comprehensive list of emerging methods that take into account the complex and dynamic nature of emotional variables. Finally, the study outlines the potential implications of this review for educational researchers.

***Keywords:***

Complexity; dynamicity; emotional factors; mental health; well-being; innovative research approaches; second and foreign language education

***Source:***

International Journal of Mental Health Promotion 2023, 25(7), 823-832.

***Link:***

<https://doi.org/10.32604/ijmhp.2023.029877>

***Title:***

**A Survey on Federated Learning Systems: Vision, Hype and Reality for Data Privacy and Protection**

***Author:***

Qinbin Li<sup>1</sup>, Zeyi Wen<sup>2</sup>, Zhaomin Wu<sup>1</sup>, Sixu Hu<sup>1</sup>, Naibo Wang<sup>1</sup>, Yuan Li<sup>1</sup>, Xu Liu<sup>1</sup>,

Bingsheng He<sup>1</sup>

***Institution:***

1. National University of Singapore
2. The University of Western Australia

***Abstract:***

Federated learning has been a hot research topic in enabling the collaborative training of machine learning models among different organizations under the privacy restrictions. As researchers try to support more machine learning models with different privacy-preserving approaches, there is a requirement in developing systems and infrastructures to ease the development of various federated learning algorithms. Similar to deep learning systems such as PyTorch and TensorFlow that boost the development of deep learning, federated learning systems (FLSs) are equivalently important, and face challenges from various aspects such as effectiveness, efficiency, and privacy. In this survey, we conduct a comprehensive review on federated learning systems. To achieve smooth flow and guide future research, we introduce the definition of federated learning systems and analyze the system components. Moreover, we provide a thorough categorization for federated learning systems according to six different aspects, including data distribution, machine learning model, privacy mechanism, communication architecture, scale of federation and motivation of federation. The categorization can help the design of federated learning systems as shown in our case studies. By systematically summarizing the existing federated learning systems, we present the design factors, case studies, and future research opportunities.

***Keywords:***

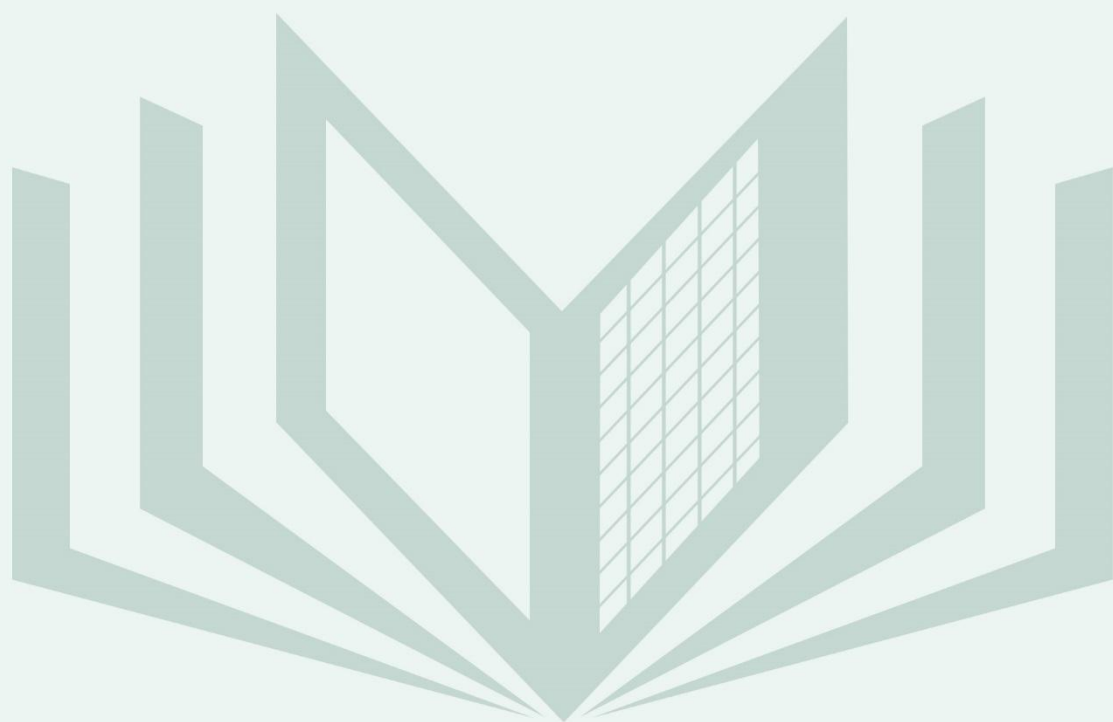
Federated learning; machine learning; data mining; survey

***Source:***

Ieee Transactions on Knowledge and Data Engineering, Volume:35, Issue4, Page:3347-3366

***Link:***

<https://webofscience.clarivate.cn/wos/woscc/full-record/WOS:000965299600001>



图书馆主页: <http://lib.sdtbu.edu.cn>

扫一扫，关注我!

